Chen Ajiang, Cheng Pengli, and Luo Yajuan

Chinese "Cancer Villages"

Rural Development, Environmental Change and Public Health

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Chen Ajiang,
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Translated by
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Preface to the English Language Edition

Jennifer Holdaway and Wang Wuyi[1]

We are delighted that this book is finally seeing the light of day in the English language. As some readers are aware, this has been a long and difficult process, and we are grateful to Amsterdam University Press (AUP) for its support.

Several of the chapters in this book first appeared as journal articles, and in 2013 they were collected in a Chinese language volume, titled 'Cancer Village Research'. In 2014, Professor Chen and his colleagues signed a contract with AUP for the English version of the book containing additional material, and in 2016 we expanded our original preface to include a discussion of the new material. Although several years have passed, we have chosen to retain that 2016 version here and add just a short coda for the English edition, so that the evolution of the content of the book and our thinking about the topic is clear.[2]

Preface to the 2016 Edition

'Cancer villages' are a highly emotive issue. Cancer is a 'dread disease,' more frightening to most people than other equally life-threatening illnesses, such

1 The authors are Co-Directors of the Forum on Health, Environment and Development (www.forhead.org). Jennifer Holdaway is currently an Affiliated Fellow with the International Institute for Asian Studies (IIAS) of the University of Leiden and a Foreign Expert at the Institute of Geographic Sciences and Natural Resources Research of the Chinese Academy of Sciences. She was formerly a Senior Research Fellow with the School of. Global and Area Studies at Oxford University and prior to that, Program Director and China Representative at the Social Science Research Council. Wang Wuyi is Professor and Former Deputy Director at the Institute of Geographic Sciences and Natural Resources Research of the Chinese Academy of Sciences.

2 Where available, we have replaced Chinese language references with English language versions of the same publication, and conference papers with published versions of the same text. Aside from the discussion of new material and new relevant publications, this text is only minimally different from the preface to the 2013 Chinese language book.

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as heart or respiratory failure. Since villages generally conjure up images of a natural and healthy rural environment, the idea of their being plagued by cancer is therefore especially unexpected and disturbing. Although poverty has decreased dramatically and the social safety net has expanded in recent years, overall, it is widely acknowledged that rural Chinese have also received fewer benefits from rapid economic development than urban dwellers. Reports of cancer villages suggest that they may also be bearing the brunt of its negative environmental impacts.

Media reports of cancer villages are shocking, citing rapid rises in cancer deaths and showing photographs or film of skeletal victims and grieving families. But how do media accounts and public perceptions of 'cancer villages' relate to what we know about the phenomenon from research; and how can research help to address the problem? This book explores these questions.

Although the government has acknowledged that 'cancer villages' exist, little is known about them.[3] In the aggregate, cancer rates in China have been rising for some time and data from the Ministry of Health shows that the disease is now the leading cause of death in rural as well as urban areas.[4] Many cancers have a long latency period and the increase in its frequency can be seen to broadly follow the curve of China's economic growth. To a certain extent, this is just part of a larger 'epidemiological transition' resulting from longer life spans, and lower mortality from communicable diseases associated with poverty as well as improved diagnosis and access to health care. It also reflects changes in diet and lifestyle that contribute to cancer, cardiovascular illnesses, and other 'diseases of affluence'.[5] In fact, when the ageing of the population is taken into account, mortality rates for some cancers (including some types of liver cancer, stomach and oesophagus cancer) have fallen between 1990 and 2013, while others (liver cancer due to hepatitis C, prostate cancer and pancreatic cancer) have shown an increase.[6]

There is little doubt that part of the increase in certain types of cancer is due to environmental pollution. But how much, and the contribution of pollution to disease in any particular location, is hard to determine. The carcinogenic effect of certain chemicals is well understood on a biological

3 Ministry of Environmental Protection, 'Huaxuepin fangkong shierwu guihua'.

4 Ministry of Health, '2012 nian woguo weisheng tongji tiyao'.

5 Gong et al., 'Urbanization and Health in China.'; van de Poel et al., 'Is There a Health Penalty of China's Rapid Urbanization?'; World Bank. *Toward a Healthy and Harmonious Life in China*.

