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Environment, Modernization and Development in East Asia

Perspectives from Environmental History

Edited by

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and

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To our families, for their patience and love

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Introduction—Environment, Modernization, and Development in East Asia: Perspectives from Environmental History

James Beattie and Ts'ui-jung Liu

Across East Asia, modernization and development projects continue to have great environmental and human impacts. Serious health problems resulting from pollution affect many Chinese, including those living in Beijing, whose 'airpocalypse' has attracted worldwide attention.[1] As a measure of its significance, in 2013, Premier Li Keqiang declared that only through 'the concerted effort of the whole society' could the problem be addressed.[2] Since then, government has made improvements to air quality, but sometimes at the expense of moving the problem elsewhere, through relocating heavy-polluting industries away from the capital, although recent efforts have also been directed at cutting pollution and restricting the number of registered cars.[3]

As well as health problems, pollution has major economic implications for such a rapidly industrializing country. China's 'staggering mistreatment of the environment', noted a perceptive commentator in 2004, 'may well be the most fundamental check on [the country's] … reach toward prosperity'. A decade ago, pollution was cutting an estimated ten per cent from China's annual gross domestic product (GDP) growth.[4] In 2010, even official estimates placed the cost to GDP of pollution at 3.5 per cent.[5] Pollution also provides a flashpoint for social unrest, as a result of which Xi Jinping's government has cracked down on both polluters and protestors against pollution.[6]

Nor is pollution by China simply China's problem. Pollution knows no political boundaries. In its rush for modernization, China—as the West did before it—is consuming ever more of the globe's scarce resources, whether minerals, animals, or agricultural products. It is buying up more and more agricultural land overseas, investing in new technologies, and trying to squeeze ever-greater productivity from ever-diminishing areas of cultivable land, which are being reduced by

environmental degradation. Despite impressive growth in the use of renewables over the last decade, China's environmental footprint is still spreading because of incredibly rapid economic growth. China's modernization is, in short, having a planetary effect. 'Since 2000 China alone has accounted for two-thirds of the global growth in carbon-dioxide emissions'.[7] As the recent G20 meeting in Brisbane (2014) demonstrated, without China, any hope of meaningfully addressing climate change, let alone successfully checking it, is ultimately doomed.

One of the particularly pressing issues of our age, then, is how China, but so too Japan and the Koreas more generally, will continue to industrialize. Will resource use and pollution in East Asia continue to accelerate? If so, China—and the world—will soon run out of resources. Or, will China and North and South Korea take a 'greener' path, reliant more on non-carbon-emitting energy sources which may enable these countries to mitigate the many environmental issues they face today? And what of Japan? If it chooses a non-nuclear path, what alternative energy sources can it utilize in the future, and how can it reduce emissions and its citizens' environmental footprints as it transitions to a post-industrial future?

Environmental history offers important long-term perspectives from which to understand the pressing ecological crises of today. The chapters in this volume examine East Asian modernization and development within the framework of environmental history. They place recent environmental and social impacts of development in a longer historical trajectory—from the 1700s to the early 2000s—than most studies on current environmental issues. *Environment, Modernization and Development in East Asia*'s longer-term perspective challenges the misapprehension—still apparent in some quarters—that development and an ethos supporting it only occurred in East Asia following the region's adoption and adaptation of various aspects of Western technology and manufacturing techniques. It also challenges the view that, if East Asian experiences differed from the West, they were somehow aberrant.[8] Instead, in taking its cue from recent debates on East Asian development,[9] this volume highlights Japan and China's often divergent paths of development from Europe and North America, including their often contrasting environmental outcomes, and the implications of these divergent paths for the region's human and environmental histories.

This volume also seeks to demonstrate the heterogeneity of local responses in Japan and China to development schemes and their environmental impacts. This means that it examines processes of adaptation, rejection, and accommodation to Western ideas of modernization. It also analyses the myriad of actors—elites, peasants, states, or

imperialist powers—and the myriad of influences—cultures, environments, philosophies—that have shaped East Asia's particular development paths and resulting environmental and social impacts. Not least, the volume recognizes environmental systems and human institutions as interlinked phenomena; that development cannot be understood without environment or environment without development.

In recognizing the heterogeneity of environment–development interactions, this volume forms an important reminder that, as imperial historian C. A. Bayly showed in *The Birth of the Modern World, 1780–1914: Global Connections and Comparisons*, the last two hundred years or more have been a period of increasing globalization, but not necessarily of uniformity, or, indeed, of the erasure of difference across the world.[10] *Environment, Modernization and Development in East Asia* shows that globalization has brought people together but also, through such factors as nationalism and localism, placed into starker relief differences both within East Asia and between this region and other areas of the globe.

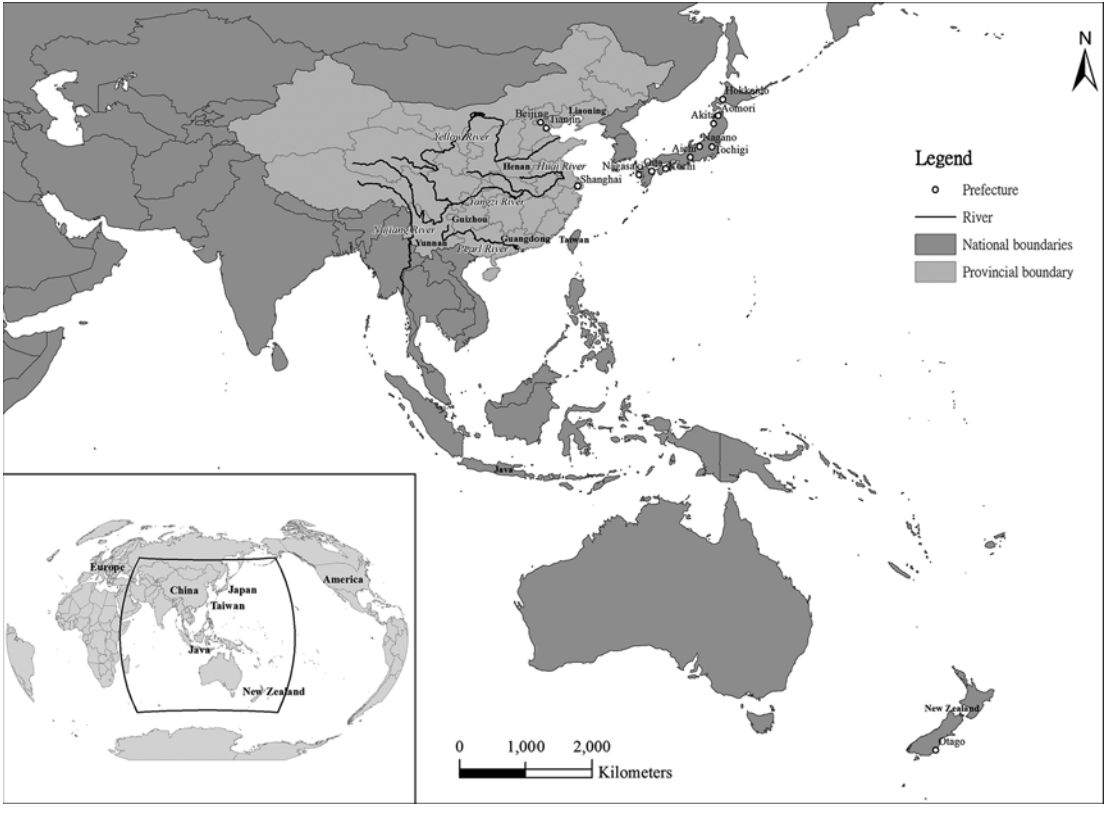
Environment, Modernization and Development in East Asia also brings leading up-and-coming researchers, together with established scholars of East Asian environmental history, to present to an English-speaking readership the latest scholarship on environment and modernization drawn from Chinese- and Japanese-language sources. (Korean environmental history barely exists, and we were unable to secure a scholar to contribute work on this region to our volume.)

Through its focus on development's environmental dimensions, this volume adds significant new perspectives to Chinese, Japanese, and global environmental history, as well as world history and development studies.[11] In doing so, it suggests new frameworks for understanding as interrelated processes environmental, social, and economic change. Also, it opens up new points of comparison within East Asia and among East Asia, Europe, and North America (Map I.1).

Before examining our particular approach and contribution, we first situate this volume in relation to English-, Japanese-, and Chinese-language environmental histories of East Asia. Our aim in doing this is twofold: first, to introduce readers to the very different trajectories and approaches of environmental history in East Asia, which is one of the key themes of this book, and, second, to make clearer the particular contribution of this volume to those debates.

East Asian environmental history in English

As world environmental historian John R. McNeill pointed out in 2010, Western scholars predominate in the writing of East Asian environmental



Map I.1 Major places discussed in chapters of this volume
Source: Thanks to Dr Ya-wen Ku for drawing this map.

history.[12] Over the last decade or more, Western-trained scholars have written many environmental histories of China and to a lesser extent Japan, but almost none on either North or South Korea. Dozens of new books have enriched the pioneering works on China written by Mark Elvin and Robert B. Marks, among others of the first generation of environmental historians of this country. Many of these early first works examined the environmental impacts of development—especially state growth and intensification of economic and agricultural activity consequent on market development. For example, Elvin's works demonstrate, as he most famously titled one of his articles, China's experience of 'two thousand years of unsustainable growth'.[13] Marks has, likewise, traced the linkages between marketization, economic development, and environmental change in South China over the *longue durée*.[14]

In contrast to these long-term perspectives, in 2010 McNeill claimed that despite the unprecedented ecological changes resulting from post-1960s industrialization, the period had failed to attract a great deal of attention from environmental historians of East Asia.[15] A number of exceptions come to mind of pre-2010 works which address this theme. Among several are Judith Shapiro's *Mao's War Against Nature …* (2001), on the subjugation of nature and people in China from 1949 until 1976, and Elizabeth Economy's study of water pollution, *The River Runs Black …* (2004). Since 2010, several other works have appeared on modernization and the environment, written both by established scholars and by what one may term the second generation of environmental historians of China. For example, Shapiro's *China's Environmental Challenge* (2012) examined, among several topics, state and citizen action, and offers a sober assessment of possible future trends.[16] Robert Marks' *China: Its Environment and Society* (2012), spanning ten thousand years of China's history, argues that many of the country's mid-twentieth century problems of modernization cannot be understood without reference to earlier challenges of development and environmental decline. A representative of the second generation of scholars, Micah Muscolino's *Fishing Wars …* (2009) examined piscine exploitation in late imperial and Republican (from 1912) China, while another of his books has considered wartime mobilization of people and resources as interlinked flows of energy, material, and organisms.[17]

Despite the richness of these recent works, there remains much truth in McNeill's characterization of the neglect of the post-1960 period by environmental historians. Writing on environment and development in China—and, indeed, Japan—in this post-1960 period has largely been undertaken by writers other than historians. While often

well-researched, lively, and provocative, their work often fails to place either Japan or China's experiences of development and environmental change within longer-term historical trajectories. Instead, most resolutely focuses on contemporary dimensions of issues like human-caused climate change, industrial pollution, or environmental protest.[18]

Such a lack of historical awareness can risk presenting certain phenomena—such as the idea of development or twentieth-century industrialization—as exceptional or without precedent, creating the impression of a marked break with prior trends or attitudes.[19] While this volume argues that the means, pace, and scale of modernization and its environmental and human impacts irrevocably changed in the twentieth century, it recognizes that there were nevertheless also both important continuities with past experiences of development and significant adaptations, as well as notable local differences, across East Asia.

Twentieth-century modernization schemes, especially post-1960, were often the means of establishing or shoring up nation-states and enhancing the power of elites through 'national development schemes'. Accordingly, many studies of modernization and environment have critically examined development and nation-building. Like most other works of environmental history, they use the nation as a framework of analysis.[20] Where *Environment, Modernization and Development in East Asia* differs from such approaches is in tracing regional interconnections and variations at a local level. A focus on locality highlights the complexity of modernization schemes and their environmental impacts, even within the same polity. This approach allows contributors to compare and contrast similar attempts at development, often involving the same personnel or models. It also enables them to discern when and to explain why local experiences bucked global or national trends (see the final section).

In contrast to Chinese scholarship, Japanese environmental history is of a much more recent date, and has benefited from the contribution of two remarkably prolific authors in particular. Until the 2014 publication of his environmental history of Japan, Conrad Totman had mainly worked on forestry, especially in the pre-industrial period.[21] He is also one of the few academics to have written on Korean environmental history.[22] Brett L. Walker is the leading scholar of the second generation of environmental historians of Japan. His first book on wolves in Japan contributed at once to agricultural history, identity politics, and animal studies. Another focussed on the social and environmental tensions of Japan's northward expansion from the late sixteenth to the early nineteenth century.[23] Walker's more recent, *Toxic Archipelago: A History*

of Industrial Disease in Japan (2011), sombrely chronicled the effects of Japan's industrialization over the last two hundred years.[24]

The current strength, breadth, and diversity of the field in Japan is evidenced by the ground-breaking volume, *Japan at Nature's Edge: The Environmental Context of a Global Power* (2013). Among several topics explored are maritime environmental history, pollution and health, animal history and urban history, literature, policy, and risk.[25] Yet, in contrast to both China and Japan, to our knowledge, aside from Totman, environmental history has hardly registered in North or South Korea. This lacuna remains a weakness of this volume, but also, we hope, a challenge for scholars of Korea to take up.

Chinese- and Japanese-language environmental history

We believe that understanding differences in the historical experiences of development in Japan and China enables us to better highlight several of the key themes of this book: first, that there were—and are—significant differences within each country's own particular environmental histories of development that can best be understood at a local scale; second, that Chinese and Japanese trajectories of development differ from experiences in North America and Europe; third, that interactions and comparisons across East Asia and beyond can usefully be examined at the local scale; fourth, that we need to understand Chinese and Japanese experiences of development and environmental change on their own terms—not necessarily by using the West as a referent.

As elsewhere, environmental history in China and Japan emerged partly in response to industrialization's very serious environmental impacts in the region, allied to a growing ecological and scientific awareness of these processes. Important political, social, economic, and environmental factors also contributed to differences in the character, focus, and approach of environmental history in both countries.

Environmental history in China written in Chinese has burgeoned in the last decade or more. For instance, in 2010 alone Chinese-language journals published some 280 articles on this topic. Most have focussed on environmental change and economic development, as well as animal and plant distribution and disappearance. Other popular topics include agriculture, water and land use, climate change and environmental ideas, and histories of diseases and disasters.[26] Several special journal issues have also appeared on the topic, along with some specially compiled volumes. For example, the collected volume *Environmental History: A Discourse of the History of Interrelationships Between Humans and*

Nature republished 28 articles from the journal *Academic Research*. The volume examined: environmental history, theory, and methodology (12 chapters); Chinese civilization viewed from an environmental history perspective (12 chapters); and the environmental history of world civilizations (four chapters). Most authors were Chinese scholars, except for J. Donald Hughes and John R. McNeill, whose articles were translated into Chinese.[27] Such a slew of publications indicates the growing popularity of environmental history in the Chinese-speaking world.

Modernization and development have also been popular topics of book-length investigations. For example, Wang Xingguang's long-term overview of China's agricultural and environmental history traced the origins of agriculture, farming, crops, tools, and technologies, right through to the Holocene warm period, and examines agricultural development in the Yellow River's middle and lower reaches.[28] For Taiwan, for example, in *Three Hundred Years of the Zhoushui River* (2014), Chang Su-Bing has analysed social and environmental changes alongside issues of development, such as water-control and flood-prevention engineering from 1898 to 1945. As well, the work examines social movements and struggles over water, and recent debates over whether to prioritize agriculture or industry.[29]

An insightful discussion illustrating some of the differences between environmental history in East Asia and North America, and within East Asia more generally, is Bao Maohong's Chinese-language work, *The Origins of Environmental History and its Development* (2012). Bao's perceptive worldwide overview of environmental history sought to introduce Chinese readers to environmental history's methodology and diversity. In it, Bao contrasted Western and Chinese approaches to environmental history, contending that, even though they have adopted an interdisciplinary approach as their primary methodology, Chinese environmental historians have insisted on applying a traditional narrative form of writing which tends to highlight the practical application of knowledge, rather than applying to or drawing from evidence any theoretical insights. To strengthen the field, he suggested that Chinese environmental historians needed to gain a better understanding of environmental science, pay more attention to contemporary environmental problems, and engage more with Western environmental scholarship, including taking up academic exchanges.[30]

Other scholars writing in Chinese have also raised methodological issues with Chinese environmental history. Notably, they have stressed the need for scholars to have a more thorough grounding in ecological sciences to enable them to assess the ecological plausibility of historical

facts; several other scholars have pointed out the need to convince the wider historical profession of the relevance of environmental history.[31] With regard to the latter, within the Chinese historical profession, modernization might well have been the burning focus of attention since the 1990s. And the topics of class struggle, revolution, and historical materialism might well have given way to vigorous debates on modernization and the need for modernization theory to account for China's unique experiences.[32] But, by and large, this great historiographical shift in China has focussed on social, political—and obviously economic—issues, with a corresponding neglect of the environmental dimensions of modernization, an oversight this volume begins to address.

In particular, many scholars writing in Chinese have suggested the need to develop new paradigms for Chinese environmental history.[33] Not all have agreed with this assessment. In 2013, Peter C. Perdue contended that Chinese environmental historians would be better served by standardizing methods to help forge comparisons between China and other countries to increase awareness of the dangers of continued environmental deterioration.[34] Other suggestions for broadening Chinese environmental history include developing regional environmental history,[35] or promoting examination of non-Chinese environmental histories, including accessing Manchu sources as part of the new Qing history.[36]

Like Chinese scholarship, Japanese-language environmental history has developed in leaps and bounds over the past decade or so. As in China, Japanese scholars, too, have attempted to define the field and encourage interdisciplinary collaboration. But unlike Chinese academics, who have favoured journal articles, Japanese scholars have tended to present their work in multi-volume overviews, a reflection of the different publishing cultures of the two countries.

In 2011, an important six-volume series covering the past 35,000 years of Japanese environmental history appeared. The first volume addressed the field of environmental history, and examined such topics as Japan's changing biodiversity, the wisdom of utilizing natural resources, and the feasibility of sustainability. The series' remaining five volumes presented a themed chronological discussion of, respectively: wilderness and plain areas; villages and forests; islands and seas; mountains and forests; and techniques for conducting environmental history research. Using environment as its organizing principle represented a novel departure from conventional approaches to Japan's history, which generally centre on periodization defined by particular governments or different forms of socio-political organization. Commonly,

Japanese history is divided into the categories of ancient, medieval, early modern, modern, and contemporary.

Another characteristic Japanese scholarships shares with Chinese environmental history is its multidisciplinary nature. For example, the 2011 series, mentioned above, drew on experts from biology, ecology, forestry, archaeology, environmental history, economic history, cultural anthropology, environmental anthropology, ancient history, and botany.[37]

A second collection on Japanese environmental history, consisting of a five-volume series, published across 2012–13, underlines the field's developing strength. Unlike the 2011 volumes, the more recent series adopted a more traditional chronological structure. The first volume employs modern scientific methodologies to interpret environmental change. Its chapters also explore historical concepts of nature drawn from agricultural production, resource exploitation of 'mountains, plains, rivers, and seas' (*san-ya-ka-kai*), traditional thought and religion, and ancient maps. As Volume 1's editor points out, understanding human–environment relations in Japan's history is necessary given the present environmental crisis. The four other volumes use more conventional periodization: ancient, medieval, early modern, modern, and contemporary. The last volume's thematic focus is modernization in relation to environmental destruction, production activities, changing concepts of value, and the societal impacts of the great earthquakes.[38]

Translating environmental history in Japan and China: pitfalls and potential

For environmental historians of Japan and China, translating Western concepts and ideas drawn from very different historical, social, and linguistic contexts into another language is a major challenge. Issues of translation from one European language or another into Chinese were thoughtfully considered by the extraordinary literary scholar, Qian Zhongshu (1910–98). Qian characterized

> both the language of the nation of the original work as point of departure and the language of the nation into which the work is translated as point of arrival. The path that leads between these two points is an exceedingly tortuous one and the original, buffeted by hardships and encountering every sort of peril along the way, will inevitably suffer loss or damage.

To this extent then, he wrote that: 'All translations … are, in part, untrue to their originals and serve to distort them. They either violate [both] the meaning and tone of these originals, or, at the very least, fail to quite match them'.[39]

Do difficulties in translating key terms from environmental history distort or even violate the meaning of the originals, as Qian suggests is commonplace with translation? Environmental history's terms and concepts differ markedly in East Asia and the West. To illustrate this and some of the problems which arise with translations, we discuss Chinese and Western constructions of 'nature'. In the West, the meanings accruing to 'nature' reflect very particular historical experiences: from ancient philosophical divisions between nature and culture onwards to evolving Christian thought about the role of humans and nature, and, more recently, to the particular interlinked developments of science, industrialization, and imperialism experienced from the nineteenth century. As Raymond Williams succinctly stated, nature is 'perhaps the most complex word in the [English] language'.[40]

Robert Weller has examined the pitfalls awaiting translators of terms such as 'nature' into Chinese.[41] As he notes, in the twentieth century an existing Chinese word—*ziran* 自然 or *da ziran* 大自然 (*da* means 'great'); in Japanese, *shizen* 自然—came to gloss 'nature'. While the meaning of its two characters—'spontaneously' or 'self-evidently'—overlaps with the secondary meaning of the English word 'nature', the Chinese (and Japanese) word

> does not touch on much of what 'nature' has come to mean in the West: the essential quality of something; the inherent force directing the world or humanity; the material world itself. Nor does it capture the opposition between nature and culture that has been so important in Western uses, especially since the Enlightenment.[42]

Other translators have chosen to gloss 'nature' as 'heaven and earth' (*tiandi* 天地). This means 'all aspects of the world apart from humanity', and recalls 'the modern Western distinction between nature and culture'. Yet, even then, Weller points out, *tian* 天 retains its original meaning pertaining to ethical order. Still other words—such as *shanshui* 山水 ('mountain and river')—for 'landscape' appear to offer better approximations in Chinese for Western understandings of landscape. But *shanshui*, too, is underpinned by a very different worldview than that expressed by the word landscape: *shanshui* reflects Chinese belief in the cosmic unity of things rather than differences between culture and

nature.[43] (Chapter 10 explores these different philosophical dimensions in greater detail.)

Investigating nature–culture interactions is of course a central focus of environmental history. As a discipline, it developed in the West amidst the crucible of the 1960s' and 1970s' protest movements, sparked in part by the work of ecologists in raising awareness of the interconnection of living and non-living things, and of the impacts of human activities on environments.[44] Environmental history relies on Western scientific models—especially from the ecological sciences—to explain and measure historical change. But Western science is a relatively recent introduction into China and Japan. In China, it only really gained traction from the later nineteenth century, and often through Chinese reliance on Japanese interlocutors to translate and understand Western scientific terms.[45] Even aside from issues of translation, very different political contexts have shaped its subsequent trajectory in China. In the 1960s, when ecological understandings were coming to the fore in the West and helping to play a crucial role in the development of the protest movement out of which environmental history emerged, Chinese intellectuals were suffering under the Cultural Revolution (1966–76).[46] As a result, until recently, ecological ideas were nowhere near as widely known in China as in the West.

How, then, has the term 'environmental history' been translated into Chinese and Japanese? Generally speaking, in Chinese and Japanese the same characters (though differently pronounced) are used to express the term 'environment'—*huanjing* 環境 in Chinese and *kankyō* 環境 in Japanese—and these have been applied to 'environmental history': *huanjingshi* 環境史 in Chinese and *kankyōshi* 環境史 in Japanese. These are all modern usages of terms for English counterparts. For example, traditional Chinese documents seldom employ the term *huanjing* to convey the modern meaning of 'environment'. Instead, ancient Chinese used 'mountains, forests, rivers, and marshes' (*shan-lin-chuan-ze* 山林川澤) to refer to what in English might now be termed the natural environment and resource utilization.[47] An additional challenge of translating 'environment' is that among Western environmental historians, the term itself is under-theorized and has only recently been subject to historical examination of its modern meanings.[48] As Libby Robin, Sverker Sörlin, and Paul Warde note: 'The idea of "the environment", and the prediction of a whole global system falling into degradation, emerged together', in the years following World War II.[49]

Other differences also characterize the practice of environmental history in China and North America. The crusading zeal with which

environmental historians have sometimes been tasked—especially in the United States—to expose environmental problems or to help change environmental policy is more difficult to realize in China. As Fei Sheng (Chapter 8) and others have noted, political sensitivities to criticism of state environmental politics—especially the risk of them spilling over into calls for reform of other areas of government—means that many Chinese environmental historians have focussed on ancient history. This is by no means a new approach among Chinese historians, but the political dimension does present particular challenges for those wanting to examine what the Chinese classify as recent Chinese history—that is, history of the last three or four hundred years. Political factors make it challenging for scholars in Taiwan and China to work on certain contemporary projects, too, but of course it does not preclude them from doing so, as this volume demonstrates.

National differences have also shaped the trajectory of environmental history in China and Japan. The dominance since 1949 of Marxist thought in China has meant that much environmental history in that country focuses on material and class relations.[50] While such a focus, as we note below, is now changing, environmental historians in China still tend to study as separate spheres—usually within national boundaries—the intellectual and material dimensions of their polity's environmental history.

In Japan, Bao Maohong has pointed out that environmental history there has transitioned from a history focussed on *kogai* 公害 (pollution and environmental degradation) to agriculture-focussed environmental history, and subsequently to an environmental history that emphasizes *bummeiron* 文明論 (civilization discourse). This transition, he argues, reveals a changing environmental consciousness within Japanese society and reflects an academic adjustment to Japan's rising international position. Yet Japanese environmental history has also placed special emphasis on exploring the continuity and superiority of its own traditions of environmental culture, as a kind of national environmental exceptionalism.[51]

Aside from national differences, linguistic challenges throw up practical problems, sometimes precluding access to foreign-language texts and hence the latest Western scholarship on environmental history. A challenge particular to the People's Republic of China (PRC) is the relative lack of spending power of many of its universities compared to the West. This can often preclude travel and intellectual communication with other scholars in China, as well as with scholars overseas. It is pleasing to note that this is changing, through scholarships offered by

the likes of the Rachel Carson Centre, and visiting fellowships at institutions such as the Chinese Academy of Social Sciences, and Renmin University. As well, a regional environmental history organization—the Association for East Asian Environmental History (AEAEH)—was established in 2009, holding a conference every two years. Various environmental history centres in China are also helping the field to gain a stronger following. Nevertheless, despite challenges, we are optimistic the funding situation will change in the next decade or so. Given the present crisis within Western universities, it is entirely likely that within a decade, if not much earlier, China may well have the world's leading and best-funded institutions for environmental history.

Our discussion is not intended to argue that it is impossible for environmental historians writing in Chinese or Japanese to undertake environmental history. Far from it. Just as, for example, China's evidential learning found points of contact with the methods advocated by Western positivist historians of the nineteenth and twentieth centuries, so, for example, can the venerable discipline of 'historical geography' *Yange dili* 沿革地理 (*lishi dili* 歷史地理)—or for that matter history or philosophy—shape modern environmental history in China.[52] Our intention instead is to highlight the very different historical trajectories and contexts for environmental history in China and Japan as a way of allaying any misapprehensions by Western readers that environmental history in East Asia is simply the same discipline relocated, largely unchanged, from North America or Europe.

Chinese environmental historians are very aware of these differences, as well as of the need to bridge them. For example, in addition to Bao Maohong's work, Mei Xueqin's *A Prelude to Environmental History Research* (2011) introduced into China the scholarship of several—mostly American—environmental historians whose works have been translated into Chinese.[53] Several high-profile US environmental historians, such as J. Donald Hughes, who served as a visiting professor in China in 2013, and Donald Worster, as Director at the Center for Ecological History at Renmin University, have also been teaching and holding seminars and conferences introducing English-language environmental histories to Chinese students.[54] More work needs to focus on translating environmental histories from other parts of the world, as an American focus can be very limiting.

If Chinese scholars have shown such interest in Western scholarship, it is timely and appropriate, we think, for Western scholars to access Chinese- and Japanese-language scholarship. A starting point is provided in this volume. Ten of the 14 contributors write primarily

in Japanese or Chinese, while all but three teach at institutions in East Asia.

Structure and contribution

The previous two sections presented environmental history in China and Japan as a relatively new, but growing, area of study. It also highlighted how the methodological and historical differences within the region, and in comparison to North America and Europe, have shaped particular questions and approaches in East Asian environmental history. These particular questions and approaches reinforce the need for Western readers to try to understand East Asia's environmental history—and diversity—on its own terms.

In this respect, the volume makes several contributions to English-, Japanese-, and Chinese-language environmental history. First, it examines as interlinked the *cultural* and *material* dimensions of modernization and environment through the idea of co-production. Second, it explores comparative and transnational connections across parts of East Asia through analysis of local-level development schemes, state–human interactions, and their environmental impacts. A local-level focus reveals variations in experiences of development, and environmental and social change below a national level. Not only that, but it also highlights transnational connections and furthers comparisons between different localities. Third, selected chapters place East Asian experiences of development and environment within North American and European contexts. This is to stress the different paths to modernization and their environmental impacts; in addition, it offers an entry point for readers more familiar with Western scholarship.

As used in this book, 'modernization' refers to interlinked social, material, intellectual, and environmental changes associated with industrialization. This includes the application of science and technology to intensify the exploitation of resources, such as through application of artificial fertilizers and development of higher-yielding, genetically engineered crops. It encompasses mass production of goods using large-scale industrial manufacturing operations powered by coal, and later oil and other fuel sources. It also takes in a corresponding cluster of attitudes and ways of living associated broadly with the term 'modernity': including, but not limited to, a growth in leisure, separation of work and home, growing consumption, industrial labour organization, urbanization, mobility, mass literacy, and nationalism. This book follows broader scholarly understandings of modernity and

modernization in East Asia by recognizing differences in timing, extent, and characteristics across the region.[55] Crucially, it extends existing discussions by considering environmental factors in both retarding and making possible modernization.

The volume's chapters examine the period known as the Great Acceleration. This is shorthand for the rapid social, political, economic, and environmental changes associated with modernization over the last 200 years, an acceleration made possible through our consumption of fossil fuels. Indeed, such has been the unprecedented scale and depth of human environmental impacts on our Earth over this period—on everything from climate and geology to terrestrial and aquatic ecosystems—that some scientists are calling for a new geological period to be named to reflect this—the Anthropocene. The term recognizes that we now live on a planet whose energy systems and whose very geology are unmistakably shaped by human actions.[56]

This volume's examination of East Asian experiences during the Anthropocene is valuable for two reasons. First, as Mark J. Hudson has pointed out, very few scholars have examined this topic in relation to Asia. Second, as he notes: '[d]espite the global stage of the Anthropocene [having been reached] … its human players are embedded in local worlds, and the multiple, interconnecting scales of the Anthropocene are lived on the scale of everyday human experience in Asia as much as elsewhere'.[57] This book's chapters trace the local environmental and social implications of a shift from developmental schemes reliant ultimately on inputs of energy from the sun—trapped through plants and released through animal and human labour—to modernization schemes associated with the exploitation of fossil fuels. While this volume shows that fossil fuels enabled societies to break free from the energy limits imposed by a reliance on the sun, it argues that their use did not necessarily mark a complete break from prior attitudes or schemes encouraging development.[58]

In addition, *Environment, Modernization and Development* proposes that the commodification of nature has integrated local economies, societies, and environments, in turn, mobilizing labour, ideas, banking systems, organisms, and bureaucracies. It uses the term co-production 'for the proposition that the ways in which we know and represent the world (both nature and society) are inseparable from the ways in which we choose to live in it. Knowledge and its material embodiments are at once products of social work and constitutive of forms of social life'.[59]

The structure of the volume reflects this integrated approach, and the need to mark continuities with the past. It examines four key

themes: modernization and development in comparative perspectives (Part I); waterscapes: development, modernization, and society (Part II); landscape commodification (Part III); and reactions to development (Part IV). Although the sections explore particular kinds of environments or themes, each chapter examines the integration of peoples and environments consequent on modernization. In addition, several chapters offer a long-term perspective on environment and development in East Asia that highlights change and continuity over several centuries. For example, Chapter 3 presents a three hundred-year overview that illustrates that, after 1949, state modernization accelerated environmental change, but did not necessarily represent a radical departure from existing development trends, as many have argued.

This volume's focus on the material and cultural dimensions of East Asian environmental history is important because environmental historians of the region have often considered cultural and material aspects separately.[60] As an example of this integrated approach, Chapter 10 traces the material impacts of particular environmental values. Several other chapters also present new frameworks for examining the material and cultural dimensions of modernization and environmental change. In Chapter 7, Muscolino provides an integrated approach to consider war and environment, which, although a rapidly growing area of environmental history in general,[61] has received relatively little attention in East Asia.[62] Muscolino examines war-induced ecological disasters in Henan, northern China, and considers the mobilization of people and resources, along with the actions of climate, as interlinked flows of energy, material, and animals. His work also demonstrates how older energy regimes—in this case, stored water, and human and animal power—could be deployed effectively to fight an opponent (Japan) armed with the latest weapons manufactured by a military-industrial complex reliant on factories powered by fossil fuels.

The book's chapters also reveal the complexity of modernization and its diverse social and environmental impacts across East Asia. For example, Chapter 4—on southern Taiwan's indigenous Mudan communities—demonstrates that modernization schemes did not invariably disempower local people, as so often occurred. In fact, Shao-hua Liu and Shu-min Huang show that, to an extent, the southern Taiwan's Paiwan benefited materially from modernization. This finding complements Brett L. Walker's seminal work on Tokugawa Japan's expansion into Hokkaido, in which he shows that Ainu peoples actively encouraged the commodification of their resources and their incorporation into markets.[63] Liu and Huang's chapter presents

a somewhat different picture from Walker, although it is a difference of degree more than anything: unlike the Ainu, the Paiwan people did not ultimately lose all their lands, experience a total resource collapse, or become devastated by introduced diseases. Their experience was tied to the nature of the environment they inhabited as much as to the character of the people themselves. Chapter 5—on Japan's selection of national landscape sites—also traces the localization of international conservation ideas. Through commemoration of the transition from the Taishō (1912–25) to Shōwa (1926–89) periods, Thomas Jones demonstrates how the Japanese state simultaneously promoted characteristically 'Japanese' landscapes alongside 'modern' Western aesthetics and concepts of scenic beauty as measures promoting nationalism.

Chapter 3 also instances how local-level case-studies can complicate national generalizations. While acknowledging that the PRC radically reshaped social and ecological relations through programmes of modernization, Jianxiong Ma stresses the ongoing importance of local-level decision-making to local agricultural development post-1949. His findings directly challenge Shapiro's interpretation in *Mao's War Against Nature*, in which Shapiro characterizes this period as one involving the top-down imposition of centralized policies exploitative of both labour and nature, irrespective of local conditions.[64]

The comparative and transnational dimensions of development are also pursued through the book's local-level studies of Japanese imperialism. Chapters on Japanese imperialism examine a range of different resources and topics: rice-growing (4), landscape preservation (5), cinchona development (6), and war and environment (7). The breadth of focus of the chapters facilitates the comparative and thematic consideration of similar processes of development involving different resources across China, Japan, and Taiwan. Together, the chapters expand existing studies on the role of modernization projects in Japanese colonial expansion by revealing how environmental factors impacted on colonial expansion and local economic development.[65]

While demonstrating how interlinked technologies and ideologies shaped the modernization of different environments, the chapters on Japanese imperialism also stress the importance of local environmental variations in complicating or even retarding development schemes. For example, Chapter 4 shows that while in many respects colonial modernization in Mudan, southern Taiwan, paralleled similar projects elsewhere, factors unique to the local environment, such as the variability of water supplies and a steep topography, restricted what modernizers

could actually achieve on the ground. This, together with the assertiveness of the local people, the authors suggest, may have militated the effects of colonization in this area. Likewise, Chapter 6 demonstrates that richly complex and varied climatic systems, coupled with local differences in topography, soil composition, and geology, undermined the scientific production of cinchona in the Japanese colony of Taiwan. In fact, Ya-wen Ku demonstrates that Taiwan's environmental challenges gave rise to competing models of scientific modernization. One, centred on Western models, used grafting and tree selection. Another drew from traditional Japanese afforestation methods involving cultivation of small areas rather than of large, terraced fields and which favoured low rather than high planting densities. Overall, this approach accommodated itself better to local environmental factors.

Japanese-led colonial development in East Asia reveals the importance of transnational approaches to understanding the region's environmental history, another theme pursued in this volume. Chapter 6 underlines the significance to Japan's colonies of scientific practices and organisms adapted from European tropical colonies, such as Java, while illustrating the policy's wider geopolitical motivation in light of global economic problems and the restriction by Western powers of Japanese access to cinchona. Chapters 2 and 7 also place East Asia in wider environmental and social contexts. Chapter 2 examines Cantonese environmental and economic impacts on New Zealand gold mining and the trans-local connections which sustained them, while Chapter 7 charts the wider social, ecological, and political impacts of Japanese aggression in North China.

The chapters on Japanese imperialism underline how the transportation of people, ideas, and organisms—as well as structures of control and military power—not only connected the region physically, but also reinforced the very idea of East Asia as a region, however unequally and problematically this occurred. The notion of the Greater East Asia Co-Prosperity Sphere (Dai-tō-a Kyōeiken 大東亞共榮圈) presented particularly problematic readings of the region's history, but nonetheless built on some existing cultural, institutional, and economic ties that were further shaped through imperialism's naked exploitation of people and resources.[66]

In different ways, all of the volume's chapters provide new perspectives on an enduring theme of recent East Asian history: the role of the state, along with cultural, religious, social, and economic factors, in promoting or inhibiting modernization.[67] For example, in Chapter 1, Gene Anderson's comparative survey introduces—and critiques—several

recent theories of Chinese development. His chapter argues that while China's population greatly stretched resources, China's particular trajectory of coping, from reliance on famine food manuals to the institution of local forestry programmes, arose from a complex interaction of ecological realities, and government and popular strategies. Like other scholars, Anderson focuses on environment and resource-use as key explanatory factors behind China's particular experience of development, but he also looks at regional and local differences within China itself. He points out that the country managed to feed itself by intensifying production, rather than—as in Europe—intensifying worker output. But without access to either easily obtainable resources necessary for industrialization or the resources of overseas colonies, Anderson shows, China struggled to modernize and reach beyond the limits of the biological old world and its reliance on inputs of solar energy.

Several other chapters in this volume add to debate on the role of the Chinese state and society in development and modernization. For example, chapter three stresses the importance of state support for agricultural reclamation and development on the Pearl River's sand-lands (also known as sand fields or polders) through the state's granting of rights to lineage groups. In this respect, Ma's findings reinforce Marks' observation that a key characteristics of China's agricultural development over the two thousand years preceding 1949 had been state support of farming.[68] Ma shows that lineage control of the agricultural sand-lands increased local power, a process that stopped after 1949. Yet, even with the development of a strong centralized state, Ma demonstrates the role of a group of local-level decision-makers recently empowered by the PRC. In contrast, Chapter 8 stresses the Chinese government's ability to control that country's great many environmental groups, but cautions that this may be unsuccessful in the long term unless effective measures are taken to address pollution and the inequalities associated with modernization. Sheng Fei also presents a complex and nuanced picture of Environmental Non-Government Organizations (ENGO)–government relations by examining their differences in size, aims, location, and financial and institutional support.

Several other chapters add new perspectives to state modernization schemes and their environmental impacts. For example, in Chapter 5, Jones demonstrates that state modernization in late 1920s Japan extended to developing new ideas about nature and nationalism.[69] He shows that an important aspect of Japanese modernization involved the creation of a new state lexicon of landscapes that later paved the way for

the development of national parks. Media campaigns mobilized people, encouraging them to select national sites at the same time as advertisements promoted domestic and international consumption of the same landscapes through tourism. In this respect, state-private initiatives worked in concert. Private tourist infrastructure—extending to the construction of roads, railways, and accommodation—supported government campaigns promoting national landscapes. As Chapter 6 shows, too, state-private initiatives developed Japan's cinchona plantations in Taiwan. In contrast, other chapters showcase development schemes largely independent of state support. These include lineage investment in, and knowledge of, commercial enterprises in nineteenth-century South China (Chapter 3) and the British Empire (Chapter 2), and state–private partnership in industrialization schemes in twentieth-century Taiwan (Chapter 9).

Another aspect of the 'governmentality' of nature—broadly conceptualized as the governance and control of resources and their use by states—pursued in the volume highlights the sometimes fragmented and limited power of the modernizing state, despite rhetoric to the contrary.[70] For example, Chapter 6 shows that in the 1930s different state organizations paired up with private Japanese companies to develop efficient methods of growing cinchona, yet relied on different and sometimes competing scientific methods. Chapter 9 demonstrates that from the 1970s local resource shortages, global economic recession, and protest sparked by the impacts of industrial pollution prompted Taiwan's government to abandon its policy of developing a heavy chemical industry.

Aside from its particular contributions to East Asian environmental history, our hope is that this volume will open up new comparative perspectives on global environmental history. Notably, we seek to add important East Asian perspectives to debates among global and imperial environmental historians and historians of science on the role of modernization, development, and imperialism as drivers of environmental change.[71] Several chapters do this by directly pursuing comparisons with Europe and North America, not because the West represents the litmus test of all experience of modernization elsewhere, but in order to compare, contrast, and open up broader themes for further analysis. For example, Chapter 1 compares modernization in China and Europe by critically assessing recent historical interpretations of this process, while Chapter 2 opens up a new area of British imperial history and Chinese environmental history by tracing the environmental and modernizing activities of Chinese migrants in one part of the British Empire.

Chapter 5 explores similarities and differences between Western and Japanese landscape protection and national development. Chapter 6 examines Japan's botanical imperialism through the exploitation and development of cinchona plantations—a topic largely neglected by Western scholars. Chapter 7 illustrates the importance of the United Nations Relief and Rehabilitation Administration in China's post-war recovery under the Nationalist regime's Chinese National Relief and Rehabilitation Administration. And Chapters 8 and 9 respectively contextualize the role of Western ENGOs in China and place Taiwan's post-war ecological modernization within Western experiences.

In drawing these comparisons, this volume challenges the Eurocentrism still inherent in some global and Western environmental history. In searching for possible intellectual bulwarks against our present crisis, some European and North American writers and thinkers, have put forward romanticized (and often inaccurate) interpretations of 'Asian' philosophical traditions seemingly in harmony with nature.[72] Chapter 10 challenges this perspective by presenting a clear and engaging argument for the relevance of Daoist thought to global issues of consumption and environmental degradation. As Yim-tze Charles Kwong notes in this chapter: 'The nature–society relationship was thus management-oriented, through which the environment would be made to "operate" better even though it turned out to be ineffective'.

We hope that this collected volume will provide stimulating insights into East Asian environmental history by placing Japanese-, Chinese-, and English-language scholarship within global debates on the environmental dimensions of development and modernization.

Notes

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Part I
Modernization and Development in Comparative Perspectives

1

Agriculture, Population, and Environment in Late Imperial China

E. N. Anderson

From the early Ming to the late Qing, China's population grew from perhaps 100 million to over 400 million. This raised population density to previously unknown levels, stretched the capacity of the food production system, and stressed the wider ecological support system. Unsurprisingly, famines became more common, and eventually devastating, as Lillian Li's magisterial *Fighting Famine in North China* shows.[1] Yet the amazing thing is that China succeeded in feeding most of its millions, most of the time. Agriculture intensified, charity and famine relief developed, transportation mostly kept pace. The environment by 1900 was battered and bruised, with massive deforestation causing large-scale flooding, soil erosion widespread, and diseases of humans and crops endemic. Although severely depleted in places, there was a vast expanse of productive, well-managed land, and hardly any extinctions. Other areas of the world had similar successes, but not on such a scale.

China's environment, already battered by everything from thousands of years of farming to the ironmongery and printed-book booms of the Song Dynasty,[2] subsequently suffered many further insults. The worst problem was beyond China's control: the Little Ice Age (*c.*1300–1850) dropped global temperatures to their coldest since the previous Ice Age—the Pleistocene (1.8 million years to 11,700 years Before Present). The Little Ice Age drove the monsoon so far south as to plunge China's north and northwest into drought. Population increase, government stasis, and progressive damage to the environment by local cultivation and water management brought about environmental decline, though less than one might reasonably expect, given the challenges and given that China continued to rely on biological, rather than fossil fuel, inputs to feed its population. The real glory of China is that its people

did manage to feed themselves for thousands of years. The real sorrow of China is the constant curse of famines that supervene whenever war, flood, or drought affects rural life. The incredible effort and success of China's farmers in the face of countless challenges deserves to be emphasized.

Interlinked environmental, social, demographic, economic, and geopolitical dynamics contributed to China's nineteenth-century ecological crisis, but with differential regional variations. Paying attention to these regional variations and complexities helps modify many leading theories of China's development and modernization in relation to the West. The first five sections examine the importance of population, agriculture, markets, and the state in shaping development and its environmental impacts. The last two sections provide case studies of the lower Yangtze Valley and famine relief to illustrate the impacts of the above factors in contributing to the crisis of the 1800s.

Population growth

Conventional wisdom in Sinological literature sees institutional and technical checks on development imprisoning China in a slow-growth economy.[3] For many of these scholars, the brake on the economy was late imperial China's steady population growth. During the Ming (1368–1644), the population reached about 150 million by 1600.[4] Then growth was interrupted by the enormous crash during the Ming–Qing transition, when population fell by at least 25 per cent and possibly more. For most of its existence, the Qing Empire (1644–1911) encompassed a greater area and had a larger population than Europe. Qing population soon bounced back from the cataclysmic Ming–Qing transition losses: to '313 million in 1794 and an estimated 430 million by 1840.'[5] By 1800, Europe had 180 million people; Qing China had 250–300 million.

Population growth had profound impacts on agricultural growth and, by extension, the environment. Agricultural land per capita declined 43 per cent between 1753 and 1812 alone (the dates are set by the availability of fairly reliable figures). This was in spite of the steady, rapid opening of new farmland on all frontiers. William Rowe[6] believes labour had previously limited the Chinese agro-ecosystem's ability to intensify, but now land was the limit, and labour was poured into making it yield more. (In fact, the system had been intensifying for centuries, so labour was not a very dramatic limit, if it was a limit at all.) This is a variant of Ester Boserup's famous theory of agricultural intensification[7] and is also related to Mark Elvin's high-level equilibrium trap, which sees further

development in China checked by an inability of the economy to provide surpluses necessary to invest in technology to enable economic growth.[8] Rowe also notes Elvin's further development of a technological lock-in model.[9] Put simply, it meant China was stuck with a labour-intensive organic model.

Most literature presents a grim Malthusian crisis created by population increase: deforestation, unsustainable conversion of wetlands, desertification, the decline of wildlife, and other impacts.[10] All these and more did indeed occur and were horrific. Conditions by the early twentieth century were awful beyond modern imagination.[11] But somehow those 400 million usually managed to eat. Superior water management,[12] famine relief, forest control, rice field protection, access to New World crops, and many other creative and dynamic innovations were responsible.

Li Bozhong has pointed out that the effects of the new crops and cropping patterns introduced in the Song (960–1279) and Yuan (1271–1368) were not widely felt until the Ming, and thus Ming population and wealth could grow steadily in spite of that troubled dynasty's poor governance.[13] The Yangtze Delta and neighbouring areas flourished especially (see below, and Introduction map). Evidently access to this rich agricultural area was one reason the dynasty survived so long. In the Ming total yields per farm stayed about the same,[14] meaning that although the size of landholdings shrank, the combination of higher yields and better measures to maintain agricultural productivity meant that people could survive.

In the late imperial period, overall, population grew, but the idea that China 'always' had a huge, fast-growing population is a myth. China's population, and its rate of increase, remained comparable to Europe's through most of this period.[15] Until the late nineteenth century, China was less densely populated than the United States is today. Only when China's eighteenth century brought peace, and Europe's birth rate declined (and declined more in the nineteenth and twentieth centuries), did China's forge ahead. Even then, China's nineteenth-century rebellions reduced population so much that whole regions were left with a shortage of labour,[16] leading to much more favourable terms for farmers and workers. China's nineteenth-century population dip released land and capital for development, especially in the lower Yangtze region, the country's richest region and one of the hardest hit by the Taiping Rebellion (1850–64; see last section).

Population pressure, then, is not a valid explanation for differences between China and Europe. One must always explain why population pressure builds up in the first place. One must then explain why people

picked one particular method of dealing with it as opposed to other possible ways. Rising population certainly drove ecological degradation in China, but other choices were possible, and were in fact adopted locally. The Chinese were aware of environmental problems,[17] and did a great deal to prevent them—by planting trees, maintaining forests, maintaining dikes, and when possible keeping them low and their channels deep (as famously directed by the Li family engineers in ancient Sichuan). True remedies were, however, beyond China's administrative power. There simply was not enough government expertise or enforcement capability.

James Lee and Wang Feng have argued that China was not up against true Malthusian pressures, even in the late nineteenth century. Infanticide was widely practised—especially, perhaps, in the most densely populated areas.[18] In some areas up to a quarter or more of girls were killed, and toward the end of a completed family—when the mother was too old for much further hope of a son—even higher rates were observed.[19] The selective elimination of female babies disproportionately reduced overall birth rates. Lee and Wang also mention abortion, although Matthew Sommer has pointed out that abortion was rare in traditional China,[20] which accords with my research findings of 40 to 50 years ago. As a result, over its history, China may have had at least 20 per cent fewer people than if everyone had as many children as they possibly could. A Chinese woman married at 20 and living to menopause could expect to have six children—Lee and Wang find the figure remarkably consistent over history—as opposed to seven to nine in the West in the same period.[21] Although their research has been challenged,[22] Lee and Wang note a striking shortage of descendants even in noble lineages, where there was every pressure to have children.[23] They also note high adoption rates. Less credibly, they allege that male heads of households had total authority, albeit qualified by heavy responsibilities.[24] Lee and Wang maintain that fathers could both abstain from sex themselves and make sure their sons and sons-in-law did—thus keeping fertility rates low. Moreover, Chinese began producing children sooner and ended reproduction later than in Europe.[25]

Their interpretation runs true to stereotype, but against all evidence. In fact, there were plenty of men, and plenty of male sex drive, but relatively few women to bear children. Selective infanticide and neglect kept sex ratios imbalanced, though to highly variable degrees in different parts of the country. Thus men often married late or not at all. Polygamy made it even harder, though Lee and Wang note that polygamy was rare—one in ten among the high elite, but only one in a thousand marriages among the rural poor. My surveys 40 to 50 years

ago found fewer than one in a hundred. My surveys were among middling people—some rich, some poor, most making an adequate but not good living. Only the rich could afford two wives, and even then most actually remained monogamous.

Chronic disease, malnutrition, and other killers took a heavy toll, but from the early Qing the principles of public health were known, and new child-care manuals devoted increasing attention to the values of breastfeeding, the proper introduction of solid foods, and other issues of care; in addition, smallpox vaccination was practised widely.[26] Readers will be aware that the Chinese, not Jenner, invented smallpox inoculation; he learned it from them. Breastfeeding was indeed normal and kept on for two years or more. In short, Lee and Wang's conclusion that '[a]s a result of China's long history as the largest national population and the most densely settled nation, the Chinese evolved a demographic system early on of low marital fertility, moderate mortality, but high rates of female infanticide, and consequently of persistent male celibacy'[27] is much contested.

By the mid-eighteenth century there may have been 500 persons per square kilometre of cultivated land in China's densely populated areas—mainly the south and southeast. Western Europe had only about 70 per square kilometre at the time.[28] The Chinese figure, however, misses a lot of cultivated land in back regions with low population densities. Conversely, parts of Europe—Holland, Denmark, the Po Valley, and others—almost reached Chinese levels of density. Contrary to earlier views,[29] cultivated acreage increased considerably in the remote regions of Manchuria and the montane southwest. Population grew rapidly here, slowly in most of China, and not at all in the desperately crowded central-east.[30] The central-east became an enormous area from which migrants moved to the other parts of China, but also to Southeast Asia and even farther afield (chapter two).

China's population increased from 150 million in 1700 to 300 million in 1800, and perhaps 430 million by 1840. It dropped back sharply because of the Taiping and other rebellions, but rose again to the famous '400 million'—a figure proverbial in the Western world in those days—by 1900.

Ming-Qing agriculture

If anything, agriculture enjoyed even higher prestige in the Qing than in earlier dynasties. The Manchus took seriously the Confucian worship of that activity. As Gang Deng's magisterial survey of China's

agriculture shows, especially in the Ming and Qing, China's agriculture was astonishingly productive, and ahead of the rest of the world.[31] Cultivated area by the late Qing reached almost a billion *mu*—about 60 million hectares. Yields were extremely high, with wheat running between 0.7 and 1.5 *shi* per *mu*, and rice typically around three, but also up to an incredible six to seven *shi*.[32] Three *shi* per *mu* would work out to about 2,600 pounds per acre or 2,900 kilograms per hectare, very respectable yields by pre-modern standards. Six or seven represented heights unprecedented and, to my knowledge, previously unrecorded in traditional grain agriculture. Non-modernized rice agriculture in twentieth-century South China normally returned per crop about 2,500 pounds per acre or 2,700 kilograms per hectare, levels of productivity not reached by American grain farmers until well into the twentieth century—and they were reliant on fossil fuel inputs, including mechanization, high-yielding varieties, and synthetic fertilizers. In late imperial China, fibre crops also spread, and commercialization of production of thread and cloth reached 'capitalist' levels. Shi Qi and Fang Zhuofen call this 'embryonic' capitalism.[33]

Reclaiming land in polders—sometimes also called 'sand fields'—and the cutting of new canals, rechannelling rivers, and other enormous projects were critical to late imperial Chinese development (chapter three).[34] Their scale was breath-taking. An engineer's autobiography from the mid-nineteenth century describes hundreds of people swarming like bees to dig a new canal.[35] The intensity of work was comparable to the Netherlands' famed reclamation, but on a much vaster scale. Janken Myrdal notes that in China this required a strong state and one that had a fair amount of legitimacy, sufficient to make people work together without unbearable friction.[36] In the Ming, attempts were made to extend wet-rice agriculture to North China, even the areas around Beijing. Of course, this was climatically difficult, if not impossible, especially during the Little Ice Age. Moreover, the flood-prone, sandy rivers were not good for irrigation, as Chinese scholars of the time pointed out.[37] And nor were Northerners accustomed to working with rice; also, their farms were too large for intensive cultivation. However, much effort was expended and much rice was actually grown.[38] This is a tribute to the quick-growing varieties of rice introduced in the Song. Rice-growing around Beijing was soon abandoned.

Despite these changes, China's great novel—at once romance, social, and cultural critique and much more besides—the eighteenth-century *Story of the Stone* shows that not all was well. A recent and extremely insightful study by Zhou Yichun shows that Cao Xueqin, the author,

consistently casts a sardonic eye on agriculture and farmers, and portrays his elite protagonists as holding both in varying degrees of scorn and ridicule.[39] This scorn was noted and at least sometimes disliked by other Qing authors. Evidently Cao touched a nerve—here as in almost everything else he wrote—and people were well aware of mixed attitudes toward farming. This partly explains the Qing state's policies favouring agriculture yet its lack of real energy about modernizing it.

Careful observers of China's food and population problems in the Qing and the early twentieth century focus not on crude Malthusian stories, but on the nature of growth. China's development before the Communist period (which began in 1949) was always 'biological' in the term of Yujiro Hayami and Vernon Ruttan.[40] It was reliant on natural energy inputs to grow wheat, to feed people, to drive the tides. People applied more and more organic fertilizer, worked harder and harder, introduced new crops, learned better cultivation and management techniques—all of which increased output per acre, and output per factor input, much more than they increased output per worker. It is doubtful whether output per work-hour increased at all. Lee and Wang point out that individuals were more productive, and did eat better, but this appears to be the result of working both harder and smarter. They note, for instance, that women 'increasingly joined the main labor force.'[41]

By the mid-Qing, the borrowings from the New World—crops like maize and sweet potatoes came in the sixteenth century[42]—were finally having their full effect. Maize 'was grown in 11 provinces' by the late Ming;[43] both spread rapidly in the Qing, becoming important in mountain settlement areas. Sucheta Mazumdar's work dramatically confirms and extends our knowledge of this.[44] Among other attributes, New World crops allowed Chinese cultivators to continue to live as small independent farmers. The new crops also fed a sustained population increase that still continues. As William Rowe points out, 'New World food crops such as potatoes, sweet potatoes, and peanuts … served as brakes on starvation during harvest failures of the more preferred staples, rice and wheat.'[45] Maize was even more important. All the crops also allowed cultivation of uplands and sandy soils, thereby extending the range of available crop-producing areas. Moreover, chillies, tomatoes, papayas, New World squash (*nan gua*), and similar crops had truly revolutionary effects on vitamin nutrition in the warmer parts of the country. They removed a serious roadblock to population increase by providing readily grown, easily stored sources of vitamins A and C.

In contrast, increases in agricultural productivity in the Western world were due largely to opening up new lands, including in new colonies.

It later relied on developments in mechanization and industrialization, such as the use of artificial chemical fertilizers. There were places where both output per worker and output per acre increased—such as, among other areas, in Denmark, the Low Countries, and parts of England and Italy. However, in general, in the Western world, output per worker soared, but output per acre was stagnant until the rise of hybrid seed varieties and other biological improvements in the mid-twentieth century.[46] Thus, Qing China was involuting while the West was industrializing.[47] Immanuel Wallerstein argued that Europe's low productivity per acre forced Europeans to seek new lands overseas, while China could simply intensify, or involute.[48]

Modern authors like Ramon Myers, Kenneth Pomeranz, and Bin Wong have stressed China's many advantages in population, resources, productivity, learning, and organization, even as late as the seventeenth and eighteenth centuries.[49] They point out that China kept up with Europe, or most of it, in the growth of markets, with people responding rationally and the state often doing what it could. They have done much to demolish the idea of European exceptionalism. Li Bozhong also emphasizes the enormous increases in agricultural production and productivity and the other economic gains in the Ming.[50] Pomeranz feels that China was equal to Europe in production, productivity, and development until 1700, after which Europe forged ahead because of its maritime successes, its scientific tradition, and its cheap coal (at least in England—although, of course, China also has a great deal of coal).

Against Pomeranz, however, Philip Huang has reaffirmed his arguments for agricultural involution, arguing that China was so trapped by its intensive agriculture and high person-to-farmland ratio that few resources—whether land, labour, or capital—could be freed for development.[51] Huang argues from his work in the Yangtze Delta without reference to newly developed, pioneer fringes like Yunnan (in the southwest) and Manchuria (in the northeast) that produced greater surpluses.[52] Pomeranz has riposted to Huang,[53] and the debate has been joined by others.[54] The arguments have come down to misplaced decimal points, mis-drawn curves, and other minutiae, at which point they became beyond resolution with the data available at the time. Recent work suggests rather strongly that per capita GDP in western Europe was about twice China's—around US$1200 in today's dollars versus US$600—in 1700, and China remained at that level as late as 1820.[55]

A very important point, made especially by Albert Feuerwerker,[56] is that a steady-state economy with no possibility of dramatic growth led

to state and local policies based on that expectation—and thus very different from those of the modern world. Access to resources is also cited as an important point of difference between China and Europe in this period. For example, Pomeranz argues that Europe's coal and farmland, and to a lesser extent its metal ores and forests, gave it an advantage. Pomeranz also argues that China was as developed as Europe, in technology and in capitalist economic forms, till the eighteenth century. Yet China had its own coal and soils. In light of this, Bin Wong and Philip Huang have proposed alternative formulations that make the situation more complex.[57] They show that Europe lacked a huge lead in resources, and they reaffirm the conventional wisdom that Europe had pulled ahead of China well before the eighteenth century. Huang, like Ian Morris,[58] points out that Europe's sparser population allowed more feeding, and thus use, of animals, and so productivity per person was greater. One must add, here, that productivity per hectare was correspondingly very much less in Europe—a real problem.

