

CHINESE ENVIRONMENTAL HISTORY NEWSLETTER

Issue 1:2, November 1994

This newsletter may be freely photocopied.

From the Editor

The response to the first issue of the *Chinese Environmental History Newsletter* (CEHN) fully confirms the timeliness of this venture, and the breadth of interest in the topic among scholars in a range of disciplines. At present, there are about 100 subscribers, the great majority of whom have direct research or other professional interests in Chinese environmental history or related topics. (We are, of course, also delighted to attempt to serve our “general interest” subscribers). Within the last few weeks, a happy error in a computer network message has also brought requests for information about an *Asian Environmental History Newsletter*. Although the “Asian” in this title is an error, we hope that these enquirers will become subscribers and contributors to the present newsletter. There is always much to be learned from cross-cultural comparison, while ecological régimes are not necessarily delimited by national boundaries.

This second issue of the newsletter exemplifies the international and interdisciplinary cooperation, and the mixture of empirical research and conceptual exploration, which will, we hope, characterize the newsletter throughout its existence. On the interdisciplinary front, Richard P. Suttmeier, from political science, considers the possibilities of mutually enriching dialogue between risk analysis and environmental history, with reference to China, while Nayna Jhaveri responds as a geographer to Peter Perdue’s reflections, in the last issue of CEHN, on Chinese property rights and environmental change. We are thoroughly pleased to have these invitation-challenges from other disciplines, and hope that they will be the first of many. We also hope that others will follow Ms Jhaveri’s initiative, and write responses to articles in the present and forthcoming issues. If this newsletter can serve as a forum for discussion and debate, it will richly fulfil its central purpose.

Empirical historical research is represented by three contributions, two of which make scholarship already published in East Asian languages accessible to a still broader readership than it is likely to have had so far. Yang Dong presents some firstfruits of his own research on the environmental history of the Shaoxing highlands over fifteen centuries. Christian Daniels devotes the first installment of a three-part article on ethno-history and environmental history in Yunnan to introducing, and amplifying, a rich study by the Japanese scholar, Takeuchi Fusaji, of an 1821 uprising and its background of environmental change. Finally, a team from MIT (Peter Perdue, Kong Jiangti, and Amy Yen) has prepared a

translation-abstract of Li Bozhong’s important study of timber supply for the Lower Yangzi region in the late imperial period. Although this article was written from the point of view of economic history, it provides essential information for historians of the environment. We thank Professors Li and Takeuchi for their cooperation.

Also in this edition, we are delighted to present a statement sent to CEHN by Professor Han Guanghui of Peking University, of the value of historical geography for informing policy on sustainable development. This contribution is an abridged version of an article already published in China, and written, naturally, for a PRC readership. We are privileged to have this opportunity of gaining insight into Chinese scholarly perspectives on a topic of concern to all students of the environment. The two case studies summarized by Professor Han will whet our appetites for further detail. We trust that Professor Han’s article will help to sustain a fruitful cooperation between environmental historians/historical geographers within and outside China; and we look forward greatly to receiving further articles from China.

The arrival of so many high-quality manuscripts (not to mention items for the “noticeboard” and “thesis abstracts” sections) unfortunately necessitates delay in sending out the directory of subscribers. This will be issued separately, as soon as possible. The delay will at least have the advantage of giving readers who have not yet formally subscribed the opportunity to do so, and thus let others know of their research interests. Subscription to the hard copy version has been facilitated for inhabitants of Australia, Britain, France and Japan by the existence of distribution coordinators for these countries (for their names and addresses, see under “Submission and Subscription Information”). Any kind person willing to serve as coordinator for another country should please contact the editor.

Two subscribers have expressed the hope that the newsletter’s scope can be broadened to include material pertaining to the teaching of Chinese environmental history.

This seems an excellent idea; submissions in this area are therefore invited.

Finally, we gratefully welcome a new translator of the newsletter. Liu Shi-yung, of the Department of History, University of Pittsburgh, has generously undertaken to prepare the Chinese-language version of this issue. It is also appropriate to thank Liu Ts’ui-jung (Academia Sinica), Huang Tsokan (Indiana State University) and Wu Kegang (University of Liverpool) for assistance in translation editing (Chinese-English as well as English-Chinese).

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Noticeboard

Research reports

The Formation of Man-land Systems in the Chifeng Region since the Holocene

Centre of Historical Geography, Peking University

The Chifeng region lies on the boundary between North and Northwest China in the zone of mixed agriculture and pastoralism in the basins of the West Liao River, Daling River, and the upper reaches of the Luan River. It occupied an important position in the development of ancient Chinese civilization. On the basis of the important

recent archaeological discoveries from the Neolithic Age in the Chifeng region, the Centre of Historical Geography at Peking University is just embarking on research on environmental change and the development and decline of cultural landscapes in the region since the Holocene. It will pay special attention to problems of balance and control in the man-land relationship.

The project is focussing initially on past and present environmental change in the Qing dynasty's imperial hunting zone at Mulan, in the upper reaches of the Luan river system. This was already one of the Centre's major historical geographical research topics; for the thinking that has guided the research, see Hou Renzhi, “Zai lun lishi dili xue de lilun yu shijian” [A Reexamination of the Theory and Practice of Historical Geography], in *Beijing Daxue xuebao: Lishi dili xue zhuankan* [The Peking University Journal: Special Issue on Historical Geography] (1992), pp. 1-5. See also Han Guanghui, “Ke chixu fazhan de lishi dili xue sikao” [Historical Geographical Reflections on Sustainable Development], in *Beijing Daxue xuebao* 3 (1994), Philosophy and Social Sciences Section, pp. 43-49. The following research articles have already been published in the above-mentioned special issue of the Peking University Journal:

Cui Haiting, “Qingdai Mulan Weichang de xingfei yu ziran jingguan de bianhua” [Landscape Change and the Rise and Fall of the Mulan Imperial Hunting Park of the Qing Dynasty] (pp. 118-23);

Zhang Baoxiu, “Qingdai kaipi Mulan Weichang de dili tiaojian” [The Geographical Conditions for the Development of the Mulan Hunting Park in the Qing Dynasty] (pp. 124-34);

Deng Hui, “Qingdai Mulan Weichang de huanjing bianqian yanjiu” [A Study of Environmental Change in the Qing Mulan Hunting Park] (pp. 135-43);

Zhao Zhongshu, “Cong diming jiaodu guankui Mulan Weichang de huanjing bianqian” [Glimpsing Environmental Change at the Mulan Hunting Park through Place Names] (pp. 144-57).

Water Knowledge and Technology in Modern China

Baruch Boxer, Cook College/Rutgers University

Professor Boxer reports as follows on this book project, funded by the National Science Foundation, 1993-95. “This project will further understanding of relations between cultural and technological aspects of water knowledge in twentieth century China. Primary and secondary Chinese and Western sources will be analyzed to assess how *shuili*, a traditional body of scientific and technical knowledge relating to water use and control, is modified and adapted in response to the demands of technological modernization and change. Contrasts since the 1920s between Chinese and foreign views on social benefits and costs of water engineering in the Yangzi basin will be analyzed with reference to three cases in which assumptions about the

social and ecological effects of engineering solutions to water-related problems can be assessed. A major goal is to document the process through which traditional attitudes and beliefs about the human and environmental impacts of water engineering change in response to foreign values, technologies, and political ideologies. The research will contribute to understanding of human dimensions of environmental change by showing how traditional beliefs and practices influence technological modernization of water systems. The results of the study will be of interest to students of modern China and the comparative social history of science, technology, and engineering.”

Forthcoming and recent conferences

International Symposium on China and the World in the Eighteenth Century, Beijing, 1995

This symposium, to be sponsored by the Institute of Qing History at Renmin Daxue, will be held during June 20th-24th, 1995. The scope of the symposium includes China's domestic eighteenth-century history as well as international eighteenth-century history. Since the list of topics on which papers are invited mentions China's latent problems in the eighteenth century, as well as frontier and ethnic history, it would seem that the symposium could well be of great interest to readers of this newsletter. Papers may be submitted in Chinese, English, French, Japanese or Russian, and should reach the Institute of Qing History by February 20th 1995 (an abstract may be substituted if need be).

Those wishing to participate should return an "Intention to Participate Form" by **January 20th 1995** to:

Dr Gao Xiang
Institute of Qing History
Renmin University of China
39 Haidian Rd., Haidian District
Beijing 100872

(Fax: 861-2566374;
Tel.: 861-2563399-2864)

International Conference on Historical Geography, Beijing, 1996

The Committee on Historical Geography of the Chinese Geographical Association plans to hold this conference at Peking University in the summer of 1996. The formal conference announcement will be issued in the summer of 1995. Those wishing to receive a copy should write to:

Professor Han Guanghui
Centre of Historical Geography
Peking University
Beijing 100871
(Fax: 861-2501187)

Recent conferences

Two historical geography conferences which have taken place this autumn are the International Conference on the Great Wall (Beijing, September) and the Annual Meeting of the Chinese Ancient Capitals Association (Anyang, October). No further information about the proceedings has yet reached CEHN.

Journals, research tools, and other publications

New cartographic resource (in preparation). Professor Shi Nianhai, of the Institute for Chinese Historical Geography, Shaanxi Teacher's University, Xi'an, reports that he is working on a "Chinese Historical Agricultural and Stockraising" map series. He has also contributed the Sui-Tang volume of a multi-volume history of China published by Shanghai renmin chubanshe.

Japanese Studies on the History of Water Control in China: A Selected Bibliography. Compiled by Mark Elvin, Hiroaki Nishioka, Keiko Tamura, and Joan Kwek, with the cooperation of the Chūgoku Suirishi Kenkyūkai (Society for the Study of the History of Water Control in China); published by the Institute of Advanced Studies, Australian National University in conjunction with the Centre for East Asian Cultural Studies for Unesco, Tōyō Bunko, Tokyo, 1994.

The coverage includes irrigation, drainage, urban water supply, inland water transport, defences against floods and tides, water control technology, and hydrological and hydraulic theories. Entries appear in both romanized Japanese and Japanese script, with English translation. The subject-matter is indexed by period, area, and topical codes.

A substantial introduction by Mark Elvin surveys the major themes of Japanese scholarship on water control in China.

The bibliography costs A\$45.00 plus postage, and may be ordered from:

The Secretary, *East Asian History*
Division of Pacific and Asian History
Research School of Pacific and Asian Studies
Australian National University
Canberra ACT 0200
Australia

Cheques etc. should be made payable to "East Asian History."

There are also plans for an electronic version of the bibliography, which should become available *via* INTERNET during the first half of 1995. For further information, please contact Dr Matthew Ciolek, whose e-mail address is Matthew.Ciolek@anu.edu.au.