6 Zhou et al., 'Cause-Specific Mortality for 240 Cases in China During 1990-2013'.

level, and even without detailed information about specific pollutants, robust statistical correlations can be established between environmental quality and health for large populations. For example, the Atlas of the Water Environment and Cancer in the Huai River Valley has demonstrated a clear association between water pollution and high rates of digestive tract cancer at the county level using regular environmental monitoring data. The analysis shows that some counties which had higher than average rates of cancer in the 1970s have seen significant improvement, while others that were on the low end have seen a rise in cancer that is clearly associated with changes in water quality. The association remains even when lifestyle factors are controlled. As water quality has improved, cancer rates have also fallen, although the reasons for this are complex and include not only environmental protection but also improved health services and possibly nutrition.[7] Recent provincial level analysis of the causes of death also shows regional clustering in types of cancer and interesting patterns of change that provide the basis for understanding how different environmental conditions as well as dietary patterns and unequal access to healthcare may be shaping health outcomes.[8]

But although associations between environmental quality and cancer can be demonstrated on the level of large populations (in China usually the county), proving the existence of cancer clusters and attributing causality at the village level is extremely hard. Even when there are good records of the number of cancer deaths, too many other factors can be involved in the onset of disease, including genetics, personal behaviours such as diet, exercise, smoking and alcohol use, and general health status and nutrition. Often this information is lacking and even if it is not, samples are too small to distinguish the role of different factors. Although the lack of good and/or publicly available data on many of these variables in China exacerbates the problem, this difficulty is not unique to China. Attempts to prove the health effects of pollution on small populations have been the subject of bitterly contested and protracted law suits in the United States, and a substantial literature has documented efforts by communities to gather evidence and gain acknowledgment of these contested illnesses.[9] It is quite rare to find situations, like the Minamata case in Japan, where disease can be clearly linked to a particular pollution source; and even in that case, responsibility and compensation were contested for many years.

7 Yang and Zhuang, *Atlas of the Huai River Basin Water Environment: Digestive Cancer Mortality*.
8 Zhou et al., 'Cause-Specific Mortality for 240 Cases in China During 1990-2013'.
9 For example, Brown, *Toxic Exposures*; Tesh, *Uncertain Hazards*.

In China, the compressed nature of the industrial transition, and the multiple social changes that have accompanied it, often make it particularly challenging to prove environmental health effects at the village level. China's industrialization has been much more rapid than that of Europe, the United States, or even Japan. Furthermore, unlike many parts of the world, a lot of China's industry has historically been located in the countryside, and in many areas there has been rapid turnover in the type and scale of industrial activity. Even during the Mao era, Third Front and other policies promoted the establishment of industries in rural areas in China's interior, and from the early 1980s, in response to the policy incentives and market forces associated with reform and opening up, Town and Village Enterprises (TVEs) sprang up all over the country.[10] These rural industries and the household workshops that accompanied them were generally small, used basic technologies and released their waste directly into the surrounding atmosphere, water and soil.[11] Many later closed or changed their product lines or form of ownership, with the result that many of China's rural areas have been affected by waves of pollution from different sources.

So while there are cases in which mines or individual industries are the clear source of health problems, there are also many situations in which complex sources and forms of pollution make it very hard to establish causality. Further complications arise from the fact that the populations affected by pollution have not been stable. Rural-urban migration has profoundly changed patterns of residence and occupation, with many people who came of age in the reform era working and living in a number of places over the course of their lives, often in jobs that have exposed them to environmental health risks.[12] Meanwhile, improved communications and media, along with financial and social remittances associated with migration, have in many places blurred the boundaries between formerly distinctive urban and rural lifestyles and the diseases associated with them.[13] These changes in place of residence, occupation and lifestyle make it difficult to isolate the impact of exposure to pollution on health, and even harder to attribute responsibility to a particular source. Migration means that many villages also have a very uneven age distribution, with healthy adults often away working in cities, leaving older people and those in poor

10 Bramall, *The Industrialisation of Rural China*.

11 Tilt, 'The Political Ecology of Pollution Enforcement in China'; Wang et al., 'Rural Industries and Water Pollution in China'; Han and Zhang, 'China's Environmental Governance of Rapid Industrialization'.

12 Hu et al., 'Internal Migration and Health in China'.

13 Holdaway, 'Environment, Health and Migration: towards a more integrated analysis'..

health behind. Migrants who are very sick are also most likely to return.[14] Although every situation is different, overall, patterns of migration skew many rural populations in the direction of poor health.