Victor Lieberman notes that the English agricultural worker had 45 times as much land as his Chinese equivalent in 1800,[59] but, of course, China's was far more productive. England's farmland produced about 500 kilograms per hectare per year at the time; North China produced little or no more than that, but southeast China could run 3,300 kilograms per hectare per year, with triple-cropping and a routine rate of 1,100 kilograms per crop. Moreover, much of England's farmland was pasture and hay crop for animals. This was not true of China. Further, the price of labour was low, especially in nineteenth-century China. The vast majority of Chinese lived on a bare subsistence wage. Starvation was probably the commonest cause of death, as it certainly was later.[60] In respect of this, Pomeranz is on very shaky ground in maintaining that China still had parity and a good shot at keeping up with Europe as late as the eighteenth century. Another factor was China's partible inheritance system, which meant land was continually broken up into smaller parcels, though there were ways around this, especially corporate landholding by lineages. Western Europe's primogeniture kept lands together (where it happened), and 'liberated' younger sons to seek their fortune on the seas and in the colonies, a boon to the development of the latter if not always to the sons themselves.

Certainly, not all areas of China were poor and densely populated. Surpluses could be, and were, extracted. One may remember Victor Lippit's old—and too long ignored—finding that China's countryside could produce an enormous surplus of food and capital in the 1950s, in spite of denser population and a much more degraded environment

than the Qing faced.[61] Peace and order allowed an explosion of productive forces; expropriating landlords freed much of the resulting production for public use. The same could clearly have been done in the Qing, had it been politically feasible. In China, some people were well paid, and levels of living were not abysmal for everyone. Under the circumstances, it could be argued that capitalism, science, and technology require a new mind-set, rather than a rich peasantry. Change was impressive and important in Ming and Qing China, but much of it was driven by governmental desire to centralize and take ever more power, rather than by development in the modern sense. Local individuals and regions might resist, but they could, at best, only slow down and dilute the rise of autocracy.

Markets

As Helen Dunstan has shown in her translations of eighteenth-century documents on trade and famine relief, Qing officials had a very lively sense of markets, including of supply-and-demand economics and the values of liberalism. These Qing officials debated mixes of national and local policy against allowing the market freedom to determine prices, and they came to wise and sensible conclusions that often worked in theory, though often failed in practice. Even the Qianlong Emperor (1711–99, r. 1735–96) briefly weighed in on the side of letting the market state the exchange rate of silver bullion to copper coin.[62] In China, free market positions as cold-blooded as any expressed in Charles Dickens' novels were denounced in similarly Dickensian terms—which meant someone really held them. Dunstan, sympathizing with a more paternalist side, calls these efforts 'rudimentary',[63] but they were not; in fact, they were not far behind Western economics before the development of the free-market ideas of Adam Smith in the late eighteenth century. Dunstan's subsequent work found that many free-market arguments were raised regarding hoarding, transport, ever-normal granaries, and other state policies, but state regulation eventually triumphed and was needed.[64] The ever-normal granary was a very old Chinese security measure: the government maintained a grain reserve, replenishing it in good years, doling it out as relief in bad ones. In spite of the obvious difficulties of managing such a plan in imperial times, this institution survived and provided at least some benefits throughout much of Chinese history.

Chinese awareness of how to manage economic policy has to be counted as another factor in eighteenth-century Chinese success at

feeding its rapidly growing population. By the late Ming, China's agriculture was widely commercial.[65] The North grew cotton, and by the late Qing many villages were specialized cotton producers who had to buy food.[66] The South grew rice and raised silkworms, the latter often because families had insufficient land for subsistence.[67] Other families sold vegetables, speciality herbs and foods, and even ornamental flowers and shrubs. The 'flowerland' (*fa tei,* Mandarin *hua di*) outside Guangdong, and elsewhere, was a vast world of ornamental nursery stock in the late Qing.[68] Markets flourished everywhere, and China's eighteenth- and nineteenth-century economy was highly commercial, with large capitalist firms.

The country remained a tributary empire, but 'sprouts of capitalism' existed;[69] they did not so much wither as grow into small trees in the shelter of autocratic rule. An economy based on trade and commerce in the Adam Smith tradition could not have arisen under those circumstances. However, rural families in China's more developed parts depended on markets to sell their key products and buy a whole range of needed goods, from metal tools and clothing to the services of the travelling rooster castrator and the village scribe. Steadily progressing commercialization allowed still further rationalization, intensification, and involution of the rural economy.

One effect of markets was to make the local economies more vulnerable to pests, because of the pressure to focus on one crop. Pests could spread like wildfire among crops and even more among silkworms. This was countered by maintaining genetic diversity, sometimes inadvertently (the pests selected for it without people knowing), but often quite deliberately. Rice varieties in the South, for instance, were incredibly diverse. Hong Kong's New Territories grew salt-tolerant ones that produced low yields, but commanded a higher price because of their better flavour; this value justified diking off the sea to construct polders. Similar local products occurred elsewhere, and kept China's agriculture diverse enough to survive without undue disasters.

Grain, taxes, and capital

'Taking grain as the key link'—an infamous campaign of Mao Zedong—had its ancestry in a Qing campaign launched by the Yongzheng Emperor (r.1723–35). In 1725, he wrote:

> I enjoy eating rice, and I never waste even a kernel. Rice is a gift from Heaven and nourishes the people. Because I love the people, I must

> respect heaven and take great pains to save and treasure rice … If I … waste food grain, Heaven will be angry, and our people will suffer calamities. I have heard that people in Kiangsi feed grain to the hogs. This is not appropriate behaviour … Avoid waste and love grain![70]

Alas, China today feeds a great deal of its grain to pigs, and in consequence has to import grain on a massive scale, driving up world prices and impacting on the world's poor. The old Chinese line 'Heaven will send calamities' is appropriate: the Chinese knew perfectly well that Heaven acted in response to human mismanagement of the rural landscape.

Pomeranz, like other authors, has recently stressed North China's vulnerability to floods, siltation, and other water problems, focusing also on the rapid growth of Qing population, as well as the limits to agricultural intensification except in the very richest ecosystems, in addition to the problems of progressive forest destruction on the internal frontiers.[71] Further, Pomeranz follows others in noting the consequences of Qing light government. In 1840, there was one magistrate for every 300,000 people. The ratios had been considerably higher earlier, but in the mid-eighteenth century were 'on average 1 per 100,000'.[72] That is a very low ratio, and these government servants were paid little, reducing their capacity to do much.

Taxes were low; figures for 1753 are quite comprehensive, and show levels of around half a *tael* to one *tael* (about 40 grams of silver) per *mu*.[73] A *tael* would buy rather more than a *shi* of rice. Yields of good rice land were high, as noted, with most areas double-cropped and some triple-cropped. Taxes were, at worst, a bit over a tenth of income. (Ten per cent was held as the standard for tax levels in the Qing Dynasty.[74]) Sometimes taxes were much lower, almost down to the classical Chinese ideal figure of three per cent, set by Emperor Jing (r. 156–142 BC) in the early Han.[75] Rent levels were similar. But when land taxes fell, salt and other taxes increased, so the state was not ruined.[76] J. L. Rosenthal and Bin Wong make the point that although taxes were low, the Qing undertook and maintained major public works—a result of generally peaceful times and relatively responsible governments.[77] This goes against the stereotype of the autocratic state (but see below). Of course, the rich paid much more, thanks to local taxes and above all to illegal squeeze. Significantly, Chinese farmers could not bear much more; they produced only about 25 per cent more than they needed for their families[78] and, as even very early writers pointed out, some could not even do that, because of poor land or physical disability.[79]

Ramon Myers and Yeh-Chien Wang's summary article describes a stunningly successful, rationalized, developed agriculture with highly sophisticated technology.[80] Farmers and writers realized that bean plants, ploughed in, restored soil fertility, as did bean cake fertilizer.[81] They knew the relative values of different kinds of dung, manure, and compost.[82] Efficiency of production, transportation, and processing all increased, at the same time as leasing arrangements, banking, and government policy were making it ever easier to trade in foodstuffs. On the other hand, rural wages (calculated in rice-buying power) declined as population rose.[83] The classic work of Kenneth Ruddle and Gongfu Zhong on the Pearl River Delta is relevant here in describing a system so sophisticated and fine-tuned that it seems beyond the reach of even modern computerized society.[84] Yet it flourished everywhere in the coastal deltas.

Much of China was involuting by 1800, certainly, but the system was still generating much wealth and showing considerable dynamism. The involutionists sometimes forget that cultivation was actively expanding in the southern and southwestern frontier, even as the old rice-growing areas were getting more congested. China's wealth continued to expand right up until the 1840s, when rebellions and famines began a course that in time would destroy the Qing.

Lieberman sees low taxation rates as emphatically bad in preventing China from having the resources to develop, rationalize, invest, and improve governance. He notes that the ratio of government administrators to people reached 1:21,750 by 1850; France's was 1:213 in 1825 and even the rest of Asia had far greater ratios.[85] I share with Pomeranz the view that low agricultural taxes are basically a good thing, allowing farmers to flourish, but this sort of ratio of governors to governed was indeed a problem by any standards.

Lieberman sees many of China's problems and successes as military related; this is part of his wider thesis that military challenges force states to improve the efficiency and competence of governance and revenue collection, but that constant warfare and violence inhibits development. For Lieberman, the 'protected zone'—the areas of Eurasia safe from Central Asian invasions—succeeded and developed rapidly, while the 'exposed zone'—the area hopelessly exposed to Central Asian war—was constantly being devastated. China and, for a long time, Russia were in an intermediate status. China was open to Central Asian invaders, but too big and isolated to be constantly challenged by any other threat. It thus had advantages over some isolated areas, but on the whole could be conquered by any strong Central Asian force (to say

nothing of the Manchus), rather than subjected to the constant pressures that drove France, Italy, and other states to modernize. Like others, Lieberman sees China as falling behind the West in technological and scientific advances by 1700; he is sceptical of the ability of China to repress progress and independent thought, but takes a position that the Qing government was strong enough to discourage or co-opt it.[86]

Others—including Mark Elvin, mentioned above—point more strongly to lack of continued innovation in science and technology as inhibiting Chinese ability to more efficiently exploit its resources. In this respect, a key date with much symbolic significance is 1593. That year Li Shizhen published *Bencao Gangmu*, the climax of Chinese herbal writing and a truly stunning achievement. It was just slightly later than Rembert Dodoens' Flemish herbal of 1554, which represented a similar breakthrough for herbals in Europe. Soon after, in 1597, came Gerard's *Herball*, the first great modern herbal in English.[87] In 1593, there was every reason to believe that Li would stimulate a major breakthrough in Chinese herbal and botanical science, as Dodoens and his colleagues and followers did in Europe. But Li remained unexcelled. Once the Ming fell, the Qing showed no interest in advancing the science, and Li is still the standard text in traditional Chinese herbalism. By contrast, Gerard was almost immediately eclipsed by John Parkinson's incredible achievement, *Paradisi in Sole*,[88] and then by John Ray's development of taxonomy. After that, botany exploded in the West. One could tell similar stories about natural sciences such as medicine, zoology, geology, and nutrition and practical arts like weaving technology. China lost the spirit at the same time the West got it.

Ming progress was slender enough, but its collapse seems to have truly blown out a light. Only medicine bucked the trend somewhat, developing strongly in the late Ming and staying dynamic in the early Qing.[89] Otherwise, in the sciences, Qing dynasty scholars republished old works and added to encyclopaedias and agricultural manuals, but really did very little creative work. Recent works on the Qing dynasty are cautious about explaining this, but recognize the continuing growth of the role of autocracy in stifling science.[90] Essentially, China had the same slow development from traditional ideas through the period from 1200 to 1900. After 1600, China did not stagnate, and did not ignore Western learning; it simply did not match the frenetic pace of Europe in changing basic knowledge. China did have the advantage of access to *some* European science (out of date and thin in many cases), thanks to the Jesuit missionaries. Contrary to frequent Western claims, the Chinese welcomed, adopted, and used the more valuable of

the Jesuit introductions.[91] What happened, however, was that the Chinese kept adding bricks to their old structure. The Europeans tore down their old structure—or at least, most of it—and built a new one, from different and superior materials.

As noted above, Mark Elvin's model of a high-level equilibrium trap pointed to the loss of scientific and technological innovation as a key factor explaining why China failed to develop further. His later idea of 'technological lock-in' pointed to the effects of China's ever more costly hydraulic maintenance works and much more intensive exploitation of land resources in inhibiting innovation. Simply put, the social and economic costs of investing in new technology were simply too high a price to pay.

China clearly invested heavily in water control, for irrigation, transport, shipping, flood prevention, and famine relief (see the final section). Of 41–2 million *taels* of annual revenue in the eighteenth century, the Qing invested 3.5 million in water control.[92] By the 1700s, intensive development had progressed especially far in the Yangtze and Pearl River Deltas. Agriculture was thoroughly commercialized. Most people depended entirely or in part on cash cropping and on their own labour in spinning their cotton and silk products into thread and weaving it into cloth for sale. Other local crafts, from basket-making to embroidery, added to income. Families depended on crafts as well as farming, and many would starve if either income stream was disrupted. Labour productivity, however, increased; yields increased after the troubles; and wages even rose, such that there was more meat for farm labourers,[93] and more people could be supported. Of course, many farmers were purely subsistence producers as far as rice went, and had to grow silk, cotton, or the like, and/or carry out household craft production, to make money for taxes (as noted above). There was also extortion, illegal rent-seeking, theft, and other ills to contend with. These were back-breaking for poor farmers, but not unsupportable for most.

Rice and forests

A point not often enough made about Ming and Qing China is that much agricultural expansion was in the rice-farming sector, a basically conservationist mode of development. It requires careful management of the whole environment—the agro-ecosystem—including water control, recycling nutrients and materials, tree and grass preservation, and efficient use of wild resources such as frogs and fish—in short, creating a stable, sustainable system. Rice farming requires protecting upstream

forests to prevent flooding and maintain water flow, something of which Qing writers were very well aware. Rice farming requires exquisitely careful water management, from regulating flows to minimizing serious pollution. It requires people to live away from the most productive land, if only because that land is flooded half the time. It is best intensified by working harder and harder to manage water, using everything efficiently, and increasing fertility through recycling, composting, and nutrient trapping.[94] It leads to steady accumulation of cultivated land and increase in its fertility. It spares forests and uplands and, in the days before pesticides, maintained an incredibly rich agro-ecosystem, with hundreds of species of wild animals reaching very high densities, and usually being tolerated for their role in eating pests. An extreme contrast in the pre-twentieth-century world was the extensive grain and livestock farming of America and Australia, where the natural landscape and all its wealth was largely destroyed and replaced with Old World grains and animals that yielded extremely little per acre.[95] However, even rice agriculture at its best eventually reaches an overdrive state, in which forests cannot be adequately protected, dikes maintained, or diseases and pests adequately controlled. Decline sets in.[96]

In contrast, in North China and marginal South China less ecologically careful dry-farming agriculture was practised, exposing the land to more erosion by water and wind, and still dominated most of China's land-use. These agro-ecosystems did not have the built-in negative feedback mechanisms of rice farming, so they intensified into disaster quite easily once the population reached its nineteenth-century levels. The highlands were even more stressed. Thanks to overcutting and similar environmental problems, 'a huge pool of late eighteenth-century mountaineers led rootless, impoverished, and desperate lives'.[97] Fortunately, some forests were well managed. Nicholas Menzies recounts temples and 'clans' that preserved forest adequately; the best preserved, however, were commercial plantings of China fir and pine.[98] The worst managed were the imperial reserves.

Nor was the situation regarding waterways much better. Keith Schoppa's excellent study of Xiang Lake, across the Qiantang River from Hangzhou, is fairly representative of what happened in China's more densely populated parts.[99] Created as a reservoir in Song times, it held excess water and released it later for irrigation. It became famous for its water-shield plants, and for bricks and tiles made from its alluvial clay. Local elite lineages constantly tried to encroach on it. Schoppa's main point is that a handful of well-meaning citizens succeeded often enough, and had enough local support, to slow degradation and keep

the lake viable until the end of imperial times. In the twentieth century, however, Xiang Lake met the fate of most of rural China—it was severely impacted by the Nationalists and destroyed utterly by the Communists, to the area's enormous damage and impoverishment.

Encroachment on lakes and wetlands continued in the Qing,[100] but perhaps the worst environmental problem in this period was massive deforestation; this led even to the expression of outright preservationist sentiments, almost unheard of anywhere in the world before Henry David Thoreau and John Muir.[101] The reduction of minorities was often the cause;[102] sometimes, too, the need to clear the forests of 'bandits and rebels'[103]—many of whom were actually desperate resistance fighters taking refuge there. Other forests were cut by poverty-stricken people who invaded them in spite of rules and restrictions. Awareness of deforestation's devastating effects was widespread, but not adequate to stop the combination of official fear and grass-roots desperation. For example, agroforestry was practised widely,[104] but poaching and the ability of the government to take over the forests acted as disincentives to tree plantation. Government reserves fell apart and were given over to cultivation, continuing a trend established as early as the Han Dynasty.

From about 1800, environmental crises due to rapidly rising population and cultivation began to reach terrifying proportions. 'Generations of encroachment on lakeshores and riverbanks of the middle Yangtze watershed, stimulated by the growing downriver demand for commercial rice, had rendered the Yangtze Valley, likely for the first time in imperial history, a source of flooding of equal concern as the Yellow or Huai rivers to the north.'[105] Lakes and sloughs silted up, hills eroded, mountains were stripped bare, forests fell. The Grand Canal silted up. China's ecological deterioration, so immeasurably worse today, was increasing. Examining in more detail the lower Yangtze locates the interacting forces which contributed to China's late-imperial ecological, social, and political crisis.

The Lower Yangtze: involution in overdrive

The lower Yangtze was China's economic heart. 'In Qianlong's day, Jiangnan accounted for 16 per cent of the total agricultural land in the empire, but provided 29 per cent of the government's land tax revenue in cash (paid in silver) and 38 per cent of its revenue in kind (paid in grain), as well as 64 per cent of the tribute grain sent to feed the capital.'[106] Kathryn Bernhardt's detailed study of the lower Yangtze River area shows that cotton had largely replaced rice by the mid-nineteenth

century, forcing the importation of thousands of tonnes of rice per year from up-river.[107] Rents were high; rice in the mid-nineteenth century was about two to three *taels* of silver per *shi*, while a *shi* per *mu* was a standard rent. As Mark Elliott elaborates: 'Popular wisdom had it that it required 4 *mu* of land (about two-thirds of an acre) to feed one person. With rapid population growth, this ratio had worsened under Qianlong from 3.5 *mu* per person in 1766 to 3.33 *mu* per person in 1790'.[108]

In contrast to the typical, and ideal, situation, small independent yeoman farmers were relatively few in number in this rich but heavily-populated area. Most were tenants. A few large landlords, mostly resident in towns and cities, owned thousands of hectares. Rents were high. Here and elsewhere in China, a division had come about between actual ownership of land and rights to cultivate it; the suffering farmer often had to pay rent for both. (These were confusingly and inaccurately named rents for 'subsoil'—in effect, actual ownership, and 'topsoil'—rights to cultivate, that is, usufruct.) Taiwan's aborigines often retained ownership, but had no control over cultivation and virtually no income, because aggressive ethnically Chinese immigrants had managed to get control of cultivation rights, and used those to maintain a stranglehold on both the cultivators and the actual owners (on its later development, see Chapters 4, 5, 6, and 10). This is a case in which actual ownership of the land ('subsoil rights') meant virtually nothing; 'topsoil rights' had taken over. Never was Marx's distinction between formal ownership and actual control more dramatically seen.

Tenants thus continually used every possible means to make more money and pay less rent, from working harder to cutting corners, to resisting rent collectors and rebelling openly. Both they and their landlords also resented and resisted taxes. As water management deteriorated and the population increased, tensions were magnified, and increasingly large resistance movements arose. Bandits could work for themselves, for angry tenants, for landlords repressing tenants, for the government, or for social ends. Sometimes the same groups did all these things in rapid succession. Violence and crime became common, ultimately resulting in the Taiping Rebellion, which began in the Yangtze Valley's southern hinterlands. Various rebel armies and pro-government forces, and many independent militias and bandit gangs, all vied for local control. Kathryn Bernhardt quotes an anonymous villager writing of his fellow locals in 1860: 'Some even follow the bandits. They do not know shame'.[109]

The resulting chaos was partially resolved by government success in quelling the Taiping Rebellion. Yet the war devastated thousands

of square kilometres and eliminated a large percentage of the population. Imperial China never recovered. The Qing's decline led to increasingly desperate government attempts to raise money by taxing more and more heavily. The Qing's fall in 1911 merely unleashed lawless violence at every level. China was not at peace until after 1949. From 1842, Western colonialist pressure was also increasingly a factor, leading to classic peripheralization—relegation to an economic and political periphery relative to a 'core' of more powerful nations.[110] As this continued, the Western world almost unanimously adopted a supercilious, patronizing attitude towards China's traditional food sector. Only those who had intimate acquaintance with it, such as F. H. King,[111] recognized what an accomplishment mere survival was, under the circumstances.

Qing famines

The effects of population increase and environmental degradation were visible in the increasing need for famine relief in Qing China, leading eventually to collapse, yet the system coped remarkably well, until reaching breaking point in the nineteenth century. Famines were almost constant in China and were probably worse than anywhere else at that time.[112] Deng Yunte found a total of 5,258 recorded famines in China between 1766 BCE and 1936 CE.[113] Of course, the earliest were legendary, since there was no writing in China in 1766 BCE, but on the other hand local, small-scale famines were not normally counted, so for actual historic periods this is an absolutely minimal figure. These famines involved 1,074 droughts and 1,058 floods. Lillian Li's *Fighting Famine in North China* identifies whole classification schemes for different types and levels of disasters.[114]

The North Chinese, Li shows, had more words for floods and droughts than the Inuit have for snow. Extremely erratic rainfall at the margin of the monsoon led to frequent droughts. In the North, she describes a diet of wheat, millets, sorghum, and—increasingly—New World crops, maize, peanuts, and sweet potatoes. Many varieties of soybeans were grown; the black one was for horses or for the starving. Cotton competed for land with food. Rice was grown but never did well in the cold climate, and in many years there was little water for it. Rice from the South tended to be old and probably infested with insects. The land was productive (far more so than most of Europe at the time). However, the climate was changeable and official policies and practices were too. The climate could produce droughts or floods; the region has a very high

amplitude of variation in rainfall. The officials could produce excellent policy in the good times (such as the early eighteenth century), but corruption was common, and in bad decades even minimal law enforcement was difficult. Wheat, the staple, was one of the more susceptible crops, making one understand why more drought-tolerant millets, sorghum, and sweet potatoes were traditional staples of the poor. Foxtail millet was more nutritious than wheat, but sweet potatoes—newly introduced from the Americas—were not, and dependence on them always made for problems. (Unlike American varieties, the common Chinese varieties are not rich in vitamin A.)

Yet, as several scholars have shown, in the seventeenth and eighteenth centuries the Qing Dynasty's famine-relief system was probably the best in the world, while charity flourished under the Ming.[115] Beijing's food security, for instance, was guarded effectively by a range of institutions.[116] Few countries at the time were as well organized as China in making sure that people had some access to food. Stockpiles of grain for famine relief could be huge: granaries overflowed and grain rotted because there was simply not enough storage capacity.[117] While, as noted, there were problems in the North, the lower Yangtze region and the coast to the south of it were, however, well fed and productive, and continued to increase production and per capita consumption through much of the time period in question. The grain tribute brought an enormous amount of food to the capital. Up to '13–15 million *shi*'[118] were stored in the city at a time: about 10,000 tons of grain.

One effect was to link prices throughout the empire; regionalism was inhibited and grain flowed throughout eastern China and to some extent through the centre and west. The nobility was given huge donations of grain (as well as silver and other items) and sold some of it. The government tried to keep grain prices low, favouring urban populations but often hurting farmers. Moreover, while the Ming sent taxes skyrocketing (to around 9.1 per cent of grain),[119] the Qing, as noted, dropped them back to the historic three per cent. Low agricultural taxes meant life to the farmers and thus to the whole food system. Famines persisted, however, because of a population so dense and so fast-growing that a government with only pre-modern transportation methods at its disposal was handicapped.[120]

In the nineteenth century, all this slowly unravelled. Rising population led to want, which fuelled rebellions that toppled the Qing. The Taiping Rebellion led to tens of millions of deaths, mostly from starvation due to the scorched-earth tactics of all sides in this multisided civil war. Soon after came perhaps the worst peacetime famine in

pre-modern history. In 1876–79, some ten to 13 million people died;[121] up to 90 per cent of the population in some districts in 1878. Thereafter and into the next century, people were reduced to eating chaff, bark, weeds, and corncobs.[122] An environment already stressed, became even more so: trees died because people ate not only the leaves, but also the bark, while reports of cannibalism were rife.[123] Food relief failed because transportation and communication resources were simply overwhelmed.

The impacts of famine and war also bear on interpretations of Chinese development. For example, Lee and Wang argue for South and East China having enjoyed economic growth in the late nineteenth and early centuries,[124] but ignore the fact that these areas had been substantially depopulated a couple of decades before by rebellion and famines, and were rebounding economically. They also ignore or minimize the effects of Westernization, which brought new health and farming practices. Perhaps most seriously, they misconstrue the key arguments about growth versus involution (the high-level equilibrium trap), not appreciating adequately the extent to which growth was really over-exploitation of family labour to the point at which health, sociability, and life itself were at the margin of breakdown.

The great sadness is that things only marginally improved in the next century. Death tolls in the 1920s, especially from 1928 to 1930, were comparable to those between 1876 and 1879.[125] Even when it came, relief was slight; rations of eight ounces of grain a day—that is, 800 calories, one third of an adult's recommended needs—were given in 1921.[126] By the 1930s, China, especially the north, was in the grip of chronic poverty, and people were reduced to near-starvation even in good times. William Hinton reported people in the 1940s virtually hibernating in winter because there were not enough calories to allow any activity. People simply lay down for days on end.[127] Maize had replaced more nourishing grains throughout much of China, with a resulting increase in malnutrition. Life expectancy may have dropped to just 25 in North China, with infant mortality running to 30 or 40 per cent.[128] Modernization, trade, factory work, and other improvements stabilized matters, but the diet of the ordinary people remained one of coarse grain. Banquets increased for the well-off, but very few were in that category. The world depression of the 1930s and the Japanese invasion increased the misery still more. By the early mid-twentieth century, however, China had a great deal of international help.[129] This at least prevented cannibalism in most cases, though the sale of children continued.

Conclusion

Late-imperial China moved deeper into involution, with consequent increasing stress to the environment. The science of the Ming Dynasty, running parallel to the West or even ahead of it in such key areas as agriculture, nutrition, and botany, continued in a linear, additive fashion in the Qing,[130] but there were no breakthroughs comparable to those of the West after 1600. China continued to develop its biological technology. Agriculture intensified, but production per person did not increase greatly. The West, meanwhile, developed mechanical and chemical technologies that immensely increased production per person.

The reason goes back to China's long-standing biological technology, which in turn owes much to China's ecological riches and its long-standing agricultural science. But, also, the autocratic government of the Ming and the even more autocratic government of the Qing clearly bear a great share of the responsibility.[131] The Qing did what it could; there is no case of a traditional empire modernizing successfully. Modernization probably requires a number of small states jockeying for position in a Wallersteinian world-system, or at least a situation in which trade, commerce, and competition force people to be creative, adaptable, and responsive to new opportunities.

On the other hand, opening up new lands in the South and West, the development of more and more intensive cultivation, the rapid adoption of New World crops, stable government, and above all reasonably decent care of the agricultural environment and the agro-ecosystem, all contributed to China's survival. Also, government became progressively more skilled at dealing with markets and with relief, both becoming more 'rational' in classical economic terms. A counterfactual speculation on what would have happened if China had been as environmentally profligate as Europe is not pleasant; the soil of the North would have eroded to bare rock, the South would have succumbed to deforestation with resultant flooding and destruction of the rice agro-ecosystem. In spite of appalling odds, China's food production and economic growth kept up with its increase in population and commercial activity.

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inadequacies in understanding them are my own. Deep gratitude also to James Beattie and Liu Ts'ui-jung for much editorial help.

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116. Lillian M. Li and Alison Dray-Novey, 'Guarding Beijing's Food Security in the Qing Dynasty: State, Market, and Police', *Journal of Asian Studies* 58 (1999): 992–1032.
117. Li, *Fighting Famine in North China,* 169.
118. Ibid., 148.
119. Brook, *The Troubled Empire*, 1098.
120. Li, *Fighting Famine in North China,* 169.
121. Ibid., 272.
122. Ibid.; see also Anderson, 'Up Against Famine', and Mallory, *China: Land of Famine*.
123. A great deal of this is summed up in a beautiful and heart-wrenching poem by Chen Wenshu, translated by Yan-Kit So in *Classic Food of China* (London: Macmillan, 1992), 226.
124. Lee and Wang, *One Quarter of Humanity.*
125. Li, *Fighting Famine in North China,* 284, 304.
126. Ibid., 300.
127. William Hinton, *Fanshen* (New York: Monthly Review Press, 1996).
128. Li, *Fighting Famine in North China,* 315.
129. Ibid. See also Anderson, 'Up Against Famine', and Harley MacNair, *With the White Cross in China: The Journal of a Famine Relief Worker with a Preliminary Essay by Way of Introduction* (Peking: Henri Vetch, 1939).
130. Elman, *On Their Own Terms: Science in China*.
131. Anderson, *The Food of China*; Deng, *The Premodern Chinese Economy*; Rowe, *China's Last Empire,* 216–18.

2

A Case Study of Chinese Migration and Colonial Development in the British Empire, 1860s–1920s

James Beattie

This chapter examines the environmental impacts of overseas Chinese as a means of developing trans-national Chinese environmental history.[1] In particular, it underlines the importance of Pacific hinterlands in shaping the environmental history of China's Guangdong Province, and adds to broader understandings of regional differences within Chinese environmental history.

The environmental history of overseas Chinese also addresses an ethnocentric bias in the environmental historiography of the British Empire, especially of its settler colonies.[2] While historians of Britain's tropical colonies have studied the role of Chinese in such activities as tin-mining or tropical agriculture,[3] environmental historians of British settler societies have largely ignored this group. They instead focus on the role of European labour and capital, supported by colonial states and their legal, bureaucratic, and military machinery, in driving large-scale environmental transformation that facilitated colonial development.[4] New Zealand environmental historians follow this interpretation.[5] My chapter complicates this picture, stressing the contribution, alongside European capital and labour, of Chinese finance and workers to New Zealand's environmental transformation.

Here, I use 'eco-cultural networks' as a framework for considering how people, environments, institutions, and systems of capital formation and labour relations in China and New Zealand became interconnected through the search for new resource frontiers. In this chapter, I demonstrate that resource extraction required, among other factors, the mobilization of labour regimes, the development of facilities enabling overseas capital investment, the expansion of communication networks, and the emergence of knowledge exchanges, all of which connected different places, peoples, and environments.[6]

The chapter begins with a brief overview of New Zealand's environmental history, before examining Chinese gold-miners and their environmental actions, views, and impacts in Otago, southern New Zealand. Next, it focuses on resource exchanges, mainly between southern New Zealand and parts of South China, and touches on the environmental impacts of gold-miners from New Zealand returning to China. Finally, the chapter discusses how an environmental history of the overseas Chinese might help reconfigure China's environmental history. Given the author's existing work and the limitations of space, the present study focuses on Chinese mining enterprises and only briefly discusses Chinese commercial market gardening and landscape perceptions.[7]

New Zealand's environmental transformation

New Zealand formally became part of the British Empire in 1840 with the Treaty of Waitangi, which was signed between many Maori chiefs and the British Crown. New Zealand, its resources and wider environment gradually become incorporated into world markets from the late eighteenth century. Vessels sought New Zealand spars, sealskins, and, later, whale products for international markets.[8] China was New Zealand's first major export market, and remained so for over 30 years. Sealskins collected in southern New Zealand and sent to Canton were in high demand in China for the making of coats. For instance, in 1792 one small vessel alone sent 4,500 skins to China. In the following years, the volume of trade expanded enormously, and was largely controlled by American merchants. The trade ended in the 1830s because of the decimation of most sealing colonies and because of oversupply, which caused profits to plummet.[9]

Colonization accelerated the pace of New Zealand's environmental transformation, bringing more people, as well as new technology to its shores, and opening up the country to global markets, aspects of change in which Maori also participated.[10] An estimated 30,000 species of introduced plants came with colonization, including many undesirable introductions whose ecological consequences were unanticipated and sometimes devastating. As colonization progressed, pastures replaced thousands of hectares of forest. Swamps made way for pasture: as a result, New Zealand eventually lost approximately 85 to 90 per cent of its wetlands. And hoofed animals—sheep, horses, and cattle—were introduced into the islands for the first time. In places, native plants and birds were decimated, with the latter's loss adding to an already long list of extinctions dating from the centuries following Maori

arrival, around 1250 to 1300 CE.[11] The extent of native forest fell from around 80 per cent of the total land area when Polynesians first arrived, to 50 per cent on the eve of European colonization. By 1900, it was about 25 per cent.[12]

Cycles of boom and bust characterized New Zealand's economic development. Extraction of primary products sustained booming economies for a time, only to slump when overseas demand slackened off or when a resource was exhausted. Wool production, and by the end of the nineteenth century, frozen meat and dairy products drove environmental transformation and oiled the workings of colonial economies. This was accompanied by other forms of shorter-lived resource exploitation, including of kauri gum, native timber, and gold.[13]

Traditionally, this rapid and remarkably widespread environmental transformation has been depicted as something undertaken largely by white settlers, mostly from Britain—scholars are yet to assess adequately Maori environmental impacts following colonization. Yet, as this chapter demonstrates, from the 1860s Chinese were also responsible for considerable environmental changes, as gold-miners, market gardeners, and labourers—the last as farm workers and navvies laying railway lines. Through their access to capital, a few high earners who invested in New Zealand also helped to develop new industries and to open up new frontiers of resource exploitation.

Chinese come to New Zealand

In 1865, the Otago Provincial Council invited Cantonese gold-miners from Australia to work the province's gold-fields (Map 2.1). The rush for gold, begun in 1861, was slowing down by the mid-1860s and miners were drifting away from the gold-fields. Otago politicians hoped by inviting Chinese to extend the mining boom and keep the economy buoyant.

Chinese were attractive to Otago politicians for several reasons. Like many colonists, they perceived the Chinese as hard-working men who kept out of trouble. Moreover, as sojourners, politicians anticipated that the miners would most likely return to China once they had made their money (Figure 2.1).

Most of the first Chinese arrivals came from the Australian colony of Victoria and comprised men from Siyi (Four Districts, southwest of the city of Canton) and, to a lesser extent, Sanyi (Three Districts, closer to and to the north of Canton). By the 1870s, men from Panyu (Sanyi) were arriving directly from China, and predominated among the

Map 2.1 Otago gold-fields
Source: Henry Aitken Wise, 'Wise's new map of Otago: corrected from official surveys January, 1875' (Dunedin: H. Wise & Co, 1875), in Sir George Grey Special Collections, Auckland Libraries, NZ Map 6533.

population of New Zealand Chinese.[14] In reaching New Zealand—which Chinese called New Gold Mountain (*Sun Gum Shan* in Cantonese, *Xin jinshan* in Pinyin, 新金山) to distinguish it from North America (Gold Mountain, 金山)—and then in proceeding to the gold-fields, Cantonese drew on their own extensive migrant networks. In places like New Zealand, they also made extensive and effective use of legal structures, financial systems, and utilised available land and other resources. What Madeline Y. Hsu has identified for the Taishanese (Siyi) coming to America, applies equally to the other migrants from the Pearl River Delta coming to New Zealand. Migrants, she notes, 'actively pursued the opportunities offered by the ever-quickening spread of capitalism in

the form of thickening webs of international trade, steadily improving transportation and communications technology, and the … job opportunities in colonial economies throughout the world'.[15]

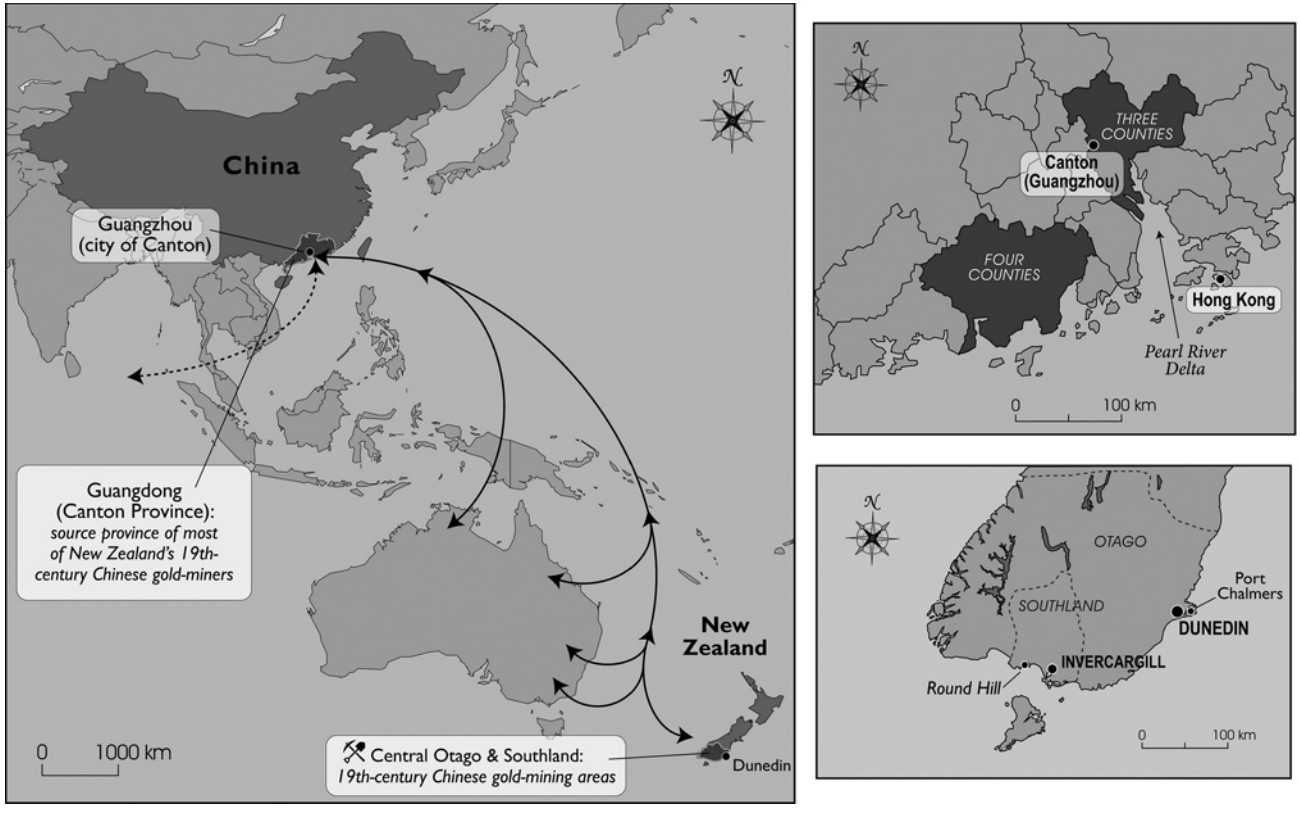
Just as lineage networks tied together family and clan in China, so these structures—together with county groupings and native-place associations—operated beyond China's territorial boundaries. Migrant networks provided financial, organizational, and emotional support to overseas Chinese, facilitating everything from travel and accommodation to the carrying of letters and transmission of remittance money. Such associations shaped the work patterns and even the movements of Cantonese in New Zealand. Otago officials initially approached Victoria-based Chinese merchants to see whether they would be interested in organizing their kinsmen to work in Otago. These merchants played vital roles as interlocutors, bridging the linguistic and cultural worlds of the Chinese and the colonial.

Cantonese in New Zealand worked mining claims along clan and county lines, just as they later operated market gardens and set up fruit and vegetable shops using these structures.[16] For example, Panyu men largely worked the nineteenth-century gold-field of Round Hill, Otago.[17] In environmental terms, these networks also facilitated introductions into New Zealand of Chinese vegetables, flowers, and agricultural techniques, transfers that were kept up by ongoing connections.

The biographies of the some 3,500 Chinese in Otago collected by the Reverend Alexander Don (1857–1934) clearly illustrate the trans-local existence of most Chinese.[18] I intentially use the term 'trans-local' to signify that only particular localities in China and New Zealand were connected (Map 2.2).

Chinese migrant connections are illustrated in a potted biography of an unnamed Cantonese gold-miner, who part-owned a large mine in Round Hill (see below). Following three years in Singapore, the miner spent 15 in Mauritius, and by 1882, 'he had been in New Zealand twelve years. He speaks a little French, picked up at Mauritius, but like the English spoken by Chinese, it is a "pidgin"'.[19] Like this man, Cantonese commonly travelled from one *Jin Shan* country to another and to various centres of Chinese population in New Gold Mountain. Kin commonly joined family or friends in working mining claims just as they later joined market gardening or laundry businesses.

Overseas Chinese tried to return home every few years for family reasons, including to get married. Only a very few brought Chinese women to New Zealand, while a handful married European women. Obviously, the ideal for the gold-miner would be to strike it lucky, and return home



Map 2.2 Place of origin and rough route taken by Cantonese to southern New Zealand
Source: Drawn from primary source accounts of nineteenth-century Chinese migration.

rich. But, for many, this did not happen. And for those who struggled to make a living in New Gold Mountain, it appears that connections with their home gradually broke down or broke altogether, because of the shame of not having earned enough money to send back to family in China, or to even be able to afford a return ticket home. A lack of understanding among families in Canton of the hardships faced by their kin compounded problems.[20]

Gold mining: moving mountains and rivers

Most nineteenth-century Chinese first arrived in Otago, even if they later moved on to other areas of New Zealand. Otago's Chinese population peaked at 3,715 in 1871.[21] New Zealand's Chinese population officially reached a high point of 5,004 in 1881—a figure only surpassed after World War II. Historian James Ng, however, believes that possibly as many as 8,000 Chinese may well have passed through New Zealand.[22]

Chinese miners worked in all of Otago's gold-fields, usually on second-quality claims. They could not afford to purchase licences to better gold-yielding lands, which, anyway, were mostly already occupied by Europeans. Figure 2.1 outlines the changing Chinese and European

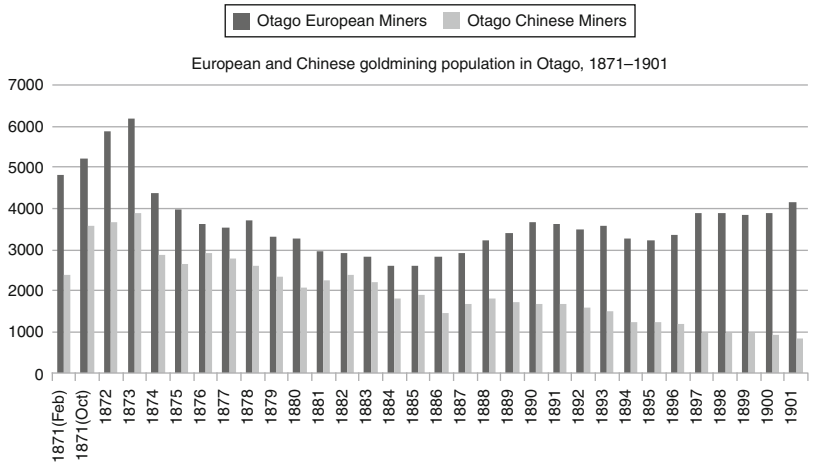


Figure 2.1 Otago's European and Chinese gold-mining population, 1871–1902
Source: Drawn from information supplied in 'Table 1—Number of Chinese Goldminers in Otago', in James Ng, *Windows on a Chinese Past* …, vol. 1 (Dunedin: Otago Heritage Books, 1993), 156.

mining population. Although European and Chinese miners sometimes worked together, this was generally the exception rather than the norm. Most Chinese worked on small claims of around two to five acres in extent (0.8 to 2 hectares) in clan and county groups of three to eight individuals. Their efficiency and hard work, often on abandoned claims, drew admiration and jealousy from white settlers.[23]

Nearly all Chinese mined alluvial land. Otago's quartz reefs were few and too costly for most Chinese to mine. Until the late 1870s, gold could be relatively easily obtained using pans, cradles, and shovels, and through ground sluicing, which suited the under-capitalized nature of most Chinese ventures. After the 1870s, more powerful hydraulic sluicing was necessary to win gold. Some Chinese miners participated in open-face sluicing, using a hose or metal pipe, and a few even went on to sluicing and elevating—a process which required more capital. Later came the dredges, effectively mobile factories processing alluvial material from the river bed. The merchant, Choie Sew Hoy (*c.* 1836–1901), was one of the few Chinese able to invest in both the expensive quartz and the dredging industries (see below).

Harnessing water was essential to gold-mining, but it was a resource in especially short supply in Central Otago, where in some areas rainfall averaged as little as 500 millimetres a year. In summer, streams frequently ran dry. In winter, water was locked up as ice—besides which it was often too cold to mine in the higher country. It was tough living in such an environment. Central Otago miners worked in a largely treeless landscape made up of ranges and basins, which, moving westwards, became higher and more rugged until eventually reaching the Southern Alps. Mining newspapers constantly referred to a lack of water and climatic extremes halting, or entirely stopping, mining activities.

As a consequence of the difficulties of securing supply, races were necessary to bring water for sluicing and to remove mining sludge. When it came to water control, Cantonese held considerable advantages, for they came from a culture steeped in thousands of years of experience of water technology, albeit gained through irrigating a sub-tropical environment (Chapter 3).[24] The miners who came from Victoria, Australia, to Otago, had also learnt how to build water races in Australian environments in which water was in scarce supply.[25] Most likely, they brought such expertise to Otago. Furthermore, some, such as Choie Sew Hoy (see below), had prior experience of the extensive waterworks on the Californian gold-fields.[26] These cases remind scholars of the importance of Chinese in transferring and adapting technology from one gold-field to another, a point I return to later in relation to the use of hydraulic mining techniques.

Mining techniques

What techniques did Chinese in Otago employ to develop gold-mining? Like their European counterparts, Cantonese miners in New Zealand constructed wing dams, from wood or stone, or both. Wing dams diverted 'a river's flow either against a bank so it could be broken down and worked, or to dewater one side of a creek bed so that the other side could be dry-worked'.[27] Water races were essential to sluicing, since the more complex forms of hydraulic sluicing required a significant head of water.

A measure of the tenacity and hard work involved in the construction of a water race comes from an 1870 description of a party of some 20 to 30 Chinese 'endeavouring to bring to light the hidden treasures of the Arrowtown Flat', on the Wakatipu gold-field. They 'deserve every credit for the enterprising manner in which they have again set in to work the ground', wrote a European newspaper correspondent. Undaunted by the complete destruction of all of their works in a flood, the party

> again tackled the undertaking, but on an entirely different principle. Instead of having an open tail-race, liable to be filled up by almost any fresh [rush of water] which may occur, they are now bringing in one which no flood can affect. As the race is being cut, they are covering it in with large slabs of stone[;] this is again laid over with layers of grass and fern, and finally a deep and firm coating of earth over all. As the race is being cut in the bed-rock, and is already some hundreds of feet long, an idea may be formed of the labour and perseverance necessary to complete the work.

The writer ended by hoping 'their efforts will meet with the measure of success [which] they richly deserve'.[28]

In several other cases, Europeans employed Chinese labourers, usually under Chinese contractors, to build water races. Many Chinese worked on the 108-kilometre-long Mt Ida Water Race in Central Otago, on the Mt Ida gold-field.[29] At Round Hill gold-field, Chinese working under Wy Kee laboured for 14 months on a 22-kilometre water race, which snaked its way from George Creek, Longwood, to Round Hill. Operated by a partnership of Wy Kee and Henry H. Port, the race (Photograph 2.1) traversed 'heavy bush, containing much rata or iron wood', with rocky ground also 'necessitating the use of dynamite'. The completed race was the 'largest in this district, being nearly 4ft wide on top, 3ft at bottom, and 2ft. 8in deep'.

Photograph 2.1 'Port's Race' [Ourewera Goldmining Co. Ltd?]
Source: Round Hill, Goldmining, Hocken Library/Uare Taoko o Hakena, University of Otago, Dunedin, c/nE2086/29.

Mining's environmental impacts, 1870s–1880s

As adduced from the discussion of water races, gold-mining had far-reaching environmental impacts—on soil, geology, water, and vegetation.[30] At Round Hill in 1882, Don 'was forcibly struck with the change which man brings about when he puts his hand on plastic Nature. Once, no doubt, the valley of Stony Creek was as beautiful as any of its neighbours with its mossy banks and graceful fern[-]trees; now it is a chaos of boulders, upturned trees, and sludge.'[31] Contemporary photographs bear out this description: Photograph 2.1—of Port's Water Race—shows the impacts of sluicing on timber and sludge build-up. (In the background, amidst Longwood Forest, is the aqueduct bringing water to the gold-field.)

For every aspect of mining, too,

> timber is an essential requisite. Deep leads cannot be reached except by means of shafts and drives heavily slabbed with timber from the surface downwards; [gold] dredges are constructed of timber; the

> races which convey water for many miles are connected by means of fluming made of timber; quartz reefing could not be carried on, nor could bank sluicing, hill sluicing, or ground sluicing be made to pay, without the assistance of wooden appliances.[32]

Wood was also vital for fuel, especially given Otago's cold and long winters.[33] But the problem on almost all of the gold-fields was that, like water, timber was in very short supply. Maniototo miners (Mt Ida gold-field) had to rely on timber milled at Hawkesbury Bush, north of Dunedin. 'Miners in the valley of the Clutha, Manuherikia, and the Dunstan, have to depend upon the supply brought from Tapanui', while those 'in the upper valley of the Clutha, at Cromwell, Nevis, Arrow, and the Shotover, have to depend upon the Earnscleugh bush at the very head of Lake Wakatipu'.[34] Chinese miners, like their European counterparts, contributed to timber demand in other parts of Otago—and nationally and internationally—through gold-mining.[35] Although beyond the scope of the present chapter, it should be possible to chart the environmental impacts of timber demand overseas through colonial newspapers and shipping and logging company records.

The one gold-field which did not suffer from timber shortages was Round Hill, located in Longwood Forest. Chinese felled portions of the forest, sometimes also employing Europeans to cut and sledge timber.[36] While trees provided a vital source of building material and fuel, they also impeded mining operations, and threatened life and limb. On 1 December 1883, Don records a 17-year-old Chinese miner, killed 'while felling a tree'—sadly only one of several such fatalities resulting from similar ventures.[37]

In addition to deforestation and vegetation disturbance, sluicing considerably changed river channels, initiated soil erosion, and precipitated wider geological changes. At Waikaia—then known as Switzers—on Central Otago's Nokomai gold-field, Sue Ting managed the Argyle Water Race Co. Chinese had bought the race from Europeans, extending it in 1885 into an adjacent gully at a cost of £1,500.[38] This necessitated the diversion of a creek from 21 kilometres away, including piping it across a deep gully. In increasing and establishing a permanent water supply, 16 Chinese miners

> are now at work washing away a whole hill. Once the water has been brought to the ground and a tail race provided for its escape downwards, the work is easy. A long canvas hose comes over the face. The water discharged from the nozzle quickly eats away deep

> incisions below. The top ground falls down, and the whole lot is speedily washed down the race, the gold being caught in the various places provided for its reception[;] just as we were watching the operations at one of the faces of the Argyle claim a fall came thundering down, containing probably a hundred cart load[s] of stuff, but this is nothing to what can be done, seeing that the faces are as much as 75 feet deep, and that the ground is simply drift without much cohesion.[39]

The Argyle Claim exhibited another 'ingenious [Chinese] contrivance' unfamiliar to European observers (and to the author): the placement of boxes, about two feet wide, '[a]t intervals down the hill, and in a regular series of gradations.' They were covered with blanketing, over which the miners had placed 'a series of flexible transverse iron bars.' As the *Mataura Ensign* correspondent explained: '[t]he agitation of the material passing over these keeps them constantly vibrating, and the stuff below is thus not allowed to set, but is what is technically called kept alive'.[40]

Like Round Hill, this area was worked primarily by men from Panyu and like Round Hill, too, the environmental effects of removing hillsides were palpable. These included the removal of large volumes of topsoil and rocks, changes to river channels, and siltation downstream. Hydraulic sluicing considerably accelerated environmental impacts by enabling 'a few miners to accomplish in weeks what formerly required a hundred men months to do'.[41]

Round Hill Chinese undertook significant sluicing and tunnelling, but, from about 1890, European interests, backed by greater capital enabling operations of a much larger scale to take place, increasingly took over the gold-field. In 1882, the *Otago Witness* noted how, through sluicing 'a large amount of ground is worked by the Chinamen by tunnelling out the washdirt, and washing it in whatever drainage water they can get hold of. The bulk of the sludge goes down the Orawera [sic] Creek to Whakapatu Bay, the rest into Lake George'. Because of mining, '[t]he whole of the Orawera [sic] flat is sludged up, and the creek itself has disappeared, there being only about [a] 50 feet fall in four miles'.[42]

Both Lake George/Uruwera and Whakapatu Bay suffered from pollution as a result of mining, especially from miners' use of quicksilver (mercury). In 1882, a reporter for the *Otago Witness* regretted that Lake George, 'a pretty piece of water … its surface … generally dotted with black swan and wild duck … should be destroyed [by this means], but I am afraid it is inevitable'.[43] Despite the author's fears, in 1888,

another report from the *Otago Witness* noted that 'the primeval forest' that 'embosomed' the 91-hectare lake will 'soon, alas … be the prey of the woodman's ruthless axe', indicating perhaps that the decline of this body of water had not been quite as dramatic as the earlier report had suggested.[44] Nevertheless, recent scientific monitoring has revealed 'substantial sediment infilling of the lake bed' resulting from '[h]istorical gold mining activities in the lake's catchment'.[45]

What did Chinese make of such changes? While coloured by Don's bias against what he perceived as Chinese superstition, his accounts reveal diverse Chinese attitudes towards landscapes and the effects of mining. While walking to Round Hill in 1882, Don paused to observe the 'many fern tree gullies, and the banks covered with moss and ferns', motivated in the knowledge that '[a]s population increases[,] the trees and scrub will, of course, decrease in quantity'. Don contrasted his attitude with that of the majority of Cantonese miners—for, as he perceived it, 'out of a hundred Chinese perhaps ninety-nine have not the slightest relish for the beauties which met us at every turn of this road'.[46] His comment, of course, could have equally applied to the attitudes of the majority of European miners.

Later that year, again at Round Hill, Don inadvertently illustrated two Chinese miners' apprehension of the environmental destruction resulting from their actions. Over a discussion of mining, 'Tsaam' and 'Tsang' informed Don that while 'it would never do to dig for gold in China, … in New Zealand it mattered not, as it had only been "opened" for a few years'. This was because, they explained, 'there is no *fung shui* [sic] in New Zealand' because 'New Zealand is *tei wan* (of earthy nature?) while China is *t'in wan* [sic] (of heavenly nature?)'. In traditional China, *fengshui* provided a system and set of rituals for managing human–nature relations,[47] according to which, 'land forms and bodies of water direct the flow of the universal *qi*, or "cosmic currents"'. A grave or house advantageously situated could bring 'wealth, happiness, longevity and procreation' for descendants or occupants. Conversely, 'a malicious flow of *qi*' could cause anything from bankruptcy to even death.[48] Other Chinese also made recourse to geomantic principles in appreciation of the Otago landscape.

Chinese believed that Riverton, the largest settlement near the Round Hill diggings, enjoyed 'good' *fengshui*, 'owing to the arrangement of the hills and rivers about' the place.[49] Don also records that Cantonese attributed 'the increasing mildness of the Southland climate to the presence of Chinese in the country'.[50] This may well have been similar to European ideas that the settling of a country with people engaged

in agricultural pursuits produced climatic changes, including diminished rainfall and hotter temperatures.[51] The complexity and variety of Cantonese attitudes towards Otago's landscape illustrated here demonstrate an awareness of environmental change and appreciation of existing landforms that, as interpreted through traditional Chinese geomantic principles, presents very different perspectives from Maori or European views.

'Hungry Dragons': the dredging boom and mining-agriculture tensions, late 1880s–1910s

From the late nineteenth century, the environmental costs of mining were generating heated debate in the Colony, as they were overseas. Many European colonists, especially farmers, were starting to question mining's effects on agricultural land, especially following the late nineteenth-century dredging boom, which significantly accelerated its ecological and landscape impacts. In New Zealand, mining, through land despoliation and water pollution, also threatened closer land-settlement policies and Central Otago's fledgling fruit-growing industry.[52]

Existing mining regulations magnified tensions between mining and agricultural interests. Gold-mining employed the law of capture to allow mining law, resolve disputes and collect taxes. Private water rights associated with mining differed sharply from private property rights, which included rights of possession, use, management, income, security, capital, transmission and absence of term.[53]

Effectively, gold-mining regulations permitted miners to foul waterways and despoil agricultural land. Concerned landowners recommended introducing regulations requiring mining interests to restore and revegetate damaged agricultural land, as had recently occurred in Victoria.[54]

An impassioned article portraying mining as destructive to the nation's welfare reflected concerns about dredging's potential to dramatically transform landscapes. 'Paying too much for the Golden Whistle' (1906) advocated that, although mining might well be the best use of poor-quality land, a balance needed to be struck between mining and agricultural interests to ensure the Colony's long-term prosperity. Since New Zealand's soils were productive, the author argued, agricultural land required protection from mining.

Already, he continued, through hydraulic sluicing and dredging

> [i]mmense masses of rich cultivable soil have been torn up and buried under heaps of worthless clay and gravel, and much good land

> on the banks of streams has been rendered temporarily valueless by deposits of raw sludge and silt.[55]

Dredging, in particular, had changed 'many a smiling green field into a brown stony waste'. The 'gnawing scoop of the dredge-bucket, and the vicious volleys of the hydraulic nozzle' had converted many 'splendid patches of fruitful land … into utterly irreclaimable wildernesses'. Indeed, the author vividly likened a dredge's operation on the Island Block—located between Lawrence and Roxburgh along the Clutha River—to 'hungry dragons voraciously biting off huge chunks of this superb land'. Dredging removed 726,000 cubic yards of soil per year, effectively destroying the equivalent of '£36,000 worth of soil' annually 'in order to get £5,000 worth of gold'.[56]

A Chinese entrepreneur—Choie Sew Hoy—began New Zealand's dredging boom and so set in motion large-scale environmental changes of the nature described above. He and his second son, Choie Kum Poy (1867–1942), developed the first dredge in New Zealand whose protruding central ladder of buckets and shallow draught enabled it to work riverbeds, beaches, and flats. With modifications, Choie Sew Hoy's design became known as the New Zealand Gold Dredge, serving as a prototype for gold and tin dredges around the world.[57] Choie Sew Hoy started two dredging companies, both in 1889: the first, a private—later publicly listed—company, was liquidated, but not before sparking the dredging boom. A second enterprise—the Nokomai Hydraulic Sluicing Company—enjoyed great success, operating under various names until 1943.[58]

As a result of the dredging boom set off by Choie Sew Hoy, government faced mounting pressure from agricultural interests and land-hungry settlers to regulate and restrict mining's damaging effects. Despite this pressure, government largely continued to support mining, introducing only piecemeal protective measures, none of which significantly restricted mining operations.[59] It did, however, try to placate private landowners. Established due to claimant pressure, the Rivers Commission of 1900–1901 attempted to ascertain the nature of mining needs and, where appropriate, proclaim watercourses suitable for mining purposes. It also compensated litigants whose land was affected by mining: by March 1907, the Commission had paid out £51,000 in compensation, an indication of the seriousness of mining's impact on other forms of land use.[60]

The Rivers Commission's findings and recommendations also illustrate the extent of mining damage and, despite compensation payments,

officialdom's general disregard for mining's environmental effects. For example, the Commission casually noted that 'seeing that some of the principal rivers have been used as main channels to carry off the waste water and silt from gold-workings during the past thirty-nine years', it saw no need 'to recommend that the Clutha, Kawarau, Dunstan, Manuherikia, and Shag Rivers be proclaimed watercourses into which tailings, debris, and waste water from mining claims may be discharged'.[61]

Chinese miners contributed to this pollution. Photograph 2.2 illustrates the effects of sluicing and elevating on Spec Gully, near Naseby, on the Mt Ida gold-field. Note, especially, the deep gullying caused by the operations, including the removal of topsoil and underlying rock, as well as the diversion of water. Added to these were health problems associated with mining activities. Mining sludge polluted drinking water, while this and wider geological changes, encouraged water to pool and hence disease to spread. It also led to flooding.[62]

Photograph 2.2 James Ng identifies the individuals as (left to right): Sue/Sew Hoy, Rev. George H. McNeur, and Shum Bun
Note: See Note 69.
Source: Sluicing on the goldfield at Spec Gully in Naseby, shows miners and Rev George H McNeur. McNeur Collection: Photographs of Chinese goldminers who worked in Otago and Southland goldfields. Ref: 1/2-019157-F. Alexander Turnbull Library, Wellington, New Zealand.