Environment and History (ISSN 0969-3407), published by The White Horse Press at 1 Strond, Isle of Harris, Scotland PA83 3UD, UK. The subscription for individuals is \$US

50.00 *per annum*. Manuscripts for publication should be submitted to The Editor, *Environment and History*, c/o The White Horse Press, 10 High Street, Knapwell, Cambridge CB3 8NR, UK. The fax number for the Harris office is 44 859 520 204.

Asia-Pacific Uplands is a newsletter of the Pacific Science Association published in Hong Kong. It focusses on upland environmental and developmental issues in the region, including China. There is no charge to receive this publication, which usually appears twice a year. Anyone interested should write to:

Prof. R.D. Hill

Editor, *Asia-Pacific Uplands*
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Risk Analysis and Environmental History: Some Thoughts on Complementarities

Richard P. Suttmeier

University of Oregon

The emergence of a field of Chinese environmental history is an exciting development for many of us who are not historians, but who have keen interests in China's contemporary environmental quandaries. While there is much to be learned about the latter from *a*-historical perspectives derived from disciplines in the natural and social sciences — from geophysics to political economy — there clearly are also deep currents of culture and tradition shaping contemporary environmental problems which can only be understood historically. This is especially evident when we consider environmental problems in terms of risk — how human beings identify, assess, manage and represent the uncertainties from environmental and technological hazards that surround them.

Risk issues have come to play important and controversial roles in contemporary Western thinking about environmental policy over the past fifteen years or so, and are poised to become more central to Chinese environmental policy as well. Technical risk analysis can help clarify areas of uncertainty in policy formulation, and, more importantly, can help policy makers prioritize hazards and thus identify those risks which warrant the greatest attention and commitment of resources. In the U.S.A of 1994, for instance, Congress, the White House, and agencies such as the Environmental Protection Agency are increasingly calling for more and better risk analysis in order to get priorities right, and improve the bases for regulatory policy.

At the same time, the methods and uses of risk analysis in policy-making have become the objects of widespread critical comment from those who see it as a tool for centralized, technocratic — and, thus, by implication, undemocratic — approaches to the management of environmental problems. Unease about risk analysis is reinforced by the findings of students of risk perception which call attention to the disparities between popular and expert risk perceptions, and demonstrate with considerable effect that the former cannot be readily dismissed simply as “misinformed” and/or “irrational.”

The importance of risk in policy-making, and the considerable controversy about how risk should be understood, have spawned a rapidly growing interdisciplinary literature in the West focussing on risk issues. This literature goes considerably beyond technical risk analysis narrowly understood. Where proponents of the latter might define risk as a function of the probability of an accident (or other untoward event) and the magnitude of its consequences ($R=PM$), many other students of risk have come to see risk as including something more. To explain how popular perceptions of risk diverge from those of experts, for instance, the “something more” might include such factors as trust, liability, and consent (thus, $R=PM+TLC$) (Rayner, 1992). The introduction of these considerations, of course, requires that risk studies take seriously the cultural and institutional settings in which risks are determined and managed. It also forces us to consider the extent to which we should regard risks as socially or culturally constructed. A cross cultural and historically informed research agenda becomes especially appealing in these circumstances, as do new cooperative relations between students of risk and environmental historians.

During the past two years, with support from the National Science Foundation, I have been involved in a project on “Evolving Chinese Approaches to the Management of Technological Risks.” The project is concerned with environmental and safety issues in contemporary China, with special attention given to case materials drawn from nuclear power, airline safety, and flood control (Suttmeier, 1994). On the assumption that one cannot fully understand contemporary problems of risk without understanding the cultural and historical settings for thinking about risk, I have also attempted to understand how the concept of risk could be applied to one of the more serious hazard management challenges faced in traditional China, that of flood control. As the project has proceeded, I have found myself both drawing lessons for interpreting today's cases from the historical materials (as presented, for instance, in such works as Dodgen, 1989; Leonard, 1988; Perdue, 1987; and Will, 1990), and wanting to interrogate the historical records further, with questions arising from the analysis of the present.

In trying to understand the perils and promises of nuclear power, the problems of airline and mine safety, a worsening flood damage record, and China's environmental

dilemmas more generally, the choice of an interpretive/explanatory framework is no small challenge. Mixing historical inspirations with *a*-historical behavioral considerations, I have found it useful to approach interpretive issues using three analytically separable (but not mutually exclusive) explanatory frameworks. I will refer to them here as the “modernization”, “reform”, and “culture” perspectives.

The first considers China’s contemporary risk problems as a phase of industrialization through which others have gone. Defenders of a modernization perspective of this sort would note that many of the “social costs of modernization” which are becoming so evident in today’s China are reminiscent of those faced by “successful modernizers” (Western Europe, Japan, the U.S.A) in other periods. These countries also faced severe environmental and safety problems at earlier stages of industrialization, but overcame them once other “more basic” human needs were satisfied, and additional wealth was available to sustain new regulatory régimes (laws, policies, implementing agencies) and other modern risk management institutions. In this “sanguine” view of modernization, a successfully modernizing China can be expected to follow a similar trajectory.

There is considerably more to the risk-modernization relationship, however, than the identification of phases of industrialization. Less sanguine observers of modernization have problematized a link between risk and modernization to develop a critique of modernity, questioning whether “successful” modernizers really can be said to have developed workable schemes for managing risk (cf. Beck, 1993; Giddens, 1990, 1991; Mol and Spaargaren, 1993). By extension, this dissent would imply that China is on the wrong path, that workable approaches to new hazards will not arise from modernization, and that China’s risk problems must therefore be reconceptualized.

A slightly different approach to the risk-modernization relationship has been suggested by Kirk Smith. Taking his cue from the demographer’s concept of “demographic transition,” Smith has introduced the notion of a “risk transition” which occurs with modernization (Smith, 1990). In this view, the risks found in “traditional” societies — plagues, famines, uncontrollable natural hazards, and other sources of early death — are gradually reduced with the help of modern science, technology and industry, but are then replaced by new forms of risk (cancer, nuclear accidents, plane crashes, air and water pollution, etc.) associated with industrial society. For many industrializing societies, i.e., those in the risk transition, both types of risk must be faced simultaneously. However, traditional risk management strategies have often lost their effectiveness in such societies, and “modern” ones are not yet fully developed.

While China can be thought of as being in the type of risk transition described by Smith, it is one that is complicated — and, for the social scientist, made more interesting — by the fact that it is also in an institutional

transition from a socialist mode of political economy towards a market economy with confusedly assigned property rights. This transition provides the basis for a second perspective, one which views risk in terms of “reform.” Reform factors and modernization factors are analytically separable, but, empirically, they are often closely intertwined. Risks from floods have increased in contemporary China, for instance, because of new land use practices driven by economic growth (“modernization”) and the degeneration of inherited flood control institutions as a result of “reform.” Risks of airline accidents have increased as a result of the rapid expansion of the air transport system and the incomplete transition of the Civil Aviation Administration of China (CAAC) from a “ministry of air transport” to a modern regulatory agency. Risks which were once managed by socialist institutional arrangements become more serious when these decay and alternative institutional forms have yet to take hold.

In his compelling recent report on risk and the transition from socialism in Bulgaria, Brent Yarnal makes clear that these problems of institutional change are not unique to China (Yarnal, 1994). According to Yarnal, the Bulgarian transition has led to increasingly severe risks as a result of lost state capacity to protect the public from industrial and environmental hazards. The loss of state capacity in the Chinese case is also evident to foreign observers and the Chinese leadership alike. But China is not entirely helpless in mobilizing domestic resources to deal with this problem, and has been working with partners in the international community (foreign governments, the United Nations and other international organizations, and foreign corporations) to build new regulatory institutions to help manage the risks of industrial society.

To assess the prospects for these initiatives, it is helpful to go beyond “modernization” and “reform”, and introduce a third perspective, one that is sensitive to issues of culture and tradition. In trying to develop this third perspective, I have found it helpful to think about issues of culture and tradition in four modes: in terms of their effects on the individual, on organizational behavior, on the actions of the state, and in terms of Sino-foreign interactions.

The current project has not taken questions of how culture shapes judgement and cognition at the individual level as a primary focus. Nevertheless, there is a literature here to be considered, and recent work by Chinese scholars has begun to examine, in Chinese contexts, the important questions which have been raised about individual risk perception in *non*-Chinese populations (Zhang, 1994; Xu and Xie, 1994). A related issue has to do with how construals of self — arguably more collectivist in the Chinese context than in a Western — shapes perceptions and understandings of risk (cf. Marcus and Kitayama, 1991). More broadly, it would be helpful to know more about the influences of culture on Chinese approaches to problems of uncertainty and insurance. Do cultural factors bias the thinking of Chinese individuals confronted with risk away

from graduated probability calculations about uncertainty towards more dichotomous, black and white — perhaps fatalistic — notions of risk (Wright and Phillips, 1980; Wright, 1984; Pollock and Chen, 1986)? If such patterns of information processing and judgement are found, is their explanation really to be found in “culture”, or perhaps in theories of “modernization” instead? Is the uncertainty associated with encountering natural and technological risks processed in the same ways by individual Chinese as financial and commercial risks might be? Where do attitudes towards insurance, as a strategy for managing uncertainty, fit in? What are these attitudes, and are they a function of culture, modernization, or of the dominant arrangements of society’s institutions?

The latter question points to the need to blend culture’s effects on individuals with its effects on organizations. At a second, or “micro-organizational level”, approaches to thinking about and managing hazards can be explored with reference to important Chinese principles of human relationships, especially those pertaining to hierarchy and authority relations (including norms of caution in speech — especially that addressed to superiors), concerns for saving and giving “face”, and the subtle issues of blame and accountability which provide such rich textures to Chinese organizational life. A central question about risk at this level is the extent to which adherence to inherited principles of human relations fits with “objective” requirements for managing natural hazards or complex and demanding technologies.

In the contemporary cases, for instance, the safe operation of modern technological systems (nuclear reactors, chemical plants, jet aircraft, etc.) is inseparable from the creation of a “safety culture” among operators, managers, and regulators. Central components of a safety culture include giving primacy to the safety specifications of the technology, and promoting active learning about contingencies not covered in the specifications. So understood, the promotion of a safety culture requires, among other things, open communications, frank exchanges, and free reporting of “incidents” and anomalies. To what extent are Chinese culture-based forms of behavior — concerns for face, the importance of *guanxi*, a reluctance to challenge authority when it is wrong on crucial technical points, etc. — consistent with such demands and with the requirements for effective risk management more generally? With reference to the airline case, for instance, where cockpit management is an important part of safe operations, is the “Confucian cockpit” (to use Stephen Durrant’s phrase) also the safe cockpit (Durrant, 1994)?

