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# **Coping with 'Natural' Disasters in Pre-industrial Societies: Some Comments**

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## **Themes and Orientations**

The contributions to the conference approach natural hazards and disasters from different theoretical angles; they address various issues and cover different regions and time periods. One line of distinction refers to the opposition between socio-economic or socio-political analysis and cultural studies.

The first approach focuses on behavioural aspects, i.e. on preventive and coping strategies resorted to by various groups in the face of natural hazards under specific political and economic circumstances (see articles by Schenk, Astrid Meier, Pfister, Damodaran among others). Some of the main questions that emerge: How were regions and classes in a given society differently affected by a natural hazard? How and to what extent did strategies of peasants, urban dwellers and state elites succeed in mitigating the impact of disasters? Proponents of this approach also take into consideration ecological and climatological data in order to understand economic and political strategies and arrangements. They propose theoretical models allowing for the study of impacts natural hazards may have on populations as well as of strategies geared at preventing and mitigating disasters.

The second approach concentrates on the study of perceptions and conceptions concerning natural disasters as reflected in law, philosophy, religion, pictorial representation, chronicles, political ideology etc. (Akasoy, Janku, Kempe, Mischa Meier). Important as these perceptions and conceptions may be, it is not always clear to what extent they influence

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ordinary people's perceptions and ways of coping with disasters. Priests, rulers or the common people often held divergent views and explanations of those disasters. Furthermore, people were not unfamiliar with the natural hazards they had to face: historical experiences of past disasters were stored in the collective memory (see Kempe). And besides theoretical and religious explanations, people also had practical knowledge of how to deal with disasters. Perceptions and conceptions of natural disasters are relevant and interesting, but probably less important than the factor of interest, since interests of social groups not only explain their strategies, but also form the background against which diverging perceptions and explanations have to be interpreted.

The contributions to this volume (and the conference) also differ in respect of regions and the historical periods they cover. There are studies of a global disaster at a certain historical moment such as the El-Niño at the end of the eighteenth century (Grove), whereas other studies focus on single events and places such as Schenk's case study of Florence in 1333. Most of the studies deal with natural disasters, the reaction of those affected and ensuing social change over longer period of time—such as Endfield and Acosta on Mexico; Bankoff on Manila; Janku on Linfen; Soergel, Rohr, Kempe and Pfister on early modern Europe; Meier on pre-colonial Sudan; and Bhargava and Damodaran on Northern India.

There is still another line of distinction that can be identified: comparative studies vs. single case studies of natural disasters. A comparison can refer to different time periods within the same society or to different societies at the same or at different times. Most of the comparisons are qualitative, but some authors have also presented quantitative data (see Pfister).

### Case Studies and Comparison

There is a tradition of statistics and lists in the study of natural disasters, beginning with a world-wide sample undertaken by Walford,<sup>1</sup> followed by Curschmann<sup>2</sup> on medieval Europe as well as official data collections

<sup>1</sup> See Walford, 'The Famines of the World'.

<sup>2</sup> See Curschmann, *Hungersnöte im Mittelalter*.

from Imperial China,<sup>3</sup> and more sophisticated attempts by García-Acosta<sup>4</sup> and Pfister,<sup>5</sup> Militzer<sup>6</sup> and others.

Statistics largely drawn from lists pertaining to natural disasters in pre-industrial societies are notoriously unreliable. They often lack information such as on the number of people affected, on the spatial extent of a disaster, on exact death tolls and on the number of refugees. Despite the fact that those lists are usually anecdotal and sketchy, they nevertheless contain valuable data and constitute the first step towards a more comprehensive and comparative approach to natural disasters.

It is not an easy task to overcome the lacunae present in both statistics and lists. Lists may be systematized in order to make a comparison viable. Statistics can be made more complex and to contain more pertinent data. Even if statistics referring to pre-industrial societies only allow for rough quantitative estimates or even less, guesstimates, such a qualitative use of statistics can at least be used to generate new questions and hypotheses. If several sets of quantitative data are combined, we can even discern rough trends in magnitude, severity and frequency of natural disasters. Table 1 may serve as an example.