Eco-cultural networks: Commodity and raw material exchanges

These examples of mining enterprises illustrate that, in Otago, Chinese, just as much as Europeans, were agents of environmental transformation, willing to contribute 'to the same urge to transform colonial nature into commodities' as colonists 'and, to varying degrees, Maori'.[63] Chinese miners seized on the opportunities presented by New Zealand's shipping connections and availability of land. They utilized its legal apparatuses and financial systems, and grafted them, in varying ways, onto their own networks of expertise and knowledge drawn from China and elsewhere. This was as apparent on the scale of small, clan-based mining claims as it was in the large-scale operations of wealthy merchants like Choie Sew Hoy.

Like other merchants such as Chan Dah Chee (commonly known as Ah Chee, 1851–1930) in Auckland or Chew Chong (*c*. 1830–1920) in Taranaki, Choie Sew Hoy in Otago utilised his position as an interlocutor between Europeans and Cantonese from Panyu to forge 'eco-cultural networks', processes of resource extraction, with associated labour regimes, capital investment, and knowledge exchange that connected different places and ecologies.[64] These processes of resource extraction could operate trans-locally, as in the case of those connecting southern China and southern New Zealand, or, at other times, link places in New Zealand with eastern Australia.

The resulting assemblage of labour, capital, and knowledge from Canton and New Zealand resulting from the search for gold is illustrated by Choie Sew Hoy's many mining ventures. In 1889, he publically floated the Sew Hoy Big Beach Gold Mining Company. With a nominal capital of over £87,000 (although subsequently revised to £72,000), it took over from the private Shotover Big Beach Gold Mining Company. For this venture, as for others, Choie Sew Hoy worked closely with Europeans, relying heavily upon colonial capital. After its successful float, Choie Sew Hoy assumed its directorship and James Gore the chair. The company commissioned three large new dredges from a European firm in Christchurch, costing in total £11,000. As a result of its large yields, as noted, the Company was among the first dredging companies—if not the first—to seek public listing in New Zealand. Through inexperience in this process, however, it over-capitalized, and paid poor dividends.[65]

Like the Sew Hoy Big Beach Company, his more successful Nokomai Hydraulic Sluicing Company relied on Chinese and European investors

as well as European and Chinese mining engineers and workers to operate it. Investments from profits made from this, and Choie Sew Hoy's many other enterprises, contributed to the development of other mining ventures, with yet more environmental impacts. He owned three short-lived quartz mines, again backed by European and Chinese capital, but using Chinese labour. His ventures controlled 175 hectares of river claims, a significant water race running from Lauder Creek to Becks and, with two Europeans, the Golden Stream Water Race Company, which supplied water to 'part of the Kyeburn Diggings'.[66] Choie Sew Hoy's business dealings were unusual, in respect of the large capital he had available and in the business partnerships he developed with European investors. As noted, most Chinese operations were small-scale ventures involving relatively little capital and usually only Chinese money. For Choie Sew Hoy, profits derived from environmental changes associated with a particular kind of enterprise were invested in other environmentally damaging, but profitable, activities. As an example of Choie Sew Hoy's business acumen and influence, he also owned warehouses which supplied gold-fields Chinese with many goods from China. Like those of other 'headmen', this business also involved helping to send gold exports, remittance payments, and letters to South China (Figure 2.2).

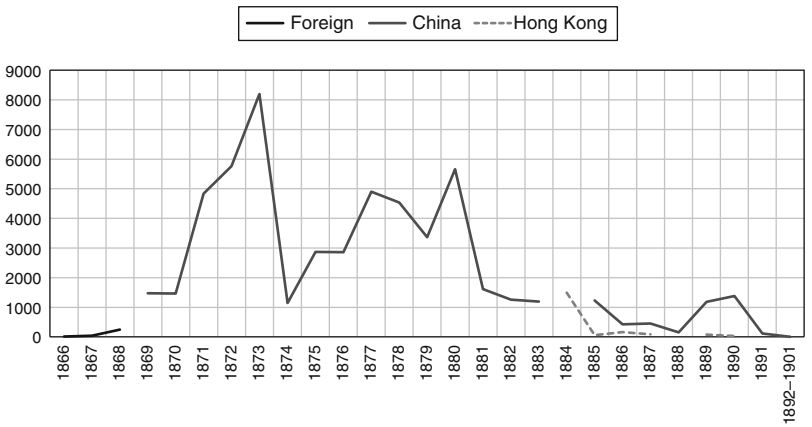


Figure 2.2 Gold exported from New Zealand to Hong Kong and China, in ounces, 1866–1901
Source: In 'Table 7—Gold Exports to China', in James Ng, *Windows on a Chinese Past*, 1: 349.

Warehouses and resource demand

For incoming Chinese, the stores of merchants like Choie Sew Hoy operated as bridges into the interior. Merchants supplied Chinese miners with goods and services, such as accommodation, loans, and advice. Their stores also offered gambling, provided meals, a news exchange, banking services, interpreting and letter-writing,[67] not to mention medical treatment and ingredients for use in traditional medicines.[68] By the 1880s, there were at least 40 Chinese storekeepers in Otago.[69] Archaeological evidence—and advertisements from the time—demonstrate the scale of local and international resource demand created by Chinese mining.

Chinese imported much of their food, drink, and other items from their homeland and elsewhere. This included rice (Figure 2.3)—mainly from Australia, India, Java, and from the 1880s, Japan and Hong Kong,[70] and extended to everything from ceramics, to Chinese-language newspapers, writing tools, coins, and opium (Figure 2.4).[71]

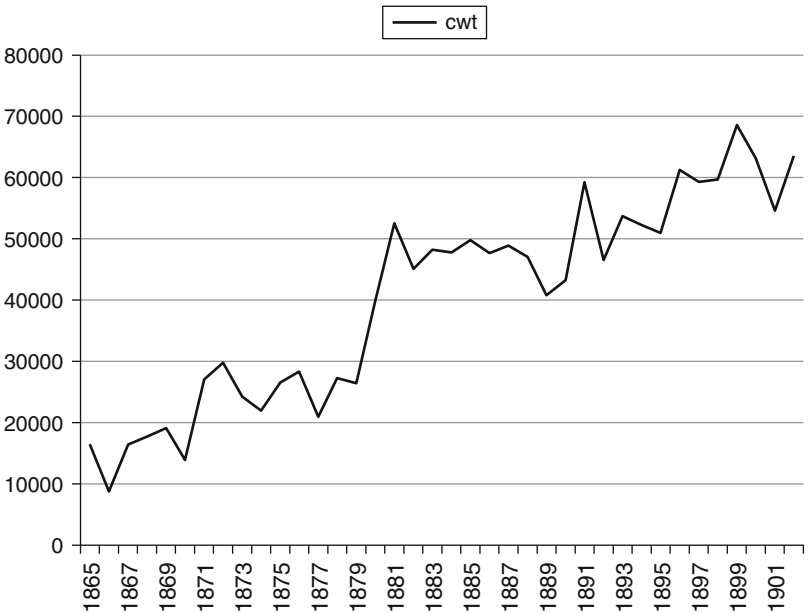


Figure 2.3 Rice imports into New Zealand, 1865–1902
Source: 'Table 9—Rice Imports', in Ng, *Windows on a Chinese Past*, 1: 350.

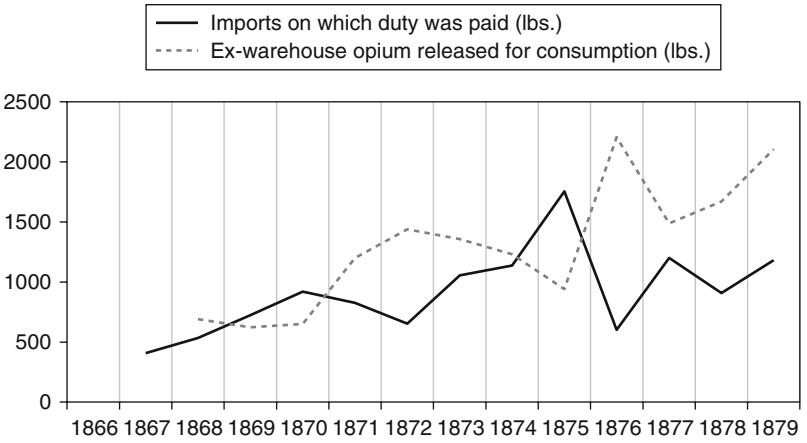


Figure 2.4 Opium imported into New Zealand, 1866–79
Source: 'Table 10—Opium Imports', in Ng, *Windows on a Chinese Past*, 1: 351.

For Chinese, as Don observed, rice 'is the stuff [sic] of life, and occupies greater prominence than any single dish among ourselves, being eaten at least twice and sometimes thrice a day'.[72] Miners mostly ate simple meals of rice, often served with a small portion of meat or, more rarely, preserved fish.[73] Occasionally, more luxurious items were sold in Chinese warehouses. Don records eating mooncakes, possibly locally made.[74] At Round Hill, an *Otago Witness* reporter noted that the store's proprietor, Wong Young Wah, offered him 'cum quots [sic], preserved plums, and other Chinese delicacies, which we find very grateful [appealing] to our European palates'. The reporter also recorded some 'queer-looking objects' dangling from the roof, including 'deer's feet, dried serpents, and other indescribable atrocities', an illustration of imported items' importance in Chinese traditional medicine.[75] Very rarely did Chinese use locally grown plants in preparing their medicines.[76]

Chinese gold-field stores sometimes served both European and Chinese customers. For example, at Cromwell, Kum Good Wa—who described himself as a 'Chinese Storekeeper and Fancy Goods Warehouseman'—advertised 'On Sale … at Prices which will command a regular market, Teas, Sugars and General Groceries for English as well as Chinese customers'.[77] European stores also imported Chinese goods. Imports from China for European consumers included Chinese tea, which early on was very popular, until a gradual shift towards the consumption of tea grown in Sri Lanka (Ceylon) and India from the 1850s.[78]

Miners' domestic food needs included hens and wildfowl, pigs, and cattle, as well as eggs, bread, sugar, and flour. Most Chinese supplemented this diet with produce grown in a domestic vegetable garden or orchard. Among the gold-seekers, Chinese miners were unusual in that most had a garden—including even the poorest living in the most ramshackle of abodes. Into their gardens, Chinese introduced seeds and bulbs of plants familiar to them from their homeland, as well as vegetables commonly found in colonial New Zealand, especially potatoes. In 1883, for example, Don '[c]aught up with a man carefully carrying a stock of turnip seed grown in China; the seed, like all other Chinese productions, he considered immensely superior to the foreign article'.[79] Bok Choy, and Pak Choi, as well as rhubarb, chives, and bean sprouts, were also commonly available.[80] Alongside these, Chinese grew vegetables eaten by Europeans—potatoes, peas, carrots, and so on.[81] Chinese market gardeners were also probably the first to introduce several ornamentals from China into New Zealand, such as the 'Chinese Narcissus', possibly *Narcissus tazetta var. chinensis* (Chinese Sacred Lily or daffodil).[82] By the late nineteenth century, Chinese were supplying New Zealand towns with most of their fresh vegetables.[83]

As well as imports and local demand, Chinese exported vast quantities of New Zealand resources, notably gold (Figure 2.3), but also things like the edible tree fungus—*Auricularia polytricha*—that grew in abundance in the North Island's forests, particularly on rotting logs. In Taranaki, Chew Chong collected the fungus from European colonists and Maori. Once dried, he sent it to Dunedin for export to China—with some also being sent to New South Wales for the Chinese market there.[84] The fungus generated significant export revenue for Chew Chong and the others involved in the industry, including Dunedin-based Choie Sew Hoy; from 1880 to 1920 New Zealand fungus exports totalled £401,551.[85]

Merchants like Chew Chong and Choie Sew Hoy were unusual in that they chose to reinvest much of their profit into enterprises in New Zealand. Most of their countrymen instead sent remittances to their homeland. The size of remittance payments sent by overseas Chinese varied greatly, from only a few pounds a year in the case of most miners to sizeable donations made by wealthy businessmen. Although a detailed picture of remittance payments sent from overseas Chinese in New Zealand to southern China is unavailable, based on what limited evidence remains, James Ng believes that most remittances from New Zealand were of a few pounds sterling only—the largest amount of which was only £22.[86]

Remittance money funded construction in South China, from the establishment of businesses, orphanages, and hospitals, to the erection and refurbishment of buildings, including ancestral halls, private residences, towers, and the like. For example, the Chan Ancestral Hall at Shek Ma (Mandarin, Shi Ma, or Stone Horse village) had been built almost entirely with the money collected by New Zealand Chinese.[87] Others anticipated making money in New Zealand and using it to purchase farmland in South China.[88] Some wealthy returnees even built Western-style houses. After leaving Auckland, New Zealand, Chan Ah Chee kept a 'Western room' in his three-storey house. It was set in a garden of two to three acres (0.6 to 1.2 hectares) and located in the upmarket suburb of Tung Shan, Canton (Mandarin, Dong Shan), where he and his wife, Joong Chew Lee, retired to in 1920. In the 'Western room', Joong Chew Lee displayed Western artworks, played the piano, and sang hymns.[89]

Conclusion and future research directions

In examining South China-southern New Zealand connections through the concept of eco-cultural networks, this chapter has actively pursued world historian Micah Muscolino's recommendation for scholars to situate Chinese environmental history within global trends.[90] Its translocal perspectives highlight the role of Cantonese miners in developing New Zealand's economy, especially in Otago, and point to their environmental impacts either directly through landscape transformation or indirectly through local and international resource demand. In addition, it shows that remittance money earned in New Zealand contributed towards Canton's own environmental transformation.[91]

These findings advance scholarship on non-state agents of colonial landscape change by challenging interpretations that, by implication, present Europeans as the only drivers of environmental transformation. Paul Star's memorable phrase 'biota barons' describes colonists, exclusively Europeans, whose activities disproportionately shaped New Zealand ecological change.[92] This chapter suggests the need to broaden discussion to include Chinese in environmental histories of New Zealand and other settler societies. Cantonese gold-miners clearly contributed to southern New Zealand's environmental transformation by altering watercourses, sluicing hillsides, and cutting timber, and through the local and international resource demands they generated. In addition, Chinese merchants—and their utilization of colonial and Chinese capital, markets, labour, and environmental resources—helped to

fashion eco-cultural networks which had far-reaching implications for environments and peoples in South China and parts of New Zealand.

The Cantonese experience in southern New Zealand can provide new vantage points for viewing China's own environmental history. Alongside stories of the nineteenth-century opium trade and the imposition of unequal treaties and the treaty-port system—for China, stories of exploitation and national humiliation—studying the transformation of imperial environments can help historians recover something of the agency of Chinese in the British Empire.[93] Focussing on the environmental and material impacts of the returning Chinese to southern China can add a new—and hitherto overlooked—environmental dimension to studies of the Chinese diaspora and migrant networks.[94]

As scholars such as Peter Lavelle and Joseph Lawson are demonstrating, in this period in China the model of Euro-American imperialism and resource development received widespread, if not always accurate, reporting by officials tasked with settling China's inland frontiers.[95] The irony was it was the likes of the overseas Chinese rather than China's scholar-elite who not only knew more about, but also implemented and sometimes introduced and adapted, Western technology in new territories in the British Empire and elsewhere. This points to the lack of knowledge transfer in China across social classes as well as across geographical boundaries, from north to south. Each group had different sources of information: in this period, scholar-officials commonly gained much knowledge about the outside world from Japan,[96] while overseas Chinese gained this directly, through practical experience in the countries in which they were living.

This chapter also suggests the benefits of comparing resource development in China with that by Chinese in the British Empire. For example, near Tacheng, Xinjiang, late nineteenth-century Chinese officials reversed earlier policies, by encouraging gold-mining as means of pacifying and securing a marginal region.[97] Did opinion on Xinjiang gold-mining change official attitudes towards overseas Chinese gold-miners? Was private capital—as utilized by overseas Chinese—or state oversight (Xinjiang) of Chinese entrepreneurs more financially successful, and which had the greater environmental impacts? Compared to inland Chinese provinces like Xinjiang, Cantonese access to southern Pacific capital and resources, in addition to those of South East Asia, accentuated Canton's differences from other parts of China.[98]

The environmental history of overseas Chinese, then, can help explain something of China's own diversity while at the same time casting light on issues of development and resource use in other parts of the world.

This chapter suggests that it is time to produce more environmental histories that place China within a global perspective. Given China's increasing economic dominance and resource demands, such a perspective will become ever more necessary.

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Notes

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2. Exceptions include: James Beattie, 'Empire of the Rhododendron: Re-orienting New Zealand Garden History', in *Making a New Land: Environmental Histories of New Zealand*, ed. Eric Pawson and Tom Brooking, 2nd edn. (Dunedin: Otago University Press, 2013), 241–57, 365–7; and 'Eco-cultural Networks in Southern China and Colonial New Zealand, 1860s–1910s', in *Eco-Cultural Networks and the British Empire: New Views on Environmental History*, ed. James Beattie, Edward Melillo and Emily O'Gorman (London: Bloomsbury, 2015), 151–9; Fei Sheng, 'Environmental Experiences of Chinese People in the Mid-Nineteenth Century Australian Gold Rush', *Global Environment: A Journal of History and Natural and Social Sciences*, 7–8 (2012): 99–127; James Beattie and Duncan M. Campbell, *Lan Yuan* 蘭園*: A Garden of Distant Longing* (Dunedin: Shanghai Museum Press and Dunedin Chinese Gardens Trust, 2013).
3. Corey Ross, 'The Tin Frontier: Mining, Empire, and Environment in Southeast Asia, 1870s–1930s', *Environmental History*, 19 (2014): 454–79; Jeyamalar Kathirithamby-Wells, *Nature and Nation: Forests and Development in Peninsular Malaysia* (Singapore: Singapore University Press, 2005).
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5. See Eric Pawson and Tom Brooking, eds., *Environmental Histories of New Zealand* (Auckland: Oxford University Press, 2002); David Young, *Our Islands, Ourselves: A History of Conservation in New Zealand* (Dunedin: Otago University Press, 2004); Peter Holland, *Home in the Howling Wilderness: Settlers and the Environment in Southern New Zealand* (Auckland: Auckland University Press, 2013); Paul Star, 'New Zealand's Biota Barons: Ecological Transformation in Colonial New Zealand', *ENNZ: Environment and Nature in New Zealand*, 6 (2011): 1–12.
6. *Eco-Cultural Networks*., ed. Beattie et al.
7. Beattie, 'Eco-cultural networks'.
8. Jim McAloon, 'Resource Frontiers, Settler Capitalism and Environmental Change 1770–1860', in *Environmental Histories of New Zealand*, ed. Pawson and Brooking, 1st edn., 52–68; C. J. Elder and M. F. Green, 'New Zealand and China', in *New Zealand and China*, ed. Ann Trotter (Dunedin: University of Otago, 1986), 16–63.
9. William Tai Yuen, *The Origins of China's Awareness of New Zealand, 1674–1911* (Auckland: New Zealand Asia Institute, The University of Auckland, 2005), 93–109; Ian Smith, *The New Zealand Sealing Industry* (Wellington: Department of Conservation, 2002).
10. Richard Boast, *Buying the Land, Selling the Land: Governments and Māori Land in the North Island* (Wellington: Victoria University Press, 2008); David V. Williams, *'Te kooti tango whenua': The Native Land Court 1864–1909* (Wellington: Huia, 1999); McAloon, 'Resource frontiers'; James Beattie, 'Plants, Animals and Environmental Transformation: Indian/New Zealand Biological and Landscape Connections, 1830s–1890s', in *East India Companies and the Natural World 1600–1850*, ed. Vinita Damoradaran and Anna Winterbottom (Basingstoke: Palgrave Macmillan, 2014), 219–48; Tom Brooking and Eric Pawson, *Seeds of Empire: The Environmental Transformation of New Zealand* (London: I. B. Tauris, 2010).
11. *Making a New Land*, ed. Pawson and Brooking. Figure of loss of wetlands from: Geoff Park, 'Swamps Which Might Doubtless Easily be Drained: Swamp Drainage and its Impact on the Indigenous', in *Environmental Histories of New Zealand*, ed. Pawson and Brooking, 1st edn., 150.
12. Michael Roche, 'The State as Conservationist', in *Environmental Histories of New Zealand*, ed. Pawson and Brooking, 1st edn., 185.
13. Brooking and Pawson, *Seeds of Empire*; McAloon, 'Resource Frontiers.'
14. James Ng, *Windows on a Chinese Past*, vol. 1: *How the Cantonese Goldseekers and their Heirs Settled in New Zealand* (Dunedin: Otago Heritage Books, 1993).
15. Madeline Y. Hsu, *Dreaming of Gold, Dreaming of Home: Transnationalism and Migration between the United States and South China, 1882–1943* (Stanford, CA: Stanford University Press, 2000), 2.
16. Ng, *Windows on a Chinese Past*, 1: 11. On migrant networks in a broader context, see Adam McKeown, *Chinese Migrant Networks and Cultural Change: Peru, Chicago, and Hawaii, 1900–1936*, 2nd edn. (Chicago, IL: University of

Chicago Press, 2001); Adam McKeown, *Melancholy Order: Asian Migration and the Globalization of Borders* (New York: Columbia University Press, 2008); and 'Conceptualising Chinese Diasporas, 1842 to 1949', in *The Chinese Diaspora in the Pacific*, ed. Anthony Reid (Aldershot: Ashgate, 2008), 1–32.

17. Southland Province existed from 1861 to 1870; it was part of Otago Province from 1853 to 1861, and again from 1870 to 1876. As shorthand, I refer to sites in Southland as being in Otago.
18. This is reproduced fully in James Ng, *Windows on a Chinese Past*, vol. 4: *Don's 'Roll of Chinese'* (Dunedin: Otago Heritage Books, 1993).
19. Alexander Don, 'Our Chinese Mission', *The New Zealand Presbyterian* (henceforth *NZP*), 1 July 1882, 7.
20. Ng, *Windows on a Chinese Past*, vols. 1–4.
21. Select Committee, 1871, *Appendices to the Journal of the House of Representatives* (*AJHR*), 23.
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23. Neville Ritchie, 'Archaeology and History of the Chinese in Southern New Zealand during the Nineteenth Century: A Study of Acculturation, Adaptation and Change' (Ph.D. diss., University of Otago, 1986), 53–6.
24. Marks, *Tigers, Rice, Silk, & Silt*.
25. On Chinese miners in Australia, see: Sheng, 'Environmental Experiences', 115–19; Michael MacLellan Tracey, 'No Water – No Gold – Applied Hydrology in Nineteenth Century Gold Mining', in *The Australian Historical Mining Association—Conference Proceedings 1996*, ed. Ruth Kerr and Michael MacLellan Tracey (Canberra: Home Planet Design and Publishing, 1996?), available at: http://www.heritagearchaeology.com.au/water.htm, accessed 21 February 2014.
26. For the biographies of other Cantonese who had been in California, see, for example, Alexander Don, *The Evangelist* III: 9 (1 September 1871): 264; and *The Evangelist* IV: 9 (2 September 1872): 274.
27. Ritchie, 'Archaeology and History', 60.
28. *Otago Witness*, 15 October 1870, 11.
29. Ng, *Windows on a Chinese Past*, 1: 318.
30. Randall Rohe, 'Mining's Impact on the Land', in *Green Versus Gold: Sources in Californian Environmental History*, ed. Carolyn Merchant (Washington, DC: Island Press, 1998), 125–35.
31. Don, 'Our Chinese Mission', *NZP*, 1 July 1882, 6.
32. *Otago Witness*, 18 September 1869, 2.
33. Otago holds the record for the coldest and hottest temperatures recorded in New Zealand. On its climate extremes, see Julian Kuzma, 'The 1895 Snowstorm', *ENNZ: Environment and Nature in New Zealand*, 9, no. 1 (2014): 79–103; James Beattie et al., eds, *Climate, Science, and Colonization: Histories from Australia and New Zealand* (New York: Palgrave Macmillan, 2014).
34. *Otago Witness*, 18 September 1869, 2.
35. For example, Australian, North American, and Baltic timber was imported into New Zealand to supply its gold-fields.
36. Don, 'Our Chinese Mission', *NZP*, 1 October 1882, 67. On employment of Europeans, see *Southland Times*, 26 July 1888, 3.
37. Don, 'Our Chinese Mission', *NZP*, 1 December 1883, 106. Note also, another death: Don, 'Our Chinese Mission', *NZP*, 1 January 1884, 124.
38. Ng, *Windows on a Chinese Past,* 1: 175, footnote 184c.

39. *Mataura Ensign*, 24 January 1888, 4.
40. *Mataura Ensign*, 24 January 1888, 4.
41. *Otago Witness*, 7 October 1882, 11.
42. *Otago Witness*, 7 October 1882, 11.
43. *Otago Witness*, 7 October 1882, 11.
44. *Otago Witness*, 9 March 1888, 14.
45. Marc Schallenberg and David Kelly, *Ecological Condition of Six Shallow Southland Lakes*, Report No. 2198 (Nelson: Cawthron Institute, 2012), 1.
46. Don, 'Our Chinese Mission', *NZP*, 1 July 1882, 6.
47. I have struggled to find appropriate or even approximate terms for Chinese concepts of the non-human world. See the introduction to this volume.
48. Ole Bruun, 'The Fengshui Resurgence in China: Conflicting Cosmologies Between State and Peasantry', *China Journal* 36 (1996): 48.
49. Don, 'Our Chinese Mission', *NZP*, 1 July 1882, 7.
50. Don, 'Our Chinese Mission', *NZP*, 1 September 1883, 47.
51. On these notions, see Beattie, *Empire and Environmental Anxiety*.
52. In response to agitation from increasing numbers of land-hungry settlers, a key manifesto of the Liberal Government (1891–1912) involved land redistribution, the breaking up of the larger estates for closer settlement. Tom Brooking, *Lands for the People? The Highland Clearances and the Colonisation of New Zealand: A Biography of John McKenzie* (Dunedin: Otago University Press, 1996).
53. Terry Hearn, 'Mining the Quarry', in *Making a New Land*, ed. Pawson and Brooking, 106–21 (quotation: 108).
54. Hearn, 'Mining the Quarry', 109–10, 117; Susan Lawrence and Peter Davies, 'The Sludge Question: The Regulation of Mine Tailings in Nineteenth-Century Victoria', *Environment and History*, 20 (2014): 385–410.
55. *Tuapeka Times*, 8 September 1906, 3.
56. *Tuapeka Times*, 8 September 1906, 3.
57. Ng, *Windows on a Chinese Past*, 1: 316.
58. See, Ng, *Windows on a Chinese Past,* 1: 315–20; Terry Hearn and Ray Hargreaves, *The Speculator's Dream: Gold Dredging in Southern New Zealand* (Dunedin: Allied Press, 1985), 12. Ritchie, 'Archaeology and History of the Chinese', 59.
59. Hearn, 'Mining the Quarry', 117–18.
60. Hearn, 'Mining the Quarry', 110.
61. *AJHR*, H-21, vol. 1, 1901, 6.
62. Note, for example: Keith Scott, *Naseby: A History. To Everything There Is a Season* (Christchurch: Naseby Vision Inc., 2012), 88–90.
63. Beattie, 'Eco-cultural Networks', 165.
64. James Beattie, Edward Melillo, and Emily O'Gorman, 'Introduction: Eco-Cultural Networks and the British Empire, 1837–1945', in *Eco-Cultural Networks*, ed. Beattie et al., 3–20.
65. Ng, *Windows on a Chinese Past*, 3: 272–83.
66. Ng, *Windows on a Chinese Past*, 1: 315–16.
67. Ritchie, 'Archaeology and History', 37.
68. Ng, *Windows on a Chinese Past*, 1: 200–1; Beattie, 'Eco-cultural Networks'.
69. Ng, *Windows on a Chinese Past*, 1: 355, note 29a.
70. Ritchie, 'Archaeology and History', 155–710.
71. Ritchie, 'Archaeology and History'; A. Piper, 'Chinese Diet and Cultural Conservatism in Nineteenth-century Southern New Zealand', *Australian Journal of Historical Archaeology*, 6 (1988): 34–42.

72. Don, 'Our Chinese Mission', *NZP*, 1 December 1882, 104.
73. Don, 'Our Chinese Mission', *NZP*, 1 October 1882, 66.
74. Don, 'Our Chinese Mission', *NZP*, 1 November 1884, 85.
75. *Otago Witness*, 9 March 1888, 4.
76. Don, 'Our Chinese Mission', *NZP*, 1 August 1882, 28.
77. *Cromwell Argus*, 17 May 1881, cited in Ritchie, 'Archaeology and History', 36.
78. Edward Melillo, 'Empire in a Cup: Imagining Colonial Geographies through British Tea Consumption', in *Eco-cultural Networks*, ed. Beattie et al., 68–91.
79. Don, 'Our Chinese Mission', *NZP*, 1 January 1883, 127.
80. Ng, *Windows on a Chinese Past*, 1: 341, notes 151a and 151b.
81. Beattie, 'Empire of the Rhododendron.'
82. Beattie, 'Eco-cultural Networks', 162.
83. Beattie, 'Empire of the Rhododendron.'
84. No. 2. Mr. W. Townsend to Mr. W. Seed. (No. 8) Custom House, New Plymouth, 15 March 1873, in 'Exportation of Fungus to China (Correspondence Relative to)', H-39, *AJHR*, 1873, 1.
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86. Ng, *Windows on a Chinese Past*, 1: 345–56.
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88. Don, 'Our Chinese Mission', *NZP*, 2 April 1883, 184.
89. May Sai Louie [grand-daughter of Ah Chee], interview, 21 December 2007, Lily Lee, cited in Lily Lee and Ruth Lamb, '陈达枝 Chan Dah Chee, 1851–1930', (unpublished research paper, 2009), 25–6.
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92. Star, 'New Zealand's Biota Barons'.
93. I am indebted to one of the anonymous reviewers for raising this point.
94. Most studies of the Chinese diaspora examine self-help societies and political organizations, as well as business and migration networks, and issues of identity formation and racism rather than environmental connections. McKeown, *Melancholy Order*; Keir Reeves, 'Tracking the Dragon Down Under: Chinese Cultural Connections in Gold Rush Australia and Aotearoa, New Zealand', *Graduate Journal of Asia–Pacific Studies*, 5 (2005): 41–66.
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Part II
Waterscapes: Development, Modernization, and Society

3

Dike-based Communities between Water and Sand: The Sand-land Environmental System in Dongchong, South China, 1720s–1980s

Jianxiong Ma

The mouth of the Pearl River, from Panyu 番禺 District toward Nansha 南沙 District of Guangzhou City, is the centre of a delta famed for its sand-land (also known as sand fields or polders). From the northwest to the southeast, three main water channels of the Pearl River divide the sand-lands into stretches of farmland, giving the area its name as 'a town of rivers on sand-land' 沙田水鄉. Today, this area covers 99.66 square kilometres, comprising three main channels: the Xiqiao Channel, the Shawan Channel, and the Liugang Channel.

This chapter examines the kinds of dike system which developed between these channels and the historical process which separated sand-land and water. Sand-land is a key concept yet also a complex historical term in the Pearl River Delta. It refers to 'a kind of land tax of the coastal farmland in Guangdong during the Ming and Qing periods (1368–1911)', and indicates a farmland plain formed by long-term sand sedimentation. In general, sand-land refers to the sedimentary farming land in this coastal region and along the rivers in South China.[1] The entwined social and environmental meaning of sand-land hints at the complex and interlinked human–environment processes underpinning the creation of communities, systems of labour relations, and hydrological control, as well as agricultural production and economic development.

Significant sand-land sedimentation in the Pearl River Delta resulted directly from human activity dating from the Song dynasty (960–1279). From the Yuan dynasty (1271–1368) onwards, more and more immigrants settled on the uplands along branches of the Pearl River.

Increasing migration into South China intensified environmental change. Agricultural activities and deforestation caused serious soil erosion, with repercussions for peoples and economic activities.[2] Rivers upstream transported eroded soil into the delta. Sea tides halted its movement, causing the transported soil to be deposited. Gradually, sedimentary deposits separated sand and water, causing a large sandbank to be established at the Pearl River Delta mouth. As the sandbanks aged, sedimentary sand drifted toward the sea, leaving behind sand-land suitable for reclamation for agricultural purposes. From the Song to the Ming and Qing periods, large areas of sand-land were reclaimed. The history of the Pearl River Delta is a history of sand sedimentation and the methods humans have used to control it in order to reclaim farmland from the sea.[3]

Several critical factors account for the social and environmental background of land reclamation. Firstly, farmland reclamation during the Qianlong reign (1736–95) was linked with rapid demographic increases in China in general, which created serious demand for food produced in the delta region. Additionally, migration from various neighbouring provinces into Guangdong province increased pressure for farmland reclamation, and this pushed forward Pearl River Delta dike construction from the 1700s.[4] Reliable population figures are difficult to come by, but, as Robert B. Marks' detailed work has shown, Guangdong's late-Ming population had increased markedly. Across Guangdong and Guangxi provinces, the population rose from around four million in 1400 to possibly 12 million by 1640, while Guangzhou city became one of the three main economic powerhouses and population centres of the two provinces—and would remain so.[5] Guangzhou's population increased in line with general growth in China, which was from around 60 million in 1391 to 295 million by 1800, and an estimated 426 million by 1848.[6]

Secondly, growing commercialization from the sixteenth century onwards pushed Pearl River Delta society to become more market-orientated, which helped some powerful lineages to accumulate sufficient capital to invest in long-term dike construction for sand-land reclamation. After the 1740s, sand-land reclamation became rapid. Thirdly, in 1757 the Qing government made Guangzhou the only trade port open to European business. This policy stimulated the silk industry's rapid development, and created another peak in dike construction for farmland reclamation. Therefore, local commercialization and sand-land reclamation became parallel social and ecological changes. Commercialization and harvests from sand-land agriculture reinforced

the development of powerful lineages and their corporations in a cyclical process, and further enmeshed the lineage gentry's and officials' mutual interests.[7] Even after the Qing's fall in 1911, powerful lineages still controlled the sand-lands, until the establishment of the People's Republic of China (PRC). In 1952, land reform movements distributed sand-lands to tenants, only to be collectivized after communes were established in 1958.[8]

Based on examination of environmental and social changes in the Pearl River Delta drawn from historical documents and anthropological fieldwork, the author considers the construction of irrigation systems and dike-based communities as interlinked processes. The chapter argues that Pearl River Delta residents accumulated rich knowledge and developed diverse techniques to facilitate sand sedimentation, so as to create sand-land. This system of sand-land creation was intimately bound up with local social structures, notably labour and investment requirements for land reclamation through dike construction, and as witnessed later in the power struggles among powerful lineages for control of this area.[9]

Examination of local-level processes like these can enrich Chinese environmental historiography. As environmental historian Robert Marks and others have pointed out, regional economic commercialization especially after 1600 gradually shifted the Pearl River Delta over to silk production, and the region became a net importer of food.[10] This marketization explanation puts South China into the bigger picture, but fails to explore or explain local diversity. Dongchong's environmental history exhibits a very different pattern: of rice-farming expansion through reclamation. This applied especially to the fundamental communal structure of hierarchical social categories based on commercialized lineages, their representative gentry, and the people who worked for them—the Dan 疍 tenants. This chapter analyses the continuing reconstruction of dike-based communities and environments in this region principally from the 1720s to the 1980s, demonstrating the mutual creation and maintenance of dike-based communities and human-environment relations in the Pearl River Delta.

These interlinked social and environmental processes changed over time. Lineage-controlled reclamation, agricultural development, and social relations were dramatically transformed in the post-1949 period as these private groups yielded power to a strong state intent on rapid industrialization through modernization of the agricultural sector. Among several measures, the state redistributed the harvest, re-organized a vast labour workforce for a huge hydraulic and irrigation system

project to construct the Dike Alliance system, and applied to agriculture new forms of science and technology. Although these social and environmental changes were based on new, socialist-style relationships between the state, the Dan tenant farmers, and the formerly powerful lineages, certain continuities with the past remained. To a large extent, the post-1950 period accelerated existing trends towards reclamation, agricultural development, and commercialization.

Dan households gained much, materially and financially, from these changes. Not least, significantly larger rice harvests resulted from development, while they also gained politically through local-level control. The chapter's identification of continuities and changes benefiting certain groups challenges Judith Shapiro's characterization of the 1950s to the 1980s as a period of wholesale tragedy associated with political repression and environmental degradation.[11]

Sedimentation, agricultural development, and local lineage groups in the Qing dynasty

The sand sedimentation and dike building that created today's sandlands in Dongchong town originated in two dikes: the Yuwo Tou 魚窩頭 and the Jixiang Wei 吉祥圍 dikes. In the 1720s, the Yuwo Tou dikes were created in formerly shallow water that, for more than a hundred years, had been known as the 'nest' of fishes and shrimps, Yu Xia Wo 魚蝦窩. Rapid sedimentation produced a relatively high sandbank. The original farmers who worked in this sandbank area were known as the sand farmers, and later made this place their camp.

The powerful He lineage in Shawan 沙灣 controlled another higher, nearby sandbank, Jixiang Wei.[12] This lineage first invested capital to build up stone dikes on this sandbank during the Yongzheng reign (1723–35). In the early Qing, these sandbanks were initially controlled by officials; later, control shifted to the He lineage.[13] According to the He lineage archives, the He gentry paid officials for some early sandbanks, from which they reclaimed several thousand *mu* (one *mu* is 666 square metres) and made it the lineage's common property. Money earned from developing these sand-lands enabled the He lineage to apply to purchase more land from the Qing government.

The He lineage called these original sandbanks that appeared from the water 'sand bones'. They reclaimed them through the construction of dikes, which reinforced the process of sand sedimentation. The most important source for the He's long-term dike construction came from a common fund established under the name of their ancestral hall, the Liugeng Tang. Working as a common property cooperative, the

Liugeng Tang oversaw the smelting of many large iron weights which were to be dropped into the water. These—known as 'iron oxen'—were used to shape the direction of sandbank sedimentation. The He lineage numbered these iron oxen, as means of proving possession of the underwater sand-land, and—through prevention of sand and water mixing—encouraging sandbank formation, as the base of future dikes. For example, during the Kangxi reign (1654–1722), the He lineage smelted 40 iron oxen which they dropped into the water, allowing them to 'occupy' and lay claim to more than 30,000 *mu* of sand-land for farming.

During the Yongzheng reign, another powerful lineage nearby the He, the Su, based in Bijiang in Shunde County, also applied to Qing officials for the right to exploit sand-land in the area of today's Jixiang Wei, north of the Yuwo Tou area. There, they built up dikes. By the Daoguang reign (1821–50), all the main dikes in this area had been constructed by the He and the Su lineages.[14]

In general, settlement of Dongchong's sand-lands took place from the 1720s thanks to lineage investment in dike construction. This process established the landlord-tenant relationship, and boat people became part-time tenant farmers. The lineage landowners provided taxes to the government and, supported by the state, invested in long-term dike building. The landlords, or representatives of these common property corporations, rented sand-land to farmers based on verbal contracts arranged through middlemen (gangers). Farmers came from different places and, because of the instability of harvests, rents, and inundations, were quite a mobile population before 1949. Compared to the lineage communities who controlled the sand-land, this situation meant that it was relatively hard to maintain a tenant community on the dikes before farmland distribution under the Communist government in the 1950s.[15]

However, the social and cultural systems on the dikes gradually developed some particular characteristics as the sand-land farmers learned how to cooperate with the tides at the mouth of the Pearl River Delta and to adjust their activities accordingly. A particular style of sand-land culture developed, whereby agricultural practices changed in response to changes in the dikes system. In this sense, three fundamental elements set the conditions for people's relationship with the environment here: the sand-land itself, the tide, and the sand-land farmers. Most fundamentally, sand-land farmers relied on the tidal energy harnessed by water gates. The new landlord-tenant relationships and associated environmental changes also impacted on societal organization and environmental usage.

In the early Qing, before any sandbanks appeared, settlers constructed very simple grass houses and jetties, working occasionally as fishermen.

These boat people were known as the Dan, after the name for the vessels they used, recorded in documents as 'Dan boats'. Most Dan households 'originally fished from the sea shore', but could also 'sail out to sea to capture big fish' with spears. Most Dan did not normally live on land. 'Because the Pearl River is extremely wide, some Dan boats could assemble into a long boat gathering, as long as seven or eight miles, in several layers. They also set up pillars to rack their boats [and] these frameworks could protect them against big typhoons.'[16]

To prevent the boat people from organizing and challenging their political authority, local lineages gave the Dan no opportunity to develop their own lineages, and thus prevented them from competing for sand-land. Besides this, the Qing government also set up lineage-led garrison stations on the newly developed sand-land, such as the Ying 營 and the Xun 汛 camps, to guard the area and maintain social order.

During Qianlong's reign—that is, before the exploitation of the large sand-land area, and when the relationship between the landlord lineages and the sand-land tenants had not yet been established—historical documents recorded more than ten villages in the area of Jiao Tang 茭塘 in Panyu District. Most families had members who had been 'pirates for many generations'. Jiao Tang pirates would often 'rob other boats in the day time', and themselves were subject to the depredations of larger groups of pirates. Generally speaking, officials were unable to control these activities, the exception being when pirate boats sailed past the river gate, and soldiers at the military camp could unofficially tax them. If the pirates paid the unofficial tax, it gave them one month's free sailing.[17]

Social order at the Pearl River Delta mouth, especially the sand-land areas around Dongchong, then, was not stable in the early and middle Qing. As Liu Zhiwei points out, during sand-land reclamation, those who had previously been fishermen under the category of Dan people gradually became sand farmers.[18] Although the lineages still regarded them as a floating population of sand farmers, as land took form from water through reclamation, the social relationships and groups of the Pearl River Delta came into sharper focus.

Competition between the powerful lineages in their applications for land exploitation and their competitive dike construction continued for a long time. In 1770, the Qing official, Zhao Yi, described the process of official sand-land approval, land reclamation, and development, as well as how claimants upheld rights to reclaimed land:

> The newly appeared sand banks in the coastal region of Canton are common. If the residents can see, indistinctly, the sand several inches

> under water, they will go and report it to the government, declare that they are willing to contribute the tax on this piece of sand-land, and start to pay tax to the government. However, they still need to wait for several years for the sand to finally appear above the water level. Then they start to plant grass on this land for several years and after that, they begin to build dikes to circle the land, using the ridges to divide the land into smaller pieces. After these tasks are done, they will start to try to plant rice for another several years, after which the whole process to make fertile farming land is complete. By whatever means, the claimants, who apply to the officials for their tax contribution to the government, always claimed much smaller areas than [actually] appeared above water. For example, if they claimed a piece of new land the size of 100 *mu*, the exact measurement of this newly exploited land would [be] several times that. However, there is a local law about the sand-land: if somebody reported to the government that the land owner has cheated to get more land, the government would take back the land rights from the first claimant and reward them to the informer. If so, the former claimant will lose their investment. This kind of law encourages some people to monitor others in their sand-land reclamation. For the side of the first claimant, once they have invested time, labour and money for many years, how can they lie down over such a contest? So, the conflicts always happen during the harvest, the two sides fight each other when competing for the harvest. Many people died in these cases.[19]

In the Qing dynasty, the process of sand-land reclamation was complex and long, and took place as a five-stage operation. Because of long-term sand sedimentation, a certain foundation had accumulated on the channel bottom even before the bank had appeared above the water. Human labour enriched this process.

1. Known as the stage of 'fishing swimming' 魚遊 or 'the show of sand' 沙影, the sedimentary base had already accumulated under the water, but required more time for the sand bar to appear. Normally the sand base was some two to three metres below the water surface.
2. As the names of this stage suggests—'sand base appears' 水坦 or 'paddle difficulty' 櫓逼—at low water, the sandbank was only about one to two metres below the low-tide mark.
3. The stage of 'crane standing' 鶴立, was so-called because the sand base would appear at low tide, but was covered by water at high tide. At this stage, birds could easily find food on the sandbank.

4. In the 'grass land' 草坍 stage, the sandbank appeared above the water surface, enabling people to plant grass on it.
5. At this stage, sandbanks and a unit of sand-land were protected by a 'circle of dikes' 圍, following which a special species of rice which could be irrigated in salty water was planted.[20]

The most important element in sand-land development, then, was the construction of dikes which protected farmland from fluctuating tidal flows.

Normally, sand-land reclamation was controlled by representative gentries of powerful lineages. Lineage leaders first declared their willingness to contribute tax on the targeted sand-land, and then started to pay tax before constructing the dikes. After the completion of reclamation, landowners set up a military guard, known as the security bureau, based on the sand-land, to protect their land and enforce the collection of the rental harvest. After that, sand-land farmers could work for the lineage landlord as tenants under contract, or gangers. Due to the silk industry's development in the Pearl River Delta, some areas in the delta's west, like Shunde County, became famous for the commercialization of the mulberry dikes system for the silk industry. The increasing demands for rice from the local market was therefore met by the newly developed sand-land, because commercialization stimulated powerful lineages to exploit more sand-land for rice farming, thanks to their political power and ability to invest in long-term dike construction. In addition, in order to maintain their political power through military power, these lineages did not allow their tenants to 'duplicate' their lineage organization, build any kinds of temples or even permanent houses on the dikes.[21] In general, the Pearl River Delta lineage societies maintained the rigid hierarchy of lineage members and non-lineage tenants based on the category of the Dan people, who gradually evolved from fishermen to a status of half-fishing, half-farming households, then eventually peasant communities in Dongchong. Sand-land reclamation, commercialization, and capital accumulation for dike construction investment reinforced social reconstruction of lineage and non-lineage groups. However, the powerful lineage gentries performed the most significant role of social political agency.[22]

Before 1949, sand-land agriculturists were called by the discriminatory term 'floating firewood families'. Under this official category, the Qing law defined the Dan as the untouchable underclass until 1729. Even after its repeal, officials and gentries did not permit this non-lineage Dan to wear shoes on land, attend school, or participate in civil service

examinations, a state of affairs that persisted until 1949.[23] In their lifestyles and attitudes, the itinerant and water-bound Dans essentially challenged the basis of Chinese civilization's ideals of a land-based, stable agrarian population.

According to an informant, the original residents in today's Yuwo Tou area moved in from other neighbouring counties like Nanhai or Xianshan. As tenant farmers working for the He lineage based in Shawan,

> [e]very year in June and July, when high tide was at noon and there were strong southerly winds, the farmers would sail back to Shawan to farm. They sailed in with the wind at low tide and sailed back at high tide. … The outsiders called us the Dan Jia people. Because our dialect is different from the others, they called our language the dike dialect.[24]

As a sand-land society in the Pearl River Delta's centre, Dongchong residents constructed their social and cultural system around the dikes, relying on them for everything from sedimentary accumulation and channelling, to water-level control during different tide cycles. Knowledge of the Pearl River Delta's complex water flows has been crucial to sand-land farming's success, shaping even geomantic ideas (*fengshui*). For example, the sand-land system presented challenges to the geomantic concept, which valued the interplay of permanent features of land and water. Yet the flexibility of *fengshui* frameworks could also be manipulated to focus on 'direction' only. On the sand-land, the direction of water became very significant. For example, the concept of 'back' referred to the direction where the tides were coming from. Based on this fundamental concept, residents could design and adjust the orientations of houses, adding some elements like the directions of north and south, as well as the time of birth, and the five elements, and so on.

Until the mid-twentieth century, agricultural practices required detailed knowledge of factors such as the quantity of river water in different seasons, the regularity of tides in an annual cycle, or the behaviour of river branches or sub-branches which move sand into the sea. All of these variables shaped the water directions and layers of rivers inside the dike systems. The culture of the dike people, thus, was based on their understanding of the subtle relationship between water and sand. Through adjustments, they were able to control to varying degrees the quantity of water flow, the water level within individual dikes, and the degree of salt water in dry seasons, to develop their sand-land agriculture.

Tides, dikes, and sand-land crops in the Qing

The techniques of making sedimentary farmland, including the construction of dike circles, were refined from the middle period of the Qing (c. 1662–1840). In summer, heavy rain brought abundant water to the upper catchment of the West and North rivers. These rivers carried vast amounts of sand towards the sea. Eroded sand encountered resistance from seawater, which, being salty, has a higher density than fresh water. This, coupled with tidal currents, caused sand to deposit quickly.

The powerful lineages on the sand-lands controlled these water interfaces through the construction of stone dikes. Workers brought stones from the mountainside in boats and then dropped them directly into the water to form the rudimentary basis of the dikes. The principal way to position the stones was simply to sink the boats, with the stones inside, at the right place—a process which explains the local term for the dike base (stone base 石基). Another way to build a stone base involved driving stakes into the sandbank at low tide and dropping stones along the stakes at high tide. Since the mid-Qing, some lineages, like the He in Shawan, who had innovated in sinking iron oxen to precipitate sand sedimentation, also adopted a new and effective method of putting stones into big wooden caissons made of pine or China fir (*Cunninghamia lanceolata*), then sinking them into the sandbank to construct the stone base. The stone bases formed squares, which provided the rudimentary basis for the later development of a dike. The next stage involved many labourers filling the base with mud and grass. These mud-filled stone dikes were formed into a big dike circle 大堤. This process took several years, after which labourers would make smaller mud dikes inside the big dike circle, called the firmed mud dikes 硬泥基. Over time, the mud dikes inside the big dike circle might be eroded by water, and so require frequent rebuilding.[25] The principle of this process is reflected in the term 'attracting sand by stone' 以石引沙, which referred to the sand sedimentation which followed the establishment of the stone base.

In the Pearl River Delta, a big dike circle made of stone is known as the 'middle-base circle' 中基. Although this provided some defence against the high tide, it could not totally separate sand-land from water. Because of this, people called the sand-land of the middle-base system the 'tide-land' 潮田. Since the middle-base dikes were opened to water at high tide, tide-land agriculture was appropriate for rice seeds which could grow in salty water. Besides its agricultural purpose, the dikes also provided an essential route for transportation of labour and goods.

In the middle-base circle, then, the dike areas were not fully connected, at least before the 1920s. Each middle-base circle was a self-sufficient unit. Since dikes were open to water, natural tides irrigated rice crops; the high tide brought water in, and the low tide removed it from the dikes. This system operated after the fall of the Qing dynasty. For example, in the 1920s and 1930s, villagers from Yuwo Tou and Make, whose lands belonged to the He lineage corporation based in Shawan town, worked on the land at low tide when the land appeared until the tide turned and the water ran into the dike circles. Such a system was also seasonally dependent. In summer, when strong typhoons rolled in, dike collapse occurred frequently, making it very difficult for peasants to develop and sustain their communities on the dikes during the tide-land era.[26] Most likely because of this instability, sand-land dwellers had to seek alternative sources of income, hence the Dan people's continued reliance on income derived from trading.

Tide-land systems to Crop Circle: changes in the Republican period

The instability in this system began to change gradually, and with it, so did the communities and environments. From 1922 to 1923, for the first time, a connected water gates system was established in Dongchong linking several middle-bases into a chain. Because after the 1911 revolution lineage property was regarded as a remnant of feudalism, the He lineage in Shawan tried to change the title of its common property corporation, which consisted of several middle-base circles, from Ho Liugeng Tang 何留耕堂 to the He Shengli Common Hall 何生理公堂. The former referred to a private name while the latter meant a common hall. In the 1930s, sugarcane plantations began to be introduced and a small sugar workshop was established by the He lineage based on connections with Singapore, even though rice was still.[27] During the 1920s and 1930s, Guangzhou became a political centre in South China as the Nationalist Party established its government there. Industrialization started and some new technologies also were imported. However, these changes were also shaped by the power of the big lineages, as the Qing-style gentry shifted to become local political warlords.[28]

From this period, investment enabled the construction of water gates to isolate internal land and rivers from the external channel, thereby allowing farming units inside certain dike circles to be free from tides, provided the water gates were closed. This revolutionary change

essentially transformed the tide-land system into a 'crop-circle' 農作圍. Each crop-circle unit consisted of farmland of about 100 *mu* (about 6.67 hectares or 66,667 square metres) to 500 *mu* (about 33.3 hectares) in extent. Because the water gates protected the crop-circle units from high-tide water, farmland could be divided into smaller units by rows of ridges, and some basic level water gates between sections of paddy fields were built. Normally for every ten to 20 sections of paddy fields, a water gate was placed across the field ridges.

The dikes along the boundaries of the crop-circle units also provided a safe foundation for houses. Additionally, once the gates between the middle-bases linked the dikes' circles together, they also facilitated the building of roads and bridges. By this means, the middle-bases became the second levels of a huge dike system, while the third or fourth levels of dikes or field ridges linked crop-circles together in a water-gate controlled irrigation system. The rivers between or inside the linked crop-circles were called the smaller rivers (*he* or *chong*). In response to this development, the style of agriculture also changed.

In the late Republican era, tenants needed to pay a certain portion of their harvest as rent to landlords, based on certain ratios, normally 3:7 or 4:6. The landlords sent their guards or representatives to inspect harvests and collect the rent. In this period, the harvest for each *mu* was only about 400 *jin* (200 kilograms), while one family could farm about 15 *mu* of paddy fields.[29] On the eve of 1949, the farming population in Dongchong was about 23,000 persons, while the size of the farmland area was about 50,000 *mu*.

Mao's war against nature in the sand-land?

In 1949, the People's Republic of China (PRC) was founded. Was the period following the PRC's establishment one of political repression and environmental degradation in the sand-lands, demonstrating, as Judith Shapiro argues, the tragic results of extreme political conditions on both people and environments?[30] The socio-environmental dynamics of Dongchong do not bear this out, when considering social class, continuities of sand-land reclamation and local-level control, and the emerging style of socialist development. With continued reclamation and increasing agricultural harvests, there was no significant water pollution or soil deterioration during the Mao era (1949–76). Certainly, Dongchong in this period supports Robert B. Marks's interpretation regarding both the importance of state power in directing large-scale environmental and social change, and in the gathering pace of

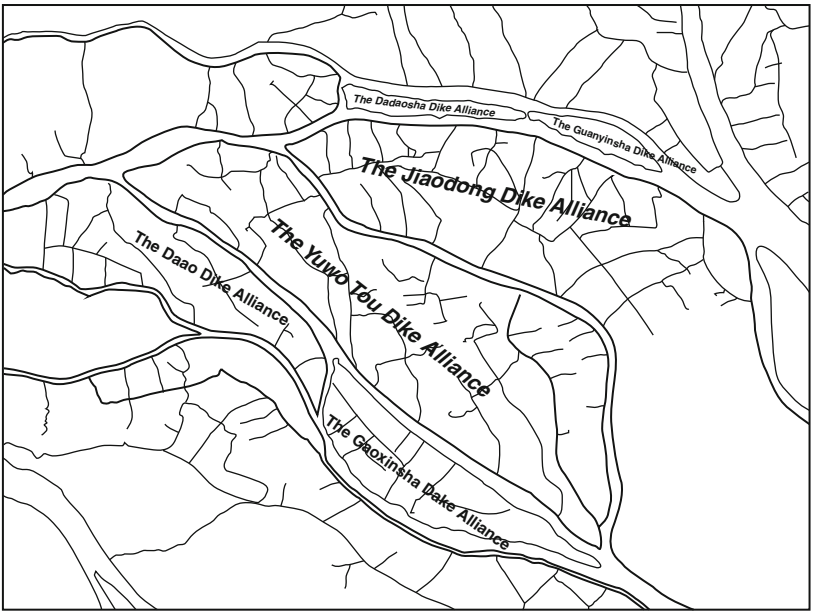
production through the application of new technology and increasing marketization.[31]

As part of socialist industrialization, based on agricultural modernization and mobilization of peasant labour, Mao initiated the slogan, 'Irrigation works [are] the lifeline of agriculture' (a slogan originating in the Jiangxi Soviet Government of 1934). Once the Communist Party established its governance in rural China, it mobilized labour and directed it into hydrological and irrigation construction, especially with collectivization.[32] The Great Leap Forward (1958–62) aimed to quickly transform Chinese society into Communism through collectivism based on communes. Communes reshaped rural life by combining agricultural collectives into enormous social and territorial units, in a three-level system from production teams to production brigades, and the communes, which served as a military guard and as engines of socialist construction. As part of the GLF's mobilization, many huge water conservancy projects were started throughout China during this period.[33]

With the consolidation of PRC power in rural areas and the initiation of major programmes of societal and agricultural reorganization, in Panyu District local communes sought to merge two areas into a giant Dike Alliance between Dongchong and Yuwo Tou to separate the main Pearl River channels. This Dike Alliance profoundly reshaped the Pearl River's agricultural and social landscape (Map 3.1).

Before 1949, there were more than 10,000 middle-base dike circles on the sand-land. Each different dike was divided into and managed by different counties and towns, and controlled by different lineages or landlords, with very diverse property rights. The Communist authorities initially transferred land rights to individual peasant families in the early 1950s. In the collectivism era of 1958 to 1982, more than 400 higher-level dike circles over the middle-bases were built in the Pearl River Delta. Water gates were also built to form a giant Dike Alliance to protect 6,700,000 *mu* (about 446,667 hectares) of farmland from salt water. Gates offered protection against possible floods based on ten- or 20-year highest flood records. Electrically powered pumping stations removed water out into the Pearl River channels when the water gates were closed and when the water level outside the Dike Alliance was higher than the rivers and their tributaries inside. Through these measures, more than an additional 4,200,000 *mu* (about 280,000 hectares) of lowland was protected.[34]

Despite its large scale, reclamation took place relatively quickly, and the whole of the Dongchong area came under the protection of one giant Dike Alliance system, called the Dongchong Dike Alliance, while



Map 3.1 Dike Alliances in the Dongchong area
Source: Drawn by the author.

the Yuwo Tou was protected by the Yuwo Tou Dike Alliance 魚窩頭聯圍. Following the winter of 1957, Dongchong commune organized its labourers to build six water gates between the middle-bases in Shagong Bao, Sansha, Maofeng, Guantan, Shipai, Liugang, and Nanchong. Construction was finished in 1960. During this period, the Dongchong and Yuwo Tao Alliances were constructed, and this extended into a higher level Dike Alliance linking all alliances into a super-giant Dike Alliance in the mouth of the Pearl River Delta. This was known as the Jiaomeng-Dongchong Dike Alliance or the Jiao-Dong Dike Alliance, combining the Dongchong, Yuwo Tou, and Jiaomeng Alliances into a general one, a project finally completed in 1985 with the completion of all electrically powered pumping stations.

Inside this Jiao-Dong Dike Alliance, almost all sand-land in the mouth of the Pearl River Delta came under the protection of a single dike circle. In 2014, the 40 electrically powered pumping stations of the Jiao-Dong Dike Alliance along the bank of the Pearl River stretched for 60.6 kilometres. Under the protection of the Jiao-Dong Dike Alliance, then, only water gates link the rivers inside with the Pearl River outside. The

water-gate system could be opened to irrigate fields and was capable of pumping water out.

The Dike Alliance system transformed sand-land agriculture from an agricultural system reliant on tides, to one now totally controlled by humans. This transformation also ushered in profound changes to sand-land communities, altering agricultural techniques as well as communal life and cultural values. The most significant changes to farming techniques were from the tide-land intersection seeding technique to the new style of double-harvest rice farming (*Shuangjidao* 雙季稻), and then, following 1982, to market-oriented agriculture.