Micro-organizational concerns of this type merge at some point with issues at what might be called the “macro-institutional” level, where the actions of the state are of greatest interest. Here, we find the Chinese state — both traditional and Mao-era — often aspiring to become an instrument of total insurance with regard to major hazards — even to the point of tying its legitimacy to its success in

becoming such an instrument. The record, however, suggests that such aspirations characteristically get defeated by both the physical and administrative complexities of the hazard management problems. This is especially evident in realms where something more than local management is required, but where the central state lacks resources for consistent attention to the problem. Thus, from imperial times to the Maoist period, much about hazard management and hazard creation seems to be tied to complex interactions between authoritarian states seeking to manage and insure against risks, and natural and social phenomena beyond the reach of the state’s authority. Adding texture and complexity to this conception of Chinese problems with risk have been such intervening factors as varying views of nature, property rights arrangements, available scientific knowledge, and prevailing technological practices, all of which are both of historical importance, and quite germane for understanding current approaches to risk (cf. Suttmeier, 1994).

A fourth mode for thinking about the influences of culture and tradition, which cross-cuts the above three, involves Sino-foreign interactions. Chinese reactions to the introduction of steam locomotives by foreigners in the nineteenth century illustrate how “risk” can be socially constructed out of such interactions. The coming of European, American, and later Soviet hydraulic engineers produced a complex legacy shaping the culture of water management and flood control thinking in China (cf. Greer, 1979; Todd, 1938). The introduction of modern jet airliners poses cultural challenges to Chinese maintenance personnel (Bauer, 1986) which, in turn, affect the risks of travelling by air in China. More generally, admiration for, resentment of, and feelings of superiority or inferiority towards foreign technology in modern Chinese history are all part of the context in which new regulatory régimes and other modern risk management institutions are being established in contemporary China *with* the kinds of foreign involvement and, thus, foreign cultural influence noted above.

In the ongoing project described above, the work of historians on environmental issues has been of considerable help. I have also come to believe, however, that the contemporary interdisciplinary study of risk has the potential to generate a number of interesting questions which might be of use to environmental historians. For instance, can we enhance our understanding of the varying views of nature in the Chinese tradition by seeing them in relation to commitments to specific institutional forms, as some students of risk have suggested in different contexts (cf. Douglas, 1992; Schwartz and Thompson, 1990)? In considering the ways in which risks were perceived, characterized, and appraised in China, can we assume that mechanisms for *distributing* risks — often coercive, and characterized by unequal distributions of power — were largely responsible for the ways risks were identified and assessed?

Finally, what can more *explicit* attention to traditional institutions for managing risks tell us about approaches to the environment in Chinese history, and about Chinese society more generally? While family and state seem to stand at opposite ends of a micro-macro scale of risk management institutions in the Chinese tradition, contemporary risk studies suggest that any society's risk management strategies would typically involve a range of other institutions and practices — insurance schemes, liability law, the assignment of property rights, professional standards, etc. — which intermix with family and state to form a complex ensemble of institutions. What constituted the “complex ensemble” in China? How well did it work? And how did it shape human interventions into nature and the “construction” of the environment? How might attention to risk management institutions contribute to our understandings of civil society, and debates about a “public sphere,” in traditional China?

But, just as the exciting interdisciplinary literature on risk can help frame intriguing questions for historians, environmental history has a great deal to contribute to risk studies. While many practitioners of the latter would acknowledge the importance of institutions and cultural values in shaping how we think about risk, the empirical grounds from which such judgements are drawn have typically been *a-historical*. While important, contemporary case studies of risk often leave little room for the rich, nuanced narratives of the sort which environmental history is beginning to provide, and which allow us more fully to appreciate how risk can be socially and culturally constructed. With Chinese environmental history just beginning to acquire its collective identity, and with studies of risk in China still in their infancy, the pursuit of opportunities for regular cross-fertilization of ideas between the two holds promise, and warrants our continuing attention.

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Environmental Degradation, Forest Protection and Ethno-History in Yunnan

(I) The Uprising by Swidden Agriculturalists in 1821

Christian Daniels

Institute for the Study of the Languages and Cultures of Asia and Africa, Tokyo University of Foreign Studies

Field trips on various occasions over the past five years have alerted me to some of the less well known aspects of the history, both past and contemporary, of environmental degradation in Yunnan, and the consequences of policies designed to curb it. Although the main purpose of my excursions has been to record pre-modern technology still in use among the non-Han peoples in the remoter parts of the province, one cannot help wondering how the destruction of environmental resources has shaped their history.

Environmental degradation here undoubtedly derived from the peculiar circumstances surrounding incessant Han Chinese settlement after the Ming, and the establishment of commercial activities geared to the demands of the Empire-wide market. Yet Chinese ethno-botanists and anthropologists have demonstrated how the practices of some non-Han peoples have helped to preserve environmental equilibrium rather than disrupt it. In the three installments of this article, my purpose is not to try to judge the rights and wrongs according to the dichotomy of Han and non-Han: it is far too early to formulate grand schemes or pass judgement. I merely wish to present in digested form three specific examples, randomly selected from published material and my own field notes, to illustrate the effects of Han-induced environmental change on the history of the indigenous inhabitants of Yunnan; their traditional practices to protect the local ecology; and how their lifestyles have been altered by the recent establishment

of nature reserves.

Everyone agrees that the large scale immigration of Han Chinese in search of new frontiers, especially following the population boom of the eighteenth century, wrought profound changes on non-Han peoples. In south-west China, as elsewhere in the Empire, Han settlers gained a strong foothold once they succeeded in acquiring the rights to land originally held by indigenes. In the eighteenth and nineteenth centuries, the territories of non-Han principalities were incorporated into regular administrative units through the *gaitu guliu* policy. The resulting weakening of the political power and authority of the non-Han hereditary rulers tended to bolster the position of the Han immigrants. On some occasions, the indigenes rose up in arms against the settlers, but in the long run they were either assimilated into local Han society, or chose to isolate themselves from the source of contamination by moving out of reach.

The Lisu are a Tibetan-Burman language speaking people who are recorded as dwelling in an area straddling the boundary between southern Sichuan and north-western Yunnan from the time of the Tang dynasty (618-906 A.D.). At present, most of the Lisu in Yunnan live on slopes and plateaus at elevations of over 3,000 metres on both sides of the Jinsha, Lancang and Nujiang Rivers. As of 1982, the total Lisu population in Yunnan numbered 460,000.¹ In a recent article on the 1821 Lisu uprising, the Japanese historian Takeuchi Fusaji has demonstrated how land alienation and forest clearance for exploitative commercial agriculture by Han immigrants deprived the non-Han swidden cultivators of their livelihoods, and drove them to revolt.² This extremely fine article has passed unnoticed in English-language studies because it was written in Japanese, and published in an obscure journal. In view of the shortage of documentation on the connection between environmental degradation and ethnic unrest, I should like to devote the rest of this installment to providing readers with an account of Takeuchi’s findings. On occasion I have added information to clarify points made by Takeuchi.

Let us begin with the uprising itself. Early in 1821, a force of 1,500 armed Lisu attacked Han immigrants in Yongbei Ting (a Yunnan jurisdiction south of the border with Sichuan), demanding the return of their land. Within a few days, the number of Lisu participants had swelled to about 8,000. Some two weeks later, a contingent of over 100 Lisu marched into neighbouring Dayao county to settle accounts with Han settlers, who had refused them access to grazing land, and beaten some of the Lisu. 4,000 local Tai (Baiyi) and Yi (Luoluo) tribesmen immediately joined their ranks, and the combined force ended up killing over 500 persons. Although this uprising did not last long, and was soon put down by the Qing army, the fact that a multi-ethnic force was raised, almost spontaneously, within such a short period bespeaks deep-seated common grievances against Han settlers among different ethnic groups. Moreover, since the Lisu and the Yi practised swidden agriculture on hill slopes, while the Tai engaged in wet rice cultivation on

the valley floors, it also shows that the grievances were so ubiquitous that they transcended the great variations in elevation, a topographical factor which historically helped to reduce ethnic conflict between groups engaged in different forms of agriculture.

In analyzing the causes of the uprising, Takeuchi particularly singles out land acquisition and environmentally exploitative commercial agriculture as the main factors. Let us consider each one in turn.

1. Land alienation

After their capture, the Lisu instigators stressed the loss of their land as the major motive for the uprising. In the words of a principal Lisu protagonist whose Chinese name was Chen Tianpei:

In the past, wet and dry-field land in our barbarian territory (*yidi*) was solely cultivated by [us] barbarian people (*yiren*), and we were able to make a livelihood. Later, the hereditary ruler (*tusi*) [and his subordinates, viz.] the *tumu* and the *bashi* successively sold [the land] through *dian* transactions [see below for explanation] to villainous Han from various places in Guizhou and Sichuan, who have occupied it for cultivation. These villainous Han have often made unreasonable demands on [us] barbarian people, which has made it difficult for [us] to maintain [our] households; therefore, many [of our people] bear hatred against them in their hearts.³

The expression “barbarian territory” refers to the fact that the Lisu came under the jurisdiction of the Beisheng Aboriginal Department (*Beisheng tu zhou*), which was still administered by a non-Han hereditary ruler (*tusi*) with the Han surname Gao. From about 1745, the ancestors of the incumbent *tusi* had begun to sell their official estates (*guan Zhuang*, i.e. estates in lieu of salary) to Han settlers. Since the *tusi* depended on rent from these estates for funds for local administration and his own private income, such a transfer of indigenous land to the Han had extremely adverse effects on local society. In the long run, it reduced the income of the hereditary ruler, which in turn ultimately weakened his ability to govern, and left large numbers of non-Han landless.

Qingbao, the Governor-General of Yunnan and Guizhou who quelled the uprising, stressed this last point. He distinguished the following three methods by which Han settlers had acquired land in Beisheng Aboriginal Department: (i) sale by the *tusi*; (ii) illicit sale by *tumu* and *bashi*, who were officials of the *tusi*; and (iii) sale by non-Han tenants cultivating land owned by the *tusi*. Problems arose because the new Han proprietors shunned non-Han as tenants, and chose to rent their property exclusively to recent Han immigrants who could afford to pay rent deposits in silver. Presumably, stiff competition

among the large numbers of Han newcomers made it possible for proprietors to demand rent deposits. This resulted in increasing numbers of non-Han being denied access to land for cultivation and grazing. *Dianmai*, the term used for land sales in the sources, signified that the seller enjoyed the right to buy the property back at the sale price at any time in the future. The indigenous inhabitants, already deprived of their means of livelihood, despaired of ever being able to raise the money to redeem their land, and for this reason slaughtered *tumu* and *bashi* in their rage, as well as Han settlers.