I have listed the number of famines in Imperial China between 1271 and 1911 as reported by two authors: Yuan (1994) who provides data on years of famine and Deng (1937) on cases of famine.<sup>7</sup> The figures on famine are compared with the number of natural hazards (mainly floods and droughts, but also frosts and pests affecting agriculture). Deng (1937), Chen (1986) and Zhu (1998)<sup>8</sup> provide the data on the frequency of those natural hazards.

Table 1 shows decreasing ratios of famines to natural hazards in Chinese history. Being fully aware of the data problems mentioned earlier and although nothing is said either about the severity of the disasters

<sup>3</sup> See Kolb, 'About Figures and Aggregates'; Janku, this volume.

<sup>4</sup> García-Acosta, *Historia y desastres en América Latina*.

<sup>5</sup> Pfister, *Das Klima der Schweiz von 1525–1860* and Pfister, *Raum-zeitliche Rekonstruktion*.

<sup>6</sup> Militzer, *Klima—Umwelt—Mensch*.

<sup>7</sup> Both in Kolb, 'About Figures and Aggregates'.

<sup>8</sup> All in Kolb, 'About Figures and Aggregates'.

or the number of provinces and people affected, we may nevertheless (though cautiously) conclude from these figures that the efficiency of the state in preventing and mitigating famines (i.e. disasters) has increased, or at least not decreased, through time.

Besides studies presenting quantitative data, this collection contains a considerable number of valuable historical-cum-ethnographic case studies (see Janku, Schenk, Endfield, Pfister, García-Acosta, Damodaran) which present a complex picture of natural disasters and contain rich information about the natural, economic and political circumstances and processes, the strategies adopted by people and states affected, and about the outcomes of those disasters. Case studies allow for identifying the relevant variables and conditions to be studied in similar cases of natural disasters and are thus relevant for comparative purposes. We may learn most from those case studies which focus on a wide range of domains such as religion, technology, economy and politics and on the differential impact disasters have on classes and regions, communities and societies.<sup>9</sup> However, we would learn even more through a qualitative comparison of those cases, since merely adding one case study to the other does not seem to be a convincing and exciting research strategy.

A qualitative comparison requires greater systematisation and standardisation of case descriptions in order to make them comparable. Comparison will also be an incentive to search for missing data within individual cases studies. Furthermore, a qualitative comparison would help fill the gaps that remain within the quantitatively oriented comparisons mentioned earlier. It would provide a hint as to the information still to be included in the statistics. Such improved quantitative guesstimates could complement qualitatively oriented comparisons of carefully selected case studies. Comparisons of this kind would improve our understanding of natural hazards and their impact on populations and societies, with the effect that scholars addressing natural disasters in the present will be interested in such disasters during the past.

<sup>9</sup> Oliver-Smith, 'Anthropological Research Hazards'; Hoffman, 'Anthropology and the Angry Earth'.

Table 1

Years	Famines	Hazards (Deng)	I Famines/ Hazards	Hazards (Chen)	II Famines/ Hazards	Hazards (Zhu)	III Famines/ Hazards
1271-1368	97 (Yuan)	434	0.22	860	0.11	265	0.37
1279-1368	59 (Deng)	434	0.14	860	0.07	265	0.22
1368-1644	141 (Yuan)	854	0.17	1224	0.12	416	0.34
1368-1644	93 (Deng)	854	0.11	1224	0.08	416	0.22
1644-1949	140 (Yuan)	957	0.15	4923	0.03	997	0.14
1644-1911	90 (Deng)	957	0.09	4923	0.02	997	0.09
Average			0.13		0.07		0.23

## Concepts and Definitions

A lot of ink has been spilled on the definition of concepts such as disaster, hazard, risk, catastrophe, vulnerability, resilience and others.<sup>10</sup>

The focus of early disaster studies was on the impact of external, naturally-caused incidents on populations and on the reactions of the afflicted societies.<sup>11</sup> Later, disasters were seen as social facts, not only because they were partially caused by the afflicted societies themselves (such as by settlements in areas prone to flooding or droughts, density-dependent spread of epidemics, floods and droughts caused by deforestation and erosion). Disasters were also seen as 'socially constructed', as the constructivists maintained.

