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Disaster Management in the 19th Century, Kyushu, Japan. Seashore Villages in Amakusa Islands*

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1. Disasters in early modern Japan

Christian Pfister categorized hazards into two types, 'rapid-onset hazards' and 'slow-onset hazards' (Table 1), and suggested that, "to avoid ambiguity, historians should define their use of the term nature-induced disaster" (Pfister 2009, 18). He refers in his paper only to rapid-onset hazards, because famine, for example, is strongly linked to social causes such as the unequal distribution of resources. Nature-induced disasters are unpredictable outbreaks of natural forces that cause sudden, destructive damage to people and environments. In this paper, various sorts of disasters will be considered, however, because the purpose of the present study is to compare the styles of disaster management efforts.

In traditional agricultural Japan, each village followed a self-governance principle to improve and maintain water supply systems for rice fields and other agricultural purposes. However, if such a system was destroyed on a large scale, the local government financially supported its reconstruction. The workers were

mostly village people who were paid wages to engage in reconstruction projects involving destroyed banks, weirs and dikes that were planned by the local governor. For centuries the main strategy for dealing with floods was not to fundamentally control the rivers, but simply to avoid greater risks (Pfister 2009, 33). Village people always repaired banks, weirs and levees, and floods often seemed not to be considered terrible disasters to be conquered, but rather as endurable events.

Table 1. Rapid-onset hazards and slow-onset hazards

Rapid-Onset Hazards	Slow-Onset Hazards
Frosts	Droughts
Floods	Epidemics
Storm tides	Famines
Windstorms	
Volcanic eruptions	
Rockslides	
Earthquakes	
Tsunamis	

Source: Pfister 2009, 18

What disasters occurred in early modern Japan? How did the population understand the disasters, and what did they need to manage them?

Recently, economic historians have debated two different types of social development in early modern times. They use the terms “industrial revolution” and “industrious revolution” (Pommeranz 2000; Mizushima 2010a; Mizushima 2010b, 210-211; Sugihara 2004; Saito 2008, 141-142; Hayami 1989, 29; Tomobe 2007) to denote these two types. The former development type, “industrial revolution,” refers to the capital-intensive, labour-saving agriculture that was pursued in Western Europe, in particular in England. In this type, a great amount of capital was expended. Tokugawa Japan represents the classic development of labour-intensive agriculture, because in traditional Japan there was no large-scale agricultural management. The optimum type of labour for small-scale management was the family labour force, and the peasants improved farming management efficiently (Hayaymi 2010, 5-7). This seems to be a fundamental culture established in traditional Japan, especially in the Tokugawa period. Can we also observe this culture of “industrious revolution” in the interactive processes between past societies and the nonhuman world (Pfister 2009, 17; Worster 1993)? What kind of disaster management was practiced in this culture?

Map 1. Amakusa in Japan

2. Shoya's administrative diaries

Shoya's diaries, the administrative diaries of a village, are quite valuable historical materials. The local governors of Takahama, a village in the Amakusa Islands, Kyushu, Japan, annually wrote diaries that were carefully preserved in the depository of the house of Ueda, the family of Shoya, until the present, more than 200 years. These diaries describe in detail the "disasters" that occurred in this location and how the people of Takahama understood and managed them. The regions where ordinary people lived had for housing and farming, fishing, and the production of mountainous resources suitable places known as Mura. A Mura is a

village community which on average had a population of 400 to 500. There existed in the Tokugawa Period in Japan between 60,000 and 70,000 Mura. The inhabitants of a Mura felt a strong identity with the other residents of the same Mura. A Mura was a distinct unit of communal institutions (Hayami 2010, 245). A Mura had a responsibility to pay tax. The annual tributes in Tokugawa Japan were borne not by individual peasants, but communally by the Mura. The village community had a strong bond and solidarity (Hayami 2010, 248). The representative of a Mura, a village community, was the Shoya, a local governor, who was also a peasant but could be ranked in the lower echelons of the governmental administration.

Photo 1. Ueda-Yoshiuzu-Nikki in the Ueda Archive

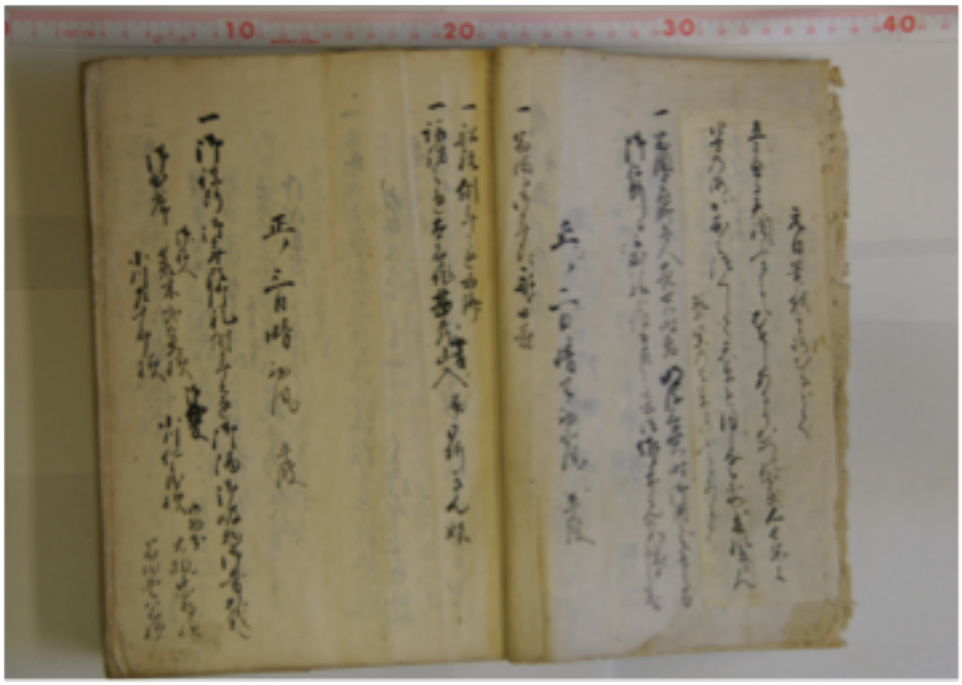


Photo 2/3. Ueda-Yoshiuzu-Nikki from January 1 to 3, 1803 (Bunka 5)

The Shoya in Takahama kept diaries dealing the governance of a village community. The Ueda house archive contains 88 diaries. The sixth Shoya Buhitsu (who was a Shoya from 1755 to 1789) left one diary, the seventh Yoshiuzu (=