Intersecting rice seeding and irrigation

In traditional sand-land agriculture dating from initial reclamation in the area up to the early years of the PRC, rice seeds were divided into intersecting rows, one for the early harvest, followed by another for the late harvest—a process termed *Zhenggao* 掙稿. The first harvested rice left space allowing for the insertion of another row to make the second re-seeding possible before the first harvest rice matured. After harvesting two crops of rice, farmers left the field vacant (called solarizing the field in winter, 曬冬).[35] The system of intersecting rice was really the only option open to farmers because of shortages of labour and animal power, as well as 'the difficulty of getting the water [to] drain away from the fields in the period from the fifth month to the eighth month of [the] lunar calendar'.[36]

In detail, intersecting re-seeding could occur in two ways: using either a wide or a narrow intersection (see Figure 3.1).

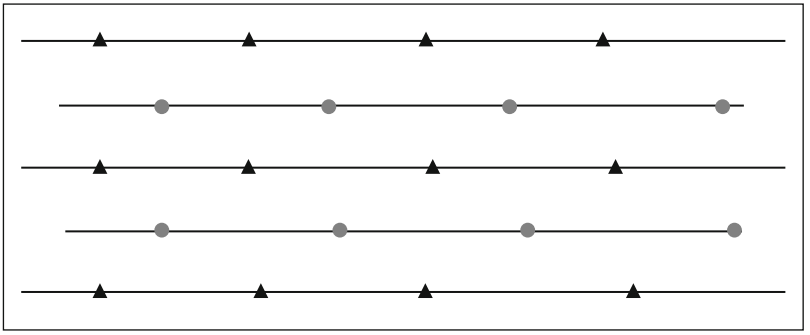


Figure 3.1 The method of intersecting the rice re-seeding
Source: Drawn by the author.

The wide intersection left a distance of as much as 80 centimetres between the two rows of the first crop of rice, while the narrow intersection could be as little as 60 cm. The distance between two rice stems was about 27 to 40 centimetres. The second harvest was from September to October. The yield of the first harvest was about 150 kilograms; the second, about 200 kilograms per *mu*. Harvests were made using a boat, after which farmers transported the cut rice to the dikes for the next stage, threshing. Threshing was labour intensive, involving the use of stone rollers to thresh rice grains, bamboo sticks to scrub the remaining grains from the stems, a wind chest to separate grasses and grains, and finally drying and storage of the grains.

From 1958, as noted, the whole community on the dikes was organized under communes, brigades, and working teams. Intersecting rice re-seeding stopped after 1960, when the water gates were built between the middle-bases. From then on, tractors started to be used for ploughing, while pumping stations provided the means of controlling water into and out of the system; thus a human-controlled water and dike system was established.

In 1964, the County Institute of Agricultural Technology of Panyu introduced a high-quality rice seed—'the short pearl'—from Taiwan into Dongchong and Yuwo Tou communes. Yields from the first planting round could reach 400 kilograms. The growth period of this new seed was about 110 days, compared to about 200 days for rice-seed varieties previously used. For a single harvest, the highest yield per *mu* could approach 400 kilograms, although normal yield ranged from 200 to 250 kilograms. Using the Taiwan seed, the second-round yield after harvest could achieve 400 to 500 kilograms, following a growth period from August to October. In the 1960s, the total yield for two crops could be as high as about 800 kilograms. As a local informant explained: 'Besides the seeding and harvest, under the job assignment system of the communes, farmers planted different crops, like sugarcane, and peanuts and soybeans in rows beside the sugarcane in the field'. Initially this was mostly done by hand.[37]

The combining of the whole sand-land area in 1952 in Dongchong and Yuwo Tou to form new townships and later two communes brought together areas formerly controlled by different lineages. The social classes of 'the local lineage landlords' and 'the floating Dan households' were also officially redesigned as 'landlord' and 'poor tenants' respectively. After that, the Dan, previously a discriminatory term, became promoted as the 'red roots class'. The Land Reform Movement of 1952 enabled them to gain farmland from their previous landlords, and

gradually, their community developed and stabilized from the 1950s to the 1960s. They were happy to join irrigation and dike construction projects, which protected their own lands and enabled them to build more permanent homes. Sand-lands stabilization, coupled with political reform and sedenterization, enabled sand-land farmers to gradually create stable communities on the dikes, even if, according to informants, they lived in quite simple houses in the early 1950s.

Social changes also resulted directly from state-initiated environmental reform. The protection from flooding made possible by the 1960s and 1970s dike extensions permitted the Dan households to construct permanent houses made of brick and wood, habitations no longer vulnerable to flooding.[38] Until then, the sand-land farmers mainly lived on boats or in simple grass houses, moving frequently between some middle-bases. In addition to the institution of communes and land redistribution, sedenterization was further encouraged because dike extension removed the interconnecting waterways formerly used as transportion routes by peasants.

Despite considerable social upheaval following 1949, local areas retained some decision-making responsibilities, albeit now in the hands of peasants, rather than lineage groups. During collectivisation, farmers became commune members, working collectively, with harvests redistributed based on working points.[39] But, from 1958 to 1982, collective cadres performed a crucial role as agents of the state in local communities, although common peasants also participated at different levels.[40] State-directed socialism, modernization, and development brought major changes to society, economy, and environment, yet needs to be considered in the context of the significance of newly reconstructed local political structures, centralized land rights, and collective labour investment. This is evident in the village-level management of the dikes.

Following the reformist period of the 1980s, the mechanized system changed yet again. In 1982, Deng Xiaoping abolished the commune system and redistributed farmland on the basis of the household contract responsibility system. Communes changed into townships, while farmland was distributed to individual families based on either 30- or 50-year contracts. Individual peasant households still could not hold private property land-rights; however, households could keep land and manage it freely, in return for paying tax. This policy was practised until 2004, as a result of which, sand-land agriculture shifted to cash crops, especially sugarcane. In the last ten years, this market orientation has intensified further. At the time of writing, many peasants now rent their fields to businessmen as plantations for different crops, such as bananas,

fruit, and vegetables. Plantations bring greater profits at market, but require different methods of irrigation, even if they are contradictory to each other. The new market-orientated crops require more complex land usage and water management.

How did the sand-land community respond to the post-1982 changes, and with what environmental results? Despite the seemingly complex hierarchy of the dike management system, from the perspective of insiders in the dike communities, operating water gates inside the Dike Alliance is very simple: every village team, which from 1958 to 1982 was organized under a working team, nominated a villager to the position of 'the agronomist', with responsibility for managing the water gates in the area of this community. This might involve every aspect of the gates, including determining when to close or open water gates to pump water out of the field or from a low-level river branch to a higher level river, and so on. The job required detailed knowledge of tide cycles. For example, the agronomist needed to know when the tides ebbed and flowed on the first and the fifth days in each month of the lunar calendar.

This system is still largely in place. In Yuwo Tou, 14 agronomists are in charge of the whole water-gate system. Because the most important water gates are at the highest level of the Dike Alliance, they are under the control of an official station of irrigation works under the township government, but this job is also based on local knowledge of the tides.[41] In principle, the Dike Alliance water-gate management must follow the indication of a water gauge set at the water gates. In an everyday context, once the tide level goes up to the '+0.9' line, the water-gate manager should close the gate. There are 43 high water gates on the Dongchong Dike Alliance, each with its own manager under the township station of irrigation works. Additionally, there are more than 20 staff who work as assistants to these 43 managers in managing the rivers inside the Dongchong Dike Alliance. They are paid by the township government and their authority in water management is higher than the village-based agronomist. Meanwhile, the task of the village-based water manager—the team agronomist—is mainly to regulate water levels, such as by pumping water out of a lower field. This is also the most important irrigation job as the agronomist needs to monitor field water-levels and be ready to turn on the pump if the water level is going to be higher than the field level inside a dike circle.

The environmental impacts of continued industrialization of the Pearl River Delta over the last 20 years, through reclamation and newly introduced cash crops and technologies, are complex changes that

cannot be explained in detail at this stage. They require further study using more detailed long-term data.

Conclusion

For over 300 years, human labour and ingenuity have performed an important role in speeding up the process of sedimentation in creating the sand-land system, linking Dongchong's environment and society at the Pearl River Delta mouth (Photograph 3.1). Initially, only powerful lineages, who were able to mobilize sufficient social and economic capital, were able to construct a large-scale dike system and thereby direct reclamation before 1949. After that, state power and collectivization pushed forward development and altered both social structures and agricultural systems. The most profound shift occurred in this later period: the mechanization of agriculture and irrigation, the establishment of communes, and the introduction of new technology, including fertilizers and new varieties of rice, have meant that the sand-land

Photograph 3.1 The newly sedimentary sand-land at the mouth of the Pearl River, 2013
Source: author.

system now could be totally controlled by humans. In this period, too, land redistribution and collectivization witnessed the re-ordering of society, as government broke up the power and land-holdings of the lineage groups and redistributed land to the Dan people.

Despite such changes, this chapter points to several continuities across political periods. First, environments and societies remained interlinked to the extent that changes in one affected the other. For example, knowledge of daily and seasonal tide cycles was vital to the success of irrigation systems and agricultural production, and in turn set up the power base of local lineages, and later, the state. Even with greater control over water, complex local knowledge about irrigation and water drainage was important in informing agricultural practice, especially after the 1980s, with the emergence of a diverse range of crops with particular and different growing requirements. The differing capacity of water-control technology in the Pearl River Delta permitted the growing of certain crops, but also determined, until recently, the extent of protection afforded from flooding.

Second, this chapter reveals continuities in technology and market forces in shaping sand-land systems. Maximizing productivity hinged on certain groups' abilities to capture profits and reinvest in technology to reinforce their position, whether lineage groups or, later, the state. Their ability to do so required the application of existing technology (rice varieties, water-control methods, and the like) to manipulate and exploit tidal flows and sand accumulation. And, just as from the 1600s population growth and the commercialization of Guangdong agriculture for the silk industry provided a spur to sand-land reclamation, so today markets and changing tastes do likewise. In addition, this chapter points to the continuing importance of accumulated local knowledge, since new technologies were developed to exploit sand-lands.

Together these continuities question several generalizations made by Judith Shapiro about the Maoist period as damaging to both people and environments. Certainly, as this chapter shows, there were winners and losers following land nationalization, but that does not equate to wholesale tragedy. Environmental indicators—in terms of pollution, declining agricultural productivity, and water standards and the like—are more difficult to judge, yet today's highly industrialized sand-land agricultural system seems to represent an intensification of trends over the past 300 years. Continued sand-land reclamation and agricultural production may well illustrate what Robert B. Marks has described as 'one of the paradoxes of Chinese history … that while the degradation of its environment has been long-term and palpable,

the Chinese farming system itself was remarkably sustainable'.[42] Land reclaimed a thousand years earlier still produces rice, fields hewn from forestland 2,000 years ago still produce a yield. Sand-lands agriculture may be helping to sustain China's development, but no one yet knows the extent to which this most recent phase of the agricultural regime will last.

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4

Waterscape and Social Transformation in Southern Taiwan: The Damming of Mudan Creek

Shao-hua Liu and Shu-min Huang

This chapter highlights how topographical and environmental factors have shaped the trajectory of social change among Taiwan's southern Paiwan people since the late nineteenth century. Taiwan's history from the late Qing dynasty (1644–1911) through the Japanese colonial period (1895–1945) has been commonly examined through the framework of modernization. This framework uses the dichotomy of 'core' and 'periphery', which claims the centrality and radiating aspects of modernization. Although those concepts are certainly useful for examining Taiwan's modern transformation, they cannot account for historical developments in which unique local variations deviated from that norm. For instance, why did certain ethnic groups at the margins encounter the forces of modernization earlier and assimilate more readily than peoples geographically closer to the so-called centre?

This question is the point of departure for our examination of the complex processes by which the indigenous Mudan communities in Hengchun Peninsula have participated in Taiwan's social transformation over the last 150 years, a much longer and 'thicker' experience than that of other indigenous tribal communities in the hill area. Social change in Mudan since the late nineteenth century has closely paralleled greater Taiwan's modernization drive. However, the early and intense social change that took place in these communities also has a particular history, which was clearly driven by factors unique to the local environment, namely, its water landscape or waterscape.

Taking the concept of waterscape as the vantage point for our analysis, we discuss how history and geography combined made the peripheral Mudan tribesmen famous and made this locality suitable for a dam-building project. The case of Mudan vividly illustrates how

environmental practices played a greater role in shaping modernization than historians of East Asia have usually recognized.

'Waterscape', by analogy with the word 'landscape', refers to works of art that delineate scenery containing bodies of water.[1] Examining the importance of waterscape in history is a perspective that has gained attention in environmental studies in recent years. Taking the presence of bodies of water as instrumental in civilizational development was an approach pioneered by Fernand Braudel in his studies of the Mediterranean.[2] Braudel's critical study revealed a geographic dynamic that connected diverse regions and localities even beyond the national borders around the Mediterranean. Recent scholars have further stressed waterscape's centrality by examining how people's relations to water have helped structure social continuity. For example, Terje Tvedt argues that previous research overemphasized human forces over water systems by overlooking the critical role of nature in shaping human history. He asks how and to what extent the structures of a particular physical body of water have contributed to the possibilities and constraints of a society's productive activity, including its efforts to modify that waterscape.[3] Many scholars have also used 'waterscape' to refocus their consideration of how culture and political economy have shaped the construction of irrigated rice fields, dams, canals, and so forth.[4]

This line of research has inspired us to reconsider extant accounts of the drive for modernity experienced among the southern Paiwan. Past research on Taiwanese indigenous peoples has for long treated the human forces of colonialism, capitalism, and state governance as the key agents of change. But what role did the environment play and how did the combined forces of nature and humans change local communities? This approach obviously limits the presentation of details in this chapter because of the long span of 150 years that it considers. Still, the concept of waterscape provides many interesting insights into the historical factors critical to local social transformation in Paiwan. Local communities were driven to change as much by factors related to bodies of water as by waves of diverse modernization projects. Critical among the former were proximity to the Pacific Ocean's western fringes, and the presence of steady year-round water flows on land.

The Paiwan locals along Mudan Creek in today's Pingdong County changed from reclusive head-hunting tribes to peasants following early encounters with outsiders from overseas over a century ago. The local ecosystem went from a marginal landscape first to a subsistence-oriented agricultural landscape and then to a politico-moral landscape, as the modern state investigated the area's water sources and recognized the potential for a dam-building project that would benefit the broader

region. Even today, the social implications of changes to the Mudan waterscape continue to unfold.

The waterscape in question is a particular section of Mudan Creek that became Mudan Reservoir in 1995. This reservoir represents the last major dam built in Taiwan to meet water shortage problems. In the face of grass-roots anti-dam movements across Taiwan in the 1990s, under the influence of global environmentalism, the construction of the Mudan Reservoir demonstrated the state's efforts and constraints in shaping its subject waterscapes. Mudan Creek's damming also highlights the state's taming of the local indigenous communities. Our interpretive account of the local community is based on key historical narratives about the local waterscape from the late nineteenth century onward. This examination of local history through the perspective of humans-in-nature may explain why Mudan experienced rapid social change in contrast to Taiwan's historical transformation in general.

Narrative one: Mudan as a maritime frontier

Despite its proximity to the mainland—the narrowest point of the hazardous Taiwan Strait is a mere 130 kilometres wide—Taiwan had had very little direct contact with China before the maritime explorations of the sixteenth century. Some historians suggest that medieval China had an active maritime trade with Southeast Asia and South Asia that relied on the Taiwan Strait as its passageway, but most of the cargo ships sailed close to mainland shores for safety reasons, and hence barely registered this outlying island.[5]

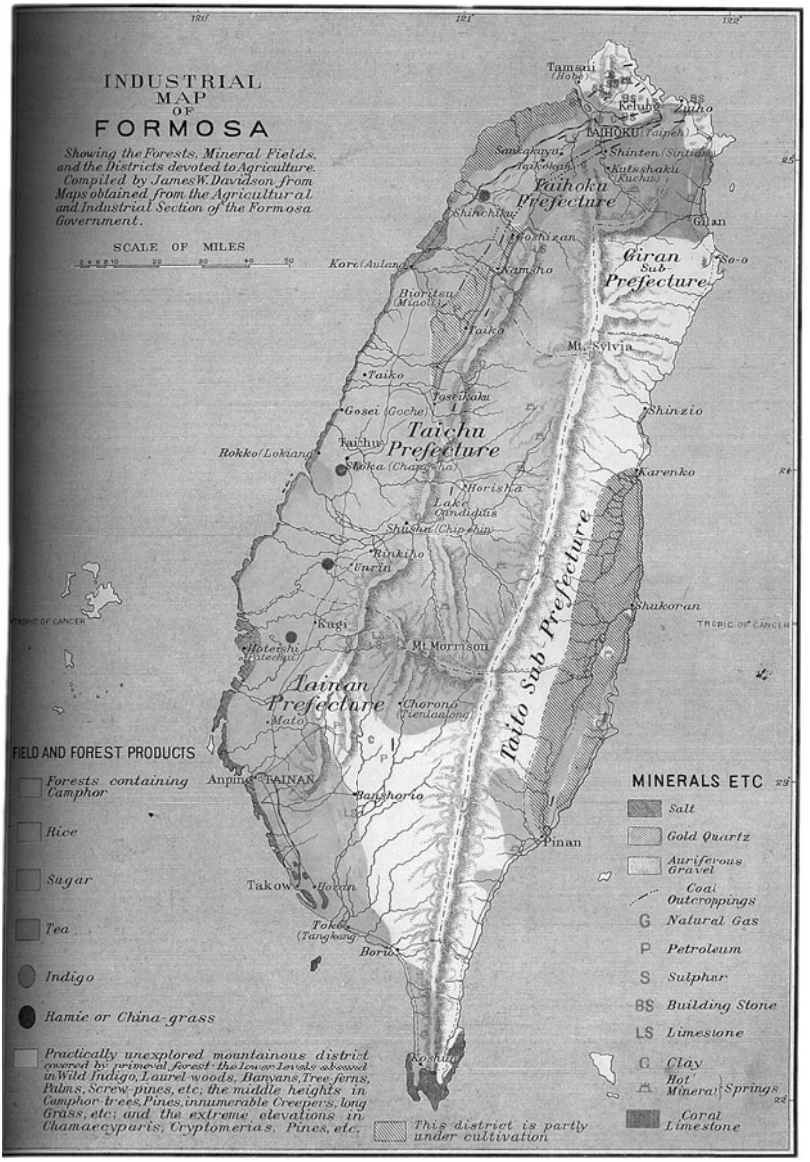
When trans-Pacific sea voyages were established, along with missionary work and colonial expansion after the sixteenth century, Taiwan's location on routes that served southeast China, northeast Asia, Southeast Asia, and the Pacific became important. The uncharted waters around the island seem to have offered both easy and dangerous passages. The competing sea powers of Spain, Portugal, and Holland, as well as the Ming (1368–1644), all fought to gain footholds on the island through the construction of harbours and fortresses during the seventeenth century. In the nineteenth century, Western and Japanese colonial powers competed in the region commercially. They all watched helplessly as their ships were wrecked by rogue currents, typhoons, underwater rocks and reefs, and local pirates.

With year-round subtropical temperatures and a strong tropical current called Kuroshio that splits into two around the island's southern cape, plus shallow coastal waters fringed with submerged reefs,[6] the region was

particularly hazardous to ocean-going vessels trying to round Taiwan's southern tip to reach the capital city of Tainan.[7] Historically, southern Taiwan's sea-coast was famous for countless misfortunes: ships wrecked in superficially calm waters, massacres of castaways who made their way to shore, military expeditions sent in pursuit of the culprits, and diplomatic disputes among competing colonial powers (see Map 4.1).[8]

The Mudan indigenes lived near Taiwan's southern cape, where the rugged tertiary Central Mountain Range, averaging 3,000 metres above sea level, gradually descends into gentle slopes, valleys, and plains, and disappears into the Pacific Ocean. The local inhabitants, who relied primarily on slash-and-burn agriculture and hunting for their livelihood, were distributed thinly along the hills and valleys of the Mudan and Nunai Creeks, close to where a dam would later be built. This location made the Mudan Paiwan among the first hill indigenes in Taiwan to encounter the outside world in the 1800s, a century marked by tussles between old empires and new colonial powers. Their frequent engagement with ethnic others, as sea traffic boomed despite increasing shipwrecks in the Western Pacific, won the Paiwan international notoriety for their ferocity.

The name Mudan, which was known early in Taiwan's history, signalled the position of these communities at the forefront of cultural and political encounters. Mudan, after all, is not an indigenous Austronesian name, but is the Chinese word for peony. Based on available sources, we find three possible explanations for the origin of the name. The first suggests that it was given by Han Chinese sometime in the early contact period. The earliest mention of the *Mudan she* (the Mudan group) in 1723 describes them as one of the 18 'naturalized raw barbarian' groups in the Langjiao region.[9] The local indigenous name for the *Mudan she* was *Sinivaudjan*, which means 'clearing up rattans'. The word *vaudjan* was probably mispronounced by neighbouring Han Chinese as *mudan*, and *sinivaudjan* was accordingly transliterated as *sinraomudan she* in some records.[10] The second explanation relates the name to the Japanese during the colonial period. One archivist claimed that the Japanese used the indigenous term because its pronunciation resembled *mudan*;[11] another, that the Japanese government simply used an already established place-name to set up a new administrative unit.[12] Third, the township's official website implies that this name was officially applied to the administrative village *Mudan cun* under Taiwan's local autonomy policy after 1945.[13] It is worth mentioning that the traditional Mudan communities extended beyond the present-day boundary of that village.



Map 4.1 Industrial map of Formosa
Source: James W. Davidson, *Island of Formosa, Past and Present* (1903), 370.
Note: This map shows in dark shading the coral reefs surrounding the southern tip of Taiwan in the late nineteenth century.

Despite these differences, there is one point that historiographers and archivists agree on: the place-name Mudan has something to do with the dominant indigenous Paiwan people in this region, who were variously called *Sinivaudjan*, *Shinivaudjan*, *Sinvaudjan*, or *Shinbauzan*. Over time, the term 'Mudan' was used to refer to one specific group (that is, *Sinivaudjan* or *Mudan she*), or the broader communities equivalent to today's Mudan Township.

Why should we care about these different explanations of the name? First, these accounts indicate that the local Paiwan's encounters with outsiders and their consequences in the region began very early indeed. The differences among the accounts may reflect the writers' interpretations, political standings, and varying methods of documentation. In addition, 'clearing up rattans' shows that *Sinivaudjan* was a new land to the Paiwan people. It is said that the people in Mudan originated in the north, possibly the area of Kavulungan (the Paiwan name for Dawu Mountain), from where they migrated toward the southern lowlands.[14] This movement brought them into new territory, close to both the open sea and major rivers.

Following the early encounters from which the region and people who lived there came to be called Mudan, an important historical event brought the Mudan communities to the forefront of Taiwan's history, namely, the 1871–74 Mudan Incident.

Narrative two: the Mudan incident and the Stone Gate battlefield

The Mudan communities were among Taiwan's first hill indigenes to face serious outside political intrusion. The Mudan Incident resulted in the Paiwan people finally being subjected to imperial governance, but their destiny was to a great extent shaped by their geographic location near the ocean and adjacent to Taiwan's southernmost cape where shipwrecks were a common occurrence.

As noted, damage to ships and stolen cargo were frequent occurrences and generally tolerated in the maritime era, but Western sea powers condemned the slaughter of innocent sailors and passengers as beneath human dignity and intolerable. The Paiwan tribes' practice of taking human heads as trophies to demonstrate a warrior's maturity and manhood ran directly counter to the rising tide of Western modernity. James W. Davidson, an American diplomat stationed in Taiwan for a short time in the late nineteenth century, wryly commented: 'The wild seas surging around the island coasts are extraordinarily violent, and

many a ship-wrecked crew reached land only to meet with a torturing death, more cruel, more brutal than even the sea would inflict'.[15] Rumours circulated that unruly barbarian tribes had taken European castaways as slaves. Further investigations by Davidson proved those rumours unfounded; however, clashes between the industrializing colonial powers and Paiwan head-hunters soon took place in southern Taiwan's shallow waters.

The Mudan Incident was preceded in 1867 by the killing of the captain and crew of an American merchant ship, the *Rover*, which had drifted onto the Hengchun Peninsula. American troops landed to launch a punitive attack on the local Paiwan, but had no success because of their unfamiliarity with the local terrain.[16] Charles W. Le Gendre (1830–99),[17] the US Consul in Xiamen, eventually reached an accord with the local Paiwan chief Tauketok. The pact required local people to rescue white shipwreck victims rather than attacking them.[18] This event forced the Qing court, under pressure from the US Consul, to pay attention to security in relation to the indigenous communities on the Hengchun Peninsula. But it was not until the Mudan Incident that the Qing finally realized the critical importance of this region as a maritime frontier of China, Taiwan, and the rest of the world.

The usual account of the Mudan Incident goes like this: on 6 November of the tenth year of the Tongzhi reign (1871), two ships from Miyako Island of Naha in the kingdom of Okinawa were blown off course by a typhoon and landed in southeast Taiwan's Padriyiur Bay. Among the 69 sailors, three had drowned and the rest ventured inland for help. They mistakenly entered indigenous Mudan territory and 54 of the men were killed. The 12 survivors were saved by Yang Youwang and his son, Han Chinese who lived in the region and had befriended the Paiwan people. The survivors were eventually assisted by the Qing government and transferred from Donggang through Fengshan, Tainan, to Fuzhou, and ultimately dispatched to Naha in Okinawa.[19]

The Mudan Incident's implications have been thoroughly reviewed by historians, but interpretations of it have diverged along the lines of the local Mudan indigenes, the Japanese government, and the Qing court. For instance, the killing of shipwreck victims who were not white was recorded and remembered differently: the Qing Court considered it an accident, something carried out by unruly 'raw barbarians' beyond its jurisdiction.[20] The newly westernized Japan legitimized its retaliation against the Paiwan by claiming that Okinawa was its sovereign territory, and so the killing of the sailors became its pretext to pull Taiwan into its colonial empire. The local indigenes considered it a justified defence

against dangerous non-white intruders who were not protected by the agreement established between Tauketok and Le Gendre.[21]

Japan's initiatives on behalf of Okinawa in this incident ran counter to established norms and show that it was well prepared to pursue its colonial ambitions. Among the 400-odd ships that drifted from Okinawa to Qing territories during the period from the Kangxi (1662–1722) to Guangxu (1875–1908) reigns, one seventh drifted to Taiwan.[22] Although there are many records of those shipwreck victims who were robbed by local residents, Han or non-Han, there is no surviving official record of Japan's protest or appeal to the Qing court for compensation on their behalf.[23] The Mudan Incident would change among competing powers relations with Taiwan's indigenous groups.

The Japanese government initially dispatched diplomats to the Qing court in 1872 to demand the punishment of the culprits and payment of monetary compensation to victims' families. The Qing government rejected Japan's requests on two grounds: the incident was a matter between the Qing and its tributary kingdom of Okinawa, and the local indigenes lived beyond Qing jurisdiction.

Qing inaction gave Japan a perfect excuse to launch a punitive expedition two years later. In April 1874, Major General Saigo Judo (1843–1902) led a force consisting of five gunboats and 3,658 soldiers which landed on Hengchun Peninsula with the intention of establishing a permanent base there. On 17 May, General Saigo ordered his initial military operations. Most of the 18 Langjiao communities surrendered, but Mudan and Kuskus, the two groups most responsible for the massacre of the Okinawans, held out.[24]

The most brutal fighting was at the Battle at Stone Gate. This was Japan's key access point to the indigenous area, while for the local tribesmen it was their crucial front line of defence.[25] Paiwan tribesmen from Mudan and Kuskus organized a defence force of around 300 warriors along the Stone Gate's ridges to stop the Japanese as they tried to pass through the narrow gorge. With their clear geographic advantage, the indigenous forces kept the Japanese in check for a few days.[26] To further punish the Mudan tribesmen, General Saigo ordered his men to attack the tribal bases with a force of 1,300 soldiers.[27] After three days of fighting, the Japanese retreated from the tribal areas and camped near Stone Gate. During the stand-off, the tribesmen hid in the woods around the waterway and continued to launch guerrilla attacks against the intruders. Both parties suffered losses. Paiwan people were handicapped by their lack of high-quality modern weapons; Japanese losses occurred mainly because of their maladaptation to the local climate and

topography. Of the 3,658 invading Japanese, 573 died, but only 12 as a result of combat. Most died from tropical diseases such as malaria.[28] Faced with such massive casualties, the Japanese negotiated and claimed victory,[29] withdrawing in November 1874, a mere six months after they had been sent.[30]

Once Japan declared victory, the Qing court finally took action; formally declaring the Hengchun Peninsula to be part of its administrative unit, Hengchun County, and all resident 'raw barbarians' to be Qing subjects. The new administration issued 'pacification flags' to the indigenous communities willing to be absorbed into the Chinese Empire. However, the indigenes may well have considered their surrender to Japan as merely a ceasefire agreement, rather than submission.[31]

Whatever the meaning of this 'pacification', the Mudan Incident ushered the Paiwan people into a long, conflicted, and complex relationship with state sovereignty that would take various forms in subsequent decades. Furthermore, under pressure from the United States and Japan, in 1883 the Qing built a Western-style lighthouse at Eluanbi, the very first on the island, to help prevent shipwrecks.[32] The lighthouse was, unusually, fortified to resist attacks by local tribesmen who resented its presence in their territory.[33] All in all, the Eluanbi lighthouse not only signalled the arrival of the modern maritime era in Taiwan, it also demonstrated the Qing state's claim of sovereignty over the region to the world.

Narrative three: using the old to serve the new

Although Japan's initial attempt at colonizing Taiwan had failed, it reasserted this ambition a mere two decades later. In 1895, Taiwan became part of Japan's colonial empire. With such dramatic change, the old battlefield marked by the two opposing mountain chains and a narrow water passage began to acquire new meanings. The features of this waterscape attracted the era's movers of modernizing social change.

The major transformation came with a common farming strategy that imperial and colonial powers worldwide used to 'civilize primitives' in tropical or sub-tropical zones—the introduction of paddy rice and the infrastructure to grow it. The cultivation of wet rice in inundated terraces had long been the benchmark of advanced civilization in East and Southeast Asia thanks to its high yields, effective topsoil conservation, and sustainable regime, not to mention the easy taxation of farmers who were fixed to the land by the ruling sovereignty.[34] In contrast, the slash-and-burn agriculture practised by Taiwanese indigenous peoples was

associated with low yields, deforestation, and semi-permanent mobility following growth cycles, all of which directly challenged the state's urge to make its administrative landscape 'legible' and sedenterized.[35]

Japan's colonial government was no exception in this regard, and it tried to adapt the local waterscape to its agricultural, civilizing, and governing purposes. Colonialists soon began to refashion Taiwan as a supplier of raw materials—including agricultural products—to feed the industrializing 'Motherland', which had entered a frenetic stage of modernization. Among the small streams on the Hengchun Peninsula, Mudan Creek appeared to be one of the very few with a steady year-round flow. The official colonial archive states: 'The Mudan *she* is located on the right bank of Mudan Creek, about 300 metres above sea level. It has a gentle slope with flat lands along the catchment. Because of its high soil fertility, it has been converted into rice terraces'.[36]

In the early colonial years, the Japanese strove to turn the former fighting tribes into settled farmers and 'civilized' peasants. Rice farming in irrigated terraces was a clear marker of being civilized in Japanese thinking, and the Mudan people were early and successful guinea-pigs in the Japanese colonial experiment. The building of rice terraces along the Mudan Creek began in earnest in the early twentieth century, gradually transforming Mudan tribesmen into Mudan peasants. The shift from a livelihood based on slash-and-burn agriculture and hunting to sedentary farming did not happen overnight. The Japanese colonialists first forced indigenes to move *en masse* from the high mountains to the lowlands for the sake of convenient governance, acculturation, and education. Between 1903 and 1941, over half of Taiwan's indigenes, a total of 43,112 people, were forced to move to the lowlands, and this resettlement policy was carried out in tandem with a policy aimed at changing livelihoods that was imposed throughout indigenous society. Resettlement created drastic social change.[37]

In 1909, Japanese police introduced rice to Mudan and educated the local people in its farming.[38] The current Mudan Village was a brand-new settlement built during this period. However, since the rice fields were distributed along both shores of Mudan Creek, some people decided to move further down to live near their fields and to form today's Stone Gate Village. It stood right by the old battlefield and the future reservoir, and hence became the gateway to non-indigenous Hengchun.

Local elites played a critical role in this transformation. For many years, local indigenes had resisted paddy rice farming because it was not

their traditional means of livelihood. Some even considered it inauspicious.[39] It is widely recorded that one local man, Liuliu Pinevar, was key in persuading his fellow tribesmen to try wet rice cultivation through his own example of successfully farming the new crop. His son Zhou Yixiong followed his path and moved from his mountainside residence to the ideal lowlands of today's Stone Gate Village around 1945.[40] This pioneering family has been economically and politically powerful in the Mudan communities ever since.[41]

Public schools, newly established by the Japanese, offered agricultural classes to teach local students modern farming knowledge. Local Japanese police worked as farming instructors. Thanks to the abundant water supply and the fertile paddy fields along the waterfront, the new Mudan farmers came to enjoy good harvests and long-term prosperity. The quantity of rice produced in the Mudan communities, with two harvests per year, was the most plentiful among the indigenous communities in Pingdong County.[42]

The success of rice agriculture in Mudan signalled the local people's early and fundamental transformation, compared to many other indigenous hill tribes. Along with the shift to farming, the colonial government also revised property rights through various land reform policies. In the wake of a settled rice-based livelihood, land rights were moved from indigenous headmen to individual peasants. Among all the Taiwanese hill tribes, the Mudan communities were the first to embrace private land rights.[43] At the collective level, the traditional millet festival (*masalut*) was replaced with a rice festival (*masupadai*) for the first time on 23 November 1938.[44]

After the introduction of wet rice farming and its related social regimen, Mudan communities paralleled the experience of other rural villages in Taiwan during Japanese rule, first through their adoption of modern farming practices, including the use of chemical fertilizers and pesticides. This was followed by the Republican era's capitalist trends, which have swirled through Taiwan's rural villages since the late 1960s. Several factors jointly contributed to subsequent social transformations. Urban industrialization pulled manpower from the villages, and the adoption of high-efficiency machines to cope with the lack of rural labour has caused additional rural unemployment and further pushed many out to the cities in search of jobs. The implementation of six-year compulsory education also moved children out of minor farm work. In addition, increased globalization has brought changes in diet among urbanites, who have gradually come to prefer Western-style

wheat-based foods to rice as staples. All these changes began to take place in the late 1960s and early 1970s and, in combination, nearly brought Taiwan's rural villages to extinction.[45]

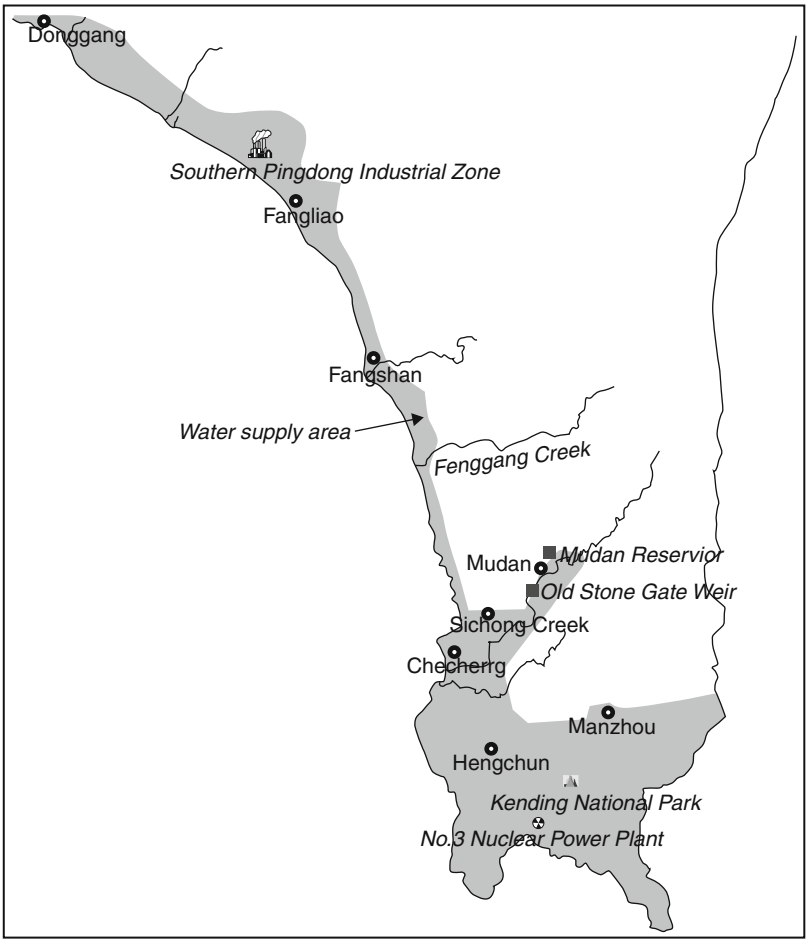
Taiwan's industrialization and urbanization since the 1960s have also brought about a structural transition in waterscape and water management. Water once used for farming was gradually transferred to industries and household uses. The Mudan communities were no exception. As young people moved out of their home villages to cities and towns in search of jobs and education, the waterscape of the Mudan communities lost its significance in sustaining and improving people's lives through agriculture. Our fieldwork in Mudan Township in 2011 and 2012 and interviews with the first cohorts of immigrants from Mudan to metropolitan Taipei in 2013 and 2014 describe the decline of paddy farming in local communities in the 1970s. In the meantime, in the shadow of the out-migration phenomenon, a dam project for Mudan Township was hurriedly conceived by the government as a way of coping with increasing water demands in the urban and industrial Pingdong and Kaohsiung areas. Ironically, this new project brought a timely solution to local communities that were facing a livelihood crisis. But there are two sides to every coin. The other impact of this timely solution was to radically change Mudan's waterscape and its future.

Narrative four: a thirsty nation

In spite of its bountiful rainfall during the wet season, Taiwan's mountainous topography and many steep torrents that rush precipitation to the open sea present real challenges to storing fresh surface water. In response to insufficient rainfall during the dry season, October to April, in addition to the fact that ground water is in short supply for extraction, the solution has been to locate stable water sources and feasible sites for reservoirs so that surplus water gathered during the rainy season can be conserved for the rest of the year. To counter its environmental constraints, Taiwan has built 21 major dams in an island of about 36,000 square kilometres.[46] The timing of each dam's construction reveals the developmental trajectory of Taiwan's population and economic growth. When southern Taiwan expanded its development projects, it became necessary for Pingdong to have a reservoir. Once again, Mudan's particular waterscape attracted that moment's movers of social change.

The Hengchun Peninsula is a relatively flat region potentially suitable for agricultural expansion or industrialization in support of Taiwan's growing population and economy. The Mudan Reservoir is Taiwan's

southernmost dam that supplies water for, in order of urgency, the Number 3 Nuclear Power Plant, regional population use, and increasing tourism to Kenting National Park.[47] Since its completion, the Mudan Reservoir has been systematically tapped to supply an expanding region, from the original target area of four rural townships on Hengchun Peninsula (see Map 4.2) to areas farther away, including rural townships beyond the peninsula.



Map 4.2 Planned water supply area (dark shading) of the Mudan Reservoir
Source: Redrawn by the author from Taiwan Provincial Government, *Mudan Reservoir Construction Plan* (1988), 26.

The opening remarks of the first report produced by the Provincial Hydraulic Bureau in 1981 on how to tap the water supply from Mudan Creek state:

> For many years, our province has witnessed a burgeoning population, rapidly expanding economy, and increasing water demands. In light of these, our government has been scouting sites for reservoirs in order to conserve surface water. However, many of the completed reservoirs have faced the problem of silting that has resulted largely from random cultivation and forest destruction above the catchment areas.[48]

According to this report, the entire catchment area of the proposed Mudan Reservoir was 69.2 square kilometres, or about 6,920 hectares.[49] The affected lands fell under different sectors: national forest (57.82 per cent), and roads and buildings (3.94 per cent), with the remaining 38.24 per cent including: forest (84.05 per cent, mostly owned by the government's Taiwan Sugar Corporation), rice terraces (12.93 per cent, also mostly owned by Taiwan Sugar Corporation), dry farming (1.51 per cent, largely privately owned), and special green plants (1.51 per cent, also largely privately owned).[50] In other words, because the indigenes have, since the Japanese colonial era, gradually lost most of their forest land to the state, the current government's tasks in preparation for building the reservoir, such as acquiring private farmland or resettling current residents, presented few challenges. And the cost would be quite low.

A follow-up study prepared by the Hydraulic Bureau in 1984 confirmed the findings of the earlier overview. It estimated that Mudan Reservoir had a storage capacity of 31,400,000 cubic metres and a life expectancy of 67 years. The report laid out more detailed plans for the project, including fine tuning. For instance, it proposed a more precise calculation of the amount of farmland to be inundated. The study indicated that of the rice terraces to be submerged, only around 50 hectares were privately owned. The remaining 90 hectares of forests mostly belonged to Taiwan Sugar Corporation—thus involving minimum monetary compensation for the requisitioned land.[51] Another change was the careful calculation of the total amount of water resources to be distributed among all end-users (Table 4.1).

The provincial government declared that the five-year Mudan Reservoir building project would be launched in July 1988 with a targeted completion date of June 1993. The most immediate challenge was

Table 4.1 Mudan Reservoir and its estimated water distribution

Total Annual Supply (Cubic Metres)	Agriculture	Drinking Water (five townships)*	Kenting National Park	No. 3 Nuclear Power Plant	Proposed Industrial Park	Airport & Harbour
48,760,000	22,240,000	10,840,000	5,400,000	5,160,000	4,440,000	680,000
100%	45.61%	22.23%	11.08%	10.58%	9.11%	1.39%

Note: *The five townships were Hengchun, Checheng, Manzhou, Fangshan, and Fangliao, with an estimated population of 121,900 people, all on the Hengchun Peninsula.
Source: Taiwan Provincial Hydraulic Bureau (1984), 7–8.

the requisitioning of private lands, to be completed by the end of 1989, with compensation payments to be made to all private landowners in the first four months of 1990.[52]

The standard compensation to landowners was based on the government's registered land prices, plus a 40 per cent mark-up as an incentive. Farmers would receive a subsidy based on the area of their land to help them find a new livelihood.[53] They might also receive other sundry payments to compensate for having to move their houses, crops and trees, graves, and so on. On average, a farmer with one hectare of land should have received about NT$600,000 for the land and other related compensation combined.

By November 1989, the government had successfully negotiated with all the landowners in the planned catchment areas of the Mudan Reservoir, their holdings totalling 58.29 hectares of land shared among 198 titles. The total compensation, NT$747,443,055 (about US$25,000,000), was duly paid out to all the property owners—almost exclusively residents of Stone Gate Village. Two results of this process were surprising. First, compared to other dam-building projects, the real cost far exceeded the government's earlier estimation. Second, the compensation process was completed six months ahead of the original target date of April 1990,[54] an unusual success considering the resistance more commonly seen with public construction projects.

Narrative five: winners and losers in a transformed waterscape

'Why was the government successful in acquiring the land to build the Mudan Reservoir?', was the question we asked Stone Gate villagers during our fieldwork there in 2011 and 2012. Informants often responded

that they had simply followed the government's rules and accepted the compensation without complaint or protest. This common answer aroused our curiosity since it is usually uncommon for farmers, who usually have a strong sentimental attachment to their land as a source of livelihood and identity, to give it up so willingly. After some probing, we came to understand that at work here was a particular kind of social transformation, one shaped by the local waterscape, the ideology about development and livelihood change in Taiwan generally, and an emerging strategy for collectively plundering public funds at the grass-roots level. All these hidden factors have contributed to Taiwan's most recent trajectory of modernity.

As mentioned above, Taiwan's industrial development began to take off in the 1960s and early 1970s (see also Chapter 9). Rapid economic growth was accompanied by urbanization that siphoned off rural youth who sought better jobs, higher wages, education, and amusement in the cities. Even in this remote corner at Taiwan's southern tip, Stone Gate Village experienced the exodus of its youth like any other rural community. By the late 1970s, rice farming in Mudan Township faced a serious labour shortage.

When rumours began to spread that the government planned to build a dam above Stone Gate Village and large swathes of the rice terraces along the creek would be requisitioned, local farmers welcomed the construction project as providing much-needed relief. Mr. Zhou, a descendant of the pioneer paddy farmer in Mudan, explained to us in an interview as follows: Before the reservoir was built, many young people had already moved out to find jobs in the cities. Their families took part in the government's farmland fallowing project that paid a subsidy for letting land go idle. When they heard about the dam project, some of them returned, hoping to find work at home.

Given the broad societal mandate of unidirectional economic development and urbanization, many local residents decided that selling neglected lands in the peripheral hills—seen as hardly useful for tangible monetary gains—was a good idea. It was a move that could immediately improve their family's living standards, which lagged behind those of the neighbouring, urban Han people. Some interviewees who lived in Mudan Township, but did not have a share in the compensation, or had only a minor share, expressed jealousy at the opportunity given to those engaged in this lucrative transaction. It seems to us, according to discussions with informants from diverse family backgrounds, that some people also worried about the loss of farm lands inherited from their ancestors, just as farmers anywhere in the world would be likely

to react. Still, most villagers focussed on how to get more money out of the project and how to spend that money immediately to improve their living standards. In those years, the transformation of the local waterscape was seen as an opportunity more than a threat.

Most of our interviewees relayed bitter-sweet memories of the community at that time. Everyone knew who or which families were the main beneficiaries of the requisitioning programme. Discussions of how to distribute the money received for the land among family members or how to use the compensation caused many violent disputes in the families involved. One of the saddest stories we collected was that of a woman who became so enraged over the distribution of the money that she was said to have died of a stroke as she argued with her mother and brother.

For a while, most villagers were obsessed with the dam project, and their main focus was how to maximize the potential windfall by whatever chicanery or expediency they had at their disposal. This ambition on the part of the local people was the reason behind the government's smooth and successful requisition of land—at a sky-rocketing cost—in the Mudan Reservoir case.

Local people quickly learned, from other dam-building and public works projects elsewhere in Taiwan, how to ramp up requisition payments. Local political elites provided the information to kin and fellow villagers, and other locals then collectively followed suit. For instance, since compensation for farm land was set according to area, the 58.29 hectares held by Stone Gate villagers and now submerged under the reservoir should have cost NT$34,974,000 (at NT$600,000 per hectare), not the NT$747,443,055 the government likely paid out in late 1989 and early 1990. How did the villagers get 21 times more money out of government coffers than the land was likely worth? There were tricks to milking the cash cow, as Table 4.2 demonstrates.

It is clear that the principal gains came from compensation for plants and crops in the field. More than 90 per cent of the cash payment, NT$675,180,495 (about US$22,500,000), combining the two rows under Farm Crops–fine and Farm Crops–crude) was actually paid for 'crops' grown on the 58.29 hectares, with the farmer receiving for each hectare on average NT$11,583,127 (about US$386,000) for those crops. If we assume that each hectare of the best rice terrace could produce an unimaginably high yield of 10,000 kilos of crude rice in a year, each kilo of the rice would be worth NT$1,158.32, more than 100 times the market price of about NT$10 per kilo. But rice was not the real cash cow in this case.

Table 4.2 Itemized monetary compensation to land-requisitioned villagers

Payment Category	Number of cases	Values (NT$)	Percentage of Total
Farmland plus 40% Markup	198 titles (58.29 Ha.)	33,391,916	4.47%
Land Improvements	198	5,829,330	0.78%
Special Allowances	198	3,437,265	0.46%
New Job Training	76	19,300,000	2.58%
House Reconstruction	68	2,034,049	0.27%
Grave Moving	318	8,270,000	1.11%
Farm Crops—fine	250	410,035,815	54.86%
Farm Crops—crude	593	265,144,680	35.47%
Total	1,899	747,443,055	100%

Source: The 7th Engineering Section of Hydraulic Bureau (1990), 16–17.

The so-called 'fine' farm crops category included mainly fruit trees. Some of our interviewees recollected how they and others had been obsessed with planting fruit trees and later uprooting them for another kind of tree that they believed would be more profitable. This frequent swapping of fruit trees not only took a lot of labour, it also required cash investment. According to many, one of the most valuable fruit trees was *lianwu* (*syzygium samarangense*), also called wax apple, a tropical fruit introduced by the Dutch from Southeast Asia to Taiwan in the seventeenth century. The compensation scheme for *lianwu* trees was based on the requisition programme of another government project in 1980. The compensation rate for a fully mature tree more than 11 years old was set at NT$8,640, a big tree of about seven to ten years was NT$7,380, and one of medium size at four to six years was NT$5,040.[55]

In 1981, when the first proposal to build the Mudan Reservoir was made public, most people in Stone Gate Village and beyond quickly set about preparations to cash in. According to our informants, villagers who had the means purchased *lianwu* saplings and planted them—either themselves or using hired workers—on their idle farm land. Those without the means or labour to convert their land into orchards would sign up speculators or venture capitalists, most of them Han people from nearby cities, to get the work done. A contract would be signed between landowner and speculator—who would provide the capital to purchase saplings, hire workers to plant the trees, and manage the orchard to ensure that the trees grew well until the land was appropriated by the government. When payment for the extant fruit trees was made (but not for the land itself, since that went to the landowner

exclusively), the landowners and speculators would split the windfall according to an agreed ratio, generally 4:6 or 3:7, depending on the land's accessibility to transportation and irrigation.

For those who planted *lianwu* early, by the time land requisition started in 1989, there were already plenty of fully mature trees that could command exorbitant level of compensation. The sudden windfall to Stone Gate villagers in 1990 generated general euphoria, though not everyone could claim a large sum because of their limited capital investment or failure to grow healthy fruit trees. And some who borrowed in anticipation of a good return wound up with only debts.

Villagers today have bitter-sweet memories of the new houses purchased in cities like Kaohsiung or Pingdong, or new modern-style houses built in Stone Gate Village itself. Conspicuous consumption led many villagers to buy new automobiles and spend freely at high-end entertainment establishments in the cities. Some entrepreneurial villagers worked on longer-term investments, for example by starting restaurants or building dormitories to cater for the workers who would be arriving for the actual construction work. And they did manage to build rows of restaurants and makeshift housing for the construction workers. Some village youths also returned home either to find jobs related to the reservoir construction or to share in the largesse of their parents or grandparents.

Euphoria, by definition, cannot last, and the Stone Gate villagers' transition from peasantry to post-peasantry, just as in other rural communities in Taiwan, was marked by frustrations and failures. The prosperity mirage in Stone Gate Village finally faded when the dam project was completed in early 1995, 18 months behind schedule. The departure of the construction workers meant the immediate closure of the roadside restaurants and dormitories. Villagers who had purchased apartments in the city could not continue paying the instalments once the cash they had received for their land was spent. Unable to make monthly payments, the villagers defaulted on their loans, and the banks foreclosed on their possessions. Only a few who managed their money with care have been able to continue living in the modern-style villas that still dot the village landscape. Otherwise, all that remains of this boom-bust cycle are the roadside tin-roofed former restaurants and housing left from the golden days, along with a number of unemployed, drunken, middle-aged male villagers reminiscing about the once-happy past.

In recent years, to make ends meet or to try to gain some peace of mind, the aging local farmers have reverted to the means of livelihood they knew best: growing food from the land. But to do so they faced

daunting challenges. For one thing, their best rice terraces along the creek are gone—requisitioned by the government and submerged. Some still have plots around the reservoir, but they are now inaccessible, and besides, their lands lie within the catchment area where, to protect the water source, the government has banned the use of all chemicals.

In 2006, to revive Taiwan's dying agricultural sector, the Council of Agriculture announced a programme called 'Small Land Holders, Large Tenants'. Under this programme, a managing farmer could organize a number of small landowners to form a cooperative with two hectares of idle farm land, and the government would pay NT$50,000 per hectare per year to encourage mainly rice or maize cultivation. Farmers can also grow *shansu* (*Asplenium nidus L.*), wild vegetables that require no chemical fertilizers or pesticides, in the fallowed woods, and raise mushrooms on logs, and then sell the harvest in the name of the cooperative. This sounded like an ideal option for aging farmers, and many villagers began actively organizing cooperatives with their kinsmen and neighbours. In 2012, four such cooperatives had already formed in Mudan Township.[56]

However, developing an alternative and viable farming system to replace the old family farming way of life appears difficult, if not impossible, at present. The most obvious challenge is a lack of participation by young people. Currently Mudan's agricultural cooperative members are all over 50 years of age, and many of them are even older. With hired labour unaffordable, labour shortage will always be a critical problem. Furthermore, selling produce as organically farmed requires a complex certification process, and so does its marketing. All these schemes seem beyond the aging farmers. At the time of writing, all four of the cooperatives formed in 2012 have become inactive, and uncertainty again befalls Mudan's farmers.

Conclusion

Social science research on landscape usually defines it as 'a symbolic environment' created by human acts conferring cultural meaning on nature.[57] This perspective has definitely provided useful insights into the links between humans and nature, but this chapter has tried to turn that reasoning around to show how a unique environment has actually influenced human interactions through a dynamic human-nature relationship. Without falling into environmental determinism, we do want to stress the role of environment in tandem with human agency in shaping history.

Over the 150-year history of the Mudan communities, the local Paiwan people have lived close to the open sea and so were party to the disputes over shipwrecks during the colonial maritime era. Later, their fertile habitation along Mudan Creek encouraged Japanese colonialists to utilize the stable water supply for economic and social development and to turn their communities into an ideal place to pursue a peasant livelihood. Most recently, the natural bounty of Mudan Creek's water supply and Old Stone Gate battlefield's unique topographic features permitted the successful construction of a reservoir to meet water demands on the Hengchun Peninsula and beyond. The social changes that took place in this locality all evolved around this local waterscape. We can also see how human forces emanating from the state—whether imperial, colonial, or republican—have transformed the waterscape and shaped the lives of local people.

But the local people were never totally passive, as can be seen from their hearty participation in robbing or killing castaways, ferocious fighting to defend their territory against intruders, initial resistance then gradual uptake of rice farming, which made good use of the local waterscape, and ultimate willingness to profit in the face of an inevitable dam construction project. Their resistance to each wave of social and environmental change, followed by active adaptation, is particularly impressive given the presentation of modernization as unidirectional.

As a result, at first sight, today's Mudan communities do not resemble other Paiwan hill tribes because of their ethnic and cultural mixing with sub-groups of Han people through marriage, religion, and lifestyle. This situation may also reflect their earlier and more sustained experience of acculturation compared to other hill tribe communities. The successes and losses in which the local indigenous people have shared have been significantly shaped by the particular topography of their habitation. Their lives have moved *en masse* along with the changes to a local landscape in which bodies of water have continuously taken on their own evolving shapes and meanings.

The latest development of the local waterscape, the dam project of the 1990s, gave the local people a one-off windfall. But, as in other farming societies, the villagers' transition from peasant to post-peasant has been full of frustrations and stresses. Now dependent largely on government subsidies, the aging farmers can only muddle along and do their best to make ends meet, just like other marginal groups in Taiwan. Along the transformation path from tribesmen to state peasants to organic farmers, the local community has lost the vitality of its youth, who have taken to the cities to look for jobs. They are unable to see the

viability of life at home given the speed of social change. This has been a stubborn problem over the long process of global modernization.

The reefs surrounding the Hengchun Peninsula, dangerous to foreign ships a century ago, have today become a tourist attraction where visitors snorkel to explore the beauty of the coral reef in Kenting National Park. The topographical guardian of Stone Gate first became a focus of colonial civilization and now marks a dam that supports regional industrialization and urbanization. Mudan Township, in its outlook, is still a typical rural village, but agriculture no longer provides a viable livelihood in this once-legendary locality.

Water is always on the move, and history's clock never stops ticking. Regardless of how the drivers of modernity projects apply cultural meanings to the waterscape, people's dread of, need for, and use of water keep shaping the landscape surrounding it. The nature of water remains unchanged, but the human condition and its meanings continue to be transformed.

Acknowledgements

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Part III
Landscape Commodification

5

The Role of the Shin Nihon Hakkei in Redrawing Japanese Attitudes to Landscape

Thomas Jones

This chapter provides a critical analysis of the Shin Nihon Hakkei (hereafter Hakkei), a canon of eight 'new' landscape sites that were nominated in 1927 following an opinion poll jointly conducted by two newspaper companies, the Tokyo Nichinichi Shinbunsha and Osaka Mainichi Shinbunsha. At first glance, the Hakkei's ostensible aim of showcasing the nation's finest landscapes in eight pre-determined geophysical categories seems relatively innocuous. Yet the poll marked an important shift toward the nation-building imperatives of the new era, particularly as it was timed to commemorate the transition from Taishō (1912–25) to Shōwa (1926–89) periods by simultaneously promoting characteristically 'Japanese' landscape along with 'modern' Western aesthetics and concepts of scenic beauty.

This chapter employs a broad cross-section of secondary sources in order to demonstrate the scope of the Hakkei and its role in redrawing Japanese attitudes to landscape. The analysis comprises three sections. The first traces the selection process which preceded the eventual nomination of eight 'new' landscape sites in 1927, and addresses the considerable controversy attracted by the poll. One source of disagreement was the then little-known Kamikōchi Valley, which had ranked a distant eleventh place in the initial postcard vote and should therefore have been excluded from selection according to the original criteria. Nonetheless, it went on to overturn Tenryūkyō's eventual nomination in the 'valley' category. The second section of this chapter thus examines the extraordinary case study of Kamikōchi in more detail, unravelling the 'untouched wilderness' theory proposed by Kojima Usui (1873–1948) based on a rationale of *terra nullius*.[1] The final, third section uses the overall legacy of the Hakkei, as well as the specific example of Kamikōchi, to discuss broader changes in attitudes to Japanese landscape appreciation.

Tracing the Shin Nihon Hakkei

The Shin Nihon Hakkei was an opinion poll conducted in April 1927, just a few months after the enthronement of the new Emperor Hirohito (1901–89) in December 1926. The Hakkei was envisaged as a tool to select the eight 'new' landscapes which would be most representative of the Japanese nation to commemorate the start of the Shōwa era. The canon concept typical of this list-making approach to cultural landscapes had numerous precedents, including the Nihon Sankei, a canonical list of Japan's three most iconic scenic sights attributed to a neo-Confucian scholar (*Jusha*) named Hayashi Gahō (1618–88),[2] the third son of Hayashi Razan (1583–1657), who is 'widely regarded as the first historian of Japan'.[3] As an administrator and revered academic within the Tokugawa government's system of higher education, Hayashi had been in a privileged position to journey across sections of the Japanese archipelago in an era when travel was otherwise heavily restricted, except for specific purposes, such as pilgrimages to sacred mountains or the imperial shrine at Ise. He recorded his experiences in a book entitled *Nihon Kokujisekikō* (*Observations about the Remains of Japan's Civil Affairs*), in which he praised the three locations he considered to be the most beautiful scenically.[4] Hayashi's 'Sankei' encompassed three coastal views of geographical phenomena, such as islands and a sand bar, and also invariably included religious architecture such as notable shrines and temples (see Table 5.1).