The position that 'hazards and disasters are socially and culturally constructed' is aimed as a corrective to a crude environmental determinism and technocratic naivety. But this kind of constructivism—quite fashionable in some academic quarters—obscures several aspects of the problem, besides the fact that the exact meaning of 'socially and culturally constructed' is not very clear. If we understand 'culturally constructed' to mean 'perceived by the members of a society', we then will have understood a disaster if we have 'reconstructed' how it has been perceived by the members of a given society. Does this mean that it is not the factual impact of a natural hazard but its perception and conception, which make it a disaster? Does it mean that disasters are caused by cultural conditions rather than by natural hazards? Admittedly, groups of a society might also hold various conceptions and perceptions, but people get killed not by those cultural facts but by the physical impact of floods and droughts, earthquakes and epidemics. If we accept people's 'constructions' as explanations, one can hardly study the relative weight of factors such as natural hazards, inefficient prevention and mitigation strategies by peasants, or state failure in causing disaster. Focusing on people's perceptions and conceptions begs the very question: what is the meaning of 'natural hazard' in the first place? What if people in a given society see a 'natural hazard' as being the product of 'the immoral behaviour of the elite', not

<sup>10</sup> Cp. among others Oliver-Smith and Hoffman, *The Angry Earth*; Quarantelli, *What is a Disaster?*; Quarantelli and Perry, *What Is a Disaster? New Answers to Old Questions*; Wisner et al. *At Risk*.

<sup>11</sup> Fritz, 'Disasters'.

of nature (see Janku on China)? The question then is not: what is a natural disaster, but rather: what is a natural hazard? Furthermore, there are no good theoretical though pragmatic reasons to exclude other potential disasters such as epidemics and wars from the analysis.<sup>12</sup> The debates on natural disasters were dominated by the concept of vulnerability.<sup>13</sup>

### Vulnerability

García-Acosta stresses the distinction between 'natural phenomena or hazards on one hand, and risk or disaster on the other. Risk and disasters are the result of processes derived from critical pre-existing conditions in which certain hazards arise. It is the magnitude of social, cultural and economic vulnerabilities which have accumulated and are associated with the presence of a severe hazard that can be said to produce real disasters'. Disasters are no longer considered to be the result of geophysical extremes, but as functions of a social system, of human-environment relations, and of the larger framework of historical and structural processes.<sup>14</sup> Such processes are seen to create vulnerabilities and the preconditions of disasters; because of the unequal distribution of resources and power, risks and vulnerabilities too are unequally distributed among the classes and regions in a society (Peacock and Ragsdale 1997). According to political ecology, social groups in a society are differentially susceptible to and affected by natural hazards and have different capacities to cope with disasters.<sup>15</sup>

However, as pointed out by Hewitt,<sup>16</sup> vulnerability is to some extent an unfortunate concept as it encourages a concept of societies as passive and pathetically weak by detracting attention from societal resilience and risk aversion arrangements that are generally present in all societies.

<sup>12</sup> See Cunningham and Grell, *The Four Horsemen*; Macfarlane, *The Savage Wars of Peace*.

<sup>13</sup> Bankoff, 'Vulnerability as a Measure of Change in Society'; Pelanda, 'Disaster as Sociosystemic Vulnerability'; Wisner et al., *At Risk*.

<sup>14</sup> Hewitt, *Interpretations of Calamity*; Torry, 'Bureaucracy, Community and Natural Disasters'.

<sup>15</sup> Hewitt, *Interpretations of Calamity*; Hoffman, 'Anthropology and the Angry Earth'; Oliver-Smith, 'Peru's Five Hundred Year Earthquake'; Torry, 'Bureaucracy, Community and Natural Disasters' and Torry, 'Anthropological Studies in Hazardous Environments'.

<sup>16</sup> Hewitt, 'Excluded Perspectives in the Social Construction of Disasters'.

Another weakness of the concept is that it lays too much emphasis on explaining the causes of disasters, thereby paying less attention to their societal consequences.