2. Commercial cultivation of mushrooms

In Yongbei Ting and the contiguous county of Dayao, the main activity that the settlers from Jiangsu and Zhejiang undertook after securing the rights to hill land, where the Lisu dwelled, was the cultivation of mushrooms. Their methods were so destructive that I should like to cite in full the description given in the 1845 Dayao county gazetteer:

In recent years, immigrants from Jiangsu and Zhejiang have bought forests through *dian* transactions. They fell large trees an armful in diameter, and lying them on the ground, pare off their tops and branches, and chisel twenty to thirty holes in the trunks. Fine ash is placed inside the holes, and a small quantity of a mixture containing the powder of the ground stipes of old mushrooms [of the species *xiangxun*, *Lentinus edodes* (Berk) Sing.] and cold rice gruel is applied to each hole, which is then covered with branches and leaves to protect it from the sun. One to two years later, following the spring rains, a sparse [crop of] some tens of mushrooms appears. After four to five years, they sprout profusely, growing close together; there are [now] thousands of mushrooms on all the trees, and the whole scene is called a red mountain (*hongshan*).

After ten years or so, the trees decay and the mountains are left bare. In a short space of time, the people's insatiable greed for quick profit has caused the decay and rot of timber [which once covered] mountains and peaks shaded from the sun by misty vapours, and in the worst affected places even firewood gathering and grass cutting have become impossible. It is the same throughout the county.... Merchants gain profit from [shipping the mushrooms] to Jiangsu and Zhejiang.⁴

Prior to the arrival of the Han, the Lisu and other swidden cultivators did forage for fungi on fallen trees for use in trade, but the quantities gathered were minimal, and they never practised the type of technique described here. The high sale value of mushrooms on the great commercial markets in Jiangsu and Zhejiang was what led the Han

immigrants to engage in intensive cultivation without regard for the environment. But production could only be sustained for a decade or so, and the outcome, as elsewhere, was denuded mountains and soil erosion. For swidden cultivators, the outright destruction of their environment threatened their very livelihoods, for it meant a loss of their hunting and grazing grounds, as well as a reduction in the total area available for slash and burn agriculture.

We can be certain that such destruction was well advanced in Beisheng Aboriginal Department, for just before the uprising, Lisu there burned down the huts of Zhejiang immigrants who had been growing mushrooms on land illicitly acquired through a *dian* transaction from a *tumu* named Li Chaogui in 1818.

Apart from the details, there may appear to be nothing startlingly new in this story as told by Takeuchi. It is well known that the expansion of commercial agriculture into virgin hill land by Han settlers created deforestation and soil erosion. But I suggest that it does have significance for ethno-history. Degradation of the environment by Han settlers made it impossible for non-Han swidden cultivators to maintain their customary modes of production: they either had to adopt sedentary agriculture and assimilate to Han culture, or move on in search of new land where they could retain their ethnic identity. Over the past 300 years, the Lisu have been continually forced to migrate south from their original base to the Nujiang River, the Sino-Burmese border area, and even as far away as northern Thailand. This attests to their persistent desire for an independent lifestyle.

In conclusion, Takeuchi says, “mass scale colonization by the Han from the eighteenth century not only created tension with the cultivators on the plains, such as Tai peoples who practised agriculture on valley floors along the Jinsha River. It also dealt a blow to the livelihood of the Lisu, who relied on swidden agriculture and hunting, because commercial cultivation on hill land resulted in the accelerated degradation of the environment. In this way, the history of minority peoples cannot possibly be unrelated to the Han-centric history of China. On the reverse side, social change among the minority peoples persuasively demonstrates the special characteristics of mid-Qing Chinese society, which spawned a huge surplus population and mass migration to border areas, and radically changed the environment everywhere.”⁵ Perhaps we need to follow Takeuchi’s suggestion, and pay more attention to the ethnic side of the history of environmental degradation in China.

[Next installment: “Traditional Practices of Non-Han Swidden Cultivators for the Protection of Forests.” Forthcoming in the Spring 1995 issue of CEHN.]

REFERENCES

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Takeuchi used the following two main sources, both of which are in the possession of the Tōyō Bunko, Tokyo:

- (i) Qing Bao, *Zougao* — *Yun Gui zongdu rennei*: a set of draft copies of memorials submitted to the throne by Qing while Governor-General of Yunnan and Guizhou;
- (ii) 1845 *Dayao xianzhi* (Gazetteer for Dayao County).

3. Qing Bao, *Zougao*, *juan* 10 (no pagination). Takeuchi does not quote this passage.

4. 1845 *Dayao xianzhi*, 6:3b-4a. Also cited by Takeuchi, p. 286.

5. Takeuchi, p. 287.

Mountains and Forests: The History of the Shaoxing Highlands during the Fourth-Eighteenth Centuries

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Shaoxing, in northern Zhejiang, has been developing as a densely populated economic core area since the twelfth century. Broadly speaking, the region comprises two distinct geographical components: a river-drained plain, and, to the south of it, a mountainous area. In some Japanese scholarship, water control is considered the most important factor in the evolution of Shaoxing’s agricultural landscape, and hence, in the high level of its pre-modern economic development.² My research, however, is concerned with Shaoxing people’s contact with their highlands, and the resulting destruction of the woodlands, a theme missing from the existing scholarship on this region.

The destruction of the Shaoxing woodlands was produced by a combination of forces, and took place over a long period. Some tracts of forest fell victim to environmental abuse quite early; others were well preserved under the management of private estates until the fourteenth century, when dramatic changes took place in the socio-economic order of the Shaoxing highlands. This research seeks to establish the linkage between the environmental degeneration of the Shaoxing highlands, and shifts in the pattern of the Shaoxing people’s interaction with their highland environment over fifteen centuries.

The Destruction of Shaoxing's Forests in the Last 1,000 years

At the turn of the nineteenth century, two things especially struck Western missionaries and travellers in China: the poverty-ridden rural society, and the myriad hills bare of trees. The impoverished vegetation of the Shaoxing highlands is reflected in the centuries-old saying: "Shaoxing has hills but no firewood, water but no fish, and men but no righteousness."³ The environmental degradation of the Shaoxing highlands has been a complex process enmeshed with numerous other developments, both local and external.

Three factors in particular have been responsible for destroying Shaoxing's highland forests: commercial logging, the introduction of American food crops, and what may be called the "ecological despotism" of the late imperial state.

1. *Commercial logging.* This can be traced back at least to the Southern Song dynasty, for it is mentioned in a text by the poet Lu You (1125-1210), a native of Shaoxing. The passage in question contains Lu's instructions to his descendants not to plant more than "a few tens of trees" around his tomb. Lu claims that in the centuries since trees were planted near the tombs of his distant ancestors, "a dense forest sprawling up hills and down valleys" had developed. Unfortunately, however, "later generations have misbehaved by logging trees for trade." In putting limits on the afforestation to be carried out around his own tomb, Lu was anticipating that such misbehaviour would continue. He was motivated partly by concern that his family's "virtue" would be "stained" by the disputes that would occur if the family attempted to prohibit logging, and partly by the desire "not to tempt my descendants into unfilial behaviour."

It may be a mistake to assume that, at this stage, ecological damage was not as serious in the minds of the élite as the decline of morality. One of Lu's contemporaries, Wei Xian, commented as follows on the soil erosion that had resulted from the extensive commercial logging on steep slopes in the Siming Mountains:

The Siming Mountains.... afford the beauty of seclusion amidst a thousand peaks. In the past, giant trees stood in dense forests there; valleys stretching along the streams were covered by dense bamboo thickets. Although floodwaters could burst forth suddenly and flow down [the hillsides] rapidly, little soil was washed away because it was well fixed by the roots of trees. Accordingly, there was little sediment deposited by the water, and dredging [channels and lakes] was quite easy. In recent years, however, as the price of timber has gone up, [people] carrying axes have been frequenting the mountains, [in search of timber]. Few hills have not been denuded, and all the bamboo thickets on the

stream flats have also been slashed down. During the flood season, torrents rush down fiercely because there are no trees to intercept them. Because there is no turf shrouding the soil, the top soil is washed down with the floods into the valleys.... The deposit fills the beds of the creeks, so that the fords of early times have turned into dry land."

2. *"Ecological despotism."* This was a characteristic of government policy in so far as it affected the Shaoxing highlands in the Ming and Qing periods (1368-1911). The government drained resources substantially from the highlands, and took little or no responsibility for restoring the highland environment. For example, several commissioners specially charged to "supervise military men and civilians for timber logging" were dispatched to Zhejiang (as well as Sichuan, Jiangxi, and Hunan) in 1407. The Jiajing reign (1522-66) saw the creation of some long-term central government posts for "logging commissars", whose sole responsibility was to direct the logging campaigns. The massive logging was renewed in the early Qing.⁴ According to gazetteer records, it had devastating effects in the target areas, including Shaoxing. Meanwhile, local governments also imposed heavy levies of fuel wood on local residents in order to meet various needs, such as firing bricks for city walls and watch-towers.

In addition, high government taxation of hill lands made the owners indifferent to the state of the vegetation on the hills. The hill taxes were quite light at the beginning of the Ming; heavy taxes began to be imposed on hill-lands from the mid-Ming on. In Sheng county, for instance, the government imposed upon all those who owned hill lands a hill-land tax assessed according to the area of their rice paddy holdings. Thus many farmers tried as hard as possible to escape the taxes by falsely transferring the ownership of their hill lands to people who had tax exemption privileges. Some who failed to avoid the levies simply abandoned their hill lands. It is possible that before they gave up their control over the hill lands, they carried out a depletive extraction of all the hill lands' economically valuable resources. The hill lands then reverted to waste.

On several occasions, the local government interfered with property rights over private woods. When natural disasters were unexpectedly prolonged, and the local government had therefore run out of its reserves of famine relief grain, it ordered that all privately owned woods, lakes and hills be opened to the free use of the public. Such orders undoubtedly encouraged environmental abuse by the owners, who promptly cut all the trees and gathered everything of economic value from their reed grounds and woods before handing the land over to the famine victims. The woods were further damaged by the "free riders", who were not brought to account for their actions. The authorities did pay the owners some rent for their reed-beds

and woodlands, but the money hardly compensated for the environmental damage.

3. *The introduction of American food crops.* This dealt the last, and fatal, blow. In the late sixteenth century, the expanding lowland population, encouraged by the availability of such imported crops as maize, potatoes, and sweet potatoes, began to swarm up the mountains, and to support themselves by growing these new crops on the slopes. The environmental effects of this kind of farming were devastating in the Shaoxing highlands.⁵

The Pre-Ming Contrast: Environmental Preservation under the Estate Economy

If the above developments were taken to represent the whole environmental history of the Shaoxing highlands, there would be some serious omissions in our understanding.