This canon of venerable scenery fitted with contemporary ideologies based on ancient Confucian cosmology. Eight was also an auspicious number, as with the eight views of the Xiao and Xiang (Xiao-Xiang bajing), the first known in Song China.[5] The concept diffused across Japan, as demonstrated by Hiroshige's Eight Views of Ōmi (1834). A range of landscape canon equivalents also emerged in specific sub-categories, including the 'three best gardens' and the 'three sacred mountains' of Japan.[6] A more detailed chronological review of the Hakkei landscape concept is beyond the scope of this chapter, but although originally published in 1643, Hayashi's text was still in general circulation in the eighteenth and nineteenth centuries, when relaxation of regulations began to allow greater swathes of the population to travel. Thereafter, the Sankei concept was adopted by Jitsugyō no Nihon Sha in 1915 as the basis for a national ballot to determine a list of the new Three Views of Japan (Table 5.1). Jitsugyō, a publishing company which produced guidebooks, announced the winners as Ōnuma, a large lake near Hakodate on the east side of Oshima Peninsula in southwest Hokkaidō;

Table 5.1 Comparison and development of Sankei: Hayashi's Sankei of 1643; Jitsugyō's Sankei of 1915; the final Shin Nihon Hakkei of 1927

Hayashi's Sankei of 1643

Site	Prefecture	Shrine	Feature
Matsushima	Miyagi	Shiogama	islands
Amanohashidate	Kyoto	Komori	sandbar
Miyajima	Hiroshima	Itsukushima	island

Jitsugyō's Sankei of 1915

Site	Prefecture	Feature
Ōnuma	Hokkaidō	large lake
Miho no Matsubara	Shizuoka	pine grove
Yabakei	Ōita	headwater

The final Shin Nihon Hakkei of 1927

Site	Prefecture	Category	NP	QNP
Muroto	Kōchi	Bayside	×	○
Towada	Aomori/Akita	Lake	○	×
Unzen	Nagasaki	Mountain	○	×
Kiso	Aichi	River	×	○
Kamikōchi	Nagano	Valley	○	×
Kegon	Tochigi	Waterfalls	○	×
Beppu	Ōita	Hot spring	×	×
Karikachi	Hokkaidō	Meadow	×	×

Note: ※NP = currently a national park (as of 2013); QNP = currently a quasi-national park.
Source: Prepared by the Author.

Miho no Matsubara, a pine grove on the Miho Peninsula in Shizuoka with coastal views of Mount Fuji;[7] and Yabakei, a gorge formed by the Yamakuni River in Ōita, Kyūshū. The 1915 Sankei lacked any overt religious component. The concept of *meisho*—temples and shrines of literary fame—that had been central to all three of Hayashi's sites were replaced with grand natural 'nature' landscapes represented by a lake, pine grove, and river valley respectively. The selection also pre-empted the nation-building agenda of later landscape canons by staking out the north–south axis of Japan's main island groups, juxtaposed with the central pillar of Mount Fuji.

The Shin Nihon Hakkei was launched in April 1927, based on a similar concept of 'natural landscapes', which were extended to incorporate

eight categories (Table 5.1). Jointly conducted by the two aforementioned newspaper companies, the Hakkei also had the official support of the Ministry of Railways (Tetsudōshō). The selection process consisted of two stages: firstly, postcard votes from the general public were used to compile a short list of the top ten sites in each of the eight categories. Next, a panel of expert judges—including well-known authors, artists, scholars, and politicians—would make the final decision for each category from among the top ten contenders.

Details of the competition were announced in April 1927 and the response from the general public was overwhelming. After six weeks of frantic submissions, the total number of postcard votes was calculated at 93,481,775—roughly one and a half times the population of Japan at that time.[8] This huge number was partly a testament to the fierce competitive spirit which emerged between rival regions, enflamed by the newspapers' regular updates of the current totals. Governments and other institutions lobbied local communities to register their support for the own region by sending in a postcard.[9] Hence, contenders such as the Unzen area of Nagasaki—already a popular destination for both domestic and international tourists that was vying for the 'best mountain' category—managed to inflate its number of votes from 84,848 on 16 May to 143,532 on 17 May, before reaching an unassailable lead of 347,246 votes on 21 May.[10] The sense of regional pride and rivalry only intensified after the members of the executive panel were announced halfway through the voting period. The presence of heavyweight experts among the judges, such as Honda Seiroku (1866–1952)[11] and Tamura Tsuyoshi (1890–1979),[12] sent a clear signal to regional governments and boosters as to the potentially decisive role which Hakkei selection could play in the impending designation of national park sites.

Given such high stakes, it is perhaps unsurprising that the published Hakkei should have attracted significant criticism, with newspapers receiving letters of complaint and even readership boycotts from disgruntled regions who were not among the final eight sites selected.[13] The ultimately opaque decision-making criteria were one cause of controversy. In one instance, the little-known Kamikōchi Valley—which had ranked a distant eleventh place in the initial vote and should therefore have been excluded from selection according to the original criteria—was reinstated following a petition and eventually went on to overturn the first-placed Tenryūkyō in the 'valley' category. The panel of experts deliberated for over 13 hours before agreeing on the final list, with Kojima Usui[14] repeatedly arguing in favour of Kamikōchi's

inclusion as a 'primeval wilderness' worthy of being considered an international destination.[15] In the next section, this chapter discusses Kamikōchi in more detail to explain its exceptional status in the Hakkei, and the way it symbolized a transition in Japanese landscape perceptions.

A case study of Kamikōchi

In order to persuade the panel of experts of Kamikōchi's status as the 'most beautiful valley in Japan', Kojima needed to paint a persuasive picture of an 'untouched' natural wilderness. In this respect, his opinion was partially validated by an inaccessible location which had in fact heavily restricted development in pre-modern Kamikōchi. Nonetheless, the valley did have a history of use by local villagers under the auspices of the Matsumoto *han* (fiefdom). The first written references date back to 1694, with evidence suggesting that selective logging had already been occurring on a regular basis from the mid-seventeenth century onwards.[16] Woodsmen from the four hamlets which would later become Azumi village[17] spent several months in the highland basin every summer chopping wood, and in autumn floating the larger logs down the River Azusa to the plains. Aside from firewood, the timber was used for construction and raw material for the carpenters, coopers,[18] and roofers in the castle town of Matsumoto on the plains below. Forestry was thus Azumi's staple industry, and evidence of the comparatively large-scale nature of the annual logging operation survives in place names such as Roppyakuzan, which records the 600 trees allegedly felled in a single season. With a settlement of more than ten buildings at peak times, the summer population was estimated to include some 250–400 woodsmen.[19] By the end of the Edo period, this selective felling had removed most of the old-growth timber and transformed the mixed woodland, in which beech (*Fagus crenata*) and oaks (*Quercus crispula*) had previously been widespread.[20]

Besides forestry, Kamikōchi also housed an inn with a hot spring which served as a post house on the Hida Shindō, an important mountain trail linking Matsumoto to the east of the Alps (modern Nagano Prefecture) with Takayama to the West (Gifu Prefecture). This hot spring served as a stop-over point for the earliest recorded climber in the region—Banryū Shōnin (1786–1840).[21] However, despite such varied records of human activity in the area, Kojima's *terra nullius* argument was legitimate at least in the sense that Kamikōchi had never been renowned as a pilgrimage site akin to sacred mountains, such as Hakusan or Tateyama

further north in the same mountain range, which was known as the Hida Sanmyaku. Many of the ridges of the remote highlands which surrounded the peaks of the Yari-Hodaka range which border the valley had rarely been explored, let alone 'systematically surveyed'.[22] Some of the 3,000-metre peaks were so inaccessible that an ascent of the now iconic Maehodaka[23] was not recorded prior to 1893.

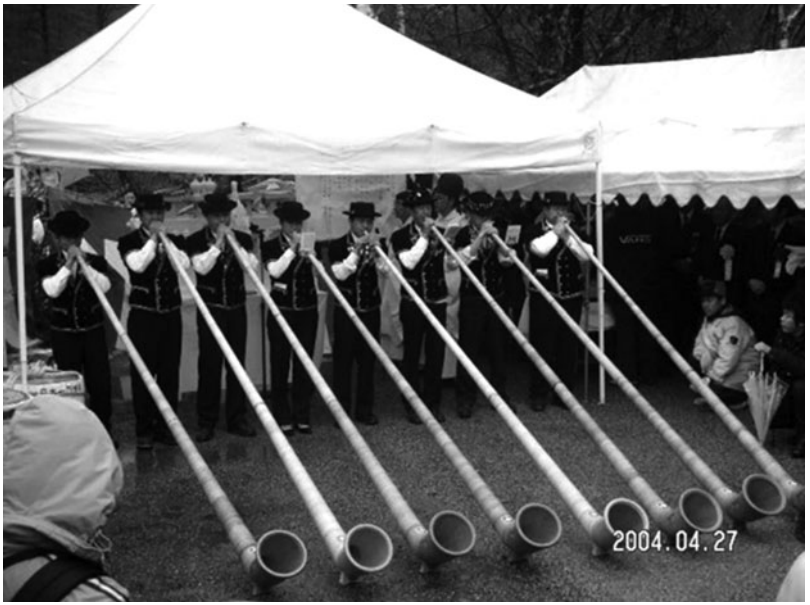
It was not until the modern era that mountain climbing consolidated its pre-eminent position among the region's emerging identities. A British chaplain, Walter Weston (1860–1940), is often misattributed with having coined the phrase 'Japan Alps', the Meiji-era neologism which remains widely used today.[24] Weston's book, entitled *Mountaineering & Exploring in the Japan Alps*, was published in London in 1896, and his role in linking Kamikōchi's name to Alpinism was an important force of legitimization at a time when the few foreigners allowed into the country were perceived as experts in their field, partly because the majority were 'advisors hired to assist with Japan's transformation into a modern nation'.[25]

Weston's own experience of climbing in the Swiss Alps helped shape the introduction of a new sport-based mountain-climbing culture, known as *Arupinizumu* (Alpinism), which appealed to wealthy or aristocratic strands of Japanese society as personified by the aforementioned Kojima Usui. The mountains' exclusive scenic delights were influential in fixing the affections of such key players who would be closely involved in the transformation of Kamikōchi's fortunes. As well as fostering aesthetic appreciation of the landscape, Kären Wigen notes that 'the high-altitude zones were a treasure trove for scientific observation',[26] and it was this drive for exploration in the name of science that coincided most closely with the patriotic fervour fuelling Japan's imperial expansion overseas. Science was thus a vital factor which underpinned newly-imported academic disciplines, such as geography and civil engineering, to further legitimize the cultural phenomenon of Japanese Alpinism, as 'mountaineering was reinvented for scientific or recreational purposes by the newly emerging middle class'.[27] Kojima's 'untouched wilderness' argument was based on a *terra nullius* rationale that exaggerated Kamikōchi's remoteness. It may have been an accurate reflection of the urban elite's perception of this mountain valley's inaccessibility, yet the Alpinists' version of the Kamikōchi story was by no means the only vision in existence at the time. Since the advent of the prefectural system of local government at the start of the Meiji period (1867–1912), the remote valley had suddenly found itself playing host to a bevy of unfolding development

narratives, which included rice farming, grazing, and later, hydroelectric power development. The set-up of a ranch in 1885 ushered in several decades of cattle and horse grazing in the valley, replacing the previous economic mainstay of logging. An alternative vision proposed more intensive agricultural development which would exploit Kamikōchi's not inconsiderable area of flat land, combined with the quality of the Azusa's water. Proposals had initially been drawn up as early as 1809,[28] while a more detailed cultivation plan was submitted in 1886 along with an application to manage the hot spring. Yet the logistical difficulties associated with access to, and from, the basin's rugged location 1,500 metres above sea level consistently undermined concerted attempts to introduce a more intensive style of agriculture via the cultivation of rice or other crops.

Kamikōchi's development path was also shaped by geological forces, and the eruption of Yakedake in 1915 seemed to offer tourism a competitive advantage by creating Taishō-ike, an eerily beautiful submerged forest lake. This picturesque addition to the valley further enhanced Kamikōchi's burgeoning reputation for mountain scenery on a par with Europe's Alpine resorts. It built upon the image of a scenic playground which had been popularized by a growing body of literature that drew inspiration from Kojima's *Nihon Sansuiron* and the works of Shiga Shigetaka (1863–1927).[29] The Taishō period also witnessed Kamikōchi's diversification as a destination, with visits not only from specialist climbing organizations, such as the Japan Alpine Club (JAC), but also by high schools and university clubs. With its red-roofed huts and cowbells, Kamikōchi was seen as the domestic equivalent of a Swiss village (see Photograph 5.1), and a number of new mountain lodges, inns, and rest-houses was built to cater for the growing numbers of climbers and sightseers. The number of annual visitors was estimated to have increased from approximately 600 visitors in 1916 to 5,000 in 1921. By 1931, at least 70,000 tourists would be making the trip each year.[30]

However, the same forces of development which were opening up Kamikōchi's hidden charms to tourism were simultaneously threatening to submerge the fragile mountain environments. From an engineering perspective, the steep valley walls and fast-flowing river shaping the Kamikōchi Valley seemed highly suitable for dam-building,[31] which offered a potential source of hydroelectric energy in a country that possessed few petrochemicals or other natural resources. Indeed, the 1915 eruption of Yakedake had already created a kind of natural levee, so it was no coincidence that a formal dam construction plan was opportunistically proposed in the same year.[32] Almost immediately,



Photograph 5.1 Swiss-style opening ceremony at Kamikōchi
Source: Picture owned by the author.

the conservation faction struck back, and when seven classifications of Protection Forest were established by the Agency for Mountain Forests (Sanrin Kyoku) in 1916, Kamikōchi was the first area in the country to be designated as a Protection Forest for Academic Consideration.[33] However, speculation in hydroelectric development projects continued unabated, and a plan proposed by Keihin Denryoku in 1924 would have flooded an area from Taishō-ike as far upstream as the mid-point between Myoji and Tokusawa, submerging modern attractions such as Kappabashi Bridge, and the Myōjin Pond and shrine.[34]

The ongoing tension between conservation and development rarely resulted in a purely dichotomous conflict and, at times, the dam-building agenda inadvertently came to the aid of Tamura's persuasive promotion of tourism's economic impact. For one thing, construction projects had necessitated the engineering of an alternative entrance to the Tokugo Pass. This narrow, punishingly steep mountain track, formerly used by ranchers to herd cattle into the valley, had served as a natural bottleneck, greatly restricting access for large-scale tourism. The 1924 opening of Kama Tunnel was thus a milestone in Kamikōchi's

development as a destination that owed as much to the hydroelectric power companies as to tourism planners. Tamura and other conservationists were quick to capitalize on it, realizing that despite the economic carrot of increased tourist numbers, the valley's future still hung in the balance without legal protection along the lines of the American national parks. Although a new law had been passed in 1919,[35] conservation restrictions were still flimsy, partly because there was no precedent for designating an entire valley as a national monument. Tamura's persistence paid off after a meeting in December 1924 succeeded in aligning an unlikely mix of nobles, academics, mountaineers, and bureaucrats against the imminent hydroelectric development.[36] The mobilization of such illustrious stakeholders provided a foretaste of the elite support which would ultimately prove powerful enough to reverse the initial postcard vote ballot and clinch its designation within the Hakkei. It was this new hybrid model of social engineering which ensured that Kamikōchi was able to avoid the kind of large-scale construction projects that were radically transforming the landscapes of other mountainous beauty spots, including the Kurobe Valley further north in the same mountain range. In 1927, coincidentally the same year as Dam Number One was completed at Kurobe, Kamikōchi was nominated in the Hakkei Valley category—a crucial step on the path to legitimization within the nation's rapidly transforming awareness of Japan's landscapes.

Japanese attitudes to landscape

The ostensible aim of the Hakkei was to promote Japan's natural landscapes—in the form of scenic spots—to the general population using the familiar framework of a canon of eight categories. Ironically, this traditional 'oriental' octagon of landscape categorization was chosen as a means of popularizing the newly imported, modern, and quintessentially Western concepts of scenic beauty and nature. The 1927 Hakkei was a continuation of the shift from Hayashi's 'original' Sankei of 1643 to Jitsugyō's equivalent of 1915, which echoed the broader transition from worship of religious sites of literary fame (*meisho*) to an appreciation of Japan's landscapes (*fūkei*) that drew upon Western concepts of natural beauty and remoteness. Alongside time-honoured destinations, such as the Ise Shrine and Tateyama, a new generation of natural landscapes was emerging based on mountain resorts such as Unzen and Kamikōchi—two nominated Hakkei sites—as well as others that were not included in the final list, such as Karuizawa and Yamanaka, the latter one of the Fuji Five

Lakes. Significantly, many of these new sites had been 'discovered' by visiting Westerners seeking refuge from hot, humid city summers.

The launch of the Hakkei just a few months after the emperor's passing was also a nation-building exercise in several ways. Firstly, it aimed to commemorate the changeover from the Taishō to the Shōwa period by reassessing Japan's compendium of characteristic geophysical resources. The stocktaking also sought to reaffirm the nation's literal and figurative geopolitical arsenal in an era of tempestuous international relations. Jitsugyō's 1915 Sankei had pre-empted the 1927 Hakkei's nation-building imperatives, and—as with other sectors, from engineering to economics—landscapes were now used as a yardstick with which to measure Japan's progress against the industrialized Western powers. Much like the intra-regional competitiveness induced by the postcard votes for each of the eight categories, this nascent nationalism often boiled down to no more than petty rivalry, such as when Kojima described the snow-melt of the Isar in Munich as a 'mixture of mud and milk' compared to the 'pure flowing' Azusa River in the Kamikōchi Valley.[37] Yet extending such nationalist rhetoric proved highly effective in gaining the long-sought consensus to protect Kamikōchi via successive designations, first of the entire valley as a natural monument in 1928, and then of the surrounding Japan Alps, which in 1934 became one of the first national parks. However, although the burgeoning nationalist rhetoric seemed an innocuous consensus-building tool at the time, there would be serious ramifications in later years, as indigenous natural landscapes became an important cog in the militarization of the general public in a manner akin to Germany, where '[i]n the crisis of late Weimar, the notion of the native *Heimat* landscape took on an increasingly xenophobic cast as preservationists tried to erect a spiritual bulwark against the imagined onslaught of foreign cultures and levelling modernization.'[38]

More pragmatically, the Hakkei epitomized a new concept of tourism as a platform for regional development—complete with infrastructure, such as railways, standardized hotels, and restaurants. In this regard, both the Hotel Development Law (1907) and establishment of the Japan Tourist Bureau (1912) had been milestones.[39] Both were symbolic of the public–private development path that would follow, with tourism assuming an ever-greater role in land policies, as shown by the publicly owned hotels built by the Railways Ministry, whose support for the Hakkei poll also lent it an air of authority.

Kamikōchi, the case study examined in the second part of this chapter, offers multiple examples of such tourist development in practice. Until the late nineteenth century, the mountain ranges around Kamikōchi

had been rendered largely inaccessible by a combination of geophysical and socio-religious boundaries. Although it had been a long-established logging area, with forestry and farming two of the potential development paths under consideration, Kojima's *terra nullius* argument struck a chord with the upwardly mobile urban masses, paving the way for a total renaming of the region. Even today, the Meiji neologism 'Japan Alps' remains widely used. The naming process was accompanied—and legitimized—by intricate map-making operations carried out in the name of scientific knowledge and geographical exploration. Such expeditions were symbolic of the broader political forces at work, as the exploration process paved the way for central government annexation of large swathes of Japan's mountainous backbone for designation as national forest (*kokuyūrin*) and later as national parks (*kokuritsu kōen*). Hakkei certification in 1927 marked the extent to which the hitherto unknown Kamikōchi had now been popularized as the southern gateway to this wild hinterland; the 'Japan Alps' had been popularized by the literature and social networks such as the JAC, which had sprung up around the new sport of Alpinism. The Hakkei was thus a milestone in the extraordinarily rapid development which would propel Kamikōchi to the forefront of national consciousness, transforming it within a mere few decades from the obscurity of a back-country logging camp to designation as one of the first new national parks in 1934.

The newly forming attitudes to the landscape were also shaped by the macro-economic climate of the time, with the National Parks Act ultimately executed in an era of austerity. The concept had been conceived much earlier, but a fierce academic and philosophical debate had raged for many years, epitomized by a dispute between Honda Seiroku and his former student Uehara Keiji (1889–1981) that echoed the ideological rift between American preservationists, led by John Muir (1838–1914), and conservationists such as Gifford Pinchot (1865–1946), who had a more utilitarian approach to resource management. Yet it was the prolonged economic depression that played an important role in finally convincing Japan's law-makers to enact the National Parks Act in 1931. More specifically, then, the Hakkei can be seen as having paved the way for the new national parks as part of a tourism policy explicitly geared towards attracting more inbound tourists and the foreign currency which they would bring.[40] Thereafter, the first twelve parks were established in quick succession between 1934 and 1936, under a designation criteria which also drew inspiration from the Hakkei model.

As well as the media attention to the polling process itself, the eight sites that had been selected went on to receive a number of high-profile

visits from aristocrats, celebrities, and high-ranking officials, which in turn boosted their status, as the events were covered in the national press. Meanwhile, the Hakkei triggered a number of opportunistic variants, partly to compensate sites that had been passed over in the original list.[41] Yet despite the initial popularity of the postcard vote, the direct legacy of the Hakkei itself was short-lived. This was to some extent a reflection of the controversy which surrounded the whittling-away of rival sites and the somewhat inevitable anticlimax of the final selection, especially for areas that had been omitted from the final eight. The Hakkei's subsequent descent into obscurity was also related to the demise of Taishō democracy as the rise of the conservative right forced through legislation such as the Peace Preservation Law of 1925 (Chian Iji Hō) that promoted the radical 'national identity' (*kokutai*) philosophy leading Japan down the 'dark valley' into war.

Nonetheless, a core of Hakkei sites did prosper, Kamikōchi among them, and went on to form the bedrock for a new national park law, passed in 1931. Less tangibly, the Hakkei's legacy was also reflected in the rapid redrawing of attitudes to landscape, based on the theories of urban elites, including alpinists, planners, and members of business factions. It ultimately proved the effectiveness of a home-grown media campaign equivalent to those conducted in the United States after the National Parks Service had been established within the Department of the Interior in 1916. The task of promoting American national parks as tourist destinations had fallen to one Stephen Mather (1867–1930), a businessman who understood that, in order to justify the 'setting-aside' of large chunks of public land, the parks needed to win the support of the American public. Alongside him was Robert Sterling Yard (1861–1945), who was 'wildly successful at getting Americans into the national parks, and at getting the national park ideal into the hearts of Americans'.[42] While Mather lobbied for political support, Yard set to work on a series of comprehensive publicity campaigns to brand the national park ideology into the hearts and minds of the general public, including the National Parks Portfolio in 1916.[43] Then, from 1917 to 1919, he produced over a thousand articles in newspapers and periodicals praising the scenic qualities of the parks and their educational, inspirational, and recreational potential. 'See America First' campaigns were launched by railroad companies, automobile associations, and tourism bureaus, as the Parks Service continued to push for development.[44]

Japan's Hakkei was of a similar ilk, but without an equivalent administrative institution to the United States National Park Service, it was the National Parks Association which emerged as the power behind

the throne.[45] Established in December 1927—just months after the announcement of the final Hakkei—it contained several of the influential members from the executive panel, including Honda Seiroku and Tamura Tsuyoshi, and employed a cross-section of elite individuals and institutions similar to the format that had proven so effective in building a consensus for Kamikōchi's listing in the Hakkei. Unlike its predecessor, the Natural Monument Preservation Society, the Association was pragmatic enough to realize that a single-minded focus on conservation would be anathema to regional development and ultimately self-defeating. Instead, it focussed on building an eclectic support base which included aristocrats, businessmen, and mandarins. At the cost of injecting an extra twist of nationalism into the rhetoric, it was also able to replicate the multi-partisan consensus and decision-making success of the Hakkei a few years later in galvanizing a cross-section of local governments, chambers of commerce, and private operators into supporting a new bill which paved the way for the designation of Japan's national parks. To do so, an innovative range of policy tools was used, including a new magazine launched in March 1929 entitled simply *Kokuritsu Kōen* (National Parks).

The Hakkei can thus be seen as an important milestone on the road from nascent attitudes to the redrawn Japanese landscape chartered by Shiga, and the full-blown nationalism of the 1930s. The claim that '[t]he debate centres on whether [Shiga]'s purpose in broadening his contemporaries' understanding of Japan's natural environment was educational or imperialistic'[46] is thus in a sense rhetorical since the *Nihon Fūkeiron* effectively fulfilled *both* purposes. And just as the mass readership of such works expanded the philosophical frameworks of generations of young Japanese, likewise the new concepts of natural landscape also offered simultaneous opportunities for both tourism and nation-building. Japan's Hakkei thus reflected many of the new ideologies and technologies springing up around the national parks in the United States, becoming a kind of template for media campaigns used to market to the new, modern aesthete. As in the United States, national park propaganda was consolidated by the construction of infrastructure, with evolving methods of transport and a rapidly expanding railway system also serving to facilitate the leap from pilgrimage to pleasure. Just a half century earlier, Thomas Cook (1808–92), an English Baptist lay preacher and social reformer, had 'combined his visions of democratic travel and the promotion of sobriety, with the chance to profit financially from the opportunities for taking townspeople to the countryside or abroad.'[47] Now, thanks to media campaigns such as the Hakkei, urban audiences in

Japan were offered a similar opportunity to explore the new landscapes, while staying at 'international-standard' hotels which were a key component of the policy goal to attract foreign tourists. When the Japan Alps National Park[48] opened for business in 1934, visitors were able to stay in the Kamikōchi Imperial Hotel, a luxurious Swiss-style lodge constructed the previous year with funding from low-interest, long-term loans from the Ministry of Finance (Zaimushō) (see Photograph 5.2). A regular bus service was also in operation to the 'most beautiful valley in Japan'.

Conclusion

This chapter provided a critical analysis of the Shin Nihon Hakkei in three sections. The first examined the two-stage selection process which preceded the eventual nomination of eight 'new' landscape sites in 1927. Next, Kamikōchi's development was discussed to explain its exceptional status in the Hakkei, and—thirdly and finally—the way it symbolized broader transitions in Japanese perceptions of natural

Photograph 5.2 The Imperial Hotel opened at Kamikōchi in 1933
Source: Available at: http://ja.wikipedia.org/wiki/%E3%83%95%E3%82%A1%E3%82%A4%E3%83%AB:Imperial_Hotel_Kamikochi01n3200.jpg. Accessed on 8 June 2015.

landscape. The 1927 canon was a milestone that epitomized various concurrent transformations which accompanied the shift from Taishō to Shōwa eras—from *meisho*, mostly religious sites of literary fame to natural landscapes, and from fixed sightseeing of coastal and religious scenes to grand natural scenery symbolized by the new national parks. Kamikōchi had ranked a distant eleventh place in the initial postcard vote and should therefore have been excluded from selection according to the original criteria. Yet a powerful core of elite players, including Honda and Tamura, helped the valley prevail and overturn Tenryūkyō to gain a place in the final Hakkei. As well as several of the same key members sitting on the executive panel, a similar combination of scientific exploration, wilderness, and tourism ingredients was again utilized in tandem with the pragmatic consensus-building format that had served the anti-dam conservationists well at Kamikōchi. At the cost of an extra injection of nationalist rhetoric, the multi-partisan success of Kamikōchi's Hakkei nomination would be scaled up within the next few years to galvanize a cross-section of government agencies, chambers of commerce, and private operators into supporting a new bill which paved the way for the designation of Japan's national parks.

Notes

1. From the Latin, *terra nullius* literally means 'land belonging to no-one'. The term was used to describe territory that had never been subject to the sovereignty of any state, or over which any prior sovereignty had been relinquished. This idea of 'unclaimed land' helped form the conceptual basis for a series of Homestead Acts, federal laws passed in the United States from 1862 giving applicants ownership of areas of public land.
2. Also known as Hayashi Shunsai (林春斎), he held the hereditary title of Daigaku-no-kami (大学頭), implying the 'head of the state university'. The Sankei quotation comes from *Observations about the Remains of Japan's Civil Affairs* [日本国事跡考] which states: 'Three unique views: Amanohashidate in Tango, Itsukushima in Aki and Matsushima, together with some small surrounding islands that appear like the moon reflected in a beautiful pond in a giant garden (松島、此島之外有小島若干、殆如盆池月波之景、境致之佳興、丹後天橋立、安芸厳島為三処奇観).'
3. John S. Brownlee, *Japanese Historians and the National Myths, 1600–1945: The Age of the Gods and Emperor Jinmu* (Vancouver, BC: University of British Columbia Press, 1999), 28.
4. The book was first published in 1643. 'Nihon Sankei' available at: http://nihonsankei.jp/eng/index.html, accessed 17 September 2013.
5. Original set of eight paintings by government official, painter, and poet Song Di 宋迪 (ca. 1015–80). Alfreda Murck has studied these paintings in her *Poetry and Painting in Song China: The Subtle Art of Dissent* (Cambridge, MA: Harvard University Asia Center, 2000).

6. The three best gardens are Kenroku-en (兼六園) in Kanazawa (金沢); Kōraku-en (後楽園) in Okayama (岡山); and Kairaku-en (偕楽園) in Mitō (水戸). The three sacred mountains are Fujisan (富士山) in Yamanashi (山梨)/ Shizuoka (静岡); Hakusan (白山) in Ishikawa (石川); and Tateyama (立山) in Toyama (富山) Prefectures.
7. From the outset, Mount Fuji was exempt as an automatic selection, while other 'man-made' landscapes such as gardens were similarly excluded from the competition.
8. Nitta Tarō 新田太郎, '*Selection of Japan's eight landscapes: tourism and media events in 1920s Japan*' ('日本八景' の選定—1920 年代の日本におけるメディア・イベントと観光), *Keio School of Art* [慶應義塾大学アート・センター] Bulletin 18 (2010): 72.
9. Nitta Tarō, 'Selection of Japan's eight landscapes', 69.
10. Nitta Tarō, 'Selection of Japan's eight landscapes', 72.
11. An influential professor of landscape architecture at the Imperial University of Tokyo, also known as one of the founders of the Japanese national park system.
12. A former student of Honda's at the Imperial University of Tokyo, who went on to work as a civil servant and played a pivotal role in the setting-up and administration of Japan's national parks.
13. Nitta Tarō, 'Selection of Japan's eight landscapes', 73.
14. A banker, art critic, and mountain climber, who helped establish the Japan Alpine Club (Nihon Sangakkai 日本山岳会, JAC) in 1905. Born in Takamatsu, Kagawa Prefecture, he completed his higher education in Yokohama, Kanagawa Prefecture.
15. Tanaka Seidai 田中正大, *Japan's Nature Parks: Conservation of Nature and Landscape* [日本の自然公園—自然保護と風景保護] (Tokyo: Sagami Publishing, 1981), 166.
16. Yokoyama Atsumi 横山篤美, *Tales of Kamikōchi: History and Nature* [上高地物語—その歴史と自然] (Nagano: Shinshū no Ryosha Publishing, 1981), 206.
17. The villages of Onoda (大野田), Shimashima (島々), Inekoki (稲核), and Onogawa (大野川).
18. Coopers traditionally crafted versatile, conically-shaped wooden vessels known as Oke (桶).
19. Natural Parks Foundation 自然公園財団, *Kamikōchi, Chubu Sangaku National Park Guide* [上高地中部山岳国立公園パークガイド] (Tokyo: Shizen Kōen Zaidan, 1993), 33.
20. Kawai Sayuri 河合小百合, 'Kamikōchi's pre-modern woodland; a mixed history shaped by logging and volcanic activity', (上高地の森林近世－伐採と火山活動による攪乱史－) *Shinshū University Institute of Mountain Science Newsletter* [信州大学山岳科学総合研究所ニュースレター] 15 (2009): 5.
21. An ascetic priest who made several climbing pilgrimages to Mount Yari and other peaks in the northern Japan Alps in the early nineteenth century.
22. Kären Wigen, 'Discovering the Japanese Alps: Meiji Mountaineering and the Quest for Geographical Enlightenment', *Journal of Japanese Studies* 31, no. 1 (2005): 1–26.
23. At 3,090 metres, this is the eleventh-highest mountain in Japan, and prominently visible from Kamikōchi.
24. In fact, he borrowed it from his compatriot Gowland, a mining surveyor who had climbed Mount Yari (槍ヶ岳) in 1877. Yet Weston, who first visited

in 1891 and ascended Yari the following year, is the better-remembered of the two, as he made three separate visits to Japan and lived there for a total of 15 years, helping to popularize mountain-climbing and becoming an honorary member of the Japan Mountaineering Association (JMC).

25. Brett L. Walker, *The Lost Wolves of Japan* (Seattle, WA: University of Washington Press, 2005), 131.
26. Kären Wigen, 'Japanese Alps', 1–26.
27. Wolfram Manzenreiter, 'Die soziale Konstruktion des japanischen Alpinismus. Kultur, Ideologie und Sport im modernen Bergsteigen' (PhD diss., Vienna University, 2000).
28. Yokoyama Atsumi, *Tales of Kamikōchi*, 81.
29. The closest English translation of Kojima's *Nihon Sansuiron* is identical to Shiga's *Japanese Landscape* [日本風景論] (Tokyo: Seikyōsha, 1894).
30. Thomas Havens, *Parkscapes: Green Spaces in Modern Japan* (Honolulu, HI: University of Hawai'i Press, 2011), 73.
31. Murayama Kenichi 村山研一, 'Kamikōchi in the early Showa era: the exploitation of water-power resources, conservation of nature and national parks', (昭和初期の上高地: 水力開発、自然保護、国立公園) *Regional Branding Research* [地域ブランド研究] 4 (2009): 4.
32. Murayama Kenichi, 'Kamikōchi in the early Showa era', 3.
33. There were 11,000 hectares designated as gakujutsu sankō hogorin (学術参考保護林). Fukuda Takamasa 福田隆政, 'The National Forest', [国有林] in *Current forest policy in Japan* [現代森林政策学], ed. Endō Kusao 遠藤日雄 (Tokyo: J-FIC, 2008), 166.
34. Tanaka Seidai, *Japan's Nature Parks*, 180.
35. Law for the preservation of historic sites, places of scenic beauty, and natural monuments (史蹟名勝天然紀念物保存法).
36. Murayama Kenichi, 'Kamikōchi in the early Showa era', 7.
37. Kojima Usui (1907), *The Head of the River Azusa*, quoted in Tanaka, *Japan's Nature Parks*, 111.
38. Thomas M. Lekan, *Imagining the Nation in Nature: Landscape Preservation and German Identity, 1885–1945* (Cambridge, MA: Harvard University Press, 2004), 145.
39. David R. Leheny, *The Rules of Play: National Identity and the Shaping of Japanese Leisure* (Ithaca, NY: Cornell University Press, 2003), 60.
40. Katō Mineo 加藤峰夫, *The National Park System of Japan*, vol. 3 [国立公園の法と制度] (Tokyo: Kokon Shōin, 2008), 14. See also Murakushi Nisaburō 村串 (2005), *Research on the Development History of Japan's National Parks* [国立公園成立史の研究] (Tokyo: Hōsei University Press, 2005), 417. '外国人観光客を増やして外貨を稼ぐ'.
41. Including landscape scenes ranked respectively as Japan's Twenty-Five Sceneries [日本二十五勝] and One Hundred Sceneries [日本百景].
42. Paul Sutter, *Driven wild: How the Fight against Automobiles Launched the Modern Wilderness Movement* (Seattle, WA: University of Washington Press, 2002), 101.
43. A compendium of national parks initially published with a contribution of US$43,000 from 17 railroads. Available at: http://www.nps.gov/history/history/online_books/portfolio/index.htm. Accessed on 16 June 2013.
44. Marguerite Shaffer, *See America First: Tourism and National Identity, 1880–1940* (Washington, DC: Smithsonian Institution Press, 2001), 429.

45. Nishimura Takahiro 西村貴裕, 'From national parks to nation-building: change in the semantics and significance of national parks from 1929 to 1944' ('国立公園' から '国土と健民' へ—国立公園の意義をめぐる言説の変遷 1929～1944], *The Bulletin of Osaka Education University* [大阪教育大学紀要] 60, no. 2 (2012): 3.
46. Masako Gavin, 'Nihon fūkeiron (Japanese Landscape): nationalistic or imperialistic?' *Japan Forum* 12, no. 2 (2000): 220.
47. Nelson H. H. Graburn, 'Tourism: The Sacred Journey', in *Hosts and Guests: The Anthropology of Tourism*, ed. Valene Smith (Philadelphia, PA: University of Pennsylvania Press, 1989), 21–36.
48. Officially known as the Chūbu Sangaku National Park (中部山岳国立公園).

6

The Development of Cinchona Cultivation and 'Kina Gaku' in the Japanese Empire, 1912–45

Ya-wen Ku

The cinchona tree, a native of South America, had an almost magical effect on malarial fever, following the introduction of its bark into Europe in the first half of the seventeenth century. The successful isolation of quinine alkaloids from cinchona bark in 1820 gave the Western medical profession confidence in its curative powers and that its pure extracts would be even more efficacious.[1] Although medical professionals frequently debated quinine's pharmaceutical effects and most effective dosage,[2] quinine gradually became the standard therapy and preventive medicine for malarial fever. The cinchona tree was thus recognized as a critical resource for European powers seeking to establish colonial settlements in the fever-ridden parts of the world.

From the mid-nineteenth century, European powers made considerable efforts to transfer cinchona to their African and Asian colonies, yet they all faced great challenges. There were over 30 species of cinchona tree; many of them were delicate and could only thrive in a particular environment. Moreover, the value of a cinchona species was decided by its bark's quinine content. However, only a few species contained a substantial amount of quinine, and it took at least eight years of growth for the bark to give the maximum quinine yield. Due to these challenges, the French largely failed in their efforts to establish viable plantations in Algeria, allowing the British and the Dutch to take a lead in its acclimatization. At the nineteenth century's end, Dutch plantations in Java were the world's largest source of cinchona bark, providing roughly 90 per cent of global supply. From 1913, its production and distribution was almost entirely controlled by a cartel known as the Kina Bureau.[3]

This chapter examines the development of cinchona in the Japanese Empire between World War I and the end of World War II, and with it,

the creation of Japanese 'Kina-Gaku' (cinchona science)—the knowledge of cinchona acclimatization and cultivation produced in government and private plantations. By illuminating the decisive roles of private companies and the state, this chapter analyses the characteristics of Japanese cinchona science, and reconsiders the relationship between botany and empire.

Despite some scholarship from a global historical perspective, most studies have focussed on either British or Dutch acclimatization of cinchona.[4] The cultivation of cinchona in the Japanese Empire from the mid-nineteenth century has been largely overlooked or even misconstrued. For example, Daniel R. Headrick inaccurately stated that the Japanese, 'having no equatorial colony, bought estates in the Netherlands East Indies'.[5] In fact, following several futile attempts between 1875 and 1910, after World War I the Japanese actively carried out cinchona acclimatization and cultivation in their only tropical colony, Taiwan. Promotion of medicinal plants, including cinchona, from the mid-1910s was part of a wider Japanese effort to use traditional herbal medicines as means of breaking dependence on Western-controlled chemical pharmacies. From the early 1920s, the Hoshi Pharmaceutical Company, then the world's second-largest quinine manufacturer, started its cinchona venture in Taiwan in order to extricate itself from the oversight of the Kina Bureau. The first batch of domestic quinine was produced in the 1930s, during which time increasing numbers of cinchona plantations were established in Taiwan's mountains. In 1942, with Java's occupation, Japan gained control of the world's largest producer of cinchona bark and the world's largest quinine factory, effectively cutting off quinine from the rest of the world. The global history of cinchona, then, is not complete without consideration of the cultivation programme launched in the Japanese Empire.[6]

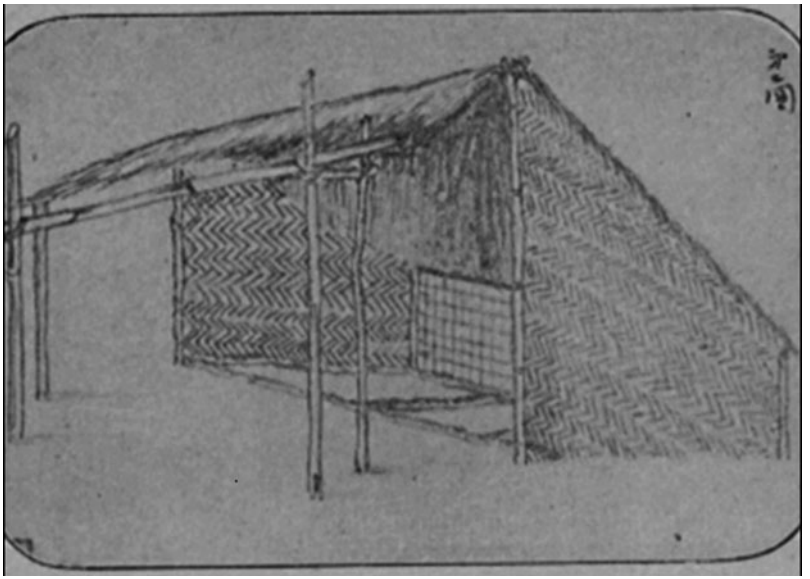
Studies of 'colonial botany' have devoted much attention to the symbiosis of botany and empire, but almost invariably from the perspective of European empires. For example, independently, Lucile Brockway and Daniel Headrick have both argued that cinchona botanical science served as the 'arm' or 'tool' of imperial colonial expansion and economic development. Richard Drayton's more recent research has further illustrated how the British imperial need for cinchona fostered Kew's centrality in a network linking metropolitan and colonial science. In addition, and with only one exception,[7] studies have ignored the equally important role of the private sector and private plantations, alongside government ventures, in furthering imperial cinchona cultivation.

1910s: government cinchona cultivation

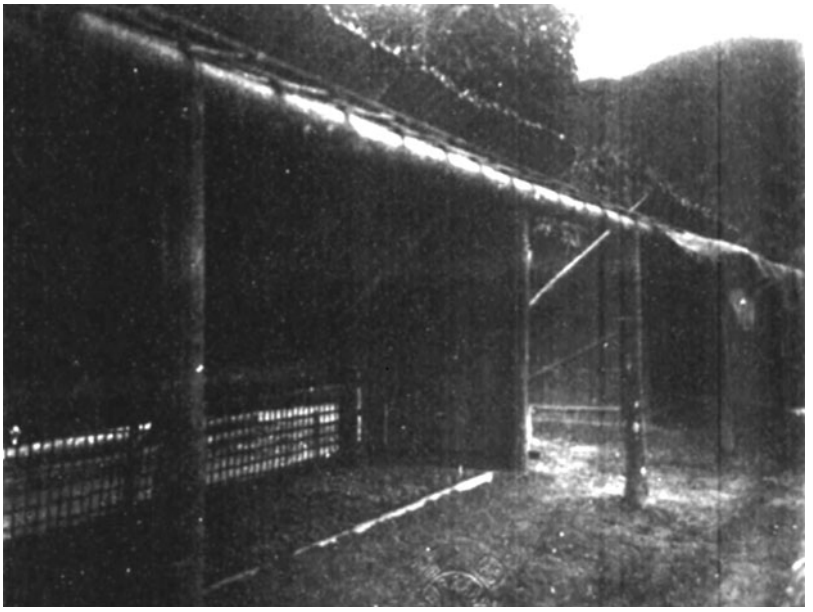
In 1912, the second year after introducing an anti-malaria policy, Taiwan's fifth Governor-General Sakuma Samata (1844–1915) announced the launch of the government cinchona programme. The government forced potential patients to take a compulsory blood test and receive quinine treatment.[8] Meanwhile, at least three important official technicians, including Fujine Kichiharu (1865–1941), Kawakami Takiya (1871–1915), and Kanehira Ryōzō (1882–1948), were sent to visit the Government Cinchona Estate (GCE) in Dutch-controlled southwest Java.[9] At that time, the GCE was the centre of cinchona science in the Dutch Empire and, indeed, the world. From the 1880s, it had developed the standardized method for cultivating high-yield quinine trees, and provided techniques as well as seedlings to the public, so as to encourage cinchona-growing on private estates.[10]

Survey reports from these technicians clearly reflected the Japanese government's intention to replicate in Taiwan the success of the Dutch in Java, including their cultivation methods and science-based planting system. For example, the technicians' reports recorded in detail Java's environmental conditions and the 60-year history of acclimatization efforts, as well as every step of cinchona cultivation involved.[11] According to their observations, a cinchona plantation was highly labour-intensive. For example, as Photograph 6.1 shows, cultivating cinchona, first of all, required preparation of a special seed-bed, since the sprouting stage required meticulous care. Then seedlings were transplanted into a nursery bed, and finally planted in permanent plantations. The plantations required terracing on the mountainside to meet the climatic requirements of the mountain-loving cinchona trees. Furthermore, all standard procedures of weeding, fertilizing, pest prevention, cutting propagation, and bark-stripping involved considerable work.

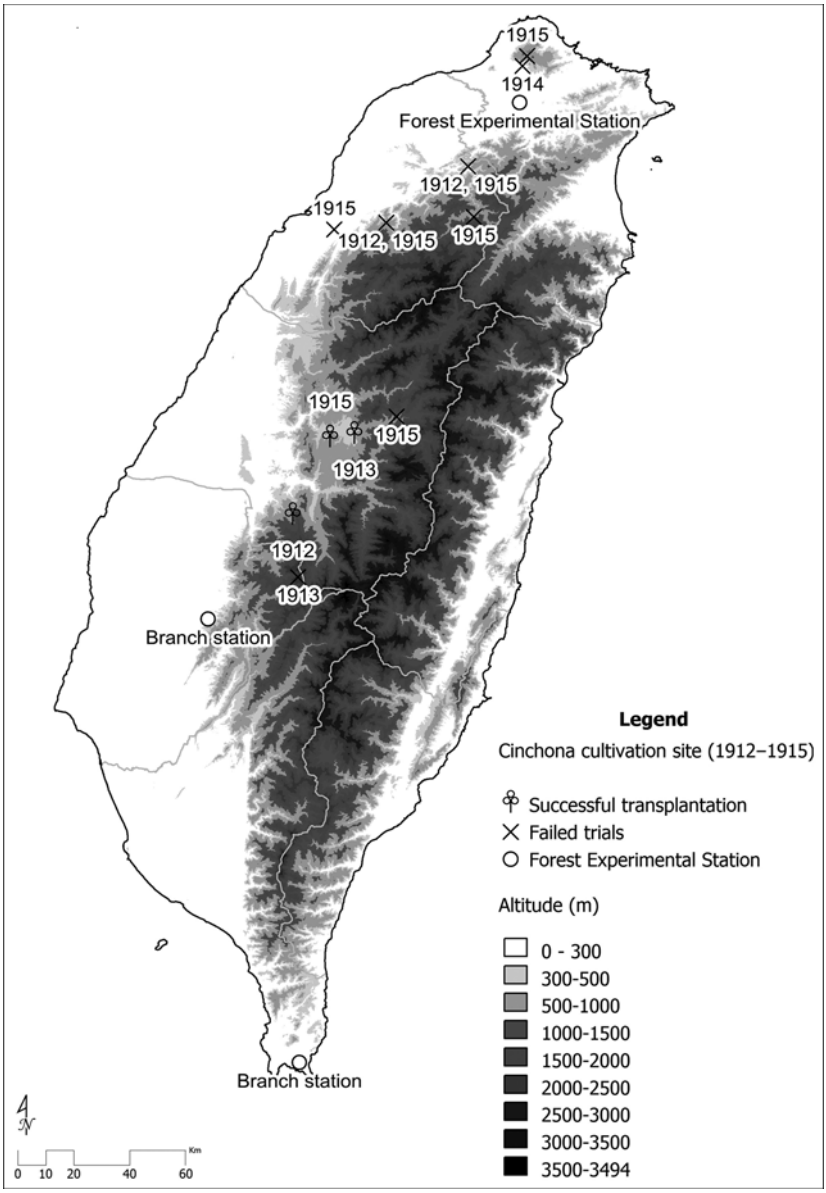
In 1911, the Forest Experimental Station was established in Taipei, and aimed to collect useful plants and to investigate where and how to cultivate them.[12] A series of experiments in cinchona sowing were conducted under the supervision of Kawakami and Kanehira, two of the aforementioned official technicians who had visited Java.[13] Experts recreated Taiwan Javanese seed-beds and nursery beds (Photograph 6.2). As Map 6.1 illustrates, the seedlings grown in the Forest Experimental Station were not transplanted to its branch stations in southern Taiwan, but either grown in privately owned plots or university-owned forests located in central and northern Taiwan. This reflected the technicians' view that central and northern Taiwan's mountains replicated the same



Photograph 6.1 Seed-bed in Java
Source: Kanehira Ryōzō, *Survey Report on South Asia*, 1914, 109.



Photograph 6.2 Seed-bed in Taiwan
Source: Kanehira Ryōzō, *Report of Forest Experimental Station IX*, 1917, 9.



Map 6.1 Cinchona cultivation sites during the 1910s
Source: Drawn by author.

environmental conditions as the Javanese cinchona plantation.[14] In the end, such transplantation only succeeded in the Experimental Forest of the Tokyo Imperial University (TIU) in central Taiwan.

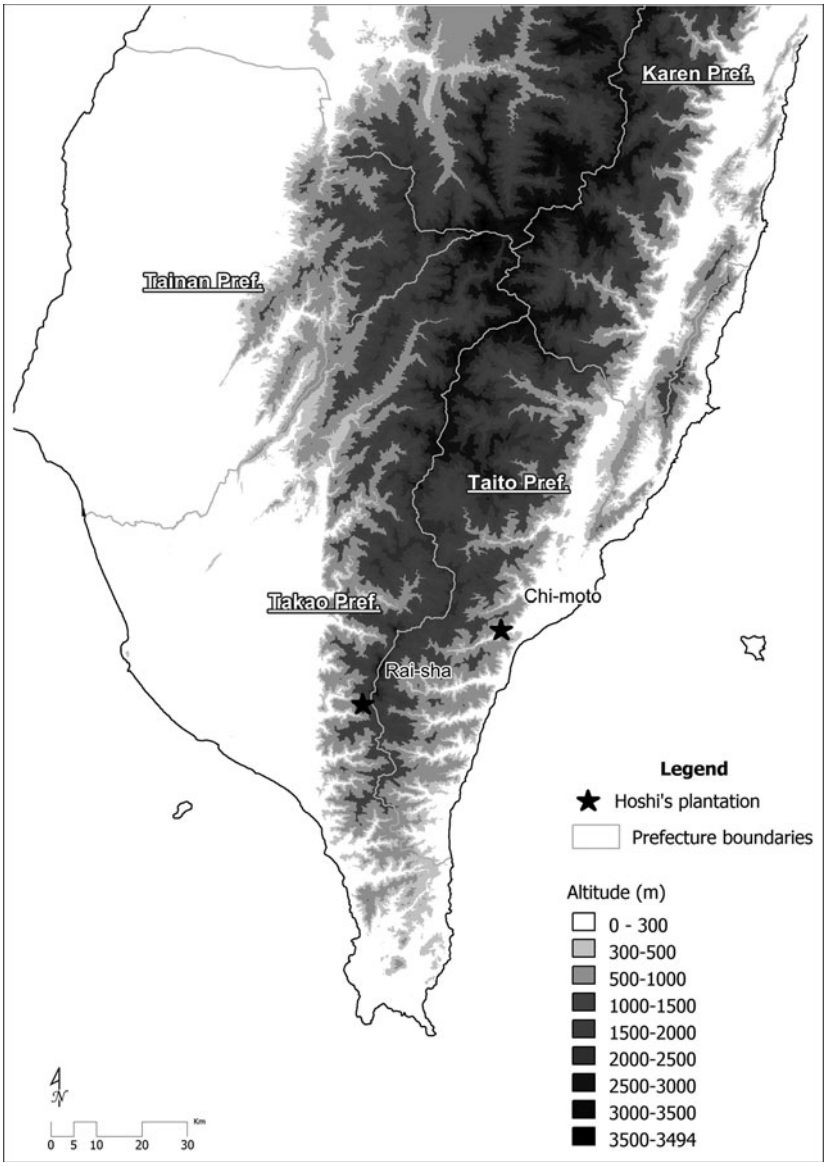
In 1918, with additional support from the imperial government, the scale of cultivation experiments further increased. In response to pharmaceutical shortages during World War I, the Japanese government promoted the domestic production of drugs. Japanese officials also believed that using Eastern medicinal plants would break the monopoly of the Western chemical industry. Research on medicinal plants was immediately launched in inland Japan, as well as colonial Taiwan and Korea.[15] The possible benefits of the cinchona trees—also known as the 'Western panacea'—meant they became one of the most anticipated medicinal plants.

As a result, 1,200 cinchona trees were cultivated in the Experimental Forest of TIU. In addition, another institute named 'Experimental Cultivated Field for Medicinal Plants' (ECFMP), covering almost 420 hectares, was established nearby and was expected to serve as the GCE. Three larger-scale Javanese experiments were also conducted, with a series of terraces built and over 2,500 cinchona trees planted.[16] Out of the blue, cultivation experiments conducted by government were abruptly stopped. After 1921, no more official reports on cinchona were published, indicating that the experimental results were far from reaching the government's expectations.[17] Shortly thereafter, Japanese officials considered that, owing to the damage caused by ill-suited soil, typhoons, and frost, it was impossible to carry out the profitable cultivation of cinchona in Taiwan.[18]

Private ventures in cinchona cultivation and the development of 'Kina Gaku'

Nevertheless, government pessimism did not entirely halt cinchona-planting by private enterprises in Taiwan. In 1922, the Hoshi Pharmaceutical Company, a Japanese company famous for alkaloid extraction, set up a 500-hectare cinchona plantation in Lai-sha on a mountain terrace in Takao Prefecture. In 1924, in Taito Prefecture, another Hoshi plantation was established, extending over 3,600 hectares on a mountain in Chi-moto in eastern Taiwan (Map 6.2). There were over 200,000 cinchona plants under cultivation in nurseries and regular plantations.[19]

Paying no heed to the opposition it raised, Hoshi invested heavily in cinchona planting in Taiwan. The ambition of its president Hoshi



Map 6.2 Hoshi's two plantations
Source: Drawn by author.

Hajime (1873–1951) might have partly accounted for the bold nature of the company's venture, while the underlying reason was intervention from both the West and the Kina Bureau in the bark trade between the Hoshi Company and Javanese planters. Early in 1916, Hoshi had started to develop technology enabling quinine extraction from cinchona bark, and achieved the first success among the Japanese pharmaceutical industry the following year.[20] When informed of the wartime interruption to transport between Java and Europe, Hoshi immediately seized the chance to collect cinchona bark from Javanese planters, who were unable to sell their bark during the war. In the meantime, the Inter-Allied Quinine Manufacturers Association, which comprised Britain, America, France, Italy, and the Kina Bureau in the Netherlands, was set up with the purpose of ensuring the supply of quinine to the West.[21] The Association's members, in particular Britain, forced the Japanese government to limit its importation of bark and quinine. In Hoshi Hajime's eyes, the West's real intention was to keep Japan and the Hoshi from becoming competitors in quinine production.[22] Using his extraordinary political and diplomatic skills, Hoshi eventually successfully imported 3,600 tons of bark from Java between 1918 and 1922, thus turning his company into the world's second-largest quinine producer.[23] To negate the cartel's interventions and to obtain a stable bark source at a low price, Hoshi placed his hopes in colonial Taiwan.[24]

Hoshi's confidence in Taiwan's suitability for cinchona cultivation was rooted in the scientific research report of the retired technician, Tashiro Yasusada (1857–1928). Hoshi hired the 65-year-old Tashiro as his chief adviser for cinchona planting. A naturalist of great reputation, Tashiro had retired from the Forest Experimental Station in 1914. In the late nineteenth century when the Japanese government showed an interest in transplanting cinchona, Tashiro had visited Kagoshima and Okinawa in southern Japan to identify possible sites for cinchona planting. As a director of the Tropical Plant Cultivation Field in southernmost Taiwan, he had hands-on experience of cinchona cultivation from 1902 to 1909.[25] Tashiro also took a keen interest in Western cinchona science, transcribing and translating relevant reports from abroad. In addition, he brought several cultivation manuals and research publications back to Japan after visiting government cinchona plantations in British India and Dutch Java in the 1880s.[26]

As the Hoshi Company's chief adviser, Tashiro faced three tasks, the selection of suitable sites being his top priority. According to his field investigation in summer 1921, Tashiro considered the Dawu mountain range, located between the aboriginal Lai and Bongari tribes, at altitudes

of between 300 and 1,000 metres, as the most suitable site. 'The soil, climate, and humidity conditions in this site are appropriate', he wrote in his report, 'and there is less conflict of interest with the aborigines'.[27] In other words, it was suitable for cultivation from both natural and social perspectives. Collecting propagating information and materials was Tashiro's second task. He spent three months visiting government and private plantations in Java, and brought back a batch of the best seeds for Hoshi's cultivation.[28] Soon after returning to Taiwan, Tashiro put forward a 20-year proposal for operating a 650-hectare cinchona plantation with 3.2 million plants. He elucidated the environmental advantages for cinchona cultivation in Taiwan, devised the methods of land preparation, planting, and harvesting, and estimated in detail the costs and revenues for each year.

Tashiro's 150-page *Taiwan Cinchona Cultivation Proposal* was a hybrid of Western cinchona science and local knowledge. The local knowledge was derived from his long-term observations of Taiwan's environment and his experience of transplanting trees. For instance, after witnessing unprecedented frost damage in winter 1917, he favoured establishing plantations in the frost-free mountain areas of south Taiwan. Furthermore, his experiences of planting acacias and teak in Taiwan had taught him that the stump sprouting from a cut tree could grow stronger and better than the parent tree. Thus, instead of uprooting the whole tree, as was done in Java, he recommended cutting down trees for harvesting, in order to regenerate better cinchona trees. Last but not least, Tashiro concluded that

> Cinchona trees prefer weather that is humid and cool in the mountain area … In their native countries, planters will choose fertile land with wet air, clean up all the useless virgin trees by which the land would come to be like cropland as tea plantations or mulberry fields. The same preparation would be done in acacia plantation in Taiwan. However, unlike Java which is located in the calm equatorial belt, Taiwan has both dry seasons and typhoons … there are also forest fires in planted land. Therefore, it is necessary to plant cinchona with windbreaks, water conservation and fire prevention forest concurrently. If the primeval forest[s] could be used, some of them must be kept.[29]

Although adopting the Javanese terrace system for cultivation, Tashiro refused to replace all the virgin forests with cinchona trees, as was the case in Java. Instead, he suggested the preservation of virgin

trees, which occupied an area twice as large as the cinchona plantation. Moreover, he believed that other native species had to be planted to protect cinchona trees. He held that '[t]he success in cinchona plantation hinges on experts who have special techniques and practical experience, sensitive eyes to identify a suitable environment, and the ability to improve climate and soil conditions'.[30] The way Tashiro developed cinchona planting in Taiwan did not duplicate Javanese methods; instead, he devised a unique cultivation method, which took into account Taiwan's different, and often extreme, environmental conditions.

However, the cinchona plantations in Lai-sha and Chi-moto did not entirely meet the programme schedule laid down by Tashiro. During the first five or six years, Tashiro inspected the plantations monthly. More than six Japanese technicians filed regular progress reports to Tashiro, and guided aboriginal 'coolies' in running the plantations.[31] In summer 1926, Tashiro was abruptly released from his contract, thus bringing routine work on the plantation to a halt. Tashiro was released because the Hoshi Company was involved in an opium scandal that soon lost it both its reputation and capital.[32] As Table 6.1 indicates, the cinchona plantations in Lai-sha and Chi-moto were ten times larger than those of the government, although only a percentage of the land was planted with trees.[33]

Despite the absence of care and attention, some cinchona trees grew luxuriantly; there were still tens of thousands of trees surviving by 1932, meaning that many had reached the age where they now had a high quinine content.[34] The two plantations not only helped Hoshi Hajime to stage a comeback in the 1930s, but also had two significant meanings for the development of Japanese cinchona ventures and science thereafter. First, during the 1920s, Hoshi's plantations were the only two sites of large-scale cinchona cultivation in Japan's empire, and also the only two fields where mature cinchona trees could be observed.

Table 6.1 Hoshi's two plantations

Name of Plantations	Opening year	Altitude (m)	Applied Area (kō*)	Labour Supply	Cultivated Area by 1932 (kō)
Lai-sha	1922.4	848	585	aboriginal tribes	32
Chi-moto	1924.2	424	4,047	aboriginal tribes	15

Note: *1 kō = 0.9699 hectares.
Source: Based on Yamada Kinji, 'The Present Situation of Cinchona Tree Planting on Taiwan Island', *Journal of the Taiwan Forestry Association* 71 (1932): 5, 6.