The Chinese village is therefore a very difficult unit of analysis when it comes to studying patterns and trends in the burden of disease and in epidemiological research the county is usually the unit of analysis. At the same time, despite all these complexities, it is still clear that in a substantial number of villages mortality from cancer is much higher than the rural average and many of these villages also have a history of industrial pollution. Even if rigorous epidemiological analysis is impossible, the likelihood of an association seems high.

Furthermore, as Chen Ajiang and his colleagues argue in this book, the village remains a key social and administrative entity. Urbanization and demographic change may lead China's villages to lose their historical significance as the primary source of social identity and economic security within a few decades, but for now, they remain an important unit of social life. And so, regardless of whether the relationship between pollution and cancer can be established at this level, these rural communities will continue to be the focus of claims and contestations for some time to come. For all these reasons, Chen Ajiang is right to insist that 'cancer villages' are a phenomenon with which both policy and research must engage.

But it is a brave social scientist who enters this highly charged and complex territory, and there are hard choices to be made in how to deal with the scientific uncertainty surrounding the relationship between pollution and cancer. One option is to take media reports or citizens' claims about the causes of disease at face value and focus on their struggles to close factories or win compensation for health damages.[15] Another is to set the question of causality aside and study the landscape of risk perception and the ways in which different understandings shape behaviour.[16] Both of these are valid approaches from a social science perspective, and research along these lines has yielded valuable insights.

Chen Ajiang and his colleagues have taken the bolder step of tackling the problem of uncertain causality and its implications head on and engaging with natural and medical as well as social science data. This was a decision

14 Hu et al., 'Internal Migration and Health in China'.

15 For example, Deng and Yang 'Pollution and Protest: Environmental Mobilization in Context'; van Rooij 'The People vs. Pollution: Understanding Citizen Action against Pollution in China'.

16 Lora Wainwright et al., 'Learning to Live with Pollution'; Lora Wainwright, 'An Anthropology of "Cancer Villages"'; Jing, 'Environmental Protests in Rural China'.

for which Professor Chen received some criticism at an early stage of the project from epidemiologists who felt that assessing cause-effect relationships was not something that a social scientist should attempt. But he persisted, and his determination to understand and weigh the different sources of evidence regarding the relationship between pollution and disease, and consider the role of social scientists in working on these issues, has produced some of the most interesting insights in his research.

Over a period of many years, Chen Ajiang and his team have conducted extensive field research in villages in, Henan, Jiangsu, Zhejiang, Jiangxi, and Guangdong. The studies published in the first edition of this book in 2013 all focused on villages which had experienced significant levels of industrial pollution and had cancer rates at least twice the rural average, and sometimes much higher. In each case, though with different degrees of confidence and assertiveness, villagers attributed cancer to pollution from local industry or mining.

Instead of shying away from the difficult question of whether these claims were justified, the researchers assembled the available evidence to determine what can be known about the relationship between pollution and cancer. They examined all the information they could find on recent levels of pollution and health outcomes, including the results (where available) of tests conducted by government agencies, but also more informal data gathered by villagers. They did their best to understand the manufacturing processes used by local industries and the kinds of pollution they created. They also dug deep into the past, leading us through the history of these communities over the course of the last 30 years, tracing their different development trajectories and the implications of these for the environment, and for public health.

This multidimensional approach enabled them to distinguish between cases in which a clear relationship between pollution from a particular source (usually a single factory or mine) and cancer could be quite clearly established; those in which the evidence was quite strong but not conclusive; and other cases in which the evidence for blaming a particular pollution source proved either weak or non-existent. In the last case, although there were polluting industries in the area, the particular pollutants involved were not known carcinogens or the pollution was too recent to be the cause of cancers with long latency periods. Examination of the history of these places complicated the search for a culprit because a series of industries have often come and gone over the years. And in some cases, such as the Huai River Basin, waves of pollution from industrial accidents upstream from the village must be considered in addition to local pollution sources.

In these situations, although the pollution-disease relationship seems clear on a general level, no single specific industry can be implicated as the responsible party.

In addition to carefully unpacking the evidence with regard to pollution, another major contribution of these case studies is that they integrate analysis of the available environmental data with attention to individual and social factors that may be contributing to the onset of cancer and other diseases. In attempting to assess the role of pollution to cancer in Huangmengying village in Henan, Chen found that smoking and hepatitis partly explained the greater prevalence of lung and liver cancer among men. Local customs such as drinking 'raw' water (*shengshui*), which increased stomach infections, also emerged as possible contributing factors. Pursuing a theme present in his earlier research, he also argued that living with 'external' pollution from industry made villagers resigned to a dirty environment and less concerned about the impact of their own 'internal' pollution from household waste or agricultural activities.