The environmental degeneration of the Shaoxing highlands was not an inevitable consequence of human activity *per se*.

In an earlier period of Chinese history, the economy and way of life of mountain-dwellers did not greatly damage the stability of the surrounding environment. Full understanding of the long-term processes of environmental change in Shaoxing requires investigation of the pre-Ming highland social order and its fate.

In the fourth century A.D., Shaoxing was renowned for the beauty of its mountains and waters. It accordingly attracted many scholar-officials and famous literati from other parts of China to establish estates and take up residence there. This further enhanced Shaoxing's reputation among scholars and retired officials as a place for living the good life in the highlands. In the Tang and Song dynasties (seventh to thirteenth centuries), numerous private mountain estates (*shanzhuang*) were founded in Shaoxing, not to mention monasteries and monastic estates.

Before the fourteenth century, the mountain estates of intellectuals and religious organizations (especially Buddhist monasteries) and private academies constituted the dominant economic and political order in the highlands. These estates varied in size, but the great majority embraced more than one ecosystem in the area which they controlled. I consider the estate economy to have been a highland resource-use system, even though it was not operated for environmental conservation. The estate economy was characterized by a combination of economic activities, including rice cultivation in the valley floors and afforestation on the foothills. Intellectual activities and religious fulfillment, rather than economic pursuits, lay at the heart of the highland way of life. The estate economy, although not self-sufficient, was little influenced by economic forces in the lowlands. The existence of the montane estates posed few threats to the overall stability of the highland environment.

The decline of the mountain estates, both religious and intellectual, took place largely in the Ming, and has been

discussed in studies focussing primarily on the China-wide shift in the social and intellectual functions of Buddhist monasteries and Confucian academies from Song to Ming. Little attention has been paid to the environmental effects of the decline. Gazetteer references indicate that by mid-Ming times, most of the buildings of the mountain academy estates were abandoned and in ruins, and the estate lands lost. The monastic estates, meanwhile, were hard hit by official confiscations of their landholdings during the Ming. Some recent scholarship also suggests a change in the nature of Buddhist foundations between Song and Ming.

Song monasteries were essentially private institutions, providing prominent families and lineages with intercessory services; Ming monasteries provided religious services for the broader community.⁶ Paradoxically, while the religious functions of Ming monasteries expanded to serve a larger rural population, their economic autonomy and size decreased. This contrast between the religious functions and economic bases of Song and Ming monasteries is fully reflected in the Shaoxing local gazetteers. Many monasteries lost their landholdings, and lived on the public funds collected in their "service areas", as well as on individual donations, during the Ming dynasty.

The deforestation of the Shaoxing highlands can in some measure be attributed to the decline of the montane estate economy. Although, as has been shown above, commercial logging was already taking its toll by the beginning of the thirteenth century, the collapse of the control previously exerted by the estates removed the last restraint on abuse of the highland environment. All woodlands were now left at the mercy of both timber-cutters and land-seekers. For example, a gazetteer of religious institutions points out that once the Zhao Hill Monastery in Hangzhou had sold its hill lands to lay people, all the woods on the slopes were uprooted (it is not clear for what purpose).

Conclusion

The patterns of environmental change cannot be understood without an understanding of the impact of social and economic processes. In the case of Shaoxing, the differences between the human impact on the highland environment in each of the two periods (pre-Ming and Ming-Qing) are so noticeable as to bespeak two distinct patterns in the Shaoxing people's use of their highland environment. The shift from one to the other coincided with China's transition to the later imperial period, a transition that began in the late Song, and extended into almost all aspects of social and economic life in the Ming. A new pattern of human interaction with the natural environment would seem to have been one additional dimension of this transition.

NOTES

1. This report is based on part of my Ph.D. dissertation, *Environment, Technology, and Society: Landscape Change in Shaoxing from the Tenth to Eighteenth Centuries*, to be submitted to the Australian National University by early 1995. Exact references to all primary sources used in this report will be found in the dissertation.
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Sustainable Development: A View from Historical Geography

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Sustainable development is an important theoretical and practical problem. It involves three strategic concepts: environmental sustainability, economic sustainability, and social sustainability. The essence of the problem is to establish a benign cycle of harmonious coexistence, mutual compatibility, and sustained development between human society and the natural environment. The various non-benign relationships — that is to say, the contradictions

and collisions between population, resources, environment, and economic and social development — did not begin in the contemporary period. Rather, they have a long history, and have evolved through long-term, cumulative processes. This is a law applying to the emergence, development, and evolution of all such geographical phenomena as population, resources, environment, and developmental problems. It cannot be deflected by any individual human will.

It is common knowledge that since the first appearance of man on Earth, there have been both human dependence upon nature, and human intervention affecting nature. However, the fact that human society has developed by stages, together with the gradual heightening of the level of productive forces, has brought about great differences in the extent of human exploitation, modification, and destruction of nature between one age and another. The hunter-gatherer way of life of the age of primitive society determined that mankind would have a purely dependent relationship with the surrounding resources and environment. However, once mankind had domesticated animals, and still more once it had domesticated plants and thus embarked on agriculture, a major change took place in the man-land relationship. Only then did man begin to leave his own imprint on the natural world through purposeful labour such as draining marshes, felling forests, and opening up grasslands for cultivation.

Accompanying the advance of human history, and the raising of the level of productive forces, man opened up nature, made demands on the planet's resources, and influenced or even ruined the environment, processes which led to the appearance of many spectacular cultural landscapes. Under the impact of the frequent human interventions, the natural world changed from an evolution of geological and biological nature to what might be termed “human-historical nature” and “human present-day nature.” However, owing to the intensification of human modificatory activity, a great difference has already appeared between human-historical nature and human present-day nature.

Since mankind entered its present stage (industrialization), the man-nature contradictions which have built up over the historical long term are still on a rising trend, owing to man's neglect of measures to conserve global resources and the global environment, coupled with the inappropriateness of some developmental activities. These contradictions manifest themselves as daily worsening problems of population, resources, environment, disasters, and development, and finally become long-term constraints on the social and economic development of all nations. The mutual incompatibility between global population, resources, environment, and development is beginning seriously to fetter the sustainable development of society and the economy on one hand, resources and the environment on the other.

In the course of this whole process, mankind has paid a heavy price, and there are bitter lessons to be learned from it.

It is time to take stock, and to clarify how the present configuration of man-land relationships has taken shape, and how it can be expected to evolve in future. This will better prepare us to profit from the lessons of experience. If we merely address the immediate problems on an *ad hoc* basis, this will be no different from “treating the symptoms, but ignoring the disease.”

The multiplication of the human species is a mark of its successful development. The fact that, while continuously adjusting the relations of production, mankind has been improving its production technology and raising the productivity of labour, is also a manifestation of social progress. If mankind is to live and develop, it cannot refrain from demanding the wherewithal for life from nature, or from affecting and reshaping its environment. However, all mankind’s social and economic activities should put socioeconomic development in a balanced relationship with resources and the carrying capacity of the environment. Mankind should not short-sightedly pursue mere short-term benefit.

It is therefore necessary to carry out numerous in-depth studies, centering on investigation of the processes, both historical and present-day, involved in the man-land relationship. The purpose of such studies is to elucidate the links between human history and man-land relationships, demonstrating the mutual influences between the various elements which have determined the nature, characteristics, and trends of these relationships. Through research on the state of, and interactions involved in, man-land processes; the creation and development processes of geographical environments; and the elements influencing all these processes, it will be possible to go on to distinguish between those features which are survivals, those which are still progressing, and those which belong to the present age. It will be possible to predict future changes, and their form, scale, and speed. Such research will play an important role both in establishing the theoretical underpinning of sustainable development, and in carrying out the actual procedures necessary for realizing sustainable development.

Because of this, sustainable development is not merely a matter of balancing contemporary population, resources, environment, and economic development. It also involves research into the origins of the contradictions and collisions between these factors. If one ignores the latter aspect, the investigation of many important theoretical and practical questions pertaining to sustainable development will lack foundations. In that case, it will be difficult either to understand the real rationale of sustainable development, or to predict future developments.

In sum, after the lessons and dilemmas of the contradictions and collisions in man-land relationships, sustainable development is mankind’s necessary choice. The transition it implies from contradictions and collisions to benign cycles of balanced development represents a great change in terms of logical thought and objective practice. The turn towards sustainable development embodies

mankind’s retrospective recognition of the severe ill-effects of the blind, not to say unbridled, socioeconomic practices of the past, and a new understanding of man-land processes.

Sustainable development is therefore also a historical category.

Obtaining a comprehensive understanding and scientific evaluation of the processes and present state of the man-land relationship, and elucidating the formation and development of this relationship in historical times, are precisely the distinctive disciplinary strengths of historical geography. Since the 1950s, historical geographers such as Hou Renzhi have written a number of penetrating discussions of historical geography, its theoretical value, and its practical significance. In the opinion of Professor Huang Bingwei, “To study geography and environment in combination is to gain a dialectical appreciation of the path taken by the formation and development of each... Such combined study involves two interconnected, complementary aspects: research into contemporary processes, and research into historical formation. Neither aspect is dispensable [since both can serve] to help us gain a still deeper understanding of geographical and environmental formation and development.” This is because “The geographical environment is a product of history. If one does not know about its past, one will not be able to gain complete understanding of its present state, or correctly to predict its future.”

Historical geography in action: two case studies

Since the establishment of the new China in 1949, the study of historical geography, guided by correct theory and methodology, has consistently upheld the principles of connecting theory and practice, and making scientific research serve social actuality. The discipline has achieved a series of significant results. Here, I will give two examples that are related to the question of sustainable development.

1. *Research on environmental change and balanced development in the imperial hunting zone of the Qing dynasty (1644-1911).* The Qing imperial hunting park was established in 1681, and is situated in the north-west of present-day Hebei. This was originally an area of rich marsh vegetation and thick woodlands, with a cover rate of more than 60%. There was an abundance of wild animals, with some tens of species. In the autumn hunt of 1692, the spoils included four tigers, two bears, ten wild boars, and 728 deer of different kinds. However, from late Qing times on, this region has become almost completely deforested; it has experienced a sharp decrease in its *fauna*, severe soil erosion, partial desertification, and general environmental degradation. What force brought about such striking change, and through what processes did the change take place? This, clearly, is a question to which other

disciplines cannot provide a complete answer.

Historical geographical research, however, has revealed the following, which is in addition to the general principles that the combined pressures of agriculture and herding lead to environmental fragility, and that the impact of human activity can readily lead to environmental degradation. The pressures which led, ultimately, to a forest cover rate as low as 7.6% in the early 1950s included: the felling of trees for timber from the late eighteenth century on; the poaching of the *fauna*; and, above all, the renting out of the land for cultivation in the late nineteenth century. Blindly over-intense agricultural reclamation led to extensive destruction of forests, through burning and felling. The wild animal populations suffered still more severely through capture, killing, or expulsion. Thus, it was totally unrestrained human economic activities which single-handedly brought about the sharpened contradictions between population, resources, environment, and economic and social development in the hunting park area over the last century and more.