For example, Sawada Kaneyoshi (1883–1950), a Department of Agriculture technician, conducted research on cinchona disease in Lai-sha on trees struck by blight in 1923. He discovered the micro-organism that caused the disease, and developed a preventative against its spread.[35] These achievements made Sawada a scholar of great significance in the field of cinchona pathology in Taiwan. In addition, the technician Sonan Jinhaku (1892–1984) investigated the outbreak of pests in 1926 on Hoshi's plantation. Based on his long-term survey, he compiled a directory of Taiwan's cinchona pests and developed a system of pest control.[36] These examples showed that a new field of Japanese 'Kina-Gaku' was developing, while Hoshi's private plantations, in replacing the government-owned ones, were evolving into a space for the production and exchange of planting knowledge as a means of colonial development.

Second, Hoshi's plantations revealed that cinchona cultivation in Taiwan was technically feasible and profitable. With cinchona cultivation once again attracting government attention in the early 1930s (see the next section), Japan's colonial government launched an investigation into where cinchona had been cultivated. In 1932, the Department of Forestry's Yamada Kinji (1891–?), active in Taiwan during the 1920s and 1930s, concluded that cinchona acclimatization in Taiwan was successful, and certainly not 'an effort in vain', as had been reported internationally.[37] In 1933, Department of Health official Araki Tadao, also active in Taiwan during the 1920s and 1930s, conducted a chemical analysis that indicated that the bark from Hoshi's plantation contained a substantial amount of quinine, around three to seven per cent, a proportion comparable, in fact, to the average content of Javanese bark. Such findings demonstrated that Hoshi's cinchona could provide sources of cinchona seeds or seedlings with a high quinine content. The era of small-scale experimental cultivation in Taiwan thus came to an end, and was followed by a phase of profitable, extensive production.[38] Consequently, in the 1930s, government restarted Taiwan's cinchona cultivation programme in conjunction with private companies.

1930s: Kina-Gaku and three scientific alliances

The 1930s saw the revival of both government and private cinchona ventures in different contexts. The imperial government approved a new budget plan in November 1932 that provided financial support for the chemical analysis of cinchona bark growing on existing planting sites. Sources of bark included Hoshi's plantation and the few surviving cinchona trees planted in the late 1910s in the Experimental Forest

of TIU, an area of less than three hectares. Furthermore, from 1928, the Experimental Forest of Kyoto Imperial University (KIU) in Takao Prefecture had carried out a cultivation experiment in an area of under two hectares in extent, using cinchona seeds acquired from TIU.[39] With such ongoing cultivation, the technician Araki believed that bark and quinine self-sufficiency would be entirely possible for Japan, since the cinchona bark produced in Taiwan had reasonable quinine content even without scrupulous care. In 1933, Japan's central government assigned Taiwan the responsibility of reviving the official cinchona ventures which had for so long been suspended.

The urgent appeal to self-sufficiency was motivated partly by worldwide political and economic crises. To begin with, international tension had heightened after the Mukden Incident in 1931 and Japan's withdrawal from the League of Nations in 1933. For fear of an economic blockade, Japanese authorities were compelled to find sources of cinchona from their tropical colony, Taiwan. Moreover, the unprecedentedly devaluated Japanese yen made imported medicines extremely expensive. Finally, the last stimulation came from Java. To prevent overproduction, the Dutch forbade Javanese exports of cinchona seeds to other countries while also enacting a series of laws to protect their own industry.[40] In response, many countries, including Japan, anxiously began to devote themselves to cinchona planting.[41] In 1934, the Japanese colonial government launched a 'Cinchona Cultivation Research Site' (CCRS) under the Central Research Institute in Maripuru Tribe, near Hoshi's plantation in eastern Taiwan, believing once again that science could promote the mass cultivation of cinchona trees and thus colonial development.

Private companies, one after another, had also begun to invest in cinchona cultivation from 1933. As Map 6.3 shows, 19 private cinchona plantations were established between 1933 and 1941. Most of them belonged to three large Japanese pharmaceutical companies: Takeda Chobee Company, Shionogi Company, and Hoshi Kina Industrial Company. All of them possessed the technique of quinine extraction from cinchona bark. For example, the Takeda Company, engaged in research on extraction techniques after World War I, finally succeeded in 1924. To gain access to a stable supply of bark at a low price, Takeda's first strategy was to purchase plantations in Java. By 1932, Takeda owned two plantations in Java, with a cultivated area of almost 400 hectares. Next, it established plantations in Taiwan at Takeyama (1933), Chokakurai (1935), and Kanzan (1939).[42] As for the Shionogi Company, its quinine production line was completed in 1933. In response to the

ban on importing cheap and high-quality raw materials from Java, Shionogi staff set up the following plantations in Taiwan: at Kuwarusu (1934), Amawan (1934), Punti (1939), Toa-au (1939), Kunanau (1942), and Rai-sha (1942).[43] In addition, the Hoshi Company was eager to stage a come-back, and regarded cinchona cultivation in Taiwan as the key to its regaining control over the pharmaceutical kingdom it had earlier lost.

To achieve this, Hoshi Hajime worked out a ten-year plan for cultivating cinchona on his plantations, which covered 12,000 hectares of land in the mountains of Taiwan. As Timothy Yang noted, 'Hoshi linked his business with the colonial policies of mountain development, ecological conservation, health promotion, and edification of the aborigines, hoping that the funding and technical assistance would come from the colonial government, particularly the Central Research Institute'.[44] In 1938, the Hoshi Company entered into a joint venture with the Taiwan Development Company to create a separate entity—the Hoshi Cinchona Industrial Company. Apart from the original plantations in Rai-sha and Chi-moto, the new company established seven cinchona plantations on other suitable sites, comprising Daikei (1938), Tjavualji (1938), Isamulu (1940), Kanadon (1940), Enabari (1940), Kiyomizu (1941), and Kasen (1941).[45] As Map 6.3 indicates, most plantations were concentrated only in certain areas, revealing intense competition among the pharmaceutical companies.

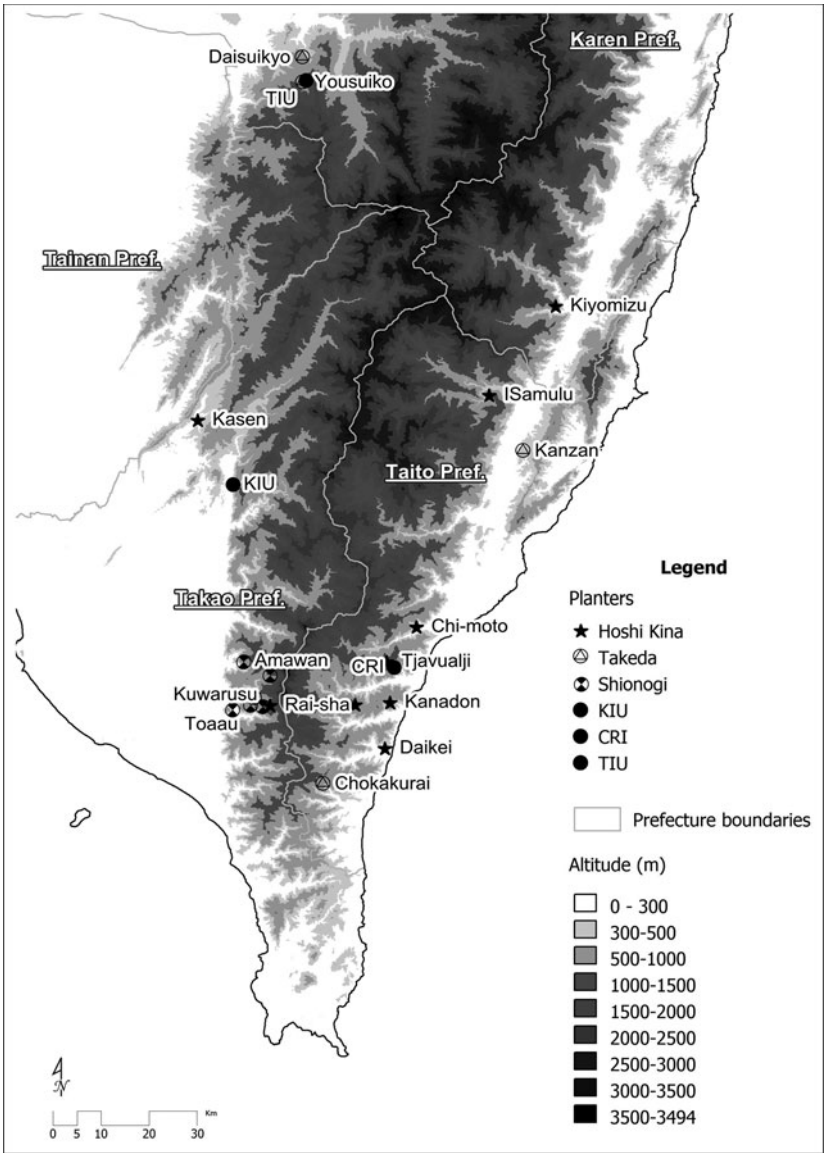
Supported by the imperial government, the CCRS took over responsibility for developing cinchona from the ECFMP, set up in 1918. With a larger planting area and more funds, the CCRS was expected to play the same role in Taiwan that the GCE had in Java, in distributing best-quality propagating materials to private plantations, and being the centre for the development of Japanese Kina-Gaku. While it was beyond the ECFMP's aim to secure the quantity of cinchona barks, the CCRS further set its goal as improving cultivation practices. As the technician Araki noted:

> From now on, the specific means to propagate cinchona of good quality is as follows: Peel down part of the bark and analyze its quinine content. Take those with the highest quinine content as parent trees. Reproduce asexually by graft or cuttings, or sexually by interspecific hybridization in order to breed improved species more acclimatized to this island. On the one hand, the cultivation method established has to cater for the natural conditions. … on the other hand, it should take into consideration the social conditions … such as the intellectual and technical capability of the aborigines.[46]

Despite its ambitious aims and greater budget, the CCRS in Taiwan was unable to provide coordinated and centralized control over the development of cinchona production. Rather than diffusing from a single centre, the Kina-Gaku in the Japanese Empire in fact spread over three locations—in central, southern, and eastern Taiwan (Map 6.3).

The competition among Hoshi Kina, Takeda, and Shionogi motivated the companies to form alliances with different scientific institutes. Geographical proximity enabled Hoshi Kina to form a strong partnership with the Central Research Institute in eastern Taiwan. In the 1920s, Hoshi Kina hired the technicians Kudō Yakurō (1889–?) and Kamitani Jōzō (1883–?), both retired from the Central Research Institute's Department of Forestry, as plantation managers.[47] In addition, it provided seeds and mature trees as research materials. Takeda's plantation was adjacent to the Experimental Forest of TIU in central Taiwan. It followed completely the Javanese method of setting up terraced fields, and employed labour-intensive management techniques. Moreover, in a controversial relationship, a private bark trade was established between TIU and Takeda.[48] Shionogi employed Yokoyama Minoru and Hirayama Mamoru, both graduates of the Department of Agriculture of KIU, to work on its plantation in southern Taiwan.[49] The seeds Shionogi planted were from the KIU, while the planting of Shionogi was supervised by Professor Numata Daigaku (1891–1956) from KIU's Experimental Forest, who invented a unique method of cinchona cultivation.

The alliances between scientific institutes and private plantations had a significant bearing on the direction of Kina-Gaku research. Rather than basic science, the research focussed on practical issues of maximizing planting efficiency and identifying those areas most suitable for plantations in order to obtain the highest quinine content under Taiwan's varied environmental conditions.[50] Different strategic partnerships also influenced the research direction of each alliance. The technicians of the Central Research Institute[51] in Hoshi Kina's plantation developed specific knowledge in selecting parent trees and seeds of good quality based on their appearance. In addition, it used the branches from the selected parent trees for propagation, and explored the most appropriate altitude for cinchona plantations.[52] In contrast, KIU and Shionogi emphasized improvement to planting methods. They objected strongly to the direct implementation of Javanese 'agricultural planting' in Taiwan because of higher local wages and distinctive climate, soil, and terrain conditions. By referencing traditional Japanese afforestation methods, they conducted extensive 'forestry planting', which required small-area cultivation instead of large terrace fields, and



Map 6.3 Distribution of government and private cinchona plantations
Source: Drawn by author.

which also encompassed lower planting density and greater accommodation to local environmental conditions. This method significantly reduced the cost and increased the area planted in cinchona.[53] It worked so well that even Hoshi Kina's plantations adopted the method in the late 1930s.[54] However, TIU and Takeda, by contrast, still followed the Javanese model, as they argued that Taiwan was too small to adopt an extensive method. They thus focussed on breed improvement, including the creation of new species that could easily survive under local conditions and still produce a high quinine content.[55] In summary, these three alliances represent competing but complementary relationships.

1940s: Japanese Kina-Gaku and the development of the Japanese Empire

The establishment of Japanese Kina-Gaku was driven not only by scientific and commercial interests; from the late 1930s, it also reflected the empire's political intention of self-sufficiency so as to avoid dependence on supplies from potential enemies.

On a war footing in 1937, Japan needed colonial Taiwan to accelerate the growth of cinchona to meet the increasing demand for quinine

Table 6.2 Ten-year cinchona cultivation plan and actual cultivated area, 1938, 1940, and 1943

Planter	Planting period	Required planting area (kō)	Actual cultivated area (kō)		
			late 1938	1940	1943
Forestry Research Institute	1939–1943	25	8.7		
Tokyo Imperial University	1939–1952	360	26.1	94	170
Kyoto Imperial University	1939–1949	830	254.3	382	402
Shionogi Company	1939–1945	500	70	149	218
Takeda Company	1939–1949	500	46.1	115	159
Hoshi Kina Company	1939–1949	4870	114.4	440	777
Zunan Company*	1939–1948	160	6		13
Silvicultural Office	1941–1948	790			
Total area		8035	525.6	1180	1739

* Zunan Industrial Co. Ltd

Sources: Columns two and three: Takumusyou takunankyoku, *Documents about Cinchona* (1942), 11; columns, four, five and six; Taiwan Development Company, *Cinchona Cultivation Venture in Taiwan* (n.d.), n.p.; Takaki Shigeru, *The Management of Cinchona Plantations in Taiwan* (1943), 46, 50, 51.

associated with imperial expansion. As shown in Table 6.2, the Ministry of Colonial Affairs requested each institute to contribute a certain area of land for cinchona planting in order to reach the goal of a growing area of 8,000 hectares (almost half of the area under cinchona cultivation in Java), with a corresponding bark production of 2,400 tons (a quarter of that of Java) within ten years.[56] These precise calculations of cinchona production and consumption targets revealed Japan's long-term ambition for colonizing Asia, and indicated the mutual shaping of Kina-Gaku with imperial geopolitical ambitions.

The statistical data shown in Table 6.2 further illustrate the deep penetration of Japan's political power into every scientific institute and private plantation. With a clearly defined practical agenda, the application of Kina-Gaku guaranteed a stable growth rate of bark production: at the end of 1938, the total acreage of cinchona propagation was only 525kō (509 hectares). Two years later, the acreage had doubled, and finally expanded to 1739 kō (1687 hectares) in 1943.

The amount of cinchona bark production in each plantation was not properly documented; yet, historical records suggest that in the early 1940s, the Takeda Company produced 17 tons of cinchona bark;[57] the Shionogi Company, 13 tons;[58] TIU, 2 tons;[59] and KIU, 150 tons.[60] Total cinchona bark production in colonial Taiwan was nearly 200 tons,[61] ranking third in the world, right behind Dutch Java and British India.[62] The large quantity was sufficient to support Japan's anti-malarial policy in Taiwan; however, local people did not receive any direct benefits because most of the quinine was sent to the battlefields in China and Southeast Asia.[63] This represents another example of the manner in which the need to wage war both linked to and dissipated the energy and resources of areas away from the battlefield (see Chapter 7 of this volume). In other words, Kina-Gaku, developed in this political context, became a tool of quantification, control, and governance serving the needs of both science and the empire.

Ironically, Japan's colonial expansion in the 1940s rendered cinchona cultivation and Kina-Gaku in Taiwan less important than before. With the Japanese defeat of the Dutch East Indies in February 1942, Japan now controlled the best cinchona cultivation site in the world. The Cabinet Planning Board, the most important administrative organ for resource allocation during wartime, had immediately established short- and long-term plans for taking over the cinchona plantations in Java and Sumatra. Hoshi Kina, Takeda, Shionogi, Zunan, and the Nangoku Industrial Company[64] were mandated to carry out the task; among them Takeda and Nangoku were entrusted with the leading role because

of their experience of operating cinchona plantations in Java. The inventory showed that the total amount of bark stored in 94 plantations was around 10,000 tons, 50 times what Taiwan had produced. The Japanese came up with a five-year production plan in 1943 because quinine was regarded as the best means of enhancing military capabilities and supporting its allies. About 440 hectares of new trees were planted in existing plantations, while 1,000 hectares of tea bushes were removed in preparation for future cultivation.[65] However, it seemed that Japanese Kina-Gaku, intermingled with science and local knowledge in Taiwan, did not have much effect in Java. In addition, in late 1944, those newly planted cinchona trees in Java were soon replaced by staple crops, in response to increasing demand for food at the battlefields.[66]

Compared with their positive attitude toward Java following its takeover, the imperial government took a negative one toward Taiwan's cultivation, and decided 'neither to encourage nor to prohibit it'. Nevertheless, the occupation of Java inevitably brought about a ripple effect among Taiwan's private plantation owners: most stopped expanding their cultivation areas, merely maintaining the status quo. Take Hoshi Kina's plantations for example: before 1941, large-scale planting was implemented under the governmental ten-year production plan; yet after 1942, the total area and the number of cinchona trees slumped heavily (Table 6.3).

The first consideration was production cost. Several internal meetings at Hoshi recommended diminishing the plantation size, because cinchona cultivation in Java was cheaper and more profitable.[67] A second reason related to shortages of technical personnel under government mobilization. Technicians in universities and private plantations were conscripted

Table 6.3 Area under cinchona cultivation in Hoshi's plantations (1937–42)

	Rai-sha plantation		**Chi-moto plantation**	
	Area (kō)	**Number of trees**	**Area (kō)**	**Number of trees**
Parent trees		102		137
Planted in 1937	26.52	6,180	27.41	37,210
Planted in 1938	21.68	62,757	35.34	72,254
Planted in 1939			60.68	98,078
Planted in 1940	17.88	61,242	41.62	49,190
Planted in 1941	13.44	43,485	82.74	371,140
Planted in 1942	0.37	1,101	10.05	83,834

Source: Documents of Taiwan Development Company, vol. 2438, TSI-94-3000-1.

to take charge of cinchona harvesting, bark packing, and shipment, as well as quinine manufacturing. Among Hoshi's 20 technicians working in nine plantations, ten were designated to work in Java.[68] A KIU's scholar of Kina-Gaku, Ueda Kōichirō (1898–1991), once sighed in dismay, saying: '[w]e should take parental responsibility to raise the born child', and requested the continuation of cinchona cultivation in Taiwan.[69] These examples also imply ironically that the development of Kina-Gaku, which emphasized both locality and practicality for imperial gain, ended up being rendered worthless as a result of imperial expansion in the 1940s.

Conclusion

Taking advantage of being a latecomer to cinchona cultivation, the Japanese Empire gained valuable knowledge about the development of this plant from Dutch Java. What Japanese authorities intended to adopt and transplant was not only the trees, but also cinchona science and the science-based planting system behind their cultivation. While initial government attempts faltered in the 1910s, the ambitious entrepreneur Hoshi undertook to develop this plant out of commercial interest, consequently opening up the new study field of Kina-Gaku on private plantations. In the 1930s, both the political and economic situations of the Japanese Empire brought cinchona into the limelight once more, and accelerated the cultivation and further development Kina-Gaku. Ironically, imperial control over Java rendered the cultivation of cinchona and the related research in Taiwan largely redundant after 1942.

This case study of the Japanese development of cinchona shows that the relationship between empire and botany can be far more subtle and complicated than previously thought. The history of Japanese cultivation ventures still witnessed the entanglement of science with imperial power, as it did in the West: the Japanese Empire's support fostered the development of Kina-Gaku, while Kina-Gaku strengthened the empire's capacity to manage natural resources, which in turn contributed to imperial development and expansion. However, unlike Western powers, in the case of Japan it was the alliance between private companies and scientific institutes that promoted and completed the Kina-Gaku, a new science with greater emphasis on locality and practicality than Javanese cinchona science.

Notes

1. Teodoro S. Kaufman and Edmundo A. Rúveda, 'The Quest for Quinine: Those Who Won the Battles and Those Who Won the War', *Angewandte Chemie International Edition* 44, no. 6 (2005): 857–8.

2. Dale C. Smith, 'Quinine and Fever: The Development of the Effective Dosage', *Journal of the History of Medicine* 30 (1976): 343–67.
3. Andrew Gross, 'Building the World's Supply of Quinine: Dutch Colonialism and the Origins of a Global Pharmaceutical Industry', *Endeavour* 38, no. 1 (2014): 8–18.
4. Lucile H. Brockway, 'Science and Colonial Expansion: The Role of the British Royal Botanic Gardens', *American Ethnologist* 6, no. 3 (1979): 449–65; Lucile H. Brockway, *Science and Colonial Expansion: The Role of the British Royal Botanic Gardens* (New Haven, CT: Yale University Press, 1979), 103–39; Richard Drayton, *Nature's Government: Science, Imperial Britain, and the 'Improvement' of the World* (New Haven, CT: Yale University Press, 2000), 206–19; Kavita Philip, *Civilizing Natures: Race, Resources, and Modernity in Colonial South India* (New Brunswick, NJ: Rutgers University Press, 2004), 171–201. As for the Dutch effort in Java, the most detailed publication in English is Andrew Gross's *The Floracrats: State-Sponsored Science and the Failure of the Enlightenment in Indonesia* (Madison, WI: University of Wisconsin Press, 2011), 33–58; Moreover, Daniel R. Headrick briefly mentions the transfer of cinchona among European powers: Daniel R. Headrick, 'Economic Botany and Tropical Plantations', in *The Tentacles of Progress: Technological Transfer in the Age of Imperialism, 1850–1940* (Oxford: Oxford University Press, 1988), 209–58. The most recent research by Arjo Roersch van der Hoogte and Toine Pieters has explored the two disparate outcomes of Dutch and British cinchona historical trajectories: 'Science in the Service of Colonial Agro-industrialism: The Case of Cinchona Cultivation in the Dutch and British East Indies, 1852–1900', *Studies in History and Philosophy of Biological and Biomedical Science* 47 (2014): 12–22.
5. Daniel R. Headrick, 'Economic Botany and Tropical Plantations', 237.
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7

The Energetics of Militarized Landscapes: The Ecology of War in Henan, 1938–50

Micah S. Muscolino

During World War II, or the 'Anti-Japanese War of Resistance' (1937–45) as it is known in China, North China's Henan Province endured a series of war-induced ecological disasters. The first struck in June 1938, when Chinese Nationalist armies under the command of Chiang Kai-shek breached the Yellow River's dikes in Henan in a desperate attempt to block a Japanese military advance.[1] For the next nine years, the Yellow River's waters spread to the southeast into the Huai River system via its tributaries, inundating vast quantities of land. Perhaps the single most environmentally damaging act of warfare in world history, the strategic interdiction threw long-established water control infrastructure into disarray, leading to floods that persisted until after the conflict had come to an end. Investigations carried out after 1945 estimated that the resulting floods killed over 800,000 and made nearly 4,000,000 people refugees in the provinces of Henan, Anhui, and Jiangsu. In Henan Province alone, wartime flooding killed over 325,000 people and displaced over 1,170,000.[2]

But that was not all. An even greater catastrophe struck Henan in 1942 and 1943, when climatic anomalies associated with a global El Niño event, wartime disruption of transport, and the food energy demands of Chinese and Japanese armies stationed in Henan precipitated a famine of terrific magnitude.[3] The Henan famine led to as many deaths—approximately two million—as the famous Bengal famine that occurred in India at nearly the same time, and millions more Henan residents took to the roads and fled to escape this subsistence crisis.[4]

This chapter contends that the disasters that took place in Henan during World War II resulted not from arbitrary destruction, but from the nature of war and militarization itself.

Military metabolism

To comprehend Henan's war-induced ecological catastrophes, one can employ a conceptual approach that traces energy flows through and between societies and environments.[5] Metabolic processes transform energy and materials, enabling biological systems (whether organisms or higher-level ecosystems) to maintain life, grow, and reproduce. Socio-economic systems also depend on continuous throughputs of energy and materials to maintain their internal structures. By exploiting various energy sources, human societies modify and manipulate land, water, plants, and animals to fulfil their basic needs. The concept of 'social metabolism' likens this dependence to the biological metabolism of a living organism. Unlike the biological notion of metabolism, however, this socio-ecological concept links energy and material flows to social organization. The quantity of resource use, its material composition, and the sources of these flows are functions of socio-economic production and consumption systems that vary greatly across time and space. This framework analyses socio-metabolic patterns at different spatial, functional, and temporal scales, while also tracing their environmental consequences.[6] By seeing human societies as embedded in larger organic systems, an energy-centred approach renders legible the connections between phenomena that historians have conventionally treated as discrete. Rather than artificially separating socio-economic and bio-physical processes, this approach enables us to highlight the seamless interrelationships and interdependencies that existed among societies, environments, and the military establishments that they supported.

Like all socio-economic systems, militaries have metabolisms. Nature's energy makes warfare possible. Fighting and preparing for war, like all work, requires appropriating and exploiting energy sources. Militaries consist of vast agglomerations of humans, animals, machines, raw materials, logistical networks, engineering works, and many other components. No military system can survive without energy inputs from the surrounding environment. They take in food, fuel, building materials, and other resources; they emit wastes. Focussing on energy and its transformations allows for a better understanding of war–environment connections than any interpretation premised on an artificial division between the 'human' and the 'natural'. The metabolism of militaries and societies shapes the choices of commanders, the fates of civilian communities, and the course of environmental change. Thinking in terms of energy, moreover, offers a conceptual apparatus that can tie together the conflicts waged in vastly different times and places that, taken together, comprise the environmental history of war.

We conventionally define energy as the capacity to do work. Work occurs when a force acts on a body, causing it to move some distance in that force's direction. Moving an object entails doing work and expending energy. The specific amount of energy depends on the size of the object, how far it moves, and the resistance it encounters. Energy assumes many forms, but they all have the potential to do work. Capturing more of that energy and using it with greater efficiency enables more work to be done. On this planet, the primary source of energy is the sun. Solar energy drives energy conversions at all levels. Photosynthesis, the process by which plants capture and store solar energy as chemical energy, is central to life on earth. As Edmund Burke III explains:

> [a]ll complex life forms have devised methods for accessing the solar energy stored in plants. Human metabolism allows us to unlock this store of energy either directly, by consuming plants, or indirectly, by consuming animals. Alone among other complex forms of life, humans have been able to devise means of storing and using solar energy.[7]

Two laws govern energy flows. The first law of thermodynamics states that energy can change from one form to another, but cannot be created or destroyed. The same amount of energy exists before and after it is transformed.[8] The second law of thermodynamics dictates that whenever energy changes form, part of the energy becomes heat. Energy conversion is never 100 per cent efficient. Some energy will always become heat and dissipate into the environment. No energy transformations occur without some energy being degraded from a concentrated to a more dispersed form. The functioning of complex entities involves numerous energy conversions. As energy is converted to do work, some of it changes into heat. Energy transferred as heat is still energy, but is no longer useful for doing work. The quantity of energy is fixed, but its quality is not. As energy conversion chains progress, potential for useful work steadily declines. Entropy is the measure of this dissipation of useful energy.

All complex structures require energy inputs to maintain their organization and to keep functioning. In a closed system, energy dissipation due to entropy will lead to loss of complexity, greater homogeneity, and more disorder. In actuality, however, most energy conversions happen in open systems that interact with the surrounding environment. Complex entities can temporarily defy entropy by importing

and metabolizing energy. They arise in a balance between the usable free energy in the environment, which they can put to work, and the entropy they throw off. Inputs of high-quality energy make it possible for complex structures to combat decay from within. In the process, they also dissipate large amounts of energy as heat, increasing entropy overall. As complex systems, living organisms maintain continuous energy inflows and outflows. Metabolism enables organisms to avert decay and stay alive by drawing energy from their environment. But they maintain their structures at the expense of increased contribution of entropy to the surrounding environment.[9]

Grasping the environmental dimensions of war and militarization requires understanding how energy is converted for military purposes. Militaries can be thought of as organic systems that continuously interact with their environments, engaging in transfers of energy and materials. Militaries must constantly find new sources of useful energy and develop more effective mechanisms for handling extraordinarily large energy flows. As complex organisms, military systems extract energy to do work and maintain their internal organization, while at the same time releasing low-level energy via entropy (waste).

The forms of energy that can support this 'military metabolism' are strictly limited. Other complex systems, including agrarian ecosystems and hydraulic networks, stake their claims on these finite energy sources as well. As it is transferred across different spatial scales, energy changes form. But because the total amount of energy remains constant, appropriating energy in forms that are needed to fight or prepare for war necessarily entails losing it in others. Even if war and militarization lead economies to exploit new energy forms drawn from nature, they render energy unavailable for other purposes. Militaries struggle for strategic advantage, as well as for energy sources that drive their metabolism. The better militaries gather, store, and deploy energy, the greater their potential for organized violence, coercion, and destruction. Military systems exploit finite sources of useful energy to maintain themselves, do work, and expand. At the same time, they release heat, pollution, and waste. Building complex military structures and expanding their realm of operations leads to disorganization, chaos, and degradation in the environments on which they depend. This degradation occurs at the level of ecosystems, as well as in the wastage of human bodies.

We can imagine far-reaching webs woven together by transfers of energy. Various actors that strive for power occupy and move from one node to another in these webs. By straining one thread in the web of energy transfer, actors may break another thread. Enormous transfers

of energy occur across vast spaces, as military and non-military actors re-negotiate their roles and possessions. The catastrophes that occurred in Henan during World War II derived from the impact of channelling various forms of energy for military purposes, as well as the acute disturbances that these distorted flows created.

The Yellow River flood

The same energy that propels rivers drives all human activities, including the waging of war. As Richard White has observed, the labour that humans expend trying to control rivers ties them so closely to the environment that they become fundamentally inseparable from it.[10] White also reminds us that energy and work intertwine with power. Sometimes, power measures rates of energy flow and energy use. At other times, power means doing work and effecting change. In yet other instances, power refers to the ability to command energy and the work of others. All these different meanings of power 'involve the ability to do work, to command labor. To be powerful is to be able to accomplish things, to be able to turn the energy and work of nature and humans to your own purposes'.[11] Energy harnessed as power becomes a means of attaining human ends and pursuing human goals, including military ones.

By the twentieth century, exploiting China's rivers and waterways for military-strategic purposes had plenty of historical precedents. From ancient times, China's extensive irrigation systems had been a 'sword of Damocles—and almost anyone could snip the thread'.[12] On many occasions, armies intentionally flooded China's rivers to gain the upper hand against their opponents. Chiang Kai-shek and his subordinates perceived the Yellow River in similarly strategic terms. In June 1938, Nationalist armies transformed nature's awesome energy into a weapon by breaking the Yellow River's southern dike in Henan to block the Japanese army's advance. With this decision, the Chinese Nationalist armies exploited the river's energy to counter Japanese military power. Manipulating rivers in this fashion can also be thought of as a way of altering the energy needs of the enemy. Breaching the dikes greatly increased the energy required for the Japanese army to carry out its military advance, as well as other logistical requirements. Those logistical requirements, of course, were also energy requirements.

Throughout World War II, Chinese and Japanese armies in Henan engaged in hydraulic warfare as they struggled to harness the river's energy and deploy it against their military adversaries. Following the river's diversion in 1938, Chinese and Japanese armies confronted one

another across its new course, making it a strategically vital front-line area. Long after the initial flood, the Yellow River remained an actor in the military conflict, with battles between natural and human forces continuing to play out as part of the Sino-Japanese War. Military actors on either side expended huge amounts of energy working with, on, and against the river to attain their objectives, undertaking projects to channel and redirect its flow to fortify their positions and deploy it against their enemies. Their struggles were over power; contests over who could control the river, manipulate its energy, and secure its benefits. Manipulating the Yellow River to attain military-strategic advantage also required power in another sense—the ability to gain advantage from the labour of others. The river demanded vast expenditures of human energy to match its own energies. To carry out wartime hydraulic engineering projects, military forces and the water control agencies allied with them had to mobilize massive flows of labour and materials. But as refugees fled Henan in the wake of the 1938 flood, those energy sources became extremely difficult to obtain. The task of providing these inputs placed an even greater burden on localities that had already been devastated by warfare and flooding.

The Yellow River was not a passive object, but acted to frustrate human efforts aimed at shaping its behaviour for military–strategic purposes. As in times past, 'hydrological systems kept twisting free from the grip of human would-be mastery, drying out, silting up, flooding over, or changing their channels. By doing so they devoured the resources needed to keep them under control or serviceable'.[13] In a time of war, when armies devoured or destroyed virtually all available resources, this cycle grew even more vicious. Given the sheer level of damage, Henan's flooded area had precious little energy to devote to hydraulic engineering, let alone for repairing ecological devastation. Military systems drained energy out of local society, making it virtually impossible to recover from war-induced disasters. Energy is finite. If it is diverted to waging war, it is unavailable for the work of reconstruction.

Competition for energy and power played out not simply between Chinese and Japanese armies—or between these military forces and the river—but between militaries and the local communities that they exploited as well. Tensions emerged between central authorities, who wanted to exploit limited energy sources for national defence, and localities in the flooded area that struggled to retain them for their own needs. War-induced distortion of energy flows rearranged the environment physically, disrupted human-constructed hydraulic and agro-ecological systems, and made their repair all but impossible. The Yellow

River's hydro-energy benefited the Nationalist military in the short term by slowing the Japanese invasion, but the fateful decision to divert its course left the Nationalists stuck in a quagmire that was at least partly of their own making.

The effect of war on environmental infrastructure

Writings on war and the environment tend to describe the myriad ways in which military conflict—or preparation for it—degrades previously healthy or unspoiled landscapes. But Henan's wartime experience points to the importance of baselines in reconstructing narratives of war's environmental effects. All agricultural landscapes are human-made or 'anthropogenic'. From late imperial times, human labour sculpted China's agricultural landscapes to an unusually high degree. Such hyper-anthropogenic landscapes required vigilant management, as well as constant investments of labour and resources. Without those inputs, rapid and costly deterioration followed. Given the vulnerability of Henan's human-constructed landscapes to neglect, wartime population loss brought rapid and severe ecological decline. To put it another way, creating and maintaining agro-ecological and hydraulic systems consumed huge energy flows in the form of human labour power and materials. In the 1930s and 1940s, diversion of energy to military conflict led to environmental degradation and disorder.[14]

North China's anthropogenic environments were neither purely 'natural', nor entirely the product of human artifice. Rather, human-engineered agricultural landscapes inhabited the 'twilight zone between Nature and Culture' characteristic of what Emmanuel Kreike calls 'environmental infrastructure'. Examples of environmental infrastructure include cultivated landscapes, farms, fields, and water-management systems. Humans, as environmental actors, 'work *with* nature (which is at once an actor and a medium), rather than dominating nature or being dominated by nature'. Any changes in how human societies interact with and maintain their environment will have implications for environmental infrastructure as well.[15]

Prior to the Japanese invasion of the late 1930s, therefore, Henan's environment did not exist in any sort of pristine or 'natural' condition. Centuries of intensive human exploitation and management thoroughly altered the landscape, removing forests and other vegetation to make way for farms. Ecological diversity, and hence resilience, declined dramatically. Population growth pressed resources to the limit; ecological buffers were lost.[16]

By the nineteenth century, Henan and the rest of North China confronted what many historians have labelled an environmental crisis (see Chapter 1). Deforestation led to intensified erosion and caused sediments to accumulate in the Yellow River, the Huai River, and many other river systems, necessitating higher dikes and resulting in more frequent and costly flooding. Loss of vegetation cover led to critical shortages of fuel, as well as building materials.[17] Maintaining a balance between hydraulic and agricultural systems demanded ever-greater amounts of energy. During the early twentieth century, in Lillian Li's assessment, '[e]nvironmental decline, especially the siltation of rivers, was historically unprecedented. … The cumulative effect of centuries of deforestation, intensive land use, and excessive control of rivers posed a problem of greater magnitude than had ever been experienced'. The frequency and scale of flood and famine in the Republican period (from 1911 to 1949) 'far exceeded anything that had occurred previously'.[18] Under these circumstances, World War II caused dislocations that destabilized fragile environments and upset precarious ecological balances, triggering acute shocks.

Upheavals created by the Japanese invasion and the Yellow River's strategic diversion led to large-scale population displacement that dispersed energy embodied in human labour power and made intensive management of Henan's environmental infrastructure impossible. Rapid ecological damage was the inevitable result. Attaining and maintaining order in anthropogenic agro-ecological and hydraulic systems, as with militaries and other complex systems, takes energy. But the energy used to maintain armies and fight wars—or energy that is dispersed due to military dislocations—cannot be utilized for other purposes. Without adequate inputs of labour and resources, Henan's agricultural and hydraulic systems quickly spiralled into disarray and recovery became nearly impossible.[19] Military conscription drained labour power from local societies, while the army's appetite for energy took food supplies out of the hands of civilian populations. As the direction of energy flows changed, agricultural landscapes transitioned into 'warscapes' transformed by destructive human action.[20]

The Henan famine

As the dislocations of war dealt a severe blow to production of energy surpluses through agriculture, short-term climatic fluctuations added additional shocks. In 1941 and 1942, Henan and other parts of North China experienced unpredictable weather patterns and low rainfall

levels connected with a strong El Niño event, causing agricultural output to fall precipitously.[21] As Peter Perdue has observed, '[w]hether or not famine happens depends on the effect of climate conditions on interactions between officials, peasants, relief agencies, and markets for labor and grain'. People's ability to sell their labour and resources on markets, not simply the aggregate availability of food, determines life or death. In late imperial times, Chinese officials had effectively mobilized relief programmes to deliver food, cash, and work opportunities to starving communities.[22] In the early 1940s, wartime instability combined with state security interests to rule out effective interventions to assist Henan's rural population and avert famine.

Even as harvests collapsed, the imperatives of war demanded huge concentrations of energy. As a front-line region, Henan had to supply vast amounts of resources to the military. Satisfying this appetite required seizing energy and materials from already devastated agro-ecological systems. The Nationalist regime collected taxes in kind and extracted an array of other levies to secure food for the army; other armies launched grain raids for the same purpose. In these circumstances, all combatants had to compete violently for food supplies, which took on the utmost military-strategic importance. In Hans van de Ven's words, '[b]attles for the harvest followed between the Nationalist state, its armies, local militaries, and the population, which the Japanese also joined'.[23] The Chinese Communist Party's military forces actively participated in these food struggles as well. With military and state actors trying to capture more and more energy to fight a war, the energy available for other life-forms dwindled. Channelling energy to the military distorted relations of food entitlement in Henan and made grain scarce or unavailable for vulnerable segments of society.

It should be stressed that in the 1930s and 1940s, Henan and the rest of the North China Plain remained overwhelmingly an 'advanced organic economy' without a significant industrial sector powered by fossil fuels. No mechanisms existed to extract and transport hydrocarbon energy, or to process it into forms that were useful for modern militaries.[24] Waging war in this particular region of China required massive concentrations of people, animals, food, and fuel in battle zones. Under what J. R. McNeill terms the 'somatic energy regime', in which energy resources came primarily in the form of human and animal muscle, more people and livestock meant more productive power. Human and animal populations were a 'flywheel in the society's energy system' that could be mobilized regardless of the abundance or scarcity of plant crops that were the primary source of energy. The only way to achieve

political dominance and military success was to direct the somatic energy regime, harness its surplus, and apply it to fuel warfare. Because muscle was the main energy source, attaining power required controlling large numbers of people and livestock.[25]

Viewed from this perspective, agriculture was 'a solar-energy system controlled by humans, in which the energy output of selected plants [was] monopolized for human purposes'. States and militaries thus regarded humans as 'ambulatory solar-energy storage systems'.[26] Differential access to energy sources corresponded to power differentials between groups of people. Large-scale conscription of able-bodied males in wartime Henan—both to fight and to work—kept labour power away from agriculture, making recovery difficult. Extracting energy from a war-devastated environment influenced by climatic anomalies threw ecological systems into disarray, creating an 'energy crisis' in which civilian populations could not obtain the caloric intake needed for their minimal subsistence.

War-induced flood and famine displaced millions of people in Henan, forcing them to adapt to unfamiliar environments and find ways to secure the energy they needed to survive. Their ecological adaptations had an impact. Many flood victims earned income by gathering and selling energy stored in the form of organic biomass as fuel for heating and cooking. But few refugees could cut down trees. In a part of China that had been deforested for centuries, and where severe fuel shortages had existed since the nineteenth century, refugees took whatever they could find. They gathered brush, grass, chaff, and roots—anything that could serve as fuel. Though fuel shortages had existed in northern China for decades, refugees' survival strategies made them more severe. Extraction of biomass deprived soils of organic nutrients and subjected land that was already jeopardized by erosion to greater damage.

Displaced people placed additional pressure on scarce resources in areas of in-migration and dramatically altered environments, especially in the sites where China's wartime state resettled refugees to reclaim wasteland for agricultural production. China's Nationalist and Communist regimes alike envisioned land reclamation as a way to mobilize refugee labour power in order to boost agricultural production and strengthen China's military resistance. Much of this 'wasteland' consisted of upland areas covered with trees and other vegetation. Unlike Henan, Shaanxi Province's Huanglongshan region, site of the largest wartime resettlement project, had forests. Land reclamation converted wooded landscapes for agricultural production, simplifying

ecosystems, jeopardizing wildlife habitats, and accelerating soil erosion. All of these ecological changes, it is important to emphasize, carried deleterious consequences for the health and well-being of most refugee populations.[27]

Aftermath

World War II did tremendous damage to North China's natural landscape. But war-induced environmental decline is only part of the story. Assessments of war's ecological legacies also have to consider the capacity of societies to restore war-ravaged landscapes to productivity.[28] Along with presenting a particularly graphic example of the immediate impact of military conflict on the natural landscape, which has been the focus of previous environmental histories of warfare, Henan's experience also illustrates the resilience of human societies and their capacity to restore war-ravaged landscapes to productive agro-ecosystems. After World War II ended—and even as China was embroiled in civil war between the Nationalist and Communist Parties—Henan's most badly damaged areas experienced resettlement, socio-environmental reconstruction, and the re-creation of humanized agricultural landscapes.

In his environmental history of World War II in Japan, William Tsutsui asserts 'that the effects of warfare on the environment (be they favorable or detrimental) are often less lasting and less significant than we might imagine'. War's environmental legacies 'are complex, contingent, and often surprisingly transitory'.[29] J. R. McNeill likewise writes of the twentieth-century world as a whole that '[c]ombat had its impacts on the environment, occasionally acute but usually fleeting. More serious changes arose from the desperate business of preparing and mobilizing for industrial warfare'. In his view, 'patient labor and the processes of nature' have usually hidden the scars of war and 'assimilated into the surrounding countryside the sites of even the most ferocious battles—except where there has been conscious effort to preserve the battlefields as memorials'. He notes that dry-land agriculture, as practised in Henan and on the rest of the North China Plain, 'recovered quickly from war, on average in about three years'.[30] These observations ring true for Henan's flooded area, at least to an extent. The rebuilding of agro-ecological systems and return of agricultural productivity to pre-war levels indeed occurred in a rather short time. In line with McNeill's assertion, agricultural output in Henan's flooded area returned to pre-1937 levels about three years after fully fledged peace and stability returned with the Chinese Civil War's conclusion in 1949. Human

labour and investment remade landscapes of unparalleled devastation into environmental infrastructure.

In other respects, however, Henan's post-conflict experience makes it necessary to qualify these conclusions about war's transitory environmental effects. Recovery did not result from nature's powers of regeneration alone. Repairing the ecological degradation caused by war-induced neglect came about only through active human management. Recovering from the damage caused by war-induced neglect of agro-ecosystems demanded huge flows of energy embodied in labour and resources, as well as agencies capable of channelling and coordinating them. After 1945, large-scale external assistance came from the United Nations Relief and Rehabilitation Administration (UNRRA), which launched redevelopment programmes in war-damaged areas of China in conjunction with the Nationalist regime's Chinese National Relief and Rehabilitation Administration (CNRRA).

In 1946 and 1947, tens of thousands of labourers supervised by UNRRA-CNRRA exerted their energies into returning the Yellow River to its pre-1938 course. UNRRA-CNRRA offered considerable material support to refugees who returned to their homes in Henan's flooded area and assisted them in bringing land back into cultivation. In conjunction with the labour of Henan's rural populace, processes of post-conflict ecological reconstruction garnered huge energy subsidies from these transnational relief agencies. Without those external inputs, human communities could not have remade war-torn landscapes into productive agro-ecosystems so quickly and the environmental scars of warfare would have persisted much longer. With this external assistance, but mostly thanks to their own exertions, farmers reclaimed nearly all of the previously flooded area by 1949 and the landscape gave little indication of the disasters that had occurred only a few years earlier.

At the same time, the rapidly changing ecological conditions in Henan's flooded areas shaped the geostrategic terrain on which the final stage of the Chinese Civil War between the Nationalists and the Chinese Communist Party (CCP) was fought. The Yellow River took on renewed strategic importance in the late 1940s, as Nationalist military leaders sought to isolate Communist forces in eastern Henan by returning the river to its pre-1938 course. Contrary to Nationalist intentions, the river's re-diversion decreased the water barrier between Nationalist and Communist armies, affording the CCP greater mobility. The Chinese Civil War of 1946 to 1949 proved much less devastating than World War II and enabled recovery to proceed without serious impediment. Return of the human population and agricultural recovery

gave the Communists and Nationalists reason to exert control over the flooded area, making it a point of military contestation.

William McNeill once conceptualized food energy consumption by armies as the 'macroparasitism of military operations'.[31] In order to sustain themselves, militaries have to rob agriculturalists of a portion of their harvests. But any parasites that kill or harm their host do not last long. Just as viruses evolve less virulent strains that exploit hosts without killing them, armies have normally recognized the importance of protecting the farmers they exploit. But such symbiotic balances have not always existed. In times of crisis, as David Christian rightly notes, able rulers often become brutal and destructive predators. Less able—or more desperate—rulers employ destructive fiscal methods that they or their advisors know will undermine the basis of their power.[32] The direction of the Chinese Civil War in Henan depended largely on which side was able to secure flows of energy and resources for its military.

Struggles over energy flows in wartime Henan intersected with twentieth-century China's most significant political transformation. At the height of World War II and into the Chinese Civil War that followed, Nationalist 'military macroparasitism' damaged its host society, seizing food supplies and drafting men as soldiers and labourers. Without effective structures to channel and coordinate large energy flows, the Nationalist military position in Henan crumbled. A more symbiotic balance, by contrast, undergirded the expansion of Communist influence. In the wake of the 1942 to 1943 famine, the CCP's forces improvised relatively stable and effective methods of exploitation that benefited armies and civilian populations alike. After 1945, the CCP proved adept at attracting returning refugees—and labour power—to its base areas in Henan's flooded area, enacting land reform in conjunction with land reclamation. In large part, the Communist capacity to innovate more stable ways of extracting energy from ecological systems explains the CCP's consolidation of power in local society.

For the Chinese Nationalist regime, a desperate need to extract energy for the army and remould the hydraulic environment to meet its strategic priorities gave rise to socio-ecological disruptions that paved the way for its eventual military collapse in North China. The Chinese Communist Party's military forces in Henan, during the 1940s at least, proved more capable of adapting to changed environmental conditions and improvising ways of capturing the energy they needed to survive. To an extent, the contrast between the ecological impact of the Chinese Nationalist and Communist militaries derived from their tactics. The Nationalist armies engaged in positional warfare, while the

Communists relied primarily upon guerrilla warfare, which gave them greater mobility and flexibility. Differing military-strategic choices necessitated by the war against Japan thus resulted in different ecological outcomes, which also had significant political implications.

Further research directions

The energy-centred approach employed in this chapter complements other ways of thinking about the war–environment nexus. Edmund Russell, for instance, has suggested that analysing military supply chains as food chains 'will help us uncover the indirect and hidden, but absolutely essential, links between armed forces and civilian, agricultural and natural systems'. Thinking in terms of food chains, as he notes, demonstrates 'that the area of militarized landscapes extends far beyond battlefields and bases, growing ever wider as the supply chain lengthens'.[33] For ecologists, trophic pyramids are used to represent the roles of different organisms within food chains. In terrestrial ecosystems, plants anchor the bottom level, herbivores the next, and predators the next up from them. 'Species at each level depend not only on the level immediately below them, but on *all* lower levels—though their dependence becomes less apparent as the food chain lengthens'.

This mode of analysis also highlights the importance of energy flows. Though Russell does not dwell on the point, it is worth stressing that trophic pyramids map *energy transfers* between producers and consumers at each step in the food chain. As he explains: '[t]he width of the pyramid represents biomass (the weight of organisms). Transforming energy from one form to another always comes at the cost of lost energy, so the biomass of each level must always be less than that of the level below it'.[34] Russell usefully applies the model of a trophic-pyramid to militarization's ecological effects: '[s]tarting at the bottom, we can label the levels[:] natural systems, agricultural systems, political, economic and technological systems, and armed forces'. Armed forces depend on political, economic, and technological systems for their sustenance.

> Less apparently but just as much, they rely on the agricultural and natural systems that support the political and economic systems. Moreover, since each level must harvest greater biomass than itself to survive, the impact of military consumption widens as one goes down the scale. This means that militarization grows ever more pervasive as it becomes ever less visible.[35]

Fully grasping the ecological impact of warfare and militarization requires investigating energy conversions at every level of the food-web pyramid.

Seeking to expand the environmental history of warfare 'beyond the battlefield' to the 'host of semiperiheral [sic] contexts where war etched its distant imprint on the land', Matthew Evenden analyzes commodity chains—'the linked labor and production processes involved in the making of a commodity from production to finished good'.[36] As Evenden explains in his path-breaking research on aluminium production during World War II,

> [f]ar from dividing the environmental history of the Second World War into a series of national histories, commodity chains bridge the distance between places, point up the importance and irrelevance of international boundaries, and connect social and environmental change on several spatial scales. The commodity chain thus offers a useful angle of vision to help understand the dynamics of warfare and environmental change over distance.[37]

Evenden examines the development of new geographies of production, military efforts to defend vital commodity chains, and the environmental repercussions of these strategically important processes. As he shows, wartime expansion of aluminium production increased the character and the extent of environmental effects.[38] Commodity-chain analysis highlights the 'unprecedented capacity of the Second World War to gather and scatter materials with untold human and environmental consequences, linking diverse locations with no necessary former connections'.[39]

As a conceptual framework for investigating links between war and the environment, commodity-chain analysis also melds nicely with the mode of analysis employed in this study of World War II and its aftermath in Henan, which focusses on energy transfers to understand the ecological dimensions of war and militarization. Most significantly for our purposes, wartime expansion of aluminium commodity chains 'required massive material and energy inputs' derived from several world regions, from extraction of tropical soils to the damming of rivers for hydroelectricity. What is more, as Evenden notes, '[t]hese critical links in the supply chain were bound together by a fossil-fueled, long-distance transportation system'.[40] Commodity-chain analysis, like the concept of metabolism, directs our attention to how military systems acquire the inputs of energy and materials that they need to survive

and function, as well as the environmental consequences of these flows. Taking a cue from the approaches proposed by Evenden and Russell, we can explore the history of war through the lens of energy conversion to better understand its environmental consequences.

Because they also depended upon constant energy inputs for their maintenance, intensively exploited agricultural landscapes and hydraulic systems like those which prevailed on the North China Plain proved especially vulnerable to war-induced disruption. Warfare upset finely honed human relationships with anthropogenic environments in Henan, triggering rapid and acute shocks. The military's insatiable appetite for energy drained the labour and resources needed to maintain environmental infrastructure, making it impossible to recreate a viable human–ecological order until conflict came to an end. Warfare, in other words, rendered post-disaster recovery even more difficult than usual by monopolizing the energy flows needed to pull things back together.

Multifaceted and multidirectional relationships played out between war, society, and the environment. Armies in eastern Henan intentionally disrupted hydraulic systems, after which they expended huge quantities of energy trying to manipulate rivers for strategic purposes. Warfare tore asunder agro-ecosystems and disrupted agricultural production, as Chinese and Japanese armies consumed increasing amounts of food energy to meet their metabolic demands. Military systems, likewise, extracted tremendous amounts of labour power from local societies in the form of soldiers and conscript labour, even as their actions caused population loss due to death and displacement. Due to precipitous war-induced population decline, local societies (or what remained of them) could not invest the labour and resources needed to maintain agro-ecological systems from which they derived food and biomass. When hydraulic systems suffered war-induced disruption, flooding led to additional loss of labour and materials.

With military actors extracting even larger amounts of energy in their efforts to manipulate waterways, maintaining militarized hydraulic systems placed greater burdens on devastated localities. At the same time, Henan lost additional energy sources as refugees migrated west to Shaanxi, where their survival strategies generated additional environmental change. After World War II came to an end in the late 1940s, it took massive influxes of energy to draw human labour power back into eastern Henan's flooded area, making it possible to repair war-ravaged environmental infrastructure and restore agricultural landscapes to productivity.

Notes

1. For existing works that examine the flood from a military perspective see, Qu Changgen 渠長根, *Merits and Wrongdoings for a Thousand Years: Research on the Huayuankou Incident* [功罪千秋: 花園口事件研究] (Lanzhou: Lanzhou daxue chubanshe, 2003); Diana Lary, 'The Waters Covered the Earth: China's War-Induced Natural Disasters', in *War and State Terrorism: The United States, Japan, and the Asia-Pacific in the Long Twentieth Century*, ed. Mark Selden and Alvin So (Lanham, MD: Rowan and Littlefield, 2004). Most of the empirical information in this chapter draws upon Micah S. Muscolino, *The Ecology of War in China: Henan Province, the Yellow River, and Beyond, 1938–1950* (Cambridge: Cambridge University Press, 2015).
2. Han Qitong 韓啓桐 and Nan Zhongwan 南鍾萬, *Damage and Recovery and Relief in the Yellow River Flooded Area* [黃氾區的損害與善後救濟] (Shanghai: Xingzhengyuan shanhou jiuji zongshu, 1948), 22–3.
3. The oldest and still the most influential account is Theodore H. White and Annalee Jacoby, *Thunder Out of China* (New York: W. Sloane Associates, 1946). For more recent accounts see, Lary, 'The Waters Covered the Earth'; Odoric Wou, 'Food Shortage and Japanese Grain Extraction in Henan', in *China at War: Regions of China, 1937–1945*, ed. Stephen R. MacKinnon, Diana Lary, and Ezra F. Vogel (Stanford, CA: Stanford University Press, 2007).
4. Largely because of flooding and famine, during the Sino-Japanese War Henan had a larger refugee population than any other province in China. From 1937 to 1945, an estimated 14,533,200 people in Henan, an astounding 43 per cent of the province's total pre-war population, lived as refugees for at least a time. Stephen R. MacKinnon, 'Refugee Flight at the Outset of the Anti-Japanese War', in *The Impact of War on Modern China*, ed. Diana Lary and Stephen MacKinnon (Vancouver, BC: University of British Columbia Press, 2001), 122.
5. My conceptual framework draws considerable inspiration from the insights provided by Mark Fiege, 'Gettysburg and the Organic Nature of the American Civil War', in *Natural Enemy, Natural Ally: Toward An Environmental History of War*, ed. Richard P. Tucker and Edmund Russell (Corvallis, OR: Oregon State University Press, 2004), 93–109; and Simo Laakkonen, 'War, an Ecological Alternative to Peace? Indirect Impacts of World War II on the Finnish Environment', in *Natural Enemy, Natural Ally*, ed. Tucker and Russell, 175–94.
6. Helga Weisz, 'Combining Social Metabolism and Input–Output Analyses to Account for Ecologically Unequal Trade', in *Rethinking Environmental History: World-System History and Global Environmental Change*, ed. Alf Hornborg, John Robert McNeill, and Juan Martínez-Alier (Lanham, MD: AltaMira Press, 2007), 291–2. This approach has also benefited greatly from Joan Martinez-Alier, *Ecological Economics: Energy, Environment and Society* (New York: Blackwell, 1987); and 'Marxism, Social Metabolism, and International Trade', in *Rethinking Environmental History*, ed. Hornborg, McNeill, and Martinez-Alier, 221–38; Marina Fischer-Kowalski and Helmut Haberl, *Socioecological Transitions and Global Change: Trajectories of Social Metabolism and Land Use* (Northampton: Edward Elgar Publishing, 2007).
7. Edmund Burke III, 'The Big Story: Human History, Energy Regimes, and the Environment', in *The Environment and World History*, ed. Edmund Burke III

and Kenneth Pomeranz (Berkeley, CA: University of California Press, 2009), 35. See also Richard White, *Organic Machine: The Remaking of the Columbia River* (New York: Hill and Wang, 1995), 4–5.

8. David Pimentel and Marcia H. Pimentel, *Food, Energy, and Society*, 3rd ed. (Boca Raton, FL: CRC Press, 2007), 9; Gerald G. Marten, *Human Ecology: Basic Concepts for Sustainable Development* (London and Sterling, VA: Earthscan Publications, 2001), 109; Vaclav Smil, *Energy in Nature and Society: General Energetics of Complex Systems* (Cambridge, MA: MIT Press, 2008), 4–5.
9. Smil, *Energy in Nature and Society*, 6–7; Marten, *Human Ecology*, 109–10; Pimentel and Pimentel, *Food, Energy, and Society*, 9–11; David Christian, *Maps of Time: An Introduction to Big History* (Berkeley, CA: University of California Press, 2005), Appendix II; Burke, 'The Big Story', 34.
10. Richard White, *Organic Machine*, 4–5.
11. White, *Organic Machine*, 14.
12. J. R. McNeill, 'China's Environmental History in World Perspective', in Mark Elvin and Liu Ts'ui-jung, eds., *Sediments of Time: Environment and Society in Chinese History* (Cambridge: Cambridge University Press, 1998), 46. See also Ralph Sawyer, *Fire and Water: The Art of Incendiary and Aquatic Warfare in China* (Boulder, CO: Westview, 2004).
13. Mark Elvin, *The Retreat of the Elephants: An Environmental History of China* (New Haven, CT: Yale University Press, 2004), 164.
14. Robert Marks, *China: its Environment and History* (Lanham, MD: Rowman & Littlefield, 2012), 336; Elvin, *Retreat of the Elephants*; Mark Elvin, 'Three Thousand Years of Unsustainable Growth: China's Environment from Archaic Times to the Present', *East Asian History* 6 (1993): 7–46.
15. Emmanuel Kreike, 'Architects of Nature: Environmental Infrastructure and the Nature-Culture Dichotomy' (PhD diss., Wageningen University, 2006), 18–19. These ideas are refined and elaborated in Emmanuel Kreike, *Environmental Infrastructure in African History: Examining the Myth of Natural Resource Management in Namibia* (Cambridge: Cambridge University Press, 2013).
16. Marks, *China*, 243.
17. A relatively abundant literature exists on the environmental crisis that prevailed in North China from the 1800s through the 1930s. See especially Kenneth Pomeranz, *The Making of a Hinterland: State, Society, and Economy in Inland North China, 1853–1937* (Berkeley, CA: University of California Press, 1993); Randall A. Dodgen, *Controlling the Dragon: Confucian Engineers and the Yellow River in Late Imperial China* (Honolulu, HI: University of Hawai'i Press, 2001); Elvin, *The Retreat of the Elephants*; Lillian M. Li, *Fighting Famine in North China: State, Market, and Environmental Decline, 1690s–1990s* (Stanford, CA: Stanford University Press, 2007); Kenneth Pomeranz, 'The Transformation of China's Environment, 1500–2000', in *The Environment and World History*, ed. Burke and Kenneth; Marks, *China*, 235–43.
18. Li, *Fighting Famine in North China*, 307. For a survey of flood and drought disasters in Henan during the Republican period, see Su Xinliu 蘇新留, *Flood and Drought Disasters and Rural Society in Henan During the Republican Period* [民國時期河南水旱災害與鄉村社會] (Zhengzhou: Huanghe shuili chubanshe, 2004). Scattered oral histories and memoir literature are usefully collected in Wen Fang 文芳, ed., *Natural and Man-Made Disasters* [天災人禍(天禍)] (Beijing: Zhongguo wenshi chubanshe, 2004).