This edition contains new material, including a chapter on Lianshui County in Jiangsu which focuses on interactions between water, agricultural practices and health. Epidemiological data show that rates of oesophagus cancer in the county are three times the national rural average, accounting for 34% of all deaths from cancer. Records show that the disease has always been regionally clustered, with northern Jiangsu, along with the Henan-Hebei border and parts of Sichuan being hotspots. There is no conclusive explanation, but some of the factors known to be associated with the disease, including nitrosamines and aflatoxins in food, protein deficiencies and certain dietary practices (such as consuming preserved food and very hot drinks) are also common in those places, where a number of studies have been conducted going back to the 1950s.

Drawing on historical records, Chen investigates the changes in the environment and rural livelihoods that might have contributed to greater risk of cancer through what epidemiologists have referred to as the 'nitrogen cycle hypothesis,' which suggests that high levels of nitrates in drinking water may combine with other substances in the body with to form carcinogenic *N*-nitroso compounds. He traces the serious impact on the county of changes in the course of the Yellow River, which caused flooding, water-logging and drought in the Huai River Basin. This left much of the land salinized, leading to low yields and a lot of land being left fallow. The county was desperately poor, with frequent famines and widespread malnourishment. These problems were successfully addressed by water engineering projects in the 1970s which irrigated the dry land and made it possible to replace low

value coarse grains with paddy rice. Along with the introduction of high yield seeds and the use of chemical fertilizers and pesticides, this led to rapid increases in production and freed the region from hunger.

However, Chen hypothesizes that this reconfiguration of the water system may also have affected villagers' drinking water, with negative effects on health. He notes that villages in the region have the custom of digging long trenches (called 'river ponds' or 'big wells') near their homes which provided earth to raise their houses above the plain and prevent flooding, and were traditionally also used for drinking water and raising fish and shrimp. But the 1970s engineering works linked these pools up to irrigation systems and therefore exposed them to contamination by fertilizers and pesticides as well as manure from the burgeoning livestock raising industry, increasing the risk to health. This interpretation is further strengthened by the fact that improvement of drinking water sources in other regions has effectively lowered the oesophagus cancer rate; although similar records have not been kept in Lianshui County, lowered rates there may also reflect improvements in drinking water sources as the county has become wealthier.

From an epidemiological perspective, Chen's account is not conclusive. His data on village water sources and environmental change cannot prove the link to cancer; only that there is evidence of some of the factors that are associated with it in the scientific literature. However, it does raise avenues of enquiry that could usefully be followed up by medical science studies and which might contribute to a better understanding of the variation in patterns of cancer in the area and suggest ways to reduce risk.

In addition to examining the medical data and relevant environmental factors, the cases also document how villagers understand the relationship between pollution and illness. These include changes in the taste and smell of water and food, death or illness among animals, and observation of new types of illnesses among family and neighbours. As Anna Lora-Wainwright has done elsewhere, the authors note the way in which rural people deploy quite sophisticated 'lay epidemiologies' to understand the causes of disease,[17] in the context of the 'society of familiars' (*shuren shehui*) of Chinese village life. But they also note how low levels of education limit villagers' ability to evaluate information from scientific tests, and their tendency to suspect current and local pollution sources that are visible to the senses, even in areas that have long and complex histories of industrialization or that suffer from regional pollution.

17 Lora Wainwright, 'The Inadequate Life: Rural Industrial Pollution and Lay Epidemiology in China'.

The book also explores the ways in which emotions, economic interests and social structure affect the attribution of responsibility for the impact of pollution on health and the way in which conflicts come to be framed and negotiated between villagers, industry and local governments. The authors note how cancer patients and their families struggle to construct a meaningful explanation for the occurrence of disease and how these emotions, especially in combination with limited scientific understanding and anger toward unresponsive government agencies, can lead them to become fixated on a certain interpretation of the cause of the disease in spite of evidence suggesting more a complex reality. Several of the analyses also explore the internal divisions that arise within villages as a result of the uneven distribution of the costs and benefits of pollution, as, for example, when some villagers own or are employed by polluting industries and others are not.