During the four decades and more since Liberation (1949), the systemic contradictions between man and land in the hunting park area have been continuing to develop, and the situation is not promising. Historical geographical research has formulated the following strategic proposals for sustained development in the area:

1. In view of the characteristics of the minority people's counties in the hunting park area, strict attention should be paid to making planned parenthood work effective. Efforts should be made to control population growth within the area, and to relax the pressure of uninterrupted population growth.
2. Given that the pursuit of a purely agricultural economy has been the root cause of rapid environmental deterioration, it is necessary to overthrow the traditional purely agricultural regime, and make full use of the local resources and ecological conditions. The policy direction of uniting development and conservation must be firmly maintained. Cultivable land per person is high in this area (three *mu* per head), but productivity per *mu* is low. It is urgent to strengthen the agricultural infrastructure, and expand the number of stable-output and high-output fields. The policy of returning slopes of more than 25° elevation to forestry or grazing must be upheld.
- Further imperatives are to put the management of small watershed and gullied agricultural zones on a sound footing; to extend afforestation; and to improve the agricultural environment, eradicating soil erosion, reducing the danger of sandstorms, and promoting benign regional environmental cycles. These measures, combined with rational utilization of the local resources, the development of a variety of enterprises, and expansion of the ecological carrying capacity, provide a basic blueprint for managing and improving the environment of this region.
3. It is necessary to carry out rational zoning on the basis of natural characteristics, combining the achievements of the so-called "Green Great Wall" afforestation scheme with the

local resource characteristics, and following scientific principles for the planning and management of natural resources. Regimes should be developed in which trees, grasses, and shrubs support each others' growth; there is an appropriate combination of strip-afforestation, network-afforestation, and full-cover afforestation; and there is mixed coniferous and broad-leaved forest. A complete ecosystem, demonstrating overall natural efficacy, should be established.

The case study discussed above has not only revealed the origin of problems in the man-land relationship in the hunting park area; it has also directly provided feasible strategies and approaches for improving this relationship. It objectively demonstrates the special strengths of historical geographical research when applied to practical problems.

2. *Research on population, resources, environment, and balanced, sustainable development in reservoir zones.* Since the 1950s, the reservoirs (especially the large and middle-sized ones) created in order to develop water conservancy have achieved important economic results in extending irrigation, improving agricultural conditions and traditional cropping patterns, raising output per unit area, developing hydro-electric power, and providing increased energy. At the same time, they have also yielded significant social benefits through flood control, hydrological management, protection of the lives and property of downstream communities, and regulation of the availability of water. However, in the reservoir zones (that is to say, the areas surrounding reservoirs), daily sharpening contradictions between population, resources, the environment, and socio-economic development have been generated by the submerging of farmland and the consequent relocation of the local inhabitants.

Reservoir zone research, carried out under the guidance of historical geographical theory, has taken as its first task the reconstruction of the basic man-land ecosystems prior to reservoir construction. It has sought to prepare preliminary cross-sections for comparative analysis of the process by which later man-land ecosystems developed. This research has shown that before the reservoirs were built, the fertility of valley soils and the abundance of water resources had encouraged the development of prosperous valley agriculture with villages and even towns and cities (albeit not all on the same scale). The man-land ecosystems were balanced, or at least basically balanced. The construction of the reservoirs fundamentally transformed these local societal arrangements. Statistics show that the 168 large or middle-sized reservoirs of Shandong submerged a total of 1,540,000 *mu* of cultivated land; led to the relocation of over 1,900 villages; caused the destruction of 920,000 units of dwelling space; and forced over 800,000 people to move to higher land. The average amount of farmland submerged per person was 1.72 *mu*, while the average amount of remaining land available per person was only 1.21 *mu*. The results of the

population relocation brought excessively heavy pressure to bear on the resources and environment of the reservoir zones.

Investigations have shown that economic conditions in reservoir zones are everywhere below the average level for the county or municipality where they are situated. Besides this, a considerable proportion of the reservoir zones are now confronting severe problems of population increase, shrinkage of cultivable area, resource depletion, environmental degradation, economic backwardness, isolation, shortage of capital, poverty, and contraction of educational opportunities. For example, let us take the 20,604 people of the reservoir zones of the middle-sized reservoirs at Hezhuang, Longwantao and Huacun, in the Taiyi mountain area of Shandong province, within the jurisdiction of Jining. At the end of 1992, the average acreage of cultivable land *per capita* was only 0.49 *mu*, income *per capita* was only 224.62 *yuan*, and grain consumption *per capita* was 104 Kg. Such a state of affairs objectively reflects the sharpness of the contradictions between population, resources, environment and development in certain reservoir zones.

The cooperative research of historical geography and other concerned disciplines has produced the following preliminary blueprint for dealing with the problems of sustainable socio-economic development in reservoir zones:

1. For each reservoir zone, searching and systematic studies of the whole drainage basin should be carried out, ignoring administrative boundaries. The carrying capacity of the environment and resources of the reservoir zone should be ascertained, and comprehensive planning and unified management implemented.

2. Development in support of the poor should be firmly upheld. Investment should be intensified, purely agricultural economic regimes should be overthrown, policies of preferential treatment should be implemented, and overall development strategies should be set in motion. The vitality of each local economy should be strengthened, and reservoir zone society should be reconstructed.

3. Planned parenthood should be implemented, and population growth rigorously controlled. There should be intensified intellectual investment and technological instruction so as to improve the population's skill levels.

4. Attention should be paid to the distribution of benefits both upstream and downstream. The transfer of the surplus labour power of the reservoir zones to non-agricultural occupations downstream should be promoted, so as completely to relax the contradictions between population, resources, environment, and development.

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As can be seen from the above, the practical value for society of historical geographical research should not be disregarded. Neither should one overlook its role in the search for solutions to the present global problems of

population, resources, environment, and sustainable development.

In sum, historical geography is not only an important basic theoretical discipline; it is also an applied discipline which can render direct service to social praxis and economic construction. Whether the research be on the reciprocal relationships between those vital factors, population, resources, environment, and society and the economy, and the formation and development of these relationships; or whether it be on providing viable policy ideas for addressing the problems of sustainable socio-economic development, experience has already demonstrated, and will continue to demonstrate, that historical geography has an important role to play. Meanwhile, sustainable development itself provides a new opportunity and impetus for the further progress of our discipline. Only by elucidating the past, and relating it to the present, can we scientifically anticipate the future, and contribute to the important subject of sustainable development.

[Translated by Helen Dunstan]

The Problem of Timber Supply in Jiangnan during the Ming-Qing Period (1368-1911)¹

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[Note: The "Jiangnan" region of Ming-Qing common parlance had no precise borders, but included at least Jiangsu south of the Yangzi and northern Zhejiang. It is convenient to regard it as corresponding to what G. William Skinner identified in 1977 as the "core" area of the Lower Yangzi Macroregion.]

Before the industrial revolution, wood was the basic construction material for houses, ships, tools, and furniture. Western European economic historians have called the pre-industrial period "The Age of Timber", and the same was true of Jiangnan during the Ming and Qing dynasties.

Agricultural and Industrial Demands for Timber

Most tools used in agricultural and industrial production in Ming-Qing Jiangnan, from well sweeps to spinning wheels, bellows for metal smelting, and iron-tipped tools, were mainly made of wood. Small hand tools did not use much wood, but large production tools consumed much more. The largest ox-drawn waterwheels and human-

powered water pumps were over two *zhang* long.² Large timbers used in oil presses “must be an armful in circumference.” Such large devices were not commonly used in Jiangnan, to be sure. But even though each individual small tool used very little wood, the large total number in use and their rapid rate of deterioration meant that every year a great amount of wood was consumed in their production and repair.

In Jiangnan, the shipbuilding and construction industries were the largest wood consumers. According to Yuan regulations, one small riverboat required 203 wooden boards of different sizes, not including the spars, pegs, and oars. According to early Ming regulations, a medium-sized seagoing ship was to consume a total of 513 tree trunks. Shipbuilding required not only larger pieces of timber, but many different varieties of wood. For example, in building an inland cargo boat, “For the mast one uses straight trunks of fir; for the beams and ribs, cedar, oak, camphor, elm, or locust wood... for the rudder-post, elm or oak; for the tiller, evergreen or locust; and for the oars, fir or Chinese juniper.”

Shipbuilders built seagoing ships, grain tribute boats, warships, and even more interior river and lake boats. One source describes how in Jiangnan “for 700 *li* there was nothing but deep creeks, small rivers and inlets, and countless myriads of ‘wave boats.’” There were also many fishing boats, the largest of which were as big as medium to large-sized seagoing ships. There were great numbers of farmers’ boats, used to carry manure to the fields. Furthermore, “pine features prominently among the local products of Zhejiang and Jiangsu, but it rots quickly in water”, so the boats had to be replaced rather quickly. Ming dynasty regulations for tribute-grain boats required replacement of pine boats every five years, and cedar boats every seven years, plus annual repairs. The demand for timber to repair and replace ships was extremely large.

Jiangnan housing construction used very few bricks; most houses were made of wood and bamboo, even in the busiest cities. Even by the Qing dynasty, “from the foundation to the beams and pillars..., only wood was used. Wood was used for fences and walls, bamboo as the bedding for tiles.... [Everything in the house] was made of either bamboo or wood.” Since wood decays easily, houses constantly needed to be repaired and rebuilt. Also, because “bamboo and wood are so combustible, and there are no separations between the houses, it is easy for neighboring houses to catch fire, and the fire becomes impossible to stop. This is inevitable.” Fires which destroyed anything from tens to myriads of dwellings happened every year in Hangzhou. In Nanjing likewise, “the god of fire brought incessant disaster.” Very significant amounts of timber were needed both for ordinary maintenance and for replacement of housing after fires.

Sources of Timber

Jiangnan has very few woods. There were practically no woods in the flat areas. “There are only trees

around the villages; they are rarely seen along rivers and creeks in the fields. Where there used to be trees, they have been cut down for tools, or the small ones for firewood.” It is thus recorded that Changshu “has no building materials for homes”, and Wuxi “has too little wood to supply [its own] housing materials.”

In Zhejiang, the western parts of Huzhou and Hangzhou prefectures had some mountain forests, but because of transport difficulties, large trees could not be carried out whole. They could only be cut into boards and then exported. Even more important, the amount of wood in this area was quite limited, and was constantly decreasing. In Yuqian County, “The towering ridges and peaks had luxuriant vegetation and thick forests from ancient times”, but “the large pine trunks were used for beams, the smaller ones for rafters and furniture.” By the late eighteenth century, “only a few trees were scattered here and there.”