Although natural hazards are familiar though not (entirely) predictable elements of a society's environment, as maintained by Torry,<sup>17</sup> they nevertheless are external to the populations they affect. But on the other hand, we have to consider only those natural hazards, which may afflict populations in pre-modern agricultural states and omit natural hazards that those pre-industrial societies are not or less susceptible to. The question is not whether natural hazards are natural (whether purely natural or partially caused by society itself) or not (such as wars), but rather the kind and extent of the impact they may have on populations and societies. These impacts may be measured in reduced harvest yields, loss of animals, hunger and displacement, sickness and death of people. A second question aims at how populations and societies succeed in reducing the risk of occurrence and in mitigating the impact of disasters once they have occurred.

So we may conceive of the impacts of hazards as external to the populations they affect, although we only consider those hazards, which may afflict groups in pre-modern societies. This seems to be a precondition for analysing the relative weight of (a combination of) hazards (of a given kind, severity and extent) and for evaluating the failure of strategies of the state and households aimed at preventing and mitigating disasters. (It is a truism that a disease, i.e. a disaster, depends not only on the impact of more or less aggressive viruses and bacterias but also on the immune system and the efficacy of medication.) Hence, I would prefer concepts such as the disaster proneness of a specific society (and its constituent groups) as well as strategies to prevent and mitigate disasters to the somewhat larmoyant term 'vulnerability'.

### *Prevention and Mitigation*

Enrico Quarantelli<sup>18</sup> has underlined the importance of distinguishing between preconditions and post-consequences of disasters and maintained that only the second are relevant for disaster analysis. But as Oliver-Smith

<sup>17</sup> Torry, 'Anthropological Studies in Hazardous Environments'.

<sup>18</sup> Quarantelli, 'What is a Disaster'?

and Hoffman rightly stressed, both are relevant for a comprehensive analysis of disasters.<sup>19</sup> Thus, it makes sense to distinguish between preventive (ex-ante) and mitigating (ex post) strategies.

Preventive are all those measures and strategies, which lower the probability of the occurrence of natural disasters as well as their severity in space and time for populations and societies. They include risk-reducing strategies resorted to by peasants (mostly diversification of crops, fields and activities) and earthquake-proof buildings, but also infrastructure and organisational capacities provided by the state including water works and dams as well as forest reserves and reforestation against droughts and floods.

Mitigating are all those measures and strategies that reduce the impact of natural hazards—once they have occurred—on populations and societies. They include coping strategies of peasants such as savings and provisions for 'bad times' as well as local and regional associations of mutual support, but also coping strategies of the state such as food and medical relief activities, public granaries (in Imperial China) and water reservoirs (in the Maya city-states), suspension of tax and rent payments, imports of food from unaffected areas, price control, reconstruction of the economy and resettlements.

### **Models and Theories**

For a comparative study of disasters in pre-modern societies a robust and simple model is required which allows a description of the relationship between the most relevant variables in natural disaster analysis, a model also on which most of the scholars may agree to a sufficient degree.<sup>20</sup> It should be a model which allows studying the relative weight of factors such as natural hazards, inefficient prevention and mitigation strategies by peasants and state failure, in causing a disaster, a model which does not pre-empt the definition of the phenomenon that should be the object of an empirical analysis.

<sup>19</sup> Oliver-Smith and Hoffman, *The Angry Earth*.

<sup>20</sup> For more complex models see Kates, *Climate Impact Assessment*; Wisner et al., *At Risk* and Pfister.

### Peasants

In pre-industrial societies about 80 to 90 per cent of a population are peasants, the rest living in cities and relying on food from surrounding villages. Thus the main question is to what extent and by what natural hazards were pre-industrial agricultural systems affected. Furthermore, to what extent did peasants develop preventive and coping strategies as well as whether and to what extent did the state intervene in the prevention and mitigation of natural disasters. Peasant households pursued a wide range of production strategies to secure their living by reducing the risk of crop failure and animal mortality.<sup>21</sup> Most peasant households were—at least to some extent—integrated in local markets in order to enhance their living standards, through paid labour, cash crop and handicraft production, although price variations created new risks at the same time. Peasant households also pursued various reproductive strategies in order to adapt the number of their offspring to the amount of productive resources (higher birth rates and less infanticide in good times, lower birth rates and more infanticide in bad times).<sup>22</sup> Thus, peasant households pursued a wide variety of strategies in order to reduce risks and cope with natural disasters. Furthermore, the elite in all pre-modern state societies appropriated a part of the peasant households' output as surplus (in the form of taxes, rents and labour).