The study of a waste incineration plant in a village in Guangdong, is particularly interesting. A list of 'cancer victims' was posted on the internet and picked up by media. Journalists visited the village and interviewed angry residents, who complained about noxious smells and dust from the plant. They alleged that dioxin emitted by the incinerator was the cause of rising rates of respiratory system cancer since the plant opened. However, when Chen and his team visited the plant they found it to be clean and well run, with regular testing of emissions; a 'village surveillance' team was allowed to conduct inspections whenever they wished. The CDC reported that they had investigated the reported cancer cases and that the level of cancer was not in fact unusually high.

The researchers realized that conditions in the plant might have recently improved, but they were doubtful that cancers could be attributed to pollution from a plant that had only just opened. Yet, this left them unable to understand the sudden leap in deaths. The answer emerged when Li Qi painstakingly visited each of the households on the list of reported respiratory cancer victims and found that a lot of the information was false, from the age of the deceased to what they died of. Many of those the media claimed had died of lung or other respiratory tract cancers had in fact died of liver cancer or other, completely different diseases unlikely to be related to air pollution. While it was not clear who initiated the list, the media had circulated it without adequate verification, and other people took advantage of the media coverage to oppose the building of another incinerator.

This finding may seem to cast the villagers in a very negative light, but Chen's analysis is more nuanced and again history is important here. The villagers' anger was rooted in their experience with a landfill that was built in 2000, and which caused serious pollution to local water sources.

Villagers' complaints were ignored and they were left deeply suspicious of the authorities. This mistrust later extended to the CDC, which conducted an investigation in the area and did not find anything irregular, but did not attempt to explain the findings to the villagers in language that they could understand or counter the misleading media reports.

These essays thus situate analysis of the impact of pollution on health, and community perceptions and responses to it, within the larger context of the unevenly distributed opportunities and costs that industrialization and urbanization have brought to various parts of China. In some cases, the benefits of industry have accrued mostly to outside investors or landfills and incinerators treating urban people's waste have been located on rural land, with deleterious impacts on the environment and no benefits for the locals. But there are also situations where villagers themselves have polluted the environment with small workshop-style factories or mines. Migration is also part of the story, as some industries draw workers in with them from other counties, while others employ at least some of the local population. The essays show that it is difficult to apply a simple environmental justice analysis to China, because although in some cases there is a clear victim, in many cases victims and beneficiaries overlap. As other studies have found,[18] conflict seems most likely to occur either in cases where locals are deriving little benefit from an existing polluting industry, or when the benefits derived from industry have disappeared, leaving health problems and a degraded environment in their wake.

In media reports and much of the social science literature on environmental pollution in China, local government is either left out of the analysis or cast in a purely negative light, as failing to enforce environmental regulations or respond to villagers' concerns about the impact of pollution on health. The cases in this book also find instances of local government colluding with industry to disguise the effects of pollution, and ignoring villagers' calls for environmental testing or for action against polluting factories. But while not excusing this behaviour, some of these studies also contextualize it with an analysis of the pressures that local government faces to attract investment and generate tax revenue. These include not only performance criteria imposed by higher levels of government, but also the pressure to generate revenue to support public services and policy mandates not covered by central funds. Like villagers, government officials are also not a homogeneous group, and village level cadres in particular face difficult

18 Deng and Yang, 'Pollution and Protest: Environmental Mobilization in Context'; van Rooij, 'The People vs. Pollution: Understanding Citizen Action Against Pollution in China'.

dilemmas as both representatives of the state and members of communities suffering from pollution.

Chen Ajiang's decision not to evade the problem of causality considerably enriches the analysis. As social scientists, we are trained to understand that the aspects of 'reality' we choose to investigate, the categories, methods, and instruments we use, and the kinds of information we privilege or ignore are all shaped by social factors as well as by the more fundamental limitations of our human cognitive abilities. The virtue of Chen's analysis is that he enables us to see the value and limitations of multiple kinds of knowledge and the ways in which circumstances filter and colour what different actors see. As a social scientist who comes himself from a rural background, and who also has some prior training in the natural sciences, Chen is in a particularly good position to give fair treatment to information from different sources, including villagers' lay epidemiologies as well as the limited data available from environmental and health tests. He notes the way in which powerful actors use their control over information to prevent villagers from finding out the risks to which they are exposed, and he understands that their experiential knowledge of the local environment and patterns of disease in the community can enable them to identify changes that may not be captured by formal data collection. But at the same time, he also shows that villagers' own understandings and use of information are loaded in various ways by emotional and social ties as well as by economic interests.