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Part IV
Reactions to Development

8

Environmental Non-Government Organizations in China since the 1970s

Sheng Fei

It is notable that during the past decades, Chinese Environmental Non-Government Organizations (ENGOs) have grown explosively, and continue to do so. According to openly available statistics, there were 2,768 registered ENGOs in 2005, with the number rising to 3,529 in 2008 and 7,881 by 2012.[1] The changing figures clearly show how fast China's environmental movement is expanding, while they also suggest increasing public anxiety about a deteriorating environment. While environmental issues are given great attention by the Chinese public and government, the nexus between ENGOs and government is still imbalanced. Although there is success in pushing many popular movements, Chinese ENGOs are shaped and sometimes constrained by Chinese political institutions and traditional culture. On the one hand, the public regards government as the critical factor in environmental protection, while ENGOs are also themselves catalysts for change. On the other hand, most Chinese ENGOs are neither independent of state power nor tightly connected to genuine grass-roots movements. Consequently, while ENGOs are usually not hesitant to expose environmental problems or to criticize the negligent government, they also abstain from radical confrontation with government and are cautious about joining in street demonstrations. Chinese ENGOs seem more acceptable to government and in turn they receive more freedom and flexibility than many other civil societies in China.

'Civil Society' and NGOs in the Chinese context

The term 'civil society' is sometimes misunderstood by the Chinese public because of its translation. Normally 'civil society' is translated as *shimin shehui* or *gongmin shehui*. Although it contains a meaning of

a realm separate from government and private business, *shehui* scarcely points to organization. A more popular and accurate counterpart of 'civil society' in Chinese should be 'non-government organization' (NGO). Moreover, the conception of 'civil society' is sometimes sensitive in the Chinese official discourse because of its deep origins in Western history and culture. As Edward Shils argues, the core characteristic of civil society is *civility*—a civil collective self-consciousness which makes civil politics possible and presumes in Western societies that citizens will collaborate with each other.[2] Therefore civil society in the Western context presumes autonomy for non-government forces. Even though the self-organization of citizens may be fallible, it could protect them from an incorrigible state or government.

However, China's 'top-down' or pyramidal political culture and rigid bureaucratic systems are always critical to understanding Chinese society. For example, Thomas Metzger argued that Chinese civil society is heterogeneous and so-called civility, evident in the West, is essentially absent in Chinese history. Put another way, China never enjoyed the strong tradition of spontaneous self-governance by common people apparent in many Western countries. Chinese society used to be efficiently governed by emperors who, mentally and morally served by intelligent elites or Mandarins, were 'Sons of Heaven' and people were naturally their subjects. 'Public good' could be always achieved and sustained by a 'corrigible state'.[3] An influential Chinese political historian, Xiao Gongqin, also declared that Chinese traditional culture never contained an idea that society owns integrated rights free from state power.[4] According to these views, in China, government at different levels is most responsible for social governance. In environmental history, one of the most evident cases is management of the Yellow River by central government in imperial China. The river flooded periodically and sometimes killed millions of residents in its flood plain, while central government always sponsored dike construction and maintenance and could call up labour from all around the country.[5]

The arguments of the authors above have been challenged in recent years, because many scholars find that state power did not completely overwhelm the autonomy of society. In effect, they argue that local Chinese communities, at least since the sixteenth century and especially in rural areas, have been carefully led by landed gentry (*shishen*), a group not directly absorbed and constrained by collective government bureaucracy and which formed a kind of proto-'third realm' of civil society.[6] In this framework, local elites directed many environmental issues, including construction of irrigation systems and distribution of

natural resources. Ironically this situation was not finally altered until 1949 with New China's establishment, which soon turned into a totalitarian state.[7] During this period, China had many social movements, but almost no civil activities. For example, in the Great Leap Forward (GLF, 1958–62), people were driven by an extreme official ideology to recklessly transform the physical environment in the name of creating a new nature and nation. Civil society and individualism, believed to be capitalist endeavours that obstructed the state from concentrating resources to initiate grand projects, were repressed for almost 30 years.[8] As currently every village or community has its Party branch, the limited 'third realm' of tradition has hardly recovered and so is not the crucial force to stimulate ENGOs.

The development of civil society in China resumed again in the early 1980s, with the Reform and Opening-up Policies. As civil society expands, some optimists suggest that it may evolve into a civil society similar to the West.[9] However, other scholars highlight distinctive traits rooted in tradition that may hamper its further development. Australian scholar He Baogang argues that China's civil society is currently entangled with state power, so its autonomy is hardly realized, and is a 'semi-civil society' identical with Philip Huang's definition of the 'third realm'.[10]

Furthermore, Gordon White classifies the emerging Chinese civil society into four categories: the first is 'the caged sector'. Sponsored and manipulated by the state, it attracts many people to organizations like the Communist Youth League, which absorbed millions of students; the second is 'the incorporated sector,' usually professional organizations formally registered by government even if many are independent NGOs. They are more acceptable to authority because they are not politically sensitive. The third sector, existing in an 'interstitial' or 'limbo' world of civil society, is barely recognized by official institutions. These organizations are very active in some professional circles and most importantly have roots in some local communities, including among patriarchal clans and religious organizations. They are sometimes suspected, but rarely suppressed, by government. The fourth sector is 'the underground civil society' or 'the suppressed sector', which is usually accused of threatening political security or being involved in criminal offences. What are easily identified as illegal are secret societies, radical political organizations, and religious cults.[11] Most Chinese ENGOs can be attributed to the former three categories and ENGOs are more inclined to exhibit characteristics of the first and second sectors identified above.

In sum, China witnessed a long history of strong state and weak society during which time civil society was not completely stifled. Although Chinese civil society has enjoyed a kind of spring since 1980, the Chinese people are still accustomed to allowing a centralized government to take responsibility for resolving all social problems, including most environmental issues. In turn, the Chinese government always expects a cooperative or even obedient society. This perception has deeply influenced the trajectory of Chinese ENGOs.

Environmental governance and the emergence of ENGOs in China

Given the powerful Chinese state, the emergence of ENGOs is not simply a spontaneous reaction by Chinese society toward a worsening environment, but is also, most crucially, a reaction to central government environmental policies. One important reason is that the new Chinese government was hesitant to recognize that the socialist country had environmental problems—environmental problems were instead viewed as an evil of capitalist institutions. Environmental issues were also logically subordinated to other emergent national affairs, namely modernization and rapid industrialization, from the GLF onwards. Moreover, dissent had been actively cracked down on by the Chinese state since the late 1950s. However, following a number of environmental events with catastrophic consequences, the massive modernization movement undertaken in China has revealed major environmental challenges.

In March 1971, for example, public health officials reported on the poisoning of many of Beijing's citizens through eating fish. Premier Zhou Enlai (1898–1976) immediately ordered the relevant departments to investigate. Soon it was reported that the problematic fish came from Guanting Reservoir, one of Beijing's main sources of drinking water, which had been heavily contaminated by DDT and other toxic chemicals. The follow-up campaign to clean up the reservoir and some other seriously polluted water bodies from Liaoning Province to Guangdong Province was testament to the government's attempts to manage the environment.[12] With the uneasy truth of environmental problems being revealed by this and other instances of pollution, the State Council called the first national meeting for environmental protection in 1973. Environmental problems were officially accepted by the central government as part of its agenda. In an unprecedented move in the new 'Constitution of 1978', China declared that government

should supervise both natural resource protection and pollution abatement. One year later, the 'Environmental Protection Law of the People's Republic of China' was promulgated by the National People's Congress and in the following decades, almost 20 acts or amendments were issued. All of these measures finally established a dominant role for government in environmental governance in China.

With the Reform and Opening-up policies of the 1980s, the Chinese government gradually began to welcome ENGOs because they were able to supplement the limited function of government in dealing with environmental affairs. Resolving environmental problems could demonstrate that the new government was more capable than any previous one or social organization in Chinese history.[13] As early as 1988, the State Environmental Protection Administration (SEPA), which is now the Ministry of Environmental Protection, separated from the Ministry of Urban-Rural Development to become an independent department. Soon, it developed into approximately 3,000 environmental protection bureaus at the provincial, municipal, and county levels. However, environmental governance was still inefficient, for two reasons. One was the country's overwhelming focus on economic development and the growth of gross domestic product. Therefore, environmental protection was not a political priority and environmental bureaucrats were about the least influential within the administration and among policymakers. The other reason was that China's bureaucratic system was increasingly reluctant to face emergent environmental problems. With environmental problems emerging in almost every province, the complicated process of reporting, reviewing, and identifying them was time- and money-wasting. Some of these agencies even became protective 'umbrellas' for polluters and environmental criminals. Realizing the shortcomings of the official institutions, some famous public figures started to advocate the creation of ENGOs and to disseminate ideas of environmental protection from bottom to top.

Essentially, three direct social factors promoted the emergence of ENGOs in China. The first derived from the decentralizing reforms, which encouraged a more open atmosphere for public debate on environmental problems. In 1979, sponsored by SEPA, but open to all professional environmental scientists, the Chinese Society of Environmental Science was founded in Beijing. Although typical of the 'caged sector' of Chinese civil society, it created a framework wherein the public could openly discuss and express different ideas to authorities on environmental issues. In April 1994, the State Council declared that government officials were no longer permitted to take a leadership

role in NGOs and that all NGOs should be registered with the Ministry of Civil Affairs as independent corporations. In 1995, only 30.4 per cent of NGOs' funding came from government. A 1998 central government document again required all governmental cadres to avoid leadership of NGOs and announced the cessation of government funding for any NGO established after 1985.[14] These decisions stimulated a more independent breed of ENGOs.

A second driving force was international communication and exchange. In the 1980s, the Chinese government invited many environmental officials and experts from abroad, including those from international ENGOs. The first two organizations were the International Crane Foundation (ICF) and the World Wildlife Fund (now World Wide Fund for Nature, WWF). Their early work in China brought new ideas for establishing natural conservation and promoting civil society. The first Chinese ENGO, initiated by Liu Detian, a journalist on *Panjin Daily*, was directly under the influence of two experts sent by ICF and WWF respectively. In April 1991, Liu registered the 'Saunders Gull (*Larus Saundersi*) Conservation Society of Panjin City' to protect this precious species and its habitat in Panjin region. 'It is the first time in my life to hear of the words "imminent danger" and "ecological net"', Liu said. Moreover, 'the Canadian expert of ICF remind[s] me [of] Norman Bethune [, 1890–1939, the well-known Canadian and Eighth Route Army physician who devoted himself to bringing medical advances to China;] the transnational work is amazing'.[15] WWF in later years contributed greatly to environmental protection in China and remains one of China's most significant international ENGOs.

The third spark was the growing consciousness of specific individuals of the need for environmental protection because of the visible loss of natural habitat, forests, and rare species, and the degradation of arable land. For example, as early as 1981, 17-year-old Xu Xiujuan formally dedicated her life to the protection and cultivation of the Red-crown Crane (*Grus japonensis*) in Zhalong Crane Nature Reserve, training for a year at the Northeast Forest University. However, Xu tragically drowned in the marsh in 1987 when searching for two lost cranes. She was quickly regarded as a heroine of environmental protection and her death inspired many other naturalists and environmentalists to follow her passion. In a more emotional sense, nature writers such as Xu Gang and Wu Dengming (1940–2013) also actively aroused people's common interest in protecting the 'wild' and other forms of environment through their writings. Wu also wrote survey reports, petitioned the government, and organized young colleagues to spread the idea of

environmental protection to local residents.[16] All these factors paved the way for the blossoming of ENGOs in the 1990s and early 2000s.

The case of 'The Friends of Nature' (FON) is undoubtedly representative of ENGOs in China in the early period of their formation. FON was formally launched in 1994 by several famous Chinese intellectuals such as Liang Congjie (1932–2010), Yang Dongping, Liang Xiaoyan, and Wang Lixiong, who were all professionals in the humanities or sciences. Of particular note is Liang's eminent family background—his grandfather, Liang Qichao (1873–1929) was an outstanding thinker and social reformer, and his parents were the famous architects who were in charge of designing the national flag. Liang Congjie was worried about Chinese environmental problems from the early 1980s. When he worked as an editor for the magazine *Encyclopedic Knowledge* [*Baike Zhishi*] an article on industrial pollution in the numerous township enterprises caught his attention. Following that, Liang selected more articles on environmental issues for his magazine. While Liang Xiaoyan, a young colleague of Liang Congjie, initiated another magazine, *The Intellectual*, she more frankly committed herself to looking for new ways to foster civil society in China and push for social reform. They were more or less involved in the movement clamouring for social reform in the late 1980s, so they were courageous and sophisticated enough to seek government support. In the mid-1990s, all NGOs were officially registered and supervised by specific government departments. When SEPA refused to oversee FON, Liang used his occupation and political leverage, as a member of the National Political Consultative Conference of China, to successfully affiliate FON to the China Cultural College (a semi-independent research institute of the time) and thereby gain it a legal identity.

The development of FON's work was never too radical because of its close association with the state. Since its foundation, the new organization's activities were simply limited to convening the Second Green Talkfest and organizing environmental photography exhibits.[17] In November 1994, Liang was invited by some foundations and international NGOs to the United States, where he received the first overseas grant towards FON's future projects. In 1995 and 1996 during the National Political Consultative Conference, Liang, with his colleagues, proposed relocating Capital Steel, one of China's biggest heavy industrial enterprises and a main source of Beijing's air pollution, to a suburban area. When Liang made the proposal, it was considered a challenge to government because Capital Steel was a state-owned company and one of the main taxpayers in Beijing. However, his proposal was finally realized in 2005 when officials ordered Capital Steel's relocation. Liang

Congjie also wrote letters to Tony Blair, the former Prime Minister of the United Kingdom, asking for the abandonment of the *chiru* (Tibetan antelope, *Pantholops hodgsonii*) fur trade in Britain, then its largest market. Blair quickly replied and soon urged constraints on the trade around the world.[18] All of these cases reflected how personal interest and international communication greatly shaped the early work of the ENGOs.

Local-level ENGOs were also developing. For example, Wu Dengming, an already famous nature writer, lived in Chongqing, the second-largest city along the Yangtze River, and turned to a more practical way to arouse public attention to the fate of this major river of China. He established the Chongqing Green Volunteer Association (CGV) and regularly organized volunteers to survey the river environment and to broadcast their suggestions to local communities. At the end of 1999, CGV organized volunteers to hike along the Yangtze River for 1,170 kilometres in 45 days. They passed through four provinces and more than 120 towns to spread the idea of environmental protection. CGV also held eight series of training courses for more than 600 local school teachers.[19] Yunnan and Guizhou provinces were also early hotspots of local Chinese ENGOs.[20] One reason is that these two provinces were both famous for their biodiversity and ethnic people who lived around the last piece of original tropical rainforest on the border between China and Southeast Asia. Another reason is that they are far from Beijing, the political centre, and so have not been developed by ambitious entrepreneurs from this region or coastal eastern China.

Chinese ENGOs' activities

China's earliest ENGOs were most successful in the least politically sensitive area of public environmental education. With help from international and other influential NGOs, such as the China Youth Development Foundation, FON launched several popular environmental education projects. In May 2000, the 'Antelope Van' project was started. It sought to protect western China's fragile ecology. Inspired by the German educational idea of mobile teaching, a cartoon image of an antelope covered the van, which was equipped with various teaching tools and materials for outdoor environmental education. The van took children to the nature reserves, enabling them to encounter viscerally and understand the natural areas to be protected through games and personal experiences. In less than a year, by April 2001, the van had visited 125 schools and brought environmental education to over 10,000 pupils. By the end of 2002, nearly a hundred media agencies,

including CCTV and the National Geographic Channel, had reported on the educational drive.

The Institute of Environment and Development (IED), founded in 1994 by sociologist Li Lailai, also focussed on environmental research and aimed at providing reliable and practical environmental information for other social groups and the younger generation. IED sponsored two projects committed to playing a special role in strengthening the capacity of Chinese ENGOs. The first was a young ENGO practitioner training programme, called Leadership for Environment and Development (LEAD). Even now, many core ENGO members have had experience in LEAD. Another project sustains a computer server and provides free space for all ENGO supporters on the Internet.

ENGOs also used various other methods to enhance their appeal. For example, in March 1996, Liao Xiaoyi and Li Hao, two long-time friends, established an ENGO, 'Global Village of Beijing' (GVB).[21] Liao was a philosopher at the Chinese Academy of Social Sciences while Li, unlike most pioneers of ENGOs in the 1990s, was a scientist, an epidemiologist with a PhD from a German university. Her Western scientific background and personal experience equipped Li with a better understanding of China's environmental crisis. Together, the pair primarily focussed on making television documentaries and promoting public environmental awareness, such as by campaigns encouraging energy and water savings, as well as the need to recycle. It is valuable that GVB enthusiastically promotes environmental education and training for the 'left-behind' children whose parents work in cities far away from their home towns.

Compared to environmental education, the political influence of Chinese ENGOs developed much more slowly. One unexpected reason was the changing nature of Chinese society in the 1990s. Whilst political reform was virtually suspended after 1989, the government prioritized economic development, and it soon occupied the central position in public debates. It meant that Chinese society, which became politically muted in the wake of the later 1980s suppression, focussed more on improving personal lives than any other issue. Another reason for political weakness was rooted in the ENGOs themselves. Most pioneers of national ENGOs were intellectuals or social elites who maintained close connections with various branches of government and so were reluctant to involve themselves in sensitive issues. These people never lacked compassion, but as elites, they found it hard to connect with grass-roots sentiments. In contrast, they were skilful in utilizing private connections to high-ranking officials to achieve environmental aims.

For example, Liang Congjie was a good friend of Mou Guangfeng, a senior official of SEPA, who fostered Liang's career and finally drafted a proposal to one of the State Councillors, who pushed for an official environmental doctrine adopted by the State Council in 1997. Requiring that all levels of government should actively support and conduct the activities of ENGOs, the doctrine is considered the first officially supportive comment on the Chinese ENGOs in general.[22] Since their very beginning, then, circumstances have made ENGOs politically conservative.

In the early 2000s, the impact of ENGOs on government decision-making remained limited, even while media pressure and professional suggestion had enlarged their influence. In 2000, the Lake Yangliu hydropower station project, in Sichuan province, incurred intense media attacks. In two months, over 180 news reports criticized the project because of its potential ecological impacts. The project was finally aborted by Zhang Xuezhong, the General Secretary of Sichuan Province. It was the first time a big official project had been suspended as a result of public pressure for environmental protection. One year later another huge debate erupted after the announcement of a project to construct a series of hydropower stations along the Nujiang River (Salween River), an international river that crosses several nations as well as China. Actors, such as state-owned power companies, local governments, central departments, scientific workers, media, and ENGOs, were involved in this debate, which was widely reported and attracted international attention, a sensitive factor that central government had to take into account when reaching its decision. The dispute did not cease until Premier Wen Jiabao suspended the project at the end of 2003.

In the new millennium, the transformation of Chinese attitudes towards life offered a great opportunity for the expansion of ENGOs and they soon became the leading force in improving environmental governance. It was widely recognized that polluted air, water, and food threatened everyone, including top political leaders and millionaires. With the rocketing of the Chinese economy, the demand for a better living environment, and with it health quality, became a hot public topic. However, the Chinese environment, especially in industrial cities and huge urban areas, was dramatically deteriorating. With the intensifying contradictions between economic development and environmental protection, a growing number of local ENGOs, with the help of local residents, endeavoured to attain specific environmental objectives. In five years, the total number of ENGOs steadily grew and almost doubled from their number prior to 2003.[23]

As Yang Guobin has argued, the emergence of the Chinese ENGO was a result of a combination of various forces wherein the Internet played a significant role, most notably from 2003.[24] What particularly changed the Chinese people's support for unfettered economic development was an unexpected epidemic, the Severe Acute Respiratory Syndrome (SARS). To stop the fast spread of this disease, people avoided public places while university students, the earliest users of the Internet, were not even allowed to leave campus between April and July 2003. Therefore, more than ever, they relied on the Internet to access the latest news. As a contagion, the likes of which had not been faced for decades, SARS killed many medical workers and caused enormous anxieties about the ecological system. When it was proven that the disease derived from the civet cat (*Paguma larvata*), sometimes eaten in Guangdong Province, ENGOs quickly seized on the opportunity to raise a wide public debate on rethinking the relationship between human beings and animals. In May, the *Southern Weekend*, a newspaper based in Guangdong, but popular throughout the whole country, carried a lengthy report that criticized the new doctrine of suspending the trade in wild animals and their products in China by the State Forestry Administration (SFA). It was considered too conservative, and most ENGOs argued for 'forbidding' rather than 'suspending' consumption of wild animals. The report interviewed Liang Congjie, the well-known head of FON, arguing that the final solution should be a revision of the 'Law of the PRC on the Protection of Wildlife'. Several days later, *People's Daily*, the largest newspaper of the Communist Party, also reported that 38 ENGOs had jointly signed an agreement for protecting eco-diversity and against SARS.[25] Since then, environmental protection and wildlife conservation has received unprecedented attention in public fora and on the Internet. In this way, the ENGOs were exposed to a large public, including parts of society with less access to education.

Some ENGOs even became active and stable participants in helping to formulate official policies. In the 2003 Nu Jiang River controversy, the ENGOs had failed to push for a public hearing. However, they succeeded in another environmental controversy at the Yuanmingyuan Royal Park in 2005. The Park, located in a suburb of Beijing, and since 1949 a symbol of European imperialist aggression against China, is an example of both cultural and ecological heritage. After a tourist, a professor from Lanzhou University, complained about a project using impermeable plastic film to line the beds of the lakes in the park, public criticism and defence of the park authority became a hot topic throughout the whole country. ENGOs successfully allied with reformists within SEPA

and pushed for a public hearing. Seven ENGOs sent their representatives to the hearing. The representatives specifically expressed opinions and cited evidence on the absurdity of the project. Finally, the hearing questioned the quality of the first Environmental Impact Assessment (EIA) report on the project. At that time, most EIA reports in China were merely stamps of approval for projects. The result of this hearing changed the role of the EIA in China. Although this should encourage optimism about the influence of Chinese ENGOs on politics, they are now facing increasing challenges.

Challenges to Chinese ENGOs

According to a report by the All-China Environment Federation (ACEF), which was founded as the largest national ENGO by SEPA in 2005, Chinese ENGOs were at the time divided into four categories. The first included those sponsored by government; the second those initiated by individuals; the third those organized by students; and the fourth those which were branches of international ENGOs in mainland China.[26] This classification is similar to Jonathan Schwartz's, which identifies three major forms of Chinese ENGOs: (1) 'government-organized non-governmental organization (GONGO)', (2) ENGOs founded by grass-roots movements, and (3) those organized in universities.[27] It is also reminiscent of Gordon White's classifications of Chinese NGOs.[28] Except for some GONGOs, which are logically more conservative, most Chinese ENGOs were at the time of the ACEF report facing huge challenges.

The first challenge facing most ENGOs is the limited funding they receive. According to the latest openly accessible material, 66.7 per cent of international ENGOs collected funds of more than 500,000 Yuan (about US$80,000), compared with 9.9 per cent for GONGOs, and 4.9 per cent among grass-roots ENGOs.[29] Although international ENGOs were financially better-off and more stable, they were not normally allowed to collect money from Chinese citizens. According to 2008 official reports, only 26 per cent of ENGOs had stable financial resources while in some completely independent ENGOs (42.1 per cent of them were GONGOs and 36.8 per cent were University ENGOs), as much as 59.6 per cent of the funds had been donated by their own members.[30] With respect to funding models, however, one notable event was the establishment in June 2004 of the Alxa Society of Entrepreneurs and Ecological Association (SEE). SEE was created by more than 100 Chinese entrepreneurs who emphasized ecological health in the Alxa area of

Inner Mongolia, and which received support from other ENGOs. Given its wealthy sponsors, this is an ENGO that rarely worries about financial problems and is more flexible in its aims than almost any other ENGO in China. Every year the SEE foundation awards an environmental prize of one million CNY (1 CNY = approximately 8.11 USD). However, SEE only encourages the most prominent environmentalists and remains the only ENGO of its type in China.

The second challenge is the low level of specialization among ENGO staff. Research in 2008 revealed that 28.9 per cent of ENGOs had no specialized staff; 46.5 per cent of the ENGOs only sustained staff of fewer than five people. Some 80 per cent of branches of international ENGOs in China had fewer than 20 staff and 59.7 per cent of grass-roots ENGOs had a staff of fewer than ten people.[31] Deficiencies in scientific knowledge and a lack of professional guidance have dramatically impaired ENGOs. For example, in November 2005, when the outbreak of the Songhuajiang River pollution event triggered a new wave of public concern with water pollution in China, ENGOs appeared to be silent in the face of this human-caused environmental disaster. ENGOs were sharply criticized by the public when a seminar held one month later exposed the main reason for their silence. Wang Yongchen, the leader of the Green Earth Volunteers, admitted that the Chinese ENGOs did not have the capacity to get involved in events which required expertise in economics, ecology, chemistry, or geology. Therefore since 2005, experts other than those specializing in humanities and the social sciences have initiated their own organizations. For example, Aurora (Public Information Technology Center) was created by experts in database and GIS (geographic information science) technology. They have helped create several environmental databases based on the demand from specific ENGOs. The Petroleum and Environment Network (established in March 2005) is another very specialized ENGO, initiated by people familiar with the petroleum industry. Their projects include information distribution, justice in the oil economy, and safety of oil and gas shipment. While the situation is improving, further cooperation is still needed because the most competent experts and scientists have always been absorbed by government organizations.

The third challenge is a lack of co-ordination among ENGOs. Firstly, the distribution of ENGOs is very imbalanced across different geographical areas. As ACEF's report of 2005 showed, Chinese ENGOs were then mainly concentrated in three regions: the economically developed coastal region; areas along the Yangtze River; and frontier areas like Yunnan, Tibet, and Xinjiang. According to ACEF's second

report, published in 2008, only Guangdong had become a new centre for ENGOs in the three years since their earlier report. It is far away from the political centre and enjoys a stronger tradition of civil society. Considering the variety of Chinese landscapes, ecosystems, and climates, some local ENGOs prefer to pursue exclusive interests. Secondly, many young leaders of ENGOs are narrowly focussed on their own careers or the interests of their small circles. Their sectarianism leads to either unfair competition or apathy about each other's work.[32] Thirdly, extreme ENGOs or 'deep green groups' attract a lot of criticism from the public and other ENGOs. A lot of disputes circle around whether Chinese people should be able to use certain plants and animals for medicine and food which are rarely used in other countries. Since 2012, animal protection organizations have blocked an attempted Initial Public Offerings (IPO) by Gui Zhen Tang, a medical company which regularly extracts bile from bears. This greatly promoted public consciousness of animal ethics. However, when extreme activists stopped trucks legally carrying dogs on an express road, they were widely criticized for their dangerous behaviour. When ENGOs took extreme action to interrupt the dog-meat festival in the city of Yulin, the local public poured scorn on them, because of the traditional acceptance of eating dog meat in this region.

The fourth challenge is the isolation of ENGOs from genuine grassroots movements. Currently there are two conspicuous environmental movements happening in parallel in China: resistance to government projects to build chemical plants and garbage incinerators. These issues belong to a wider civil rights movement because the potential victims increasingly question arbitrary official decisions to support large polluting industries. For example, in 2007, in response to an anti-PX (p-Xylene) project demonstration in Xiamen (Amoy), in an unusual move, Fujian province called in more than 100,000 citizens who were concerned with potential environmental hazards and appealed to remove the project from the city. The movement registered widely across the Internet, and similar events happened in a set of cities, including Dalian, Qingdao, Ningbo, and Maomin, all famous for their amazing coastal environments. Accompanied by sometimes violent confrontations between protestors and local administrations, most of these projects were finally aborted or transferred to other sites. Following these movements there have been a few appeals for establishing a more transparent and institutionalized public system permitting the investigation of the environmental impacts of projects. As Zhou Zhijia observed, '[c]itizen participation in the PX movement has merely

revealed a rudimentary civility, and the functional absence of NGOs is an important element leading to this situation'.[33] The project related to garbage incinerators inspired more frequent episodes of open resistance, although the scale was sometimes smaller. The earliest influential case happened in Panyu, a district of Guangzhou, in 2009. Concerned with toxic chemical pollution, local residents spontaneously organized an appeal for the removal of the incinerator and finally sued the relevant administrator. One of the most recent cases happened in Yuhang, a district of Hangzhou, a popular tourist destination, in early 2014, and evolved into a large-scale riot. In none of these cases were the existing ENGOs either major organizers or participants. Although members of ENGOs contribute scientific data with which to judge EIA reports, all these events were essentially genuine grass-roots movements.

As has been noted, ENGOs are cautious about standing in opposition to the government, and are instead content to push for 'good governance' within the existing political system. The reason is simple: environmental events are no different from other civil protests, whether individual or collective, which openly challenge the authority of the state and can easily be accused of disrupting 'social stability'. The poisonous milk powder event of 2008 was unforgettable for many ENGOs, because it dramatically aroused public concern about food security and fury against negligent administration. While the offending milk factory was shut down and relevant officials were dismissed, some lawyers who insisted on further punishment were also attacked.[34] Therefore, although genuine grass-roots environmental movements are increasing, the influence of ENGOs on them is still unpredictable.

Conclusion: understanding the uniqueness of Chinese ENGOs

The expansion of ENGOs over the past two decades has been one of the most conspicuous phenomena in the history of Chinese civil society. The birth and early development of ENGOs in China was a result of a combination of many factors: the progressive political reform of government, the defects of environmental governance, worry about environmental problems, increasing international interactions, and the efforts of influential elites. In recent years, changes in popular environmentalism, the specialization of ENGOs, the development of the Internet and a further deteriorating environment has further boosted the expansion of ENGOs. However, traditional Chinese culture and political institutions are still the leading factors that shape Chinese

ENGOs. The so-called GONGOs, ENGOs sponsored by government, are still the most powerful type of ENGO, although an increasing number of independent ENGOs are rapidly developing.

Given the Chinese political system, the official attitude towards environmental problems always creates opportunities for ENGOs. Although the 2005 Yuanmingyuan hearing was widely considered an achievement for ENGOs, it took place against the background of SEPA demonstrating an unparalleled strict attitude towards EIA reports. SEPA terminated 30 building projects for power stations, which represented more than 117.9 billion CNY of investment made earlier that year.[35] In 2008, SEPA was upgraded to the Ministry of Environmental Protection and became increasingly powerful. In June 2014 it imposed a fine of almost US$70 million on 19 power companies and heavy industrial enterprises. Many of these are state-owned companies that ENGOs have failed to challenge.[36] Another case further shows how powerful the state still is in constraining civil society. The registration of NGOs remains complicated. Although many provinces, such as Guangdong, do not require a supervisor for newly formed NGOs, informal methods of obstruction, including deliberately prolonging the application process, are still creating difficulties. Moreover, the Chinese government is usually sensitive to ENGOs with an international background, so the registration of overseas ENGOs in China is still not a terribly open process. In addition, since the 1999 US bombing of the Chinese embassy in Yugoslavia, conservative Chinese nationalists have doubted the Western media's criticisms of Chinese domestic affairs, including environmental problems: to them, such criticisms merely prove the impression of Western prejudice against the Chinese government, and their envy of the Chinese economic boom.

One should also not forget the impact of traditional political culture. As early as 1992, Deng Zhenglai, a famous Chinese sociologist and law researcher, suggested that Chinese civil society should not expose its zeal for politics too early, and nor should it be the inheritor of a tradition of radical conflict between grass roots and government that has usually ended in bloody riots. It should be very cautious in finding a way to establish civil society from the bottom up.[37] Furthermore, Jiang Qing even asserted that China could never expect to build a civil society based on the Western model because Chinese culture tends toward accepting 'a society with reasonable hierarchy and proper freedom for the individual'.[38] According to this line of argument, any development of civil society has to take into account the ideology of Confucius. Therefore, a critical issue for ENGOs might not be how to balance state

power and civil society, but rather how to boost an effective bureaucratic system in China.

Compared with many radical human rights ENGOs that fail even to be noticed by the public, ENGOs are very successful, since they choose a progressive way to pursue their aims. With the popular online name 'Basuo Fengyun', Luo Jianming—famous for his leading role in online resistance to the Panyu garbage incinerator in 2009—became an active promoter of garbage classification and a sponsor for a set of ENGOs. When he was awarded the SEE • TNC (The Nature Conservancy) annual prize in 2011, he said: 'I did not care about politics and my neighbours until 2009 when I suddenly found government was not as arrogant as the stereotype in my mind. One should adopt a more proactive approach to government and look for a benign compromise with it'.[39]

All of these cases explain the unique experience of the Chinese ENGO. It is reasonable to say that Chinese ENGOs avoid involvement in street politics conducted by grass-roots movements, and that the meritocratic ENGOs prefer to use their private connections to senior officials to bring change. Since environmental problems will be serious for a long time in China, there is hope that civil society will have a louder voice in the environmental movement, with more young students joining in. Their organizations can register under a university in a simple and convenient way. Among these ENGOs, Green Anhui, Green Longjiang, Green Camel Bell, and the Green Environmental Advisory Center of Chongqing are four successful examples. Their advantage lies in stable student groups, sufficient back-up personnel, and good connections with university scholars. This is evident in the case of Fang Minghe, born in 1984, who founded Green Eyes as a high school student in 2000, and soon became the youngest leader of an ENGO in all China. These young people and their ENGOs, having passion and talent, may speed up the development of ENGOs and even Chinese politics as well. However, the attitude of government towards civil society will still decisively influence the destiny of ENGOs in China.

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9

Taiwan's Land Use after World War II: An Ecological Modernization Approach

Hsin-Hsun Huang, Hsin-Huang Michael Hsiao, and Shih-Jung Hsu

Post-war Taiwan's environment paid dearly for its so-called economic 'miracle'. Various environmental problems resulted from Taiwan's specific political economy, namely, that of a 'developmental state', favouring economic growth and development. Such a political-economic structure has affected, if not determined, environmental policy in Taiwan. This research adopts the theory of ecological modernization (EM) to investigate and understand the historical course of shifts in land use and industrial policy in relation to the imperatives of Taiwan's developmental state.

This chapter divides Taiwan's post-war history into three phases, according to the shifts of strategic industries: development without environment (before 1975), development versus environment (around 1975–95), and development with environment (since 1995). We conclude that, while Taiwan's development modes have increasingly taken environmental considerations into account, its changes are mostly confined to technological and institutional developments, without any attempt to transform political-economic structure or social attitudes. As a result, since World War II, Taiwan has not made much progress in environmental reform.

Environmental history and Ecological Modernization

According to J. Donald Hughes, environmental history 'seeks understanding of human beings as they have lived, worked and thought in relationship to the rest of nature through the changes brought by time'.[1] J. R. McNeill emphasizes that 'the modern ecological history of the planet and the socio-economic history of humanity make full sense only if seen together'.[2] In brief, the theme of environmental history is

to investigate the relations between human activities and the natural environment. Especially since World War II, there has been recognition that human activities have brought about environmental changes to varying extents, while such changes in turn have had various impacts on human societies and histories. Humankind needs to alter its society in order to adapt to the changes caused by environments; otherwise, we risk decline or even extinction.[3]

Conceptually, both 'land' and 'environment' include at least three dimensions: the factors of production or commodity, location or physical space, and subjective self-identity.[4] More specifically, land functions as a resource facilitating economic activities, as a habitat where society exists, and as a locality with which people emotionally identify. Different kinds of land use embody distinct socio-environmental relations. Analysing changing land use provides a promising approach to observing the relations between human activities and the natural environment. To this extent, Liu Hwa-Jen argues that Taiwan's environmental history can be viewed as a 'history of struggles between people and people, people and resource management mechanisms, and people and property institutions'.[5] Here, 'resource' and 'property' mostly represent 'land'.

Since the Industrial Revolution, environmental impacts and resource demands have intensified from those in the past. In terms of the spiralling increase of world population, economic activity, and energy consumption, the twentieth century was an exponentially expansive age in which human beings put grave pressures on the Earth.[6] Because such impacts and pressures have significantly affected the well-being of the present generation and impact on the very survivability of later generations, numerous calls have been made to tackle the environmental crisis facing human civilization.[7] From the 1970s, in response to such a sense of crisis, advanced industrial countries established agencies for environmental protection and planning, and passed environmental legislation. Similarly, from the 1980s, Taiwan introduced a basic environmental protection system consisting of governmental organization, legislation, and policy.

In the face of social changes deriving from society–environment interactions, EM emphasizes interpreting, understanding, and assessing improvements in environmental reform in the process of modernization.[8] Such environmental reform is substantial and growing around the world, including not merely advanced industrial countries, but also industrializing and emerging economies, such as China, South Africa, Taiwan, Thailand, and Vietnam, among many other places.[9] Industrial

transformation is the most-studied field of environmental reform within ecological modernization.[10] As a newly industrialized country, Taiwan makes great efforts to pursue modernization and industrialization while suffering from a variety of environmental problems. The theoretical focus of EM helps to explain changes in Taiwan's land-use and industrial policies after World War II. Placing land-use and industrial policies in an historical context can enrich our understanding of complex socio-historical dynamics, and facilitate the identification of the environmental implications of different developmental phases. Followed by the introduction of ecological modernization in section two, section three analyses the historical course of development in Taiwan.

A sketch of Ecological Modernization

EM has various meanings. It can refer to a stage of socio-economic development, a political programme, a social theory, and a discourse.[11] It emerged in Western advanced industrial countries in the late 1970s and early 1980s, and argues that present institutions, such as state, scientists, and market operations, have the potential to address environmental challenges.[12] EM differs from other models in the environmental social sciences in which environmental degradation has intrinsically been viewed as a product of the twentieth-century capitalist-industrial civilization.[13]

As a historical stage of socio-economic development, according to Joseph Murphy, EM is an inevitable phase in the development of industrial society, which followed the industrial breakthrough (between 1789 and 1848) and the construction of industrial society (from 1848 to 1980).[14] With the increasing frequency and severity of environmental problems, and an enhanced expert understanding of complex ecological issues, increased reactions to environmental degradation in the form of social mobilization and institutional capacity have driven the issue to the forefront of public life and policy intervention. Subsequently, industrialization has gradually come to take into account the need to maintain the sustenance base.

In this sense, environmental problems in EM are perceived as the 'design fault of modernity in its interaction with the sustenance base'.[15] Here, the fault is conceived as a 'challenge for socio-technical and economic reform' rather than the 'inevitable consequence of the current institutional structure'.[16] The development of EM, thus, moves along the line of modernization, and represents a structurally oriented social

theory of environmental reform. With ecological restructuring, the modernization project is adaptable and capable of becoming ecologically sustainable; environmental improvement and economic development are reconcilable and compatible.[17] Three main concepts underpin this project: 'ecologizing' the economy, political modernization, and ecological rationality.

The main ideas of Ecological Modernization

'Ecologizing the economy' refers to 'giving environmental issues and interests a permanent and central position in the decision-making processes of private firms and consumers'.[18] This means not only 'getting the prices right' in economic practices and processes, but also meshing 'environmental ideas, rationalities and interests' with the logics of modern markets.[19] The former is typical of environmental economics in the name of taking into account external costs. The notions of 'industrial ecology' and 'natural capitalism' are representatives of the latter. In short, 'ecologizing the economy' seeks to rationalize environmental interventions to ensure the long-term availability of resources.[20] One of its main criteria is 'eco-efficiency'.[21]

Based on institutional learning, EM assumes that there can be a 'progressive rationalization of environmental policy' in the course of modernization.[22] The concept of 'political modernization' is used in the EM literature to frame 'policy innovations' in response to 'state failure' in resolving environmental crises;[23] in practice, it means instituting new modes of environmental governance resulting in different styles of policy formulation, decision-making, and policy implementation. A wider range of actors, including authorities, social movement organizations, non-government organizations, and private firms, contribute to these processes, while there are also a variety of innovative policy instruments (including eco-labels and voluntary agreements). In this model, environmental governance changes from a reactive, separate, centralized and command-and-control style to preventive, integrated, participatory, and flexible ones.[24]

Third and most fundamentally, EM scholars identify the 'historical' emergence and development of an increasingly 'autonomous', 'emancipating', or 'independent' ecological rationality vis-à-vis other rationalities, such as those governed solely by economic and political ideas.[25] Environmental concerns and interests are incorporated more and more into 'aspects of social relations and institutions' and into 'human values, cultures, and everyday practices'.[26] A key argument of EM is that ecological rationality will 'percolate through all aspects of society as

modernity matures'.[27] The establishment of governmental environmental protection departments, environmental laws, clean production, and green lifestyles are all good examples of the environment-induced transformations of institutions and social practices. This is because states increasingly recognize that environmental protection is part of their responsibilities rather than a goal that is in tension with other imperatives.[28] Likewise, there is an increasing understanding in industrial circles that it is in industry's interests to limit and control environmental impacts so as to safeguard future business prospects.[29]

Policy tendencies in Ecological Modernization

With a faith in the feasibility of institutional transformations to bring about environmental improvement, the pivotal point of EM for rectifying environmental problems rests upon enacting a series of adjustments to social organizations, that is, an 'organizational internalization of ecological responsibility'.[30] Instead of confining itself to conventional fields of environmental policy, environmental improvement could be better achieved by government via a 'realignment of broader policy goals relating to areas' such as economy, energy, transport, land use, and trade so that environmental problems were addressed at source.[31] Since changes in institutional form are taken as a key indicator for measuring EM,[32] three themes can be identified: economic restructuring, technological innovation, and policy reorientation.[33]

EM identifies industrialism as the main cause of environmental degradation.[34] Industrial and technological policies aiming at adding value to goods or services while using fewer resources and releasing less pollution are the first index for measuring EM. This is characterized by a shift away from the remedial strategy exemplified by end-of-pipe technology towards a preventative and continuous reduction strategy based on clean and efficient technological processes. Among alternatives, information and communication technology (ICT), for instance, has been widely deemed a critical technology for its potential to realize ecological benefits.[35]

The second point relates to the restructuring of national economies within macro-economic shifts away from energy- and resource-intensive industries to service- and knowledge-intensive ones.[36] The 'new economy' based on ICT and the 'knowledge economy' is typical of this switch, and is often depicted as 'deindustrialization' or 'dematerialization'.

The third indicator is the establishment of a 'more environmentally benign development path'.[37] For this indicator, the state promotes the

'greening of industry' by, for example, encouraging industry to adopt clean production processes and to increase resource efficiencies. This method also strengthens traditionally defined environmental protection tasks by introducing more holistic measures, such as environmental impact assessments, total quantity control, and tradable pollution permits: that is, governmental policies converge towards becoming green policy in a broad sense. Policies for technological innovation, industrial development, and environmental improvement are no longer considered separately.

Overall, EM involves a radical restructuring of production, consumption, state practices, and political discourses. With such reorientations, EM has become a new and central narrative within the public sphere, in which environmental and economic concerns are a positive-sum game, as is evident in the popularity of the concept of 'sustainable development', which has been viewed as a 'paradigmatic statement' of EM.[38]

The course of Ecological Modernization in Taiwan: land use and industrial policy

The Kuomintang (KMT) regime in Taiwan has long been characterized as a 'developmental state' whose priority is economic growth and development-related administration.[39] Land policy in this politico-economic context is thus subordinate to economic development needs. For example, in Taiwan, land policy is defined as a policy that intends to resolve land problems that obstruct the realization of 'maximizing the benefits from land while sharing those benefits', as embodied in the Constitution, the Land Act, and other related laws and regulations. Although there are regulations for managing developmental activities in response to great events or disasters, land policy has generally changed with the needs of economic development.[40] Industrialization and the resulting changes in Taiwan's economic structure, for example, decreased the area of cultivated land by around 100,000 hectares between 1971 and 2012 (see Table 9.1).

Table 9.1 Changes in areas of cultivated fields in Taiwan

Fields' year	**1971**	**1981**	**1991**	**1993**	**2001**	**2011**	**2012**
Area	902,617	900,062	884,443	874,535	848,743	808,294	802,876

Source: COA, *2012 Basic Agricultural Statistics* (Taipei: Council of Agriculture, Executive Yuan, 2013), 10.

Such change has mostly been caused by the 'Farmland Releasing Policy', a supplementary policy designated for the 'Economic Revitalization Program' in 1993, and the 'Plan for Developing Taiwan into an Asia–Pacific Regional Operations Center' in 1995. Overall, three attributes of Taiwan's land policy since World War II can be identified: the view that land policy was an auxiliary to economic development; a passive attitude toward environmental problems; and institutional designs favouring development.

Taiwan experienced a high rate of economic growth in the 1960s and 1970s which contributed to the achievement of its so-called 'economic miracle', but which also caused serious environmental degradation. Intensification of environmental problems provoked severe social grievances in the form of environmental protests, which since the 1980s have diminished the KMT's historical dominance over Taiwan's society. In response, Taiwan's government has undertaken to establish an environmental protection system, including legal institutions and authorities. Aside from the similarity in the historical process of social evolution, the changes in land use and industrial policy as well as the shift of environmental viewpoints in Taiwan after World War II, are akin to what EM describes in regard to the transition of policy discourse.

In terms of 'development-environment relations' from the perspective of changes in strategical or leading industries, as noted, this chapter divides Taiwan's land use into three phases: 'development without environment' (before 1975), 'development versus environment' (from around 1975 to 1995), and 'development with environment' (since 1995). The division of history into periods is made in a relative and analytical manner rather than by absolute standards that categorically separate a span of time into different stages without any overlap of periods.

Development without environment (before 1975)

In the 1950s, the priority of both Taiwan's industrial development and agricultural practice was to recover productivity after World War II. The major postwar measure was the reform of farm-land ownership, such as the '37.5 per cent rent reduction' and the 'land distribution to tenants'. The policy of 'agriculture incubates industry, industry facilitates agriculture' aimed to increase production, advance economic stability, and ameliorate the imbalance of international payments. Following the restoration and import-substitution policy of the early postwar years, Taiwan's industrial policy moved towards export-oriented industrialization, through which its agriculture-based economy was structurally

transformed into an industrial one. Since 1963, industry has surpassed agriculture in output value.

A critical period for promoting industrialization and accelerating economic growth took place during Taiwan's third to fifth Four-year Economic Plans (FEP), from 1961 to 1972.[41] To meet the need for economic development, the Statute for Encouragement of Investment (1960) and the Statute for the Establishment and Administration of Export Processing Zone (1965) were enacted to develop a series of industrial parks. These included those for improving industrial infrastructures, like Liudu and Linhai Industrial Parks, and those for developing rural areas, such as Yuanchang and Touciao Industrial Parks.[42] Scholars regard the Statute for Encouragement of Investment as the first industrial land policy.[43] Among several measures, it stipulated the classification of land for industrial use, established industrial parks and the means for manufacturers to acquire land, and permitted compulsory land acquisition by government for the establishment of industrial plants. Before 1960, there was no policy for developing industrial parks and local governments did not designate industrial districts under the Urban Planning Act (1939; first revised in 1964). From 1953, the first year of the first FEP, factories were built in an unplanned fashion, causing pollution and traffic problems.[44]

There was a certain portion of production undertaken in non-industrial parks or districts, although the government made great efforts to pursue industrialization in this phase. As Table 9.2 shows, in the 1960s, five industrial parks were developed, with 295 hectares allocated for constructing factories. By 1970, secondary industries employed 1,278,000

Table 9.2 Industrial parks developed in Taiwan in the 1960s

Industrial Park	Development period	Total area	Construction area
Liudu	1960/10~1963/6	59	40
Linhai (first phase)	1963/6~1965/6	149	107*
Dingkan	1964/6~1965/12	13	10
Gueishan	1966/1~1967/6	127	102
Neili	1967/1~1969/12	43	36
Total	N/A	391	295

Note: * There is no record for this figure. It comes from the total construction area multiplied by the ratio of the first phase area to the total area.
Source: Lin Li-ying, 'Industrial Development and Social Changes in Taoyuan: 1966–1996' (Master's diss., National Central University, Taiwan, 2007), 225, 230–1; Huang Hsun-Hui, 'An Economic Analysis of the Industrial Park Policy in Taiwan' (Master's thesis: Graduate Institute of International Economics, Chiayi: National Chung Cheng University, 2002), 59.

persons, of which 958,000 (75 per cent) were in manufacturing.[45] Without sufficient space for industrial development in planned and built industrial parks, home-workers located production activities in non-industrial zones. This activity constituted the bottom layer of Taiwan's export-led industries.[46] Based on this social reality, the then Governor of Taiwan Province, Hsieh Tung-Min (1908–2001), proposed in 1972 the policy of 'living room as factory', which exacerbated the problem of factories being scattered throughout non-industrial zones.

Moreover, the developmental strategy of 'agriculture incubates industry' drew agricultural workers into industrial employment.[47] In response, the government proclaimed in 1972 the 'Important measures to rural development', article nine of which supported the building of factories in rural areas. This measure was intended to create job opportunities in rural areas, raise farmers' income, and stop the drain of labour from rural villages to cities. However, it succeeded only in making 'part-time' farmers become the majority of the agricultural labour force and in introducing factories to farm land, which brought pollution problems.[48]

Government introduced land and land-use policies favourable to economic and industrial development without taking into account environmental impacts. For example, government released land for industrial zones through planning mechanisms, while companies, in many cases, also sought lands by themselves. Without clear stipulations for the location of industrial land, it was common to see factories built on farm land. In urban areas, some regulations for land use dated back to the 1964 amendment of the Urban Planning Act. Nonetheless, this amendment was intended to 'resolve problems' in order to boost economic and industrial development rather than to construct a full framework or vision for guiding various land uses.[49] Hence, such regulations were basically reactive or passive. An inattentive management regime such as this encouraged the spread of industrial pollution.

This phase was characterized by the absence of environmental considerations whereby a developmental state blindly pursued modernization and industrialization, in the process neglecting the existing and potentially adverse impacts of these activities, or naively believing that environmental problems were simply 'exceptional' events that temporarily disrupted 'normal' human development. Taiwanese largely accepted the idea of 'development equal to progress', an approach in keeping with the KMT's tight control over society and the suppression of protest in Taiwan in this period. As a result of pro-developmental policies, various environmental problems arose and spread.

Development versus environment (around 1975–95)

The 1970s was an age of 'crises' for the KMT regime.[50] Among several, two in particular impacted on industrial development in Taiwan: the double oil shocks of 1973 and 1979, and rising competition from other developing countries. The feature of industrial development in this stage thus was transformation. Beginning in the previous phase, the transformation of industrial structure from labour-intensive light industry to a heavy-chemical industry was interrupted twice by the 1970s oil shocks, which then led to the favouring of a hi-tech industrial strategy instead of one emphasizing heavy industry. Because hi-tech industry did not become the main industry until the 1990s, the discussion of this phase focusses on the unfolding of the planned development of the heavy-chemical industry. This phase was signalled during the period from the sixth to tenth Economic Plans (a period covering 1973–93).

Taiwan had been losing its competitive advantage of low labour costs since the 1970s and this represented a grave threat to the labour-intensive export-oriented development model.[51] Industrial transformation was a corollary. Government favoured developing the heavy-chemical industry because its downstream processing and related industries had been Taiwan's basis of development in the past, meaning that this would complete an industrial production chain in Taiwan and lead to industrial linkages bringing together different kinds of producers and manufactures. In the petrochemical industry, for example, the government constructed naphtha-cracking plants—'the upstream of the industry'—to supply basic petrochemical materials, such as ethylene and propylene, for further processing and production in the middle and downstream sectors. Scholars thus call this development 'backward integration'.[52] Its practical strategy was to implement the 'Ten Major Construction Projects'.[53] This plan promoted the building of infrastructure (six of the ten projects) that would make up the market demand required by the initial development of the heavy-chemical industry, through which the export-oriented import-substitution industrialization policy could be realized.[54] As Chiang Ching-kuo (1910–88) noted, 'once the *Ten Major Construction Projects* got done, Taiwan would become a heavy-chemical industrial state'.[55] The Linyuan Petrochemical Industrial Park, with a total area of over 400 hectares, was a product of this policy.

In the face of the economic crisis caused by oil shocks in the 1970s and the barrier to capital accumulation resulting from the excessive concentration of industrial production in the northern and southern metropolises—namely Taipei and Kaohsiung—the government decided

to rearrange industry and its support networks spatially by constructing transport infrastructure and industrial parks. Six transport-related plans from the *Ten Major Construction Projects* sought to integrate different regions in Taiwan so as to advance the regional redivision of labour. In addition, the government constructed many industrial parks close to large population centres and transportation network nodes to solve the problem of industrial land shortage which had emerged during the previous phase.[56]

Differing from the absence of land management in the previous phase, this was a phase of institutionalization of industrial land supply exemplified by several pieces of legislation, including the Regional Plan Act (1974), Factory Registration Act (1975), Standards for Designating Industrial Land (1975), and Regulations on Non-urban Land Use Management (1976).[57] The establishment of industrial parks subsequently took place nationwide in the period from 1974 to 1981.[58] Such a phenomenon implies that government attempted to separate incompatible land uses through zoning, thereby minimizing the health impacts and public nuisances caused by industrial development.[59] A concern with pollution control was evident in industrial policy, too. For example, the ninth and tenth FEPs emphasized 'control of environment[al] pollution' and 'environmental protection'.[60] Investment in equipment or technology for pollution control was categorized as a measure of industrial upgrading, according to the Statute for Upgrading Industries (1990). In short, environmental factors had increasingly been brought into the domain of policy planning.

The change in government policy stemmed mainly from the growth of social grievances relating to pollution and health issues. For example, there were 709 environmental protest events between 1971 and 1983, a period before the lifting of martial law. The first wave of environmental action revolved around inter-sectoral struggles over access to and control of natural resources, including protests against the destruction of agricultural production resulting from the contamination of irrigation systems, groundwater, fishing harbours, and the like.[61] The first generation of environmental legislation, including the Drinking Water Management Act (1972), Water Pollution Control Act (1974), Waste Disposal Act (1974), and Air Pollution Control Act (1975), was passed to control the spread of pollution.

With the weakening of the KMT's authoritarian regime and the intensification of environmental degradation, Taiwan's environmental protest movements continued to grow in the 1980s.[62] Public abomination of environmental nuisances should not be taken as a renunciation

of economic growth or the emergence of the 'new environmental paradigm'.[63] However, such social pressure was strong enough to make the government respond in a fuller way to environmental problems. For example, Taiwan's Environmental Protection Administration (EPA) was upgraded in 1987 from the Environmental Protection Bureau under the Department of Health. All of the aforementioned Acts were substantially amended and strengthened. New ones—like the Toxic Chemical Substances Control Act (1986) and Public Nuisance Dispute Mediation Act (1992)—were also enacted, and the Additional Articles of the Constitution of the Republic of China (1992) were supplemented with an environmental protection clause.[64] This series of environmental legislation reflected a conventional conviction in environmental governance; that is, in government control of pollution.[65]

A similar shift could be observed in conservation. Although the National Park Law had been passed in 1972, it was not until 1982 that the first, Kenting National Park, was established. Following this, another four were set up before the mid-1990s. With the enactment of the Cultural Heritage Preservation Act (1982) and the Wildlife Conservation Act (1989), a series of natural reserves and wildlife refuges was established in the same period. These establishments reflected a growing social desire for better environmental quality. More importantly, they embodied the recognition that land and other natural resources were precious, but limited, assets. However, these natural conservation areas were viewed more for their value to tourism and as a source of making money, than as places deserving of protection for scientific or aesthetic reasons, or for safeguarding certain species.[66] This, in part, explains the lack of implementation of related environmental policies. For example, government became more active in conservation after the international campaign 'Save the Rhino' in 1992 and in response to US trade sanctions banning the importation of wildlife products from Taiwan, under the Pelly Amendment of 1994. In fact, the Wuwei Harbor Wildlife Refuge was approved by Yilan County to respond to the pressure of US trade sanctions.[67] Thus, conservation policy was viewed by government as a way to alleviate a trade crisis. In this regard, these conservation measures could be understood as another sort of control measure used to separate nature destruction from human activities and to ensure profits.

Under increasing social pressure caused by deteriorating environmental quality and a rising environmental consciousness, Taiwan's government gradually perceived that development had to take the environment into account; environmental problems were not some temporary disorders in the process of pursuing development. They would

not automatically disappear, but required government intervention and management. Therefore, the administration attempted to control problems through spatial planning and environmental legislation, making the environment a segment of administration. But conceiving environments as surroundings outside society meant that environmental problems were treated as a series of isolated problems to be corrected, not as systematic deviations in the nature-society relationship. They were resolvable through technological innovations or increasing legal regulation. By doing so, Taiwan could stay on the path to endless growth without having to change environmental behaviour. Nonetheless, the result was that environmental policies of this generation often transferred environmental problems across both time and space instead of redressing them.

Development with environment (since 1995)

The third phase began in the mid-1990s, although its commencement can be tracked back to the 1980s in terms of the developmental context. As noted above, the oil shocks of the 1970s forced government to reconsider the suitability of developing a heavy-chemical base as a strategic industry in Taiwan, a country without any oil reserves.[68] Six criteria governed the choice of Taiwan's new strategic industries.[69] The passing of the *Act for Establishment and Administration of Science Parks* (1979) and the operation of the Hsinchu Science-based Industrial Park (SIP) in 1980 marked the initiation of such a transformation.

Yet, despite this shift towards a perceived low-energy and low-pollution industry, environmental protests peaked in Taiwan in the early 1990s, a legacy of earlier pollution and a lifting of restrictions on civil liberties. For example, between 1980 and 1996, there were 1,211 cases of local environmental protest, most of which pertained to industrial pollution and aimed at regaining a healthy living environment.[70] In addition to the ten-fold increase in environmental protest in the decade after martial law was lifted (from 110 to 1,101 cases), there was also a corresponding increase in preventative campaigns (from 29, between 1980 and 1990; to 214, between 1991 and 1996). This tendency not only reflected widespread discontent with existing pollution controls, but also a desire for changes in industrial policy—the need for alternatives to the then current development mode was growing.[71]

The 1990s saw some institutional changes that started to reflect this shift. For example, the Environmental Impact Assessment Act of 1994 signified the veering of Taiwan's environmental governance from an

end-of-pipe to a preventative approach. The definition of industrial upgrading in a series of amendments to the Statute for Upgrading Industries also kept broadening, from investments in 'equipment or technology for automation and pollution control' (1990) to further include those for 'reclamation of resources, energy conservation, recycling of water for industrial use' (1995), and 'new/clean energy, greenhouse gas emissions reduction, energy efficiency enhancement' (1999). The Plan for National Land Comprehensive Development (1996) was targeted at protecting the ecological environment, improving the living environment, and developing the production environment. Sustainable development was also set as a general goal in the Plan for National Development into the Next Century 1997–2000 (1997). In other words, in recent decades the environment has become an essential and a more prominent element in Taiwan's diverse policy-making, whereby a development mode informed by environmental considerations seems to have taken shape. From the perspective of social awareness, such a transition could be observed in the process of developing the Tainan SIP, the second science-based industrial park in Taiwan.