### States

Elites within the pre-modern state are, besides the peasants, the second important actor group in pre-modern societies. Such a state roughly consisted of a military and an administrative sector, both being economically relevant. In order to supply expanding armies, large amounts of resources and manpower were needed, which could not be used for disaster prevention and mitigation. The costly supplying of armies could even increase the probability of hazards (as in the case of deforestation as a consequence of building-up fleets and causing floods). Furthermore, wars caused not only hunger and death, but also led to the destruction of agricultural means

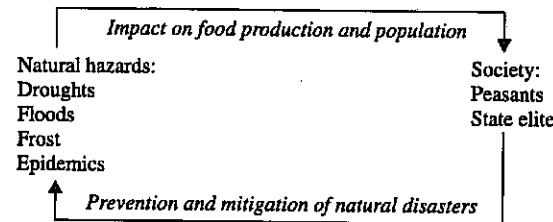
<sup>21</sup> On various forms of diversification see Ellis, 'Household Strategies' and Ellis, *Peasant Economics*.

<sup>22</sup> Cp. Harris and Ross, *Death, Sex and Fertility*; Lee and Wang, *One Quarter of Humanity*.

of food production and public infrastructure (such as transportation, market and irrigation systems). War, then, seriously hampered the organisational, technical and financial capacity of a state to prevent and mitigate disasters, although successful wars could increase the amount of economic resources (land and manpower) of a society.

Pre-industrial elites sometimes invested in transport, market and irrigation systems to enhance agricultural productivity and to increase the amount of surplus. A state could maintain a system of granaries, invest in water works, lower taxes in times of hardship, organise resettlements and take other measures in order to prevent or mitigate disasters.<sup>23</sup> The state was crucial in achieving costly public works (such as dams or water reservoirs) but also in mitigating the impact of natural hazards, which affected a large number of people and provinces. The successful prevention and mitigation of natural crises was often seen as a legitimisation of the elite's domination as in the Maya-states<sup>24</sup> and in Imperial China. In the case of large disasters, for which the state was held responsible (see Janku this volume), the elite lost its legitimacy, and popular rebellions broke out that removed the ruling dynasty from power.

Figure 1



Some critics may rightly object that an important element of pre-modern societies such as cities and their special proneness to disasters such as epidemics, earthquakes and fire<sup>25</sup> has been ignored. I also have not included religion and ideology as well as perceptions, conceptions and theories of disasters in the model although they may influence the attitudes

<sup>23</sup> On Imperial China see Will et al., *Nourish the People*.

<sup>24</sup> Lucero, 'The Collapse of the Classic Maya'.

<sup>25</sup> See Bankoff on Manila in this volume and Oliver-Smith, 'Peru's Five Hundred Year Earthquake' on Peru.

and behaviour of people afflicted by a disaster. However, not only in order to keep the model simple and robust, but also because I hold those factors to be less important, I have not considered them here.

The second main element of the proposed model comprises the various hazards that can afflict pre-industrial states based on agricultural, but also climate variations and weather extremes.

### *Natural Hazards, Climate Variations and Weather Extremes*

Long-term climate variations such as the cold and warm, wet and dry periods (climate optima and little ice ages) are important, as shown by Pfister, Fagan (2000) and others.<sup>26</sup> These variations have tremendous consequences for economy and society, but since they are long-term changes, peasants and states usually succeed in adapting to them by modifying their economy and social institutions.<sup>27</sup>

More difficult to adapt to and, hence, more relevant for the study of disasters are short-term weather conditions such as El-Niños and 'years without summers' during the little ice age, as Grove and Pfister notice.<sup>28</sup> Droughts and floods, storms and frosts, pests and epidemics could cause widespread damage in pre-industrial agriculture such as loss of harvest, death of animals, malnutrition, hunger, sickness and death of people.