Importantly, while alerting us to the different contexts in which knowledge is generated and used, the authors also make it clear that exploring different answers to the question of causality is not merely an intellectual exercise. Even if we recognize the contingent nature of our understandings of the world, we still have to act, and this entails choosing one explanation over others as a guide to behaviour. The problem of cancer villages puts this tension between uncertain knowledge and the need for action into particularly stark relief and Chen Ajiang does an admirable job in both illuminating and navigating it.

In one sense, it could be argued that there is no need to try to prove causality in individual cases. On a broader level it is painfully clear that the latent impacts of environmental degradation resulting from China's earlier waves of rural industrialization are now manifesting themselves. This is evident from the study of the Huai River Basin and other analysis of large-scale data sets.[19] The case studies in this volume reveal the human suffering behind

19 Yang and Zhuang, *Atlas of the Water Environment*; World Bank, 'The Cost of Pollution in China'.

such impersonal statistics. As the authors point out, the experience of these villages is a warning call to other areas that may be seeking to follow the same development pathway, especially as industry is now relocating from coastal areas to the hinterland and west of China. If the stories in these pages are not to be repeated, regional development policy needs to be proactive in considering the possible environmental and health effects of industrialization and in seeking to reduce the perverse incentives that lead local governments and communities to tolerate pollution. Resources and capacity are limited and cannot be quickly scaled up across the board, but targeted investments could be made in increasing enforcement capacity in areas that are likely to be particularly vulnerable, while local government's fiscal dependence on revenue from industry could be reduced if more services were supported by the central level. Even without such measures, documenting and sharing information about the experiences of early industrializing areas can help to alert other jurisdictions to the long-term consequences of unregulated industrialization and prompt them to assess the environmental and health implications of the development options open to them.

At the same time, though, something must be done in places in which problems have already surfaced, or soon will. And for this we do need to get to grips with the problem of causality in local contexts. This is first because without an understanding of possible pollution sources and pathways of exposure, interventions may be misguided and ineffective. It is important to know whether people are being exposed to toxins from current or legacy pollution and through which environmental media. If current pollution is not a problem and previous contamination affected mostly air or surface water which is now of acceptable quality, providing medical care may be the primary need, but if soil or ground water are contaminated, ecological restoration may need to be considered. In extreme cases, organized migration may be the only way to protect health. But such major interventions are lengthy and expensive undertakings that disrupt livelihoods and communities, and so it is important to target the problem as accurately as possible. Sometimes, understanding environmental media and exposure pathways can inform more immediate measures to reduce health impacts by changing the supply of drinking water or food or changing agricultural practices. But it is still important to identify the main source of exposure or such interventions will not be effective.

Of course, it will not be possible to carry out extensive environmental testing in every case: it is too expensive and there are not enough experts who are trained to do it, especially at the local level. But this does not mean that basic environmental health assessments cannot be carried out, and because

many rural communities will be facing these problems in coming years, it will be important to design tools for doing these. Although China has a National Plan for Environment and Health Work which should be implemented at the county level (MEP 2007), not much progress has been made so far, partly because financial and technical resources have not been made available for local environmental and health agencies to conduct this work. As a result, most Centres for Disease Control and Environmental Protection Bureaus at the county level lack the necessary expertise and equipment to conduct environmental health risk assessments.[20] Providing these resources will be essential if localities are to respond better to these problems.

Even then this will not be a simple process because the information generated by risk assessments will be used not just to inform interventions but to determine responsibility and provide the basis for claims for compensation for economic and health damages and clean-up costs. This, of course, is the reason why many local governments are not only unable but also reluctant to carry out these investigations. And it is the reason why, even when they do, villagers often do not accept results that do not substantiate their claims. In fact, although many of these cases are rejected by the courts, in principle, Chinese law takes the position that in cases where polluting events occur, the polluting party must prove that damages to health have not occurred. But as the essays in this volume and other research shows, this law cannot be effective if information about production processes, emissions and environmental quality is not available. At the central level, the Ministry of Environment has recognized the role that the public can play in environmental enforcement, and the recent revision of the Environmental Protection Law has stronger provisions for 'public supervision,' but it is not clear how this will be operationalised at the local level. Yet without better access to trustworthy public information, citizens can only fall back on their own observations; and without proper processes in place to adjudicate competing claims, more and more of these situations are likely to result in conflict.