Since local forest supplies were seriously inadequate, Ming-Qing Jiangnan already had some man-made forests. In the early sixteenth century, there were sandalwood plantations in Jiangyin, and “great profits were made from selling [the timber].” By the early nineteenth century, there was artificial cultivation of pine and fir in Yuqian. However, it took at least a few decades for trees to be ready for cutting, so this was not an effective solution to the timber shortage. As Jiangnan timber resources became increasingly scarce, the gap between supply and demand grew more and more severe. During the early Qing, when many warships were built in Jiangnan, lumber became very hard to find. At the end of the 1650s, “After repeated construction of [war]ships, there was no trace of large tree trunks [in Jiangnan and Zhejiang].” When warships were built in Zhenjiang in 1662, even ancient trees in private gardens could not escape being cut down. Again, in 1677, magistrates in Jiangnan had to go personally to the countryside to search for large trees. When they found one, they sealed it off. From these incidents, one can see that the timber crisis was extremely serious. The only solution was to import large quantities of timber from outside.

Ever since the tenth century, Jiangnan had begun to import timber from Hunan and Jiangxi. By the twelfth century, all the wood for shipbuilding in Jiankang Prefecture (present-day Nanjing) came from these upstream regions. Adjacent prefectures such as Xuanzhou and Shezhou (in modern Anhui) were also important suppliers of timber to Jiangnan throughout the Song and Yuan periods. Besides this, Mingzhou (Ningbo) in Song and Yuan times imported pine and fir planks and other timber from Japan. A portion of this timber must have been re-exported to Jiangnan.

During the Ming-Qing period, even more regions exported their lumber to Jiangnan. For large timbers, Kaihua and Changshan Counties in Quzhou Prefecture, Zhejiang were major suppliers. In Kaihua in Ming times, “In the heyday of the trade in fir, the profits were not less than hundreds of thousands [of taels] a year.” This trade seems to have been dependent on heavy capital investment

by Huizhou merchants, “and on smooth sales in the Lower Yangzi.” In the early Qing, a Huizhou timber merchant surnamed Cheng “was always selecting timber in Quzhou and Chuzhou Prefectures, and exporting it to Jiangnan. Because of this, he was always based in Kaihua.” A Huizhou merchant named Wang went to Changshan to buy fir, and purchased a Mr. Ding’s forest for as much as 1,500 taels. The fir trees were for the most part transported down the Fuchun River to Hangzhou and its neighbors. Mountainous Yanzhou Prefecture also produced fir trunks. “The large ones could be made into beams and rafters, the small ones could be used for firewood and steaming equipment.” There were also Huizhou businessmen yearly doing business there. Yanzhou had always been on the route of lumber exports from Quzhou to Zhejiang, so its own wood must also have been shipped along the Fuchun River to the Hangzhou/Jiaxing/Huzhou lowlands.

Southern Anhui’s Huizhou and Ningguo Prefectures also exported wood to Jiangnan. Huizhou produced high quality fir. “It was needed for everything, from beams to small implements.” “Every year wood merchants cut down trees in winter, and then wait until the fifth or sixth moons, when the waters rise. The timber destined for Zhejiang [is floated downstream] via Yanzhou, while that intended for Jiangnan [is floated] via Jixi. It is very easy.” In Ningguo, “Merchants regard fir as the best investment.... Some of them come with hundreds of taels, or even a thousand taels [to buy it].”

Imports by sea from Fujian were very popular. Fujian merchants in the Ming “went to Fujian to purchase fir, transferring it [from sea-going ships to smaller craft] at Dinghai [off the Northern Zhejiang coast opposite Ningbo].”

Another source speaks of powerful Ningbo houses buying wood in Zhangzhou. Zhejiang’s timber imports from Fujian were especially great in mid-Qing times, and there is some evidence of government encouragement for this timber trade.

One source claims that half the timber used in Zhejiang came from Fujian.

Most Hunanese timber came from the western mountains of the province, and was called “Miao wood” after the Miao people who lived in that region. Attracted by its high quality, Huizhou timber merchants purchased large amounts, sometimes paying thousands of taels of silver for one lot. The timber was sent down the Yangzi to Jiangnan in the form of rafts.

Good timber sources in southern China were concentrated mostly in the southwest. In the Ming and Qing dynasties, with the rapid depletion of timber resources in Eastern and Central China, people began to pay greater attention to southwestern timber. Wang Shixing, Wang Xiangjin and Fang Yizhi all pointed out the richness of the southwest’s forests. Wang Shixing opined that “the great woods of the mountain depths would last for hundreds, nay a thousand, years of felling”, while Fang Yizhi observed that Sichuan fir was of superior quality compared with that of Fujian. The opening and development of timber sources in

the southwest was thus of great significance.

In Ming-Qing times, the timber of Sichuan and Guizhou was already being harvested on a small scale. By the late Ming, surprisingly large amounts of timber were being transported from Sichuan. For example, palace construction in 1607 entailed expenditure of 3,630,000 taels for 24,601 huge trunks of Sichuan fir and cedar. After purchase, the logs were floated down the Jinsha River. To float timber, merchants “inscribed their names on the logs, and then collected them downstream.” In Qing times also, the eastward timber trade from Sichuan continued to flourish, as shown by the fact that timber tax receipts for 1727-28 at the Chongqing customs station totalled 6,061 taels. Chongqing itself became a key timber collection center.

Guizhou also sent much timber to Jiangnan. The large cedar trunks were mostly bought by the government for palace construction, while the smaller ones were cut into planks by local merchants. The planks were used to make cargo boats which, on arrival in Jiangnan, would be dismantled, and their timbers used to manufacture other objects. “Of late, all the utensils of the Suzhou region have been made of timber from this source.” Zunyi, in northern Guizhou, was a major timber-producing region from the sixteenth century onwards. Zunyi timber was floated down a tributary into the Yangzi, and so on down to Jiangsu. The outlet for logs from eastern Guizhou was via Hunan, while those from the southeastern part of the province could also go to Jiangnan via Guangxi and Jiangxi.

From this discussion, we can conclude that Jiangnan timber came primarily from other southern provinces; the scale of imports greatly exceeded that of former times, and the timber was drawn from a much broader area than previously.

Benefits and problems brought by timber imports

The increase of timber imports in Jiangnan was a result of the strengthening of economic ties between Jiangnan, the Yangzi river basin, and Fujian province. Commodity exchanges between Jiangnan, Zhejiang, Southern Anhui, Fujian, Jiangxi, and Hunan were reasonably frequent in the Song and Yuan dynasties, but developed much more in the Ming and Qing. Timber trade played an important role in stimulating this trade. For instance, the main imports from Fujian to Jiangnan were confined to iron products and fruit before the Ming, but the trade later increased greatly, with timber an increasingly important component.

The timber business also stimulated trade between Jiangnan and the southwestern provinces, including Sichuan. Economic exchange between the two areas was very limited before the Ming, but then large timber exports from the southwest to Jiangnan caused a great transformation. Zhang Han’s discussion of Ming markets mentions that those merchants who seek great profits go either west into Sichuan or south to Guangdong, and realize fabulous returns on pearls, jade, gold, and timber. In Suzhou, by the late seventeenth century, there were large timber markets alongside those for

rice, beans, medicines, fish, and salt. Jiangnan exported fine silk textiles and cottons to the southwest in exchange for the timber; thus merchants shipping Jiangnan textiles to Sichuan feature in many Ming-Qing short stories. Consequently, even remote areas of Sichuan became a major market for the Jiangnan textile business.

On the other hand, the enlargement of the timber supply areas needed by Jiangnan is evidence for a gap between demand and supply. Jiangnan's economic development greatly increased the demand for timber. Since timber in Jiangnan itself had disappeared in the Song, and the timber in much of Jiangxi and Hunan had been used up by the Qing, the only resources available were in the southwest. It was, however, extremely difficult and costly to transport big timbers from the remote and thickly-forested mountains in the southwest. "Whether a tree is worth 100 taels or 1,000 taels, it will still cost 1,000 taels to harvest.... Bringing one trunk out of the mountains often costs several lives." "Large trees floated on water have a spirit within them that greatly affects whether they float or sink, go sluggishly or swiftly." "Trunks which are caught in chasms [in the bank] cannot break free. Once the chasm is full of timber — which may take decades — the whole mass may be jolted into motion by a flood. People downstream compete to seize such timber as a windfall." The same source goes on to say that much of the timber which escapes the chasms is seized by "aboriginal bandits", who release it to its owners downstream in return for payment. In addition, the merchants suffered heavy losses through taxation and extortion by officials along the route. These extra costs naturally tended to be passed on to the consumer, making southwestern wood extremely expensive in Jiangnan. This was a serious constraint on the growth of imports of southwestern timber to Jiangnan.

Timber resources in Fujian remained abundant up to the mid-nineteenth century. Nevertheless, like Sichuan, Fujian was mostly mountainous, and it was very expensive to move the timber to Jiangnan, since by the mid-eighteenth century "almost all large trees near rivers and growing on south-facing slopes had been cut down." By the early nineteenth century, the Fujian shipyards had to shut down and wait for materials, because overcutting had exhausted supplies. Obtaining further supplies required penetrating into less easily accessible areas, which greatly raised costs. In the early Qing, "the value of one large tree [brought from Fujian to Jiangnan] was only some few taels, but the [transport] costs were 100-200 taels. This means that even [the costs for] one tree are enough to bankrupt a few men of moderate means." In the eighteenth century, one ship's mast from Fujian cost 400-500 taels, not including transport costs to Jiangnan. These prices greatly limited Fujian timber exports to Jiangnan.

In sum, although in Ming-Qing times Jiangnan imported timber from a wider area, the imports still could not meet the demand.

The influence of timber imports on the Jiangnan economy

Here are two examples of the scale of shipping development. First, in the early Ming, the "treasure ship" shipyard of Nanjing built huge long-distance sea-going "treasure ships", the largest of which had a displacement of 7,833 tons, over three times as large as the biggest warship of the British navy before the Industrial Revolution. These ships could travel as far as the coast of Africa. Partial figures suggest a very substantial increase in the number of "sand ships" plying along the coast from Jiangnan ports between the sixteenth and the eighteenth centuries. By the mid-Qing, "the ports of Shanghai and Zhapu each had 5,000 sea-going ships fit to make the voyage to Shandong or Guandong [Fengtian]; each ship could carry 2000-3000 *shi* [Chinese bushels] of freight."³ Timber imports were decisive in the growth of this shipbuilding industry.