The performance of pre-industrial agriculture is mainly dependent on soil quality and on crops planted, but also on climatic and weather conditions such as precipitation, temperature and the number of sunny days. A fall of 1° in average temperature reduced growth period by three to four weeks and the total acreage of arable land both in altitude (by 180 altimeters) and latitude. Also wet and dry periods required a change in agricultural techniques (melioration, poldering, irrigation) and in crops and animals used in agriculture.<sup>29</sup> Higher or lower temperatures may also have an influence on mortality: a rise of 1° to 1.5° in average temperature, for instance, lowered winter mortality of children and old people, but at the same time it led to a spread of diseases from tropical and sub-tropical areas into temperate regions, thus increasing mortality due to epidemics.

<sup>26</sup> See Pfister this volume and Fagan, *The Little Ice Age*.

<sup>27</sup> Galloway, 'Long-term Fluctuations in Climate and Population'.

<sup>28</sup> See also Fagan, *Floods, Famines, and Emperors*.

<sup>29</sup> Braudel, *The Structures of Everyday Life*.

The magnitude of an impact had repercussions on the way peasants and the state could cope with it. If peasants had suffered from several years of crop failure, the capacity of the state to mitigate the effects of a natural hazard was also seriously hampered, since its revenues declined. During a drought cheap and efficient water transport was not available, and relief goods did not arrive in due time where they were most needed.<sup>30</sup> The same natural hazard may have different effects on populations or similar effects for different reasons, as Mike Davis shows in a comparison between colonial India and late Imperial China during the two massive El-Niños at the end of the nineteenth century.<sup>31</sup>

### **Malthus**

The study of natural disasters seems to suffer from a preoccupation with definitions and a focus on case studies while neglecting modelling and theorizing about the impact of natural hazards on populations, classes and regions as well as on the preventive and mitigating strategies of peasants and states.<sup>32</sup>

Malthus is the absentee theorist from the discussions of natural disasters. This is all the more amazing since Malthus conceived of disasters such as hunger, epidemics and war as a consequence of populations outgrowing their production capacities within societies. Diamond has recently explained the collapse of societies with reference to a Malthusian paradigm: population growth, resource overuse in combination with climatic deterioration and natural hazards.<sup>33</sup> Malthusian theory has been considered as an appropriate starting point for the study of populations and resources in pre-industrial societies<sup>34</sup> while industrial society has successfully escaped the trap of over-reproduction and under-production.<sup>35</sup>

It is true that Malthus did not consider the dependence of food production on climatic and weather conditions and he showed no interest in the

<sup>30</sup> See Kolb 'About Figures and Aggregates' on China.

<sup>31</sup> Davis, *Late Victorian Holocausts*.

<sup>32</sup> See already Sorokin, *Man and Society in Calamity*.

<sup>33</sup> Diamond, *Collapse*.

<sup>34</sup> Elvin, 'The Pattern of the Chinese Past'; Wrigley, *Continuity, Chance, and Change*.

<sup>35</sup> Brinley, 'Escaping from Constraints'; Komlos, 'The Industrial Revolution'.

variation of ecosystems. He also ignored technological progress and productivity increases of both resources and labour in pre-industrial societies.<sup>36</sup> Furthermore, Malthus had a naïve conception of population growth. Lee and Wang, Harris and Ross and others have shown that families evaluate costs and benefits of further children and pursue reproductive strategies in order to have the number of children they want to have.<sup>37</sup> For Malthus, disasters such as famines, wars and epidemics were mechanisms of population reduction (positive checks) resetting the balance between population and resource stocks. But those disasters could also reduce resource stocks and increase population pressure without population growth.<sup>38</sup>

Further objections could be raised against Malthusian theory, but despite all its shortcomings, the relationship between population, technology and resources is still relevant and crucial for the study of the impact of natural hazards as well as the preventive and coping strategies in societies.