As this volume shows, in some cases it is possible to establish causality, and in these situations polluting industries should be held responsible for health and other damages. In other cases, the search for a culprit will come up blank because the factories responsible for pollution will have moved or closed, or causality will just be too unclear or complex to attribute responsibility. In these cases, government will have to bear the costs. In

20 Holdaway, 'Environment and Health Research in China'; Su and Duan, 'Zhongguo huanjing yu jiankang gongzuo de xianzhuang, wenti he duice'.

the saddest cases, communities may come to the realization that their own efforts to increase their incomes through small scale mining and industrial activities are the cause of disease. This will be especially distressing in situations where the long-term costs of environmental health impacts far outweigh the short-term benefits that industrialization has brought. It is to be hoped that greater public understanding of these long-term trade-offs will also help to generate support for a more cautious approach to development.

These studies therefore have important implications for policy. In closing, we would like to draw attention to the implications of this book for research. Several of these projects were carried out with support from the Social Science Research Council's (SSRC) China Environment and Health Initiative Collaborative Grants Program, and the team members have been active participants in the China-based Forum on Health, Environment and Development (FORHEAD). Both these programs were established with the goal of promoting interdisciplinary approaches to the study of environmental impacts on health in China with a view to providing a better evidence base for policy and civil society responses.

This book demonstrates very effectively the need for interdisciplinary collaboration. Where many social scientists take the pollution-health relationship as given, or put the question of causality aside, Chen's work shows how crucial it is to gain an understanding of the relevant medical and environmental data in order to unravel what are often complex puzzles; otherwise it is impossible to know how problems might be most effectively addressed or where responsibility lies. In many cases, although a lot of studies on health and environment suggest that causal relationships exist, what they actually show is only a correlation or an association, not causation. This is because health outcomes are shaped not only by physical, chemical and biological factors in the environment, but also by social, economic and cultural factors such as lifestyle and overall levels of health and nutrition. However, identifying such associations nonetheless helps to identify important relationships that require further investigation and when there is an urgent need to act in order to prevent further exposure to health risks, they can also point to possible interventions. Chen's studies acknowledge this complexity. They also demonstrate the importance of social science in surfacing social and cultural factors that can also generate, increase or diminish risks; and in understanding why communities perceive and respond in the ways they do. This knowledge is equally vital to tackling environment and health problems both at the macro level of policy making and in specific communities.

While recognizing the challenges involved, Chen also calls for more research focused on the local level. In his essay on Huangmengying village

in Henan, 'Village Perspectives on Understanding the Causes of Disease,'[21] he reflects on the significance of the village as an analytical unit, arguing that it offers a useful middle ground between large-sample statistical data and individual pathology for understanding the environmental sources of disease. This is because the village context makes possible an integrated, in depth study of the interaction between the natural environment and social practices over time. He calls for greater collaboration between medical science and social science researchers in village communities, especially at a time when chronic diseases related to environment and lifestyles are replacing infectious diseases as the major problems in rural China.

This book, now revised to include new material and analysis, presents a highly informative account, not only of the complex world that lies behind the headline 'cancer village', but also of the larger social transformations at work in rural China. It offers no easy answers to the dilemmas they represent, and it does not take refuge in simplistic attributions of blame. As a result, it sometimes makes for very painful reading. But in unpacking the tangled relationships between industrialization, environment and health in these different contexts, it remains a path-breaking contribution to the social science of rural China.

Beijing, October 2016

Coda to the 2020 English Edition

We hope that this book will help a broader audience of non-Chinese speaking readers understand the complex challenges facing rural China and the tangled interactions between development, environment and health, which are often simplified by the media. The introductory chapter, which has been added for this edition, situates the case studies in the context of the profound changes that industrialization and urbanization have brought to the daily lives of China's rural population. As Chen and his colleagues point out, 'cancer villages' may no longer be a hot topic in China, but the tensions between industrial development, intensified agriculture and public health will continue to be salient for the foreseeable future and China's struggles to navigate them also have reference value for other countries facing similar trade-offs.

Beijing, August 2019

21 In this English language edition, this discussion has been included as the final section of Chapter 1, 'Ins and Outs of "Cancer Villages",' to avoid repetition.

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