The increase in timber imports also had a decisive impact on urban construction. Because of population increase, there was very swift urban expansion in Jiangnan during the Ming and Qing dynasties. According to Prof. Liu Shiji, there were 329 market towns in Jiangnan by the late Ming, and 517 by the mid-Qing. The number of large market towns (towns with more than 1,000 households) for which there are firm figures increased from about fourteen by the late Ming to nineteen by the mid-Qing. Population increase in the administrative capital cities was also very rapid. Urban construction demanded an enormous amount of timber. In the case of Hangzhou, imports from Quzhou, Yanzhou and the neighboring province of Fujian had to be supplemented with wood from the southwest. In 1612, all the timber needed to repair the Grand Canal in Jiaying Prefecture was purchased at the lower Yangzi river ports of Guazhou or Yizhen, and must have been imported from the middle or upper Yangzi.

Timber shortages, however, (along with other resource constraints) put limits on the growth of shipbuilding, housing, and industrial production. Only the government was able to build giant seagoing ships by using extra-economic pressure to force down the transport costs. Later on, even the government could not afford to build big ships. The cost of wood was one factor in the cessation of early Ming ocean exploration.

In the mid-Qing, the cost for a mast from Fujian was 400-500 taels, plus a much greater amount for transport costs. A sand-ship at least ten *zhang* long typically had four or five masts, so the expenditure merely on buying the wood for the masts could exceed 2,000 taels. Zhang Xie stated that in the mid-sixteenth century, one sea-going ship cost over 1,000 taels to build, while in the early nineteenth century, Bao Shichen estimated that "to build one ship in Jiangnan costs 7,000-8,000 taels." Qi Xueqiu wrote that "One large sand-ship costs a full ten thousand taels to build; a middle-sized ship costs thousands." The rising cost of wood was the main factor in the increased cost of shipbuilding. The high price of timber put the Jiangnan shipbuilding

industry in a very unfavorable position compared with that of shipbuilders in Fujian, Guangdong, and the lands of the “south seas”, where timber was much cheaper.

The shortage of timber also negatively affected the construction industry. Even in the early sixteenth century, people in Jiangyin lacked timbers for roof beams, so “to make a house frame they do not use one single long trunk, but patch together many small ones.... The support of the house relies entirely on the walls, not on the pillars; in poor houses the pillars are not as big as the rafters, but only the size of a medium-sized bamboo, so the houses easily collapse, and the costs of repair are high.” In Hangzhou, right down till the Kangxi period (1662-1722) “dwellings far from the markets, except for those of the élite.... are made of thin, shaky timbers; Jiangdong rafters serve as pillars.”

Finally, large factories holding many workers, or warehouses storing large amounts of goods could not be built without large timbers for beams and pillars, and many planks for rafters. The high price of wood, combined with the short supply of tiles, lime, and stone, made large buildings extremely expensive. One story recounts a situation in which a silk weaver in one of the towns of Wujiang County, Jiangsu, was gradually building up his business by buying extra looms. However, once he had six looms he could expand no further in his present workshop, nor could he afford to purchase larger premises. He had to make do with buying a small house from a neighbor to give him extra room. Only after nearly ten years of hard work and saving, assisted by a windfall, could he buy a large workshop that would accommodate thirty to forty looms, and thus embark on factory production. Since increasing the size of workplaces was an essential element in the change from individual handicraft to large-scale manufacturing, the scarcity of wood considerably constrained the development of factory handicraft production in Jiangnan.

NOTES

1. Professor Li's original article, “Ming-Qing shiqi Jiangnan diqu de mucai wenti”, will be found in *Zhongguo shehui jingji shi* 1986:1, pp. 86-96. The reader should consult the original for source references, which are not included here.
2. A *zhang* was approximately equivalent to 3.13 metres.
3. In the Qing dynasty, a standard *shi* was approximately equivalent to 103.6 litres.

The Terrain of the Commons in China and Environmental Change (A Response to Peter C. Perdue, “Thoughts on Chinese Property Rights in Land and Global Environmental Change”)

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The richness of China's land reform history makes it one of the key regions attracting the attention of scholars who are currently seeking to analyze how institutions such as property régimes serve to produce particular types of environmental transformation. According to Peter Perdue (1994), within the interdisciplinary group of scholars established to study the connection between landed property rights and global environmental change, there are two mainstream approaches which predominate in the discussions as to how to examine this key relationship. On the one hand is the economic perspective which focusses on the role of individual action and incentives in producing communal outcomes, and on the other is the anthropological perspective which situates the emergence of property rights structures within a cultural context which encompasses more than just material goals.

In pursuing a comparative inquiry into this connection between property and ecology, it is vital to locate a conceptual framework which enables us to draw on both these approaches, i.e. to acknowledge the role of both culture and economics (not to mention politics) in the historical formation of the rule systems which constitute property régimes. For such insights, we can turn to the theoretical developments in the now rich common property resource (CPR) management literature which provides some significant heuristic guides, of particular relevance to Chinese property rights studies.

As a student of Chinese environmental history, Perdue points to the need to understand how property rights were defined and altered during such processes as China's expansion of its landed frontier into regions inhabited by indigenous peoples. Yet, discussions about property rights often still revolve around the out-dated and ambiguous dualism of common property and private property. Of pivotal importance, particularly in the Chinese context, is the need to clarify what really makes up a property régime, since such state-developed generic terms for agricultural production as collectivization and household responsibility systems do not slot in simply to the common-private dualism.

The specificity of the types of property rights which exist, and how they are allocated, needs to be more precisely identified.

Formulating a nuanced and more complex understanding of property rights has been one key goal of

many common property studies. By adopting a neo-institutional approach, scholars such as M. McKean (1992), R. Oakerson (1986), and E. Ostrom (1990) have sought to identify the types of institutional design features and rule structures that constitute successful CPR management systems which promote both equity and environmental sustainability. This provides an understanding of the organizational format and the rules which make it a functioning institutional structure. This literature also broadens the discussion on property by examining not only rights, but also such aspects of property régimes as duties, privileges, and incapacity or exposure. All these form part and parcel of the system of governance.

These rules, however, operate within a broader cultural and economic context. The preferences of the actors who form part of the property management committee are partly shaped by economic incentives and interests, but also embrace what may be generally termed cultural interests. The territorial expansion of the Chinese empire, Perdue emphasizes, can never be explained solely in terms of demographic and market forces. The symbolic and strategic importance of wildlands must be taken into consideration, as Menzies's study (1992) indicates. This concern composes another facet of CPR studies, which has been to analyze rule formation and action within the broader narrative of social life. CPR legal scholars such as H. Okoth-Ogendo (1989) and C. Singh (1992) have asserted that the very idea of property must be scrutinized. This depends on an appreciation of the culture within which it is expressed, rather than simply assuming the prevalence of European notions of property in non-Western settings. Empirical studies of CPR systems, primarily from the African context, focus on this cultural meaning of land, and the consequent distribution of political legitimacy for exercising control over this resource (see S. Berry 1992, P. Peters 1992, and P. Shipton and M. Goheen 1992).

In China studies, this consideration of ideology and meaning is evidenced in a study of changing resource access rights in southwestern China by N. Menzies and N. Peluso (1991). Menzies and Peluso stress that the way in which the public interest is constructed both at the national and local level will determine the distribution of benefits and responsibilities which form the natural resource management system. Valuable for gaining insight on this aspect are the methods and findings of research by A. Anagnost, J. Oi, and H. Siu. These scholars have explored how the organizational and ideological power of the state has been negotiated at various localities through the use of both subtle and overt political and cultural tactics drawn and interpreted from traditional methods.

Progress in the study of the formation and constitution of property régimes is gaining momentum. What is most lacking in CPR studies, and is the central interest of CPR scholars, is an understanding of how particular types of property régime produce particular kinds of impact on the environment. The CPR research has largely developed

within disciplines such as history, government, and anthropology. The specific linkage of property with environmental transformations has only commenced recently, and has occurred largely within geography. For example, the innovative work of Emel, Roberts and Sauri (1992) looks at how the substantive structure of law and rules governing groundwater use in the southwestern United States has affected the geographical patterns of resource use and environmental change. It is in this context that the idea of analyzing how the terrain of the commons creates environmental change comes into play. This involves looking at how property rights are mapped onto the landscape, rather like "rubber maps" where the boundaries are not fixed positions, but rather defined in relation to the rights of others (Shipton and Goheen, 1992).

In my own research on common property systems in the Liangshan Mountains in Sichuan, I am attempting to examine the way in which differing ideologies of equity (see Kasperson and Kasperson, 1993) enter into property rule systems to produce differential environmental outcomes. By comparing the history of such rule systems among both Yi and Han communities in this mountainous, agrarian landscape, I seek to discern the impact of cultural values such as equity in creating ecological change.

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Thesis abstract

Sustainable Development for Taiwan: Influences of Energy and Energy-Use Pollution

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[This thesis was submitted to the School of Natural Resources and Environment at the University of Michigan. Dr Wang is now at the Graduate School of Natural Resource Management at National Dong Hwa University, Taiwan.]

Integrated studies of environmental pollution and the economic activities of energy consumption in Taiwan have been largely ignored. This research provides information

compiled from many sources, reorganized, reinterpreted, and used to create new projections and alternatives for policy makers. The research analyzes energy systems and energy-use pollution in Taiwan. Included is a history of commercial energy consumption and supplies. The connections of air pollutants and energy consumption through major polluters such as the industrial, transportation, and energy sectors are closely examined.

An extended form of the Leontief input-output model is employed for projecting major air pollutants' trends, and providing emission reduction alternatives, based on the current economic structure.

In spite of all the possible measures to improve energy conservation and efficiency, the impact of energy-use pollution caused by large energy demands and minimal pollution control remains inevitable in Taiwan. Input-output calculations show the quantity of air pollutants, which were calculated using established industrial categories of input-output tables. The increase of air pollutants of each industrial sector due to the increase of final demands are also specified. On the basis of GNP growth rate assumptions, this research suggests that the Taiwanese EPA figures of SO_x and NO_x emissions in 2000 are underestimated, from 18% to 29% for SO_x emissions, and 0% to 13% for NO_x. Reduction options are demonstrated (in terms of their emission control rates and possible administration costs) by assuming a uniform emission decrease on each sector, and decrease on the three largest polluters.

Owing to serious environmental degradation during recent decades, and in view of Taiwan's policy towards economic growth, continued deterioration in the ambient environment may be expected. To counter the projected upward trend in air pollution levels, a balanced economic-environmental plan is needed now which will limit emissions while allowing for some positive economic growth, probably at a lower rate than currently envisaged by the Taiwan government (7%). This research recommends a 6% GNP growth rate annually during 1989-2000, while decreasing the quantities of SO_x and NO_x by 7.8% and 8.3% respectively in the year 2000.

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