### Outlook and Perspectives

An integral, though often implicit part of the research agenda of the study of natural disasters is and has always been the analysis of the complex causal links between natural and economic factors to cultural and social phenomena.<sup>39</sup> Grove has shown that the great El Niño of 1789–93 was in fact a global phenomenon having impacts in all world regions. However, this broad perspective somewhat obscures the more specific relations between climatic phenomena and the social impact they are assumed to have had in France during the revolution, in India under the East India Company, in China under the Qing, and Mexico in under the Spaniards. The extreme weather conditions (droughts or floods, cold or warm, all extreme) had an impact on agriculture and on grain prices, as Grove has pointed out. But it seems difficult to demonstrate how climatological (or meteorological) and economic facts (mounting grain prices) link up at a closer level with the political upheaval and unrest in those world regions.

<sup>36</sup> On late Imperial China see Deng, *The Premodern Chinese Economy*; Li Bozhong, *Agricultural Development in Jiangnan*; Pomeranz, *The Great Divergence*.

<sup>37</sup> Harris and Ross, *Death, Sex and Fertility*; Lee and Wang, *One Quarter of Humanity*.

<sup>38</sup> Pomeranz, *The Great Divergence*.

<sup>39</sup> See Jones, *The European Miracle*; Pfister on witch-hunt in Europe in this volume, for an example.

There have been similar attempts in historiography to explain the periodic incursions of mounted warriors and the frequency of peasant uprisings in pre-modern societies.

Peasant uprisings were frequent in pre-industrial states. However, they were not primarily triggered by natural disasters, although the 'immoral behaviour of the elite' was often held responsible for these. Explaining disasters through the corruption and immorality of the elite seems perfectly reasonable in case of drought and floods, in view of the neglect of public water works or deforestation of hilly areas. (Perhaps the popular reaction towards disasters was different in case of earthquakes where adequate house building left nobody to whom the blame could be attributed.) Political scientists and anthropologists explain revolts and rebellions as being the result of a widespread discontent with an unjustified, unequal distribution of wealth (a greedy and corrupt elite), but also as stemming from the expectation of a successful change for the better (being dependent on charismatic leaders and efficient organisations, but also on a weakness of the state). Therefore, it does not come as a surprise that J.S. Lee's graph on the frequency of revolts and rebellions in Chinese history<sup>40</sup> shows no correlation with cold/dry, hence bad times, and warm/wet, i.e. good periods: there were rebellions without weather anomalies and weather anomalies without rebellions. Explaining rebellions through widespread popular discontent and the expectation of a successful change would reveal the political logic prevailing in pre-industrial agricultural states.

Hsü is a staunch proponent of the climatic determination of economic and social factors.<sup>41</sup> However, even according to him such an important historical fact as the various waves of incursions by mounted warriors from the steppes and deserts into better-placed regions dominated by wealthy states cannot be explained by climatic variations. Goths, Huns, Vandals, Franks and the Manchu migrated during little ice ages when the economic conditions in the northern steppes deteriorated. But, Arabs, Turks, Vikings and Mongols expanded outwards during warm and good times, according to Hsü, because of their greed and bellicosity. Is it grievance in bad times and greed in good times, that explains those outward movements, as Hsü maintains, or rather the prevailing political logic of

<sup>40</sup> Sorokin, *Social and Cultural Dynamics*.

<sup>41</sup> Hsü, *Klima macht Geschichte*.

wars, expanding herds and populations, and political leaders seeking to win followers by plunder and distribution of spoils?

The study of natural disasters rests on the (implicit) assumption that we may be able to explain more cultural and social phenomena and better with reference to natural disasters rather than without such a reference. It is without a doubt important to take natural disasters into consideration while seeking such explanations, but it there appears to be no reason to revive or continue old economism by replacing it with climatological factors.

It may yet be too early to consider attempts to explain economic and social processes through recourse to climatic variations and disasters as futile. However, the study of natural hazards and disasters may only live up to its explanatory aspirations and contribute to explain economic and social variations and processes in the history of societies, if it develops more sophisticated models and uses more refined and higher quality data and if it enters into a wider theoretical discussion of the relationship between populations, technologies and resources, states and classes, climatic deterioration and natural hazards.

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