From the very beginning of policy planning in the late 1970s, hi-tech industry has long been viewed as a strategic industry with 'low environmental impacts', one capable of leading Taiwan into the next wave of economic prosperity.[72] Nonetheless, most Taiwanese had no idea about hi-tech industry until the early 1990s, when the revenues of the Hsinchu SIP started to exceed NT$100 billion. The success of the Hsinchu SIP enhanced government confidence in adopting a hi-tech development policy, while people also welcomed it as an industry without obvious pollution. The Plan for Developing Taiwan into an Asia–Pacific Regional Operations Center (1995) stated that one of its goals was to accelerate the development of hi-tech industry through which Taiwan will become a 'Sci-tech Island'.[73] The desire for such 'clean' industry was clearly displayed in the fierce competition for hosting the Tainan SIP among eleven townships between 1993 and 1995.[74] It was also the same period in which the anti-Binnan movement, a campaign against the Binnan Industrial Area Construction Project, was unfolding.[75] Among other concerns, potential threats to the Tainan SIP in the forms of air pollution and water shortages were held up as key arguments against the Binnan Project.[76] This is to say that Taiwanese, including environmental non-government organizations (ENGOs), deemed hi-tech industry compatible with sustainable development, and thus distinct from the heavy-chemical industry, which was marked by high energy intensity, water consumption, and pollution. A 'pro-hi-tech

while against polluting' trend or milieu has emerged. The 'Green Silicon Island' (GSI), a national development blueprint, was proposed by former President Chen Shui-Bian in 2000 in such a context.[77]

With its image of having high added value with low environmental impacts, Taiwan's hi-tech industry represents a better developmental path capable of reconciling economic development with environmental protection. As Chen Shui-Bian, the Democratic Progressive Party presidential candidate, speaking at a public lecture organized by the London School of Economics in December 1999, noted, it is time for Taiwan 'to move on from its interim stage in development, to achieve harmony with the environment in the pursuit of technological advances'.[78] In his mind, the perception and products of environmental protection could be a 'new source of competitiveness'.[79] The realization of a balance of environmental protection and economic development relies on building a knowledge-based economy.[80] After Chen took office in 2000, the national vision of Taiwan as a GSI materialized as a series of administrative plans, such as the Plan for National Development in the New Century 2001–2004 and Challenge 2008: National Development Plan 2002–2007. The GSI became a comprehensive policy framework, combining a knowledge-based economy and a just society with a sustainable environment, rather than simply a developmental strategy for the hi-tech sector, although this was an important component of the policy.[81]

In practice, the building of SIP—a combination of spatial arrangement and policy clusters—was adopted as a critical policy tool for promoting the development of hi-tech industry. From 2000 to 2007, government set up a new SIP every year. Undoubtedly, it had to allocate numerous resources—such as land, water, and funding—to support this policy. To justify this, technocrats often appealed to the indicator of eco-efficiency. For example, they pointed out that one ton of water in the agricultural, steel, petrochemical, and semiconductor industries could produce an output value of NT$10, 400, 700, and 2,000, respectively. They also highlighted that about 0.1 per cent of Taiwan's land can generate 14.54 per cent of its GDP.[82] This apprehension not only meant that the hi-tech sector should be given first priority for resource allocation, they argued, but also implied that the more resources that were transferred to the hi-tech sector, the more eco-efficient would be Taiwan's economy gains.

Land (use) policy, therefore, supported the establishment of various high-tech industrial parks, including SIPs, research parks, knowledge-based industrial parks, software parks, and hi-tech industrial districts, mainly through the conversion of farm land and the release of public

lands. Such development can be traced back to the 'Plan for National Land Comprehensive Development' that upheld the benefits of spatial planning of 'Sci-tech Island' to sustainable development.[83] The plan materialized the idea of 'wise use' through 'planning rationality'. In this context, developing SIPs was part of this 'wise use'. By classifying territory into 'restricted areas' and 'development areas', and introducing a 'land development reviewing system', the plan intended to protect the environment, prevent pollution and potential environmental disasters, and enhance well-being. Additional environmental considerations, in this way, have been brought into land (use) policy.

Such an orientation towards 'development with environment' could also be found in conservation policy. Natural conservation areas, the very basis of tourism, have been deemed an alternative development mode by both government and society. In 2002, the central government proposed the *Plan for the Doubling of Tourist Arrivals*, part of *Challenge 2008*. Rural residents and ENGOs utilized conservation as a weapon against undesirable projects and as a means to develop the local economy. Since the mid-1990s, three national parks and three natural reserves have been established, along with the designation of 13 wildlife refuges and eleven national scenic areas.[84] For example, both the anti-Binnan movement in Chiku and the Aogu wetland conservation movement in Dongshih resulted from opposition to industrial construction projects.[85] Nowadays, both are part of the Southwest Coast National Scenic Area. The Taijiang National Park, which contains historical, ecological, and industrial elements, is the first to be advocated by the local government.[86] The anti-reservoir movement in Meinong has evolved into a new conservation project, the Meinong National Natural Park, which integrates the protected area with rural development, although the plan has not yet been completed.[87] From an ecological modernist perspective, the GSI could be better understood as a pro-environment policy framework which advanced economic structural change, technological progress, and traditionally defined environmental protection policies.

Hi-tech industry has grown to become a major contributor to GDP, which signifies a change in economic structure. In this regard, environmental sustainability (green) and hi-tech (silicon) are not just compatible, the latter actually opens the avenue to the former. In addition to broadening the scope of environmental protection, the prevention approach has been reinforced. For instance, the Marine Pollution Control Act and Soil and Groundwater Pollution Remediation Act were both passed in 2000. The Regulations Governing Governmental

Policies on Environmental Impact Assessment were promulgated in 2000 and then amended to broaden its scope in 2006. The Basic Environment Act was enacted in 2002. The Declaration of Taiwan Sustainable Development was signed in 2003. The Environmental Protection Consensus Conferences have been held since 2004. In the Basic Environment Act, environmental interests in industrial development are mentioned in a general clause (Article 6), and the principles of 'sustainable development' (Article 1) and 'environment first' (Article 3) are highlighted.

Taiwan's environmental policy is being integrated into a broader green policy framework in which environmental protection may be given equal consideration in the future with economic and technological development. The GSI could be viewed as a landmark in the process of eco-modernization and an embodiment of the 'development-with-environment' mode in Taiwan.

Discussion: eco-modernization and sustainability?

Based on our analysis of land use and industrial transformation in post-war Taiwan, we can discern that development modes change as environmental perceptions shift. More specifically, land use basically retains its subordinate status to economic development, and industrial policy is still growth-oriented. In terms of discourse, policy, and institutions, meanwhile, Taiwan's development path has switched to one favouring the reduction of environmental impacts, a direction in line with sustainable development as EM depicts. Yet, can such an eco-modernist track lead Taiwan to a sustainable future? To answer this question, the last section of this chapter adopts a two-level analytical strategy: first, to examine the main categories of environmental administration so as to map the changes in Taiwan's environmental situation, since EM denotes a general tendency of environment-driven social change; second, to survey the environmental consequences of hi-tech industry, which has been viewed as a paradigmatic industry in EM and as a practical way toward sustainable development in Taiwan.

According to Table 9.3, it is difficult to draw a single tendency that tells us whether or not Taiwan's overall environmental situation is better off as a result of environmental reform since the milestone establishment of Taiwan's EPA in 1987. Water quality basically remains unchanged in terms of the length of rivers that are polluted, while the percentages of different pollution levels (light, moderate, and heavy) vary from 1992. The improvement in air quality is obvious even though

Table 9.3 Selected environmental indicators of Taiwan (1987–2012)

Year	Length of polluted rivers (%)	Volume of garbage clearance per capita per day (kg)	Days of unhealthy air (%)	Petition on nuisance (case)	Imported energy (1000 KLOE)	GHGs emission (kilotonnes CO2-e)
1987	29.1	0.786	17.34	N/A	N/A	N/A
1988	32.5	0.86	15.1	N/A	N/A	N/A
1989	31.7	0.896	16.16	92,558	N/A	N/A
1990	33.1	0.963	16.33	58,778	N/A	144,357
1991	32.5	1.001	16.25	67,438	N/A	153,511
1992	38.6	1.087	11.32	68,927	N/A	162,895
1993	38.8	1.101	8.18	72,807	65,897.50	177,168
1994	36.7	1.121	6.83	86,628	69,613.20	185,342
1995	35.8	1.138	5.73	92,859	76,488.30	193,747
1996	37.6	1.135	6.12	90,244	79,967.20	202,620
1997	35.6	1.143	5.23	95,711	84,409.30	214,173
1998	35.7	1.135	4.62	85,768	87,784.40	223,107
1999	33.8	1.082	4.68	92,193	92,515.70	229,703
2000	36.4	0.982	5.18	102,200	99,673.40	247,429
2001	38.3	0.899	3.42	90,032	103,920.90	251,990
2002	37.6	0.829	3.19	110,866	109,082	265,051
2003	40.6	0.752	2.61	112,725	116,889	271,710
2004	36	0.708	4.6	116,204	129,894.80	281,920
2005	35.8	0.667	4.46	129,843	131,102.60	284,300
2006	34.5	0.605	4.16	131,674	133,946	291,322
2007	38.2	0.583	4.01	148,554	141,041.50	291,824
2008	34.8	0.52	2.96	164,520	136,151.70	278,798
2009	32.8	0.501	3.23	189,795	133,407.90	257,149
2010	37.4	0.482	2.17	199,069	139,704.90	273,386
2011	36.3	0.427	1.38	207,463	135,372.50	282,535
2012	37.3	0.397	0.95	227,931	137,695.40	N/A

Sources: Taiwan EPA, *Yearbook of environmental protection statistics, Republic of China 2013* (Taipei: Environmental Protection Administration, 2013), 2–3, 2–39, 2–55, 2–84, 2–156; Taiwan EPA, *Yearbook of environmental protection statistics, Republic of China 2002* (Taipei: Environmental Protection Administration, 2002), 2–3, 2–55, 2–126, 2–194. Taiwan BOE, *Energy statistics handbook 2013* (Taipei: Bureau of Energy, MOEA, 2013), 34.

this statistic does not include $PM_{2.5}$ (particulate matter equal to or smaller than 2.5 μm) mass concentration. The decrease in volumes of solid waste removed means relief to environmental loadings, a result of the implementation of compulsory sorting and recycling policies. Both public nuisance petition cases and greenhouse gases (GHG) emission, by contrast, portray a reverse trend. The public complains more and more about its living environment. This phenomenon implies both the Taiwanese people's rising consciousness of environmental rights and their discontent with various nuisances, such as noise and odour.

GHG emissions continue to spiral. The temporary decrease in the trend towards rising emissions in 2008 and 2009 resulted from economic recession caused by the global financial crisis rather than any structural reversal. A similar trend can be observed in Taiwan's energy importation. Taiwan remains extremely dependent on energy importation, which consistently provided around 98 per cent of its energy supply in this period.[88]

With the rapid expansion of hi-tech industry since the 1990s, two types of environmental consequences can be identified: pollution/health problems and resource competition. Take, for example, the Hsinchu SIP, the hi-tech firm with the longest operational history in Taiwan. Its environmental controversies include illegal wastewater discharge (from 1997 to 2002), a public health crisis due to solvent releases (2000), waste solvent disposal incidents (from 2000 to 2009), pollution to oysters (between 2001 and 2006), and arsenic air pollution (2007).[89] Though the government and hi-tech companies reiterate that hi-tech industry is an environmental model in manufacturing, an undeniable fact is that three areas in the Hsinchu SIP have been promulgated as pollution sites in 2009.[90] It should also be noted that all these incidents gave rise to social disturbances as well as social and scientific disputes. None of them, however, has been decisively settled. In other words, hi-tech industry brings about new environmental 'risks', instead of 'dirty' issues associated with traditional (heavy) industries. As for resource competition, it comes as no surprise that more and more land and water need to be transferred to the hi-tech sector since the number of SIPs has reached 13 to date, and their total turnover has increased from NT$300 million in 1983 to over NT$2 trillion in 2012.[91] Such allocations have caused a series of protests. One of the most recent examples is the movement against water diversion from agriculture to accommodate the fourth-phase expansion project at the Central Taiwan Science Park in Sijhou, Changhua County (dating from 2011). Another is the 'Land Justice' movement against the land seizure for the Jhunan SIP at Dapu, Miaoli County (from 2010). These events show that hi-tech industry is not as 'environmentally-friendly' as many Taiwanese thought.

When considered together, Taiwan's environmental reforms show some effective improvements in the long-term monitoring of environmental indicators—such as in the areas of rivers, air, and waste—which are in marked contrast to their conditions in the early 1980s. Energy and related GHG emissions register very limited improvements given the ongoing dominance of fossil fuels in the industrial economy. For example, the industrial sector has always been both the largest GHG

emitter and the largest energy consumer.[92] Taiwan relies heavily on imported energy to meet its energy demands, but this also means it exports its environmental problems to the countries which produce its energy sources. That said, the general environmental condition would be worse than at present, were Taiwan to extract all conventional energy from its environment, *ceteris paribus*. Likewise, the hi-tech development mode in Taiwan is still growth-oriented, namely, the promotion of a 'mass production and mass consumption' model for accumulation. The imperative of growth, therefore, outweighs eco-efficiency. The current mode turns out to be problem-causing, environmentally and socially, rather than environment-improving. That is to say, Taiwan's environmental problems have been ameliorated physically, but its environmental risks have significantly increased. In this regard, Taiwan's environmental situation cannot be viewed as improved, in particular from an 'environmental justice' point of view.

Why does the GSI or Taiwan's version of environmental reform not work as EM predicts? There are three types of interpretations of EM based on institutional learning, technocratic projects, and cultural politics.[93] Moreover, different variants of EM have been distinguished by scholars: techno-corporatist and reflexive EM, or weak and strong EM.[94] The techno-corporatist or weak EM is defined by recourse to managerial solutions to environmental problems, whose solutions are to make capitalism less harmful within the existing system of production and consumption, and where outcomes are economically acceptable environmental improvements. The reflexive or strong EM emphasizes citizenship and democratic participation, through which public policy and political–economic structures are reshaped along ecologically sustainable lines, for a more fundamental social change.[95] In this vein, the GSI embodies the weak EM, which does not involve structural or value changes.

Without critical reflection on the existing politico-economic structure and dominant social values, various environmental problems and risks will continue to emerge from the growth-oriented development mode. In the case of developing the Houli SIP, for example, Taiwan's government permitted hi-tech firms to continue to construct factories even while the court had voided the approval of environmental impact assessment for the Houli SIP in 2010. Government made such a decision because hi-tech firms claimed that they had a very tight schedule to enlarge production capacity under great pressure from global competition. This may be the reason that the effects of environmental governance in Taiwan are not satisfied even if the government has made a

great deal of effort to establish varied institutions and broaden the scope of environmental governance. It is this discontented social climate in which environmental organizations and activists gave a 'tumour cake' to Taiwan EPA to 'celebrate' its twentieth anniversary.[96]

Conclusion

Human–environment interactions are constantly shifting and being reframed over time and in response to social events. In Taiwan's case, in the phase of 'development-without-environment' following World War II, Taiwanese, especially the authorities, held a naïve faith in progress, whereby the environment was perceived as the backdrop to human lives. From the 1970s, Taiwanese started to recognize the dependence of humans on the environment for the maintenance of health, food production, and amenities. The need for an 'additional' modification in the human–environment interaction drove the first wave of institutional reform in order to redress the unwanted effects of development. Basically, emphasis was placed on command and control via planning and regulation, which implies that the environment was *something out there*, external to human society, that people could control through intermediaries such as science and technology. The nature–society relationship was thus management-oriented, through which the environment would be made to 'operate' better, even though it turned out to be ineffective. Thirdly, in light of overseas economic events and increasing environmental concerns from within its population, government has adopted a 'development-with-environment' mode (since 1995). In this phase, the environment has been perceived as a *subsistence system*. Because of its intrinsic complexity, especially in the reciprocal interaction with humanity, environmental consequences are often unable to be confined to a certain domain, or even anticipated. Generally, the conviction of 'human exemptionalism' has been fading; in the meantime, a symbiotic nature–society relationship has been emerging.[97]

With all these changes, we do see a clear tendency to institutionalize environmental concerns, a central observation in EM. Various policies, legislation, and projects commonly state their aim of balancing issues related to environment, economy, and equity. Nonetheless, such a claim, in many cases, has a certain distance from practice or action. For example, nuclear power is still a knotty problem, resulting in serious conflicts and disputes, such as whether Taiwan should continue with or cancel the Fourth Nuclear Power Plant project or whether Taiwan should extend the permits of other nuclear power plants in operation, although

the Basic Environment Act has expressly stated the goal of a 'nuclear-free homeland' (Article 23). In this regard, those statements concerning sustainability should be better understood as recognition of the existence of problems in Taiwan rather than that these problems have been solved. This is the real stage of EM Taiwan has attained, and what 'development-with-environment' really means. That said, Taiwan's environmental reform or EM stage is still far from achieving an 'ecological switchover' in Thomas Kuhn's sense of a 'paradigm shift'. 'Ecological rationality' has not yet become rooted in Taiwan or a benchmark for decision-making; not until, that is, Taiwan steps into the phase of 'development with environment' in which Taiwanese profoundly reflect on the ideology of development and growth. The trade-off between economic growth and environmental benefits will be still a thorny issue in the future.

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10

Material Fetters and Spiritual Transcendence: Zhuang Zi and Environmental Thought

Yim-tze Charles Kwong

In basic earthly terms, the environmental question is a matter of maintaining Nature in a balanced state of health and harmony, of preserving the inherent integrity of the environment and its capacity to support all forms of life and matter emerging in a transformational process. From the early days of civilization, however, human beings have locked themselves in a spiral of deepening materialism, engendering and exacerbating environmental problems through ever-intensifying activities of overproduction and over-consumption. While animals also cause damage to the environment out of existential needs like grazing and loosening soil, few living things have gone beyond Nature's capacity to heal and rebalance itself, and none has damaged Nature in the gratuitous manner of human acts of needless and pointless extravagance. It is obvious that the environmental crisis cannot be addressed on the material level alone, for mankind's material overindulgence is itself rooted in a deeper spiritual disorder.

As the oldest surviving written story in the world, dating back to the third millennium BC, *The Epic of Gilgamesh* already mentions how cedars were felled to build palaces and temples,[1] which led to regional deforestation.[2] Writing nostalgically of a pre-civilization 'Golden Age' when 'Trees had not yet/ Been cut and hollowed', of a time when 'People were unaggressive, and unanxious;/ The years went by in peace' in a food-gathering mode of simple collective existence,[3] the Roman poet Ovid (43 BC–17 AD) outlines how Nature suffered in proportion as civilization extended its conquest of the environment: 'The woodland thickets, and the bark-bound shelters/ No longer served' living needs as 'men built houses' in the 'Age of Silver', 'Then came

the Age of Bronze, and dispositions/ Took on aggressive instincts', till at length

> The Iron Age succeeded, whose base vein
> Let loose all evil: modesty and truth
> And righteousness fled earth, and in their place
> Came trickery and slyness, plotting, swindling,
> Violence and the damned desire of having.
> Men spread their sails to winds unknown to sailors,
> The pines came down their mountain-sides, to revel
> And leap in the deep waters, and the ground,
> Free, once, to everyone, like air and sunshine,
> Was stepped off by surveyors. The rich earth,
> Good giver of all the bounty of the harvest,
> Was asked for more; they dug into her vitals,
> Pried out the wealth a kinder lord had hidden
> In Stygian shadow, all that precious metal,
> The root of evil. They found the guilt of iron,
> And gold, more guilty still. And war came forth
> That uses both to fight with; bloody hands
> Brandished the clashing weapons. Men lived on plunder.[4]

Written two thousand years ago, this passage offers a cogent, prophetic summary of mankind's selfish 'plunder' of Nature in the building of 'civilization'. Ovid even notes how mining more than ravaged the integrity of the crust of Earth, in parallel to the devastation of overbuilding. The passage has a modern and contemporary ring to it, for industrialization continues to produce excessive volumes of carbon dioxide and toxic waste that result in air pollution, the poisoning of land, and even ocean acidification. Only in the past few decades have humans seriously begun to reflect broadly on handling the environmental issue in a more thorough and systematic manner: how to stem, if not reverse, the serious environmental damage which humans have caused?

Ironically, humankind's plunder of Nature is not meant to be a process of wilful destruction; it is merely a self-justifying by-product of misguided values and purposes, rooted in blindness, greed, and aggressiveness that 'let loose all evil'. At the heart of the matter is the fundamental question of reconceiving humankind's position in the known universe and the nature of existence. Is humankind the chosen, privileged species, whether in religious or evolutionary terms, to

be master of the environment? Is material superabundance and excess the purpose and glory of human existence, thus giving legitimacy to a ruthless exploitation of Nature? Two millennia after the Biblical pronouncement that humans 'subdue … and have dominion over … every living thing that moves upon the earth',[5] Pascal (1623–62) spoke of the human mind in heroic terms: 'through space the universe grasps me and swallows me up like a speck; through thought I grasp it'.[6] What is the intrinsic relationship between Nature and humankind, and to what extent is anthropocentrism based on wrong ideas, twisted values, and even *hubris*?

Unity and equality of things in the vision of Zhuang Zi

In trying to reshape a less environmentally exploitative relationship in outlook, modern thinkers have been looking for inspiration in various spatial and temporal directions beyond the Judeo-Christian framework.[7] Clearly no single system of thought or values can suffice by itself to solve the environmental problem, but those who are prepared to think outside the box may find the following excerpt from the Daoist text *Zhuangzi*[8] interesting and relevant:

> Master Dongguo inquired of Zhuang Zi: 'This thing called the Way—where is it?'
> Zhuang Zi said, 'There is no place where it is not'.
> 'Allowable only if you specify', said Master Dongguo.
> 'It is in the ant', Zhuang Zi replied.
> 'How come so low?'
> 'It is in the weeds of ricefields'.
> 'How come even lower?'
> 'It is in the tiles and shards'.
> 'How come lower than ever?'
> 'It is in shit and piss'. (Z 22/43–5)[9]

From insects and vegetation to waste and inorganic ware, everything (including the functional tiles produced by the nature-endowed ability of humans) is a manifestation of the Way. The *Zhuangzi* chooses to focus on 'low' items as a dramatic way of accentuating its point, in order to jolt people out of misguided norms and prejudicial perception towards a unifying vision.

Zhuang Zi (ca. 369–286 BC), of course, is being more than shockingly polemical or playfully facetious here. Much like Lao Zi (ca. 604–531 BC),

who writes of how: 'Dao begets one, one begets two, two begets three, three begets the myriad things' (Chapter 42), Zhuang Zi sees the Way everywhere, in that all things are generated by the natural dynamic of Dao, which is all-inclusive and all-unifying:

> In the Great Beginning there was Nonbeing, there was no Being and no name. From this arose One, the existent One yet without form. Out of this things came into being, receiving what is known as 'virtue' [*de*]; … each has its mode and principle, known as inborn nature. When the nature is cultivated and returns to its virtue, the fully attained virtue is the same as it was at the beginning.[10]

And much like Lao Zi, who envisions 'as Dao begets the myriad things, so de fosters them' in 'self-equitable' fashion without prejudice (Chapters 51, 32), Zhuang Zi sees an allotment of Dao in everything generated by it, an intrinsic nature and innate potency (or 'virtue') 'obtained' from the Way.[11] Despite many differences in material form and function, Zhuang Zi sees 'the myriad things unified and equal' (Z 17/44) within Dao, with no differentiation of ontological value and cosmological status among them within the overarching unity of the Way:

> Everything is a 'that'; everything is a 'this'. … 'This' is also 'that'; 'that' is also 'this'. 'That' has its standards of right and wrong; 'this' also has its standards of right and wrong. … Where 'that' and 'this' no longer find their opposites is called the hinge of the Way … There is nothing that is not what it is, nothing that cannot be affirmed. So whether one points to a stalk of grass or a house pillar, a leper or [beautiful] Xi Shi, things expansive and mysterious or things grotesque and strange, Dao connects them all into one.[12]

In addition to being intrinsically relative, divisive, and contrary to the transformative reality of Dao, human-value distinctions harden biases and amplify desires, causing even more mistaken goals and destructive conduct. In Zhuang Zi's view, all value-loaded differentiation produces arbitrary and injurious distortions of a harmonious universe, fuelling greed-driven aggression on a personal level and anthropocentric violence as a species. Humankind, in Zhuang Zi's vision, is not ontologically or cosmologically privileged: knowing the world as an equal and unified whole is the only correct understanding, and more conducive to an appreciative outlook and respect for all things within the compass of the Way, including the natural environment.

It is self-evident that the unifying, non-differentiating vision of Zhuang Zi also covers the fundamental issue of humankind's position in the universe in relation to the Way. While one does not read Zhuang Zi as an environmental thinker—his all-encompassing outlook reaches far beyond the parameters of what is now called environmental philosophy—the *Zhuangzi*'s vision offers a metaphysical yet naturalistic framework that casts environmental issues in a broader and higher light. His liberating insights remain timelessly illuminating: ontologically, existentially, and cosmologically, *Homo sapiens* are not masters of the universe, with rights to colonize and abuse the environment in imperialistic (or even terroristic) fashion. If all things are generated by the Way, all things are equal in ontological status in spite of differences in cosmological precedence and material attributes: 'Heaven and Earth were born together with me, and the myriad things are one with me'.[13]

One may be tempted to ask: does Zhuang Zi literally conceive of man as equal to ants and weeds within the unity of Dao? After all, humans do seem to have a unique mental ability, including a reflective self-consciousness, to help them transcend in part the limits of their physical ability. On one level, it may be that Zhuang Zi is just reminding humans not to inflate their own importance too much, that even 'Mount Tai is small' in the infinite compass of Dao (Z 2/52). But more fundamentally, he is drawing attention to the underlying unity and transformational equality of living things, as another well-known episode illustrates:

> Once Zhuang Zhou dreamt he was a butterfly, a butterfly flitting and fluttering around, feeling happy with himself and doing as he pleased. He did not know he was Zhuang Zhou. Suddenly he woke up and there he was, concretely and unmistakably Zhuang Zhou. He did not know if he was Zhuang Zhou who had dreamt he was a butterfly, or a butterfly dreaming he was Zhuang Zhou. Yet between Zhuang Zhou and a butterfly there must be some distinction. This is called the Transformation of things.[14]

Clearly, Zhuang Zi has more than *hubris* in mind when he speaks of the limitation of the self-consciousness, the continuum between the dream world and material 'reality', as well as the 'interchangeability' of man and butterfly. While there is indeed a material distinction between the two, at some point the decomposing human corpse turns into nutrients to feed other creatures and organisms, which in turn are linked to the butterfly via various routes along a cyclical food chain.

What is more, man and butterfly are linked not in a hierarchical 'Chain of Being' (*scala naturae*),[15] but in a flux of transforming stages of Being, as Dao ever gives rise to life in its dynamic. If all things are connected as one in an endless macro- and micro-transformational flux of Being,[16] can one still speak of a distinct or unique identity? The 'inter-dreaming' between man and butterfly is symbolic of a unifying and equalizing vision of existence, along with an existential attitude of natural humility and respect, including for the environment.

Environment and material civilization: the turn against Nature

The above outline shows that Zhuang Zi looked at the issue of 'Heaven/Nature and man' in a wide-ranging manner, from the naturalistic and human, to relational points of view. In turn, his multiple perspectives suggest that the environmental crisis we face today can be gauged from interpenetrating angles: (a) the unnecessarily ruinous *hubris* of a self-inflated constituent species in the much larger reality of Nature; (b) the environmental crisis being part of a deeper crisis in the direction and purpose of human civilization; and (c) beyond that, the fundamental question of humankind's ontological, cosmological, and existential 'relationality'.

One point almost too easy to make is that humanity is one-sidedly dependent on Heaven and Earth for life, which is immaterial to the pre-human (or post-human) reality of the universe.[17] That is why the *Laozi* writes: 'Man is modelled after Earth; Earth is modelled after Heaven; Heaven is modelled after Dao; Dao is based on naturalness' (Chapter 25). 'Naturalness' (*ziran*, literally 'self-so') is the key principle here, for as the cosmic pulse impelling the spontaneous rhythms of Heaven, Earth, and the myriad things, *ziran* is Dao as universal operational dynamic, logically covering the nature of humans as well as the physical environment (or 'Earth').[18] This means that in a cosmic spirit and the natural scheme of things, all human values and distinctions, desires and purposes, are misguided and injurious. Instead, it follows from Zhuang Zi's vision that everyone should 'accord with the natural way of things and give no place to the self—then the world will be managed'. (Z 7/11) This point is well illustrated in the *Zhuangzi* through animal (or extra-human) imagery that shows humankind's exploitation of Nature:

> What is natural [from Heaven] is intrinsic, what is man-made is extrinsic; virtue lies in Heaven. … That oxen and horses have four feet is natural; that a halter is put on a horse's head or a string

> through an ox's nose is man-made. So it is said: do not let the man-made destroy the natural.[19]

'Not to let the man-made destroy the natural' is to comprehend Nature's norms and follow its rhythms rather than to disrupt and control it; it means understanding humankind's position in the universe and refraining from acting as the master of all things. It is to stop over-exploiting Nature according to targets of human utility, and to abide in a gentle or even minimalist approach to the use of Nature's resources. Once the human being is awakened to his original unity with *ziran* and rests in the cosmic reality and principle, he can try to re-establish peace and harmony with Earth, from which the same among humankind can be re-established in a more lasting way. To 'do nothing [artificial] and ever proceed naturally' (Z 16/7) is to abide in *ziran*, where action fosters and completes rather than possesses and dominates.

Within the scale of Nature, whether conceived in religious, ontological, or scientific terms, humans have always assumed the right to exert their unique intelligence for the betterment of their lives. From the viewpoint of modern humanity, Zhuang Zi's vision smacks of an anti-civilization stance—that of primitivism. At the other end, from the Daoist perspective, material civilization has always been a history of the human betrayal of the Way, and the environmental crisis is just one among many pieces of evidence attesting to this process. An anecdote in the *Zhuangzi* relates how an old gardener refuses to use machinery to help him water his vegetables, and not a few modern thinkers may find the following statement clairvoyantly relevant:

> He who has machines is bound to have machine affairs; he who has machine affairs is bound to have a machine heart. And with a machine heart lodged in one's breast, what was pure and stainless will no longer be … Achievement, profit, machines, cleverness—they are certain to be forgotten … in the person of complete virtue.[20]

One easy criticism of Zhuang Zi is that he often speaks in terms of polar positions, but this usual objection does not negate the basic point that from weapons of mass destruction to personal electronic goods blunting the senses and sensibility, modern civilization has long been taken captive by machines of sundry kinds, without being fully aware of its own enslavement.

Jumping from ancient to modern times, it is remarkable that Gandhi (1869–1948) makes almost exactly the same remark while reflecting

on the pitfalls of materialistic (industrial and military) civilization, apparently without any prior knowledge of Zhuang Zi: 'It was not that we did not know how to invent machinery, but our forefathers knew that, if we set our hearts after such things, we would become slaves and lose our moral fibre'.[21] Warning against the dehumanizing tyranny of modern machinery, against self-enslavement 'by temptation of money and of the luxuries that money can buy' under the inner compulsion of insatiable desire, Gandhi lashes out at the 'half mad … intoxication' and 'self-destr[uctive]' 'irreligion' of a Western (but really modern) 'Satanic Civilization' that 'seeks to increase bodily comforts' but ensnares people through 'life-corroding competition'.[22] Like Zhuang Zi, Gandhi is no 'environmentalist' *per se*, but is similarly against the 'restless' insatiability and aggression of the human mind, as manifested in 'machinery', 'factories and mines', and 'large cities'. One may not entirely agree with Gandhi's anti-modernity outlook, yet in his preference for the 'indigenous' simplicity of 'cottages' with 'their agricultural occupation' and timeless 'plough[s]', which are more conducive to the 'elevat[ion of] the moral being',[23] one can see yet another case of how sagely respect for life, including the environment, is closely linked to such values as modesty, simplicity, non-lavishness, and ultimately minimal material desire.

More than two thousand years ago, Zhuang Zi witnessed a material civilization in ancient China already too sophisticated and over-aggressive for the good of human nature:

> The five colors confuse the eye; … the five notes confuse the ear; … the five odours incite the nose; … the five flavours dull the mouth. Likes and dislikes unhinge the mind, making the nature unstable and flighty. These five aspects all do harm to the nature … If what you've gained gets you mired, can you really be said to have gained something? If so, even the pigeons and doves in their cage can be said to have gained something. And then likes and dislikes, sounds and colors picking [off] the inner [spirit] … and tethering the outer [self] … can also be said to have gained something.[24]

By physiological default, artificial distinctions and value fabrications appeal more immediately to the lower, material side of human nature, multiplying desires and greed, inciting an impulse for indulgence and extravagance, which in turn generates more destructive conduct that turns human beings into 'denizens of wind-blown waves' (Z 12/67). Interestingly enough, Mark Twain (1835–1910) writes about how even

Tom Sawyer 'had discovered a great law of human action, without knowing it—namely, that in order to make a man or a boy covet a thing, it is only necessary to make the thing difficult to attain'.[25] What the boy has learnt by instinct is the concept of 'scarcity value' in economic theory, which Lao Zi had pointed out two-and-a-half millennia before: 'goods hard to come by will make one do harm' (Chapter 12), whether to other humans or to Nature. Since human beings create their own problems within the prison-house of material pursuit, Zhuang Zi and his followers focus on 'cultivating the inner and not cultivating the outer [aspects of human life]' (Z 12/68). Ideally, the whole environmental question need not be solved but will *dis*solve by itself, once humankind has 'shed the burden of things' and 'cast off [its] dependence on them' (Z 13/15; Z 15/12; Z 20/45).

It may be more useful, then, to see the environmental question in the related contexts of materialism and mass consumerism, especially in modern, post-industrial times. For surely the environmental problem would have been much smaller and far less thorny to deal with, if the human damage to Nature had been occasioned purely by existential needs (which may, in part, justify certain disruptive activities). Shipwrecked during a storm and marooned on a bleak island all alone, Robinson Crusoe 'apply'd [him]self to the works proper for [his] preservation and supply': killing animals, fish, and fowl for food; cutting wood to make a fence, tools, furniture, and posts to prop up the cave ceiling; breeding goats to secure a meat supply; digging up ground to cultivate barley and rice, then fencing in the land to prevent animals from raiding the crops are all existentially justifiable activities.[26] On the other hand, the environmental crisis, as it stands in our age, is more a symptom of humankind's insatiable phantom desires that had run wild early. The quintessential utopian idealist Thomas More (1478–1535), for one, sees human greed rooted in vanity, seen perhaps most clearly and universally as the hoarding of 'superfluous property'.[27] For instance, gold is a non-edible, largely useless mineral-turned-precious-metal whose perceived value or market price is a composite index of greed, stupidity, and vanity; the human craving for gold is a perfect case of how 'colour has confused the eye', and how the common concept of scarcity value is illusory in nature, at least as far as substances with no practical utility are concerned. That is why in the envisioned ideal domain of More's *Utopia*, gold is earmarked for use in making undignified utensils like chamber pots or shameful 'ornaments' that mark out criminals, in order to 'bring it into contempt' and to neutralize misguided desires.[28]

What humankind has craved and laboured for throughout time and in countless different civilizations, from so-called precious stones and metals, to fashion and cosmetics, and all forms of fame and fortune, constitutes a shrinking cell of self-imprisonment, a self-replicating illusion of vanity that has no relation whatsoever with truth, goodness, or beauty. One may even say that the environment is a mere accidental casualty in such a process of superfluous acquisition (through mining in the case of gold, for instance). Notwithstanding the anthropocentric nature of their criticisms and insights, utopian idealists from Plato (ca. 427–347 BC)[29] and Mencius (ca. 372–289 BC)[30] to More and Kang Youwei (1858–1927)[31] have mostly seen the notion of self and the amassing of private possessions as the main temptations that lead human beings to stifle public interest for personal gain. One can generalize the point further: Daniel Defoe (1659–1731) need not be a utopian thinker in order for Robinson Crusoe, upon his return to England after leading a self-sufficient and simple island life for 28 years, to realize the burden and worries of his unexpected new wealth: 'I had more care upon my head now, than I had in my silent state of life in the island, where I wanted nothing but what I had, and had nothing but what I wanted'.[32] Such words amount to eloquent and timelessly valid testimony to the curse of personal material excess, let alone general materialism. Humankind would do well to control its desires and aggression, and to remember Zhuang Zi's explication of a simple cosmic truth: 'the Way of Heaven impels without amassing, so the ten thousand things come to completion' (Z 13/1).

Cosmic understanding and existential outlook in Zhuang Zi

Far more than a matter of technical mastery by science and technology, the environmental crisis cannot be truly solved without a parallel and fundamental reorientation of human values. The *Laozi* has already spoken of 'diminishing the self and reducing desire' (Chapter 19), for self and desire are the starting points for harmful action and contention. As Zhuang Zi highlights the transformational nature of Dao even more than Lao Zi (who tends to stress its constancy more)—and 'transformation means no constancy' (Z 6/93), fixation on petty notions of self and desire becomes even more illogical and pointless. The inhabitants of the 'Land of No Descendants' in Li Ruzhen's (1763–1828?) *Flowers in the Mirror* [*Jinghua yuan*] are in a perfect position to practise this truth: they have no physiological

distinction between male and female, thus no offspring to produce; they are resurrected intact 120 years after death to take part in an altered world, and so come to see the illusoriness of all ambitions and possessions. Indeed, even life and death, the ultimate distinctions in human existence, are understood as transient states of 'dreaming' and 'sleeping'.[33] This is why Zhuang Zi writes logically of having 'no self' (*wu ji*), 'no merit' (*wu gong*), and 'no name' (*wu ming*) in the universe (Z 1/21–2). Translated into environmental terms, as long as desire for self-gain, fame, and achievement remains a driving force of action, what is seen as useful is sure to be plundered by covetous humankind sooner or later, such as fructiferous trees or trees that yield wood for construction (Z 4/69–70, 79–81). Yet even what is seen as useless might not be left in peace, like the voiceless goose that is killed for a feast (Z 20/2–3), for humans can always find various kinds and levels of pragmatic utility in material things.[34] However one may justify it, unbridled desire is an insatiable impulse that can only end in self-consumption and self-destruction.

As Zhuang Zi explains to the logician Hui Shi (ca. 370–310 BC), the essence of life in the spirit of Dao is a relaxed and non-utilitarian attitude, an appreciative aesthetic sensitivity to the world:

> Now you have this big tree and you're vexed that it's useless. Why don't you plant it in a village where there is nothing, or in a broad, boundless field, then relax and do nothing by its side, or lie down for a free and easy sleep under it? Axes will not shorten its life, nothing can ever harm it. If there's no use for it, how can it cause grief or worry?[35]

Like Lao Zi, Zhuang Zi advocates a non-aggressive, non-exploitative attitude to life, a return to Dao as embodied in Nature. Such a modest, peaceful outlook is not shrinking but expansive, in enabling humankind to transcend the narrow vista and goals of materialistic pursuits. It is far more than liberation from anthropocentrism, for the latter is only the relational aspect of the environmental problem, of the whole issue of understanding the ontological and cosmological reality of the Way, together with existential self-knowledge within the macro-unity. There is a genuine sense in which the environmental issue is ultimately a matter of the spirit.

In the broader scheme of things, the prophetic wisdom of ancient thinkers like Zhuang Zi and Lao Zi sounded an early call for humankind to revert to a simple (if not literally 'self-less') mode of life. This

includes a respectful, amiable attitude of peaceful coexistence with the larger environment, rather than a ruthless abuse of Nature and its resources:

> With non-action [*wu wei*], one can put the world to use and have enough to spare; with action [*you wei*], one will find oneself used by the world and feel deficient … Heaven does not 'produce', yet the ten thousand things are transformed; Earth does not 'grow', yet the ten thousand things are nourished.[36]

Here we return to the existential key of *wu wei* in Daoism, of 'acting by non-action' and 'keeping to deeds of non-action)' (*Laozi*, Chapters 3, 2). Except perhaps when natural disasters would call for an active existential response from mankind, *wu wei* points to a minimally meddling and disruptive mode of life. No doubt *wu wei* is a relative rather than an absolute concept, but such an outlook at least offers a much better chance for all things organic and inorganic to run their natural course without destructive interference or stifling domination: less industrialization, commercialism, and consumerism would result in less air pollution and less poisoning of our water and food. Through the 'transformation of the ten thousand things amid non-action', humans can then 'take no action yet leave nothing undone' (Z 12/5; Z 25/64).[37] Above the level of practical utility, *wu wei* also attends to the spiritual side of human nature, as a fitting antidote to the bustling yet shallow life of humankind as super-producer, super-consumer, and super-waster. After all, non-action is not just 'emptiness, stillness, peace, limpidity, silence and non-action' (Z 13/4–5, 7); in the macro vision of the Way and its cosmic operation, *wu wei* is dynamic rather than static, fostering rather than limiting, joyous rather than lethargic.

Natural catastrophes aside, then, the environmental crisis is basically a cancerous growth self-generated by human material overindulgence, and material attachment is only among the more superficial levels of dependence that need to be dissolved.[38] Zhuang Zi's essential vision is to 'be happy in Heaven and Earth while the myriad [human-driven] affairs melt away, so that the myriad things return to their natural state' (Z 12/77). As he shows everywhere in the text that bears his name, Zhuang Zi embodies such a free and open-spirited attitude to life, joyously appreciative of a Nature larger than humankind: '[m]ountains and woods, hills and fields, make me overflow with delight and joy' (Z 22/81). Or better still, in yet another exchange with the logician

Hui Shi, Zhuang Zi shows the spiritual superiority of an aesthetic attitude to Nature:

> Zhuang Zi and Hui Shi were strolling along the dam of the Hao River when Zhuang Zi said, 'See how the minnows come out and meander around as they please. That's the joy of fish!' Hui Zi said, 'You're not a fish—how do you know the joy of fish?' Zhuang Zi said, 'You're not I, so how do you know I don't know the joy of fish?' Hui Zi said, 'I'm not you, so I certainly don't know you. But you're certainly not a fish—so that's quite enough to show you don't know the joy of fish!' Zhuang Zi said, 'Let's go back to your original question, please. You asked me *how* I know the joy of fish—so you already knew I knew it when you asked the question. I know it here standing beside the Hao'.[39]

Zhuang Zi playfully 'wins' the sparring with a verbal trick that almost borders on sophistry, for that is the limited level on which Hui Shi thinks and speaks. Zhuang Zi 'knows' the joy of the fish out of an intuitive sense of spiritual unity with the Dao of which he is happily certain; Hui Shi does not know it because he is severed from the unity by human logic. What the logician loses, therefore, is not so much the argument he initiates—which is pointless to begin with—as the spiritual unity with Dao and the joyous freedom that comes with it.

The environmental history of China might have been a happier record if Daoism had been the leading system of thought in Chinese society and politics. But at no time do ideas suffice by themselves to steer human behaviour, especially when it hinges on self-vigilant cultivation and inner spiritual transcendence far more than on the punitive deterrent of a watchful external providence. The spiritual side of human nature and its higher yearnings logically take second place to basic material needs, which typically expand into gratuitous material desires. Despite early ideas of a unity between Heaven and humanity in both Daoist and Confucian thought, human nature cannot be assumed to vary widely from place to place, which means that in terms of a society's *collective and aggregate* behaviour, there need not be any hypocritical discrepancy between a culture that cherishes Nature, and a society that ends up abusing it out of material motivation. This is one of the cultural paradoxes in traditional China that needs to be faced; but it also means that there is no reason why traditional spiritual resources like Daoism cannot be re-understood and reactivated for the good of human civilization today.

Between the two Daoist philosophers, Zhuang Zi's vision is more expansive, fluid, and dynamic. He speaks of selflessness (*wu ji*) leading to spiritual freedom that enables one to roam Heaven and Earth, riding the natural elements and wandering beyond the four seas in absolute freedom and joy.[40] While Nature's capaciousness can inspire the human spirit to expand to the highest reaches and become one with the infinite Dao, union with the Way also takes place at the opposite end of the spatial spectrum: it is in 'merging' with a butterfly in a fluid dream that Zhuang Zi becomes one with the transformational flux. In both cases, the union between man and Dao takes place within the context of Nature, albeit in absolute terms, that union is not confined to any spatial or temporal parameters. Equalizing things—or rather, recognizing the intrinsic equality of things (*qi wu*)—will foster a life of 'free, easy wandering' (*xiaoyao you*) (Z 1) in 'perfect happiness' (*zhi le*) (Z 18). It is the life of a 'true man' (*zhen ren*) (Z 6/4–9) who, living amid civilization, has managed to 'fast his mind' (*xin zhai*) (Z 4/26–8), at times even to the point of 'forgetting' (*wang*) his body and mind as well as other people and things.[41] All of these elements make the *Zhuangzi*'s portrait of naturalness and Nature an even more delightful one: we see the Daoist thinker admiring a useless tree; fishing in the Pu River and admiring the life of a free tortoise (Z 17/81–4); walking in the mountains; and strolling along the dam of the Hao River sharing the joy of the fish, talking (in another context) about how they can 'forget each other among rivers and lakes' (Z 6/22–3). The extensive references to Nature reflect not only an environmental affection, but also a cosmic vision. Nature has a special place in the overall framework, for the clear implication is that macrocosmically and microcosmically, Nature is the purest embodiment of the Dao of naturalness untarnished by human artifice. This is the same general import as in the *Laozi*, in which Earth, as metaphysical manifestation as well as physical environment, is properly the model for humankind.

Concluding remarks

In the final analysis, the environmental crisis, insofar as humankind has caused it, is one facet of a larger crisis of values and their behavioural manifestations by individuals on a global scale. Even in the Bible, where God decreed man's dominion over the earth and its resources, it was mainly for the sake of 'food' (Genesis 1.29) and other modest practical uses, rather than for the purposes of extravagant materialism, idolatry, and sensuality: this much is clear from warnings against Baal worship

in the Old Testament, and from admonitions against Mammonism in the New Testament.[42] Ironically, organized religions and their powerful leaders are not themselves entirely guilt-free in terms of causing environmental damage, given the extensive scale of tree-cutting and quarrying entailed by the construction of temples, churches, and other imposing structures erected in the name of God.[43] Whichever way one looks at it, one cannot avoid the conclusion that since its earliest days of city formation, human civilization has moved along a ruinous, unilaterally corrosive course against Nature, punctuated by pulses of struggling goodwill and failed reconciliations between domination and appreciation, indulgence and simplicity, between self-glorification and humility, self-destruction and self-transcendence.

Bringing this fundamental ambiguity in human civilization into even sharper focus, the modern Industrial Revolution of the past few centuries has revealed in intensified fashion the age-old tension between material (-cum-technological) advance and spiritual decay. From the vantage point of human conduct, environmental issues are no doubt a result of arrogance, greed, and blindness. If the crisis is in large part a mark of our over-pursuit of self-destructive materialism, then the ultimate solution, as Zhuang Zi sees it, is not a matter of controlling the materialistic desire within less lavish bounds, but one of liberation from material attachment. Beyond what is needed to sustain physical existence, human life is supra-material in direction, and the spirit is transcendently free and infinite in the unity and equality of Dao. Zhuang Zi's words, as he himself knew well, may be so 'grand and useless [that] people spurn them alike' (Z 1/44). Indeed, the Confucian philosopher Xun Zi (ca. 313–238 BC) faults Zhuang Zi for being 'blinded by Nature and ignorant of man['s affairs]',[44] while the historian Sima Qian (ca. 145–86 BC), also the first person to write a biographical note on Zhuang Zi, sees his work as 'all empty words without facts … his language is grand and indulgent for his own pleasure, so rulers and officials could find no use for it'.[45]

It is true that Zhuang Zi's wisdom may be too ethereal to be accepted literally by an urban civilization half consumed by its own aggressiveness; in collective terms, it would be corrective enough if human actions could at least be more gentle and moderate. Still, in an age of self-mutilating excess and dissipated sophistication, a vision of unity and equality within Nature, of physical liberation and spiritual transcendence, is no doubt a refreshing reminder of the potentialities of human life. In the end, no environmental thinking or policy can be collectively meaningful or effective, unless and until every individual acts conscientiously on what s/he knows.

Notes

1. In *Gilgamesh*, an episode known as 'The Forest Journey' relates the ruthless, extensive destruction of cedar forests by Gilgamesh and his friend Enkidu: 'while Gilgamesh felled the first of the trees of the forest Enkidu cleared their roots as far as the banks of Euphrates'; in vain the chief Sumerian deity 'Enlil has appointed Humbaba [a ferocious giant] to guard' the forest against the encroachment of civilization and the human desire for glory. See N. K. Sandars, trans., *The Epic of Gilgamesh*, rev. edn. (Harmondsworth: Penguin Books, 1972), 83, 71.
2. Deforestation for the construction of temples and palaces in the Fertile Crescent of the Middle East in the third millennium BC resulted in severe flooding, and accelerated soil loss, leading to declining soil productivity, and desertification in the region, which precipitated the disappearance of whole forests and caused shortages of wood as early as about two thousand years ago. See John Perlin, *A Forest Journey: The Role of Wood in the Development of Civilization* (Cambridge, MA: Harvard University Press, 1991), 35–47.
3. Ovid, *Metamorphoses*, trans. Rolfe Humphries (Bloomington, IN: Indiana University Press, 1983), p. 6 (Book I, ll. 94–111). Ovid's myth of the four deteriorating ages (golden, silver, bronze, and iron) takes its cue from the Greek poet Hesiod's (eighth century BC?) *Works and Days*, which reckons a total of five races, with a race of heroes or demi-gods interposed between the races of bronze and iron; see Dorothea Wender, trans., *Hesiod and Theognis* (Harmondsworth: Penguin Books, 1973), 62–5. But note that Ovid is far more specific than Hesiod in sketching humankind's acts of environmental damage.
4. Ovid, *Metamorphoses*, 6–7 (Book I, ll. 114, 120–6, ll. 128–45).
5. Genesis 1: 26–8. See Herbert G. May and Bruce M. Metzger, eds., *The New Oxford Annotated Bible with the Apocrypha* (New York: Oxford University Press, 1977), 2.
6. Blaise Pascal, *Pensées* (1670), trans. A. J. Krailsheimer (Harmondsworth: Penguin Books, 1966), 59.
7. For a summary of Judeo-Christian views of Nature, see Yim-tze Kwong, 'Environmental Ethics and Aesthetics: The *Laozi* Revisited', in *Environmental History in East Asia: Interdisciplinary Perspectives*, ed. Ts'ui-jung Liu (New York: Routledge, 2014), 40–63, esp. 40–2.
8. It is generally agreed that of the 33 chapters in the *Zhuangzi*, the seven 'inner chapters' (內篇) constitute the essential core of Zhuang Zi's philosophy likely to have been written by himself, whereas the 15 'outer chapters' (外篇) and 11 'miscellaneous chapters' (雜篇) are largely expansions and illustrations of the core ideas, but do occasionally contain inconsistencies and even contradictions, and may have been written by various generations of followers. For the sake of stylistic convenience, the terms *Zhuangzi* and Zhuang Zi are at times used interchangeably in this essay, as the focus here is not on the authorship of the text, but on the whole body of ideas received and assimilated by posterity.
9. Cf. A. C. Graham's rendition in his *Chuang-tzu: The Inner Chapters* (London: Unwin Paperbacks, 1986), 161. The original text is: 東郭子問於莊子曰: '所謂道,惡乎在?' 莊子曰: '無所不在.' 東郭子曰: '期而後可.' 莊子曰: '在螻蟻.' 曰: '何

其下邪?' 曰: '在稊稗.' 曰: '何其愈下邪?' 曰: '在瓦甓.' 曰: '何其愈甚邪?' 曰: '在屎溺.' (Z 22/43–5 知北遊). Numerals refer respectively to chapter numbers in the *Zhuangzi* and line numbers as printed in the Harvard–Yenching index *Zhuangzi yinde* (1941), reprinted ed. (Shanghai: Shanghai guji chubanshe, 1986). The *Zhuangzi* is abbreviated as 'Z' in this essay.

10. The original text is: 泰初有無, 無有無名; 一之所起, 有一而未形. 物得以生, 謂之德; … 各有儀則, 謂之性. 性修反德, 德至同於初. (Z 12/37–9 天地).
11. Cf. Wing-tsit Chan's observation: '*Te* [de] is Tao [Dao] endowed in the individual things. While Tao is common to all, it is what each thing has obtained from Tao, or its *te*, that makes it different from others. *Te* is then the individualizing factor, the embodiment of definite principles which give things their determinate features or characters'. See Wing-tsit Chan, *The Way of Lao Tzu: A Translation and Study of the Tao-te Ching* (New York: Bobbs-Merrill, 1963), 11. Chan bases his interpretation partly on the homophonous *de* (得) 'to obtain', which is a traditional definition of 'virtue' (de 德).
12. The original text is: 物無非彼; 物無非是. … 是亦彼也; 彼亦是也. 彼亦一是非; 此亦一是非. … 彼是莫得其偶, 謂之道樞. … 無物不然; 無物不可. 故爲是舉莛與楹, 厲與西施, 恢恑憰怪, 道通爲一. (Z 2/27, 29–31, 34–5 齊物論).
13. The original text is: 天地與我並生, 而萬物與我爲一. (Z 2/52–3 齊物論).
14. The original text is: 昔者莊周夢爲胡蝶, 栩栩然胡蝶也, 自喻適志與, 不知周也. 俄然覺, 則蘧蘧然周也. 不知周之夢爲胡蝶與? 胡蝶之夢爲周與? 周與胡蝶則必有分矣. 此之謂物化. (Z 2/94–6 齊物論).
15. Literally 'ladder/stairway of nature', the Latin term is a conception derived from Plato and Aristotle and developed fully in Neoplatonism. It depicts a strict, religious hierarchical structure of all matter and life believed to have been decreed by God, moving downward from God and angelic beings through humankind, animals, and plants to minerals, soil, and dirt. As one shifts from religion to science, one notes that the *scala naturae* is not static in evolutionary terms; but it does remain a hierarchy consisting of 'higher' and 'lower' forms. For a modern exposition, see Arthur O. Lovejoy, *The Great Chain of Being: A Study of the History of an Idea* (Cambridge, MA: Harvard University Press, 1964).
16. This brings Zhuang Zi close to Heraclitus's (sixth–fifth centuries BC) vision of cosmic flux and harmony. But of course Heraclitus was never admitted into mainstream philosophy in the West.
17. It may be interesting to note that Hesiod's *Theogony* offers a mythological history of the world from murky primeval beginnings: 'Chaos was first of all, but next appeared/ Broad-bosomed Earth, … / And Earth bore starry Heaven, … / And then she lay with Heaven, and bore' the Titan gods. See Wender, *Hesiod and Theognis*, 26–9. Apparently the universe first emerged via spontaneous generation, and then multiplied its inhabitants through mating.
18. For an overview of these ontologically interrelated areas of meaning in the Chinese vision of *ziran*, as well as the logic behind the slightly different translation of the final line, see Yim-tze Kwong, 'Environmental Ethics and Aesthetics', 42–7.
19. The original text is: 天在內, 人在外; 德在天. … 牛馬四足, 是謂天; 落馬首, 穿牛鼻, 是謂人.故曰: 無以人滅天. (Z 17/50-52 秋水).
20. The original text is: 有機械者必有機事, 有機事者必有機心. 機心存於胸中, 則純白不備. … 功利機巧必忘夫 … 全德之人 …' (Z 12/56–7, 64–7 天地).

21. M.K. Gandhi, '"Indian Home Rule"', Chapter 13; in *The Gandhi Reader: A Sourcebook of His Life and Writings*, ed. Homer A. Jack (New York: Grove Weidenfeld, 1989), 109.
22. Gandhi, '"Indian Home Rule"', Chapters 6, 13; in *The Gandhi Reader*, 106–9.
23. Gandhi, '"Indian Home Rule"', Chapters 6, 13; in *The Gandhi Reader*, 106–10.
24. The original text is: 五色亂目, … 五音亂耳, … 五臭薰鼻, … 五味濁口, … 趣舍滑心, 使性飛揚. 此五者, 皆生之害也. … 夫得者困, 可以爲得乎? 則鳩鴞之在於籠也, 亦可以爲得矣. 且夫趣舍聲色以柴其內, … 外重縲繳, … 亦可以爲得矣. (Z 12/97–102 天地) Cf. similar views expressed in the *Laozi*, Chapter 12.
25. Mark Twain, *The Adventures of Tom Sawyer* (Philadelphia, PA: American Publishing Company, 1876), Chapter 2 (end of the whitewashing scene).
26. Daniel Defoe, *Robinson Crusoe* (1719), ed. Angus Ross (Harmondsworth: Penguin Books, 1965), 104. For some of Crusoe's earliest existential activities, see 88–93, 95–6, 100–1, 115, 118–21.
27. Thomas More, *Utopia*, trans. Paul Turner (Harmondsworth: Penguin Books, 1961), 80 (Book II).
28. More, *Utopia*, 86–7 (Book II).
29. See for instance Plato, *The Republic*, trans. Desmond Lee, 2nd, rev. edn. (Harmondsworth: Penguin Books, 1974), 182–5 (Book III).
30. See for instance Mencius's discussion of the 'well-field' system (cultivation of public land before private plots) and how all people beyond one's family, from old to young, should be taken care of; respectively *Mencius* 3A3 and 1A7.
31. See Kang's *Book on the Grand Unity* (大同書), passim. For an overview of human suffering caused by artificial divisions and boundaries, see Part I, especially sec. 6.
32. *Robinson Crusoe*, 281. Cf. Richard Steele's final observation in his account of Alexander Selkirk, a Scottish sailor whose life offered a central incident on which Crusoe's story is based: 'he is happiest who confines his Wants to natural Necessities; and he that goes further in his Desires, increases his Wants in proportion to his Acquisitions; or to use [Selkirk's] own Expression, *I am now worth 800 Pounds, but shall never be so happy, as when I was not worth a Farthing*' ('Appendix', 310).
33. Chapter 16. Such an attitude is reminiscent of Zhuang Zi: 'How do I know that taking pleasure in life is not a delusion? How do I know that detesting death is not like one who has left home in his youth and forgotten the way back? … While we dream we do not know we are dreaming, … only after we wake up do we know we were dreaming … Yet fools believe they are awake, smug about their assumed knowledge. 予惡乎知說生之非惑邪? 予惡乎知惡死之非弱喪而不知歸者邪? … 方其夢也, 不知其夢也, … 覺而後知其夢也. … 而愚者自以爲覺, 竊竊然知之.' (Z2/78–9, 81–3齊物論)
34. The gnarled, bumpy, and twisted trees mentioned at various points in the *Zhuangzi* (e.g. Z 1/43–4 逍遙遊, Z 4/68–81 人間世, Z 20/1–2 山木) do stand a better chance of fulfilling their natural life span due to their unusable nature, since they may be too bulky to handle profitably.
35. The original text is: 今子有大樹, 患其無用. 何不樹之於無何有之鄉, 廣莫之野, 彷徨乎無爲其側, 逍遙乎寢卧其下. 不夭斤斧, 物無害者, 無所可用, 安所困苦哉? (Z 1/46–7 逍遙遊)

36. The original text is: 無爲也, 則用天下而有餘; 有爲也, 則爲天下用而不足. … 天不產而萬物化, 地不長而萬物育. (Z 13/15 天道)
37. Cf. similar statements in the *Laozi*, Chapters 37, 48, 57, 63.
38. Attachment to love and attachment to life itself, for instance, are even more difficult to transcend.
39. The original text is: 莊子與惠子遊於濠梁之上. 莊子曰: '儵魚出遊從容, 是魚之樂也.' 惠子曰: '子非魚, 安知魚之樂?' 莊子曰: '子非我, 安知我不知魚之樂?' 惠子曰: '我非子, 固不知子矣. 子固非魚也, 子之不知魚之樂全矣.' 莊子曰: '請循其本. 子曰: '汝安知魚樂' 云者, 既已知吾知之而問我. 我知之濠上也.' (Z 17/87–91 秋水)
40. See for instance Z 1/29 逍遙遊, 2/72 齊物論, 21/30 田子方.
41. See terms like忘身 (Z 4/43 人間世), 忘心 (Z 28/51 讓王), 相忘 (Z 6/23 大宗師) and 忘物 (Z 12/45 天地).
42. See for instance Judges 3: 7, 1 Kings 16: 31–2 (Old Testament); Matthew 6: 24, Luke 16: 13 (New Testament).
43. The spire, for instance, is an ambiguous symbol that can variously reflect religious sentiments or human vanity. One of the more potent explorations of this symbol can be found in William Golding's *The Spire* (1964).
44. See the *Xunzi*, Chapter 21, 'Dispelling Blindness' (荀子 · 解蔽). Cf. John Knoblock, trans., *Xunzi: A Translation and Study of His Complete Works*, 3 vols. (Stanford: Stanford University Press, 1988–94), 3: 102.
45. Sima Qian, *Historical Records* (史記), 10 vols. (Beijing: Zhonghua shuju, 1982), 7: 2143–4 (Chapter 63). The original text is: 皆空語無事實 … 其言洸洋自恣以適己, 故自王公大人不能器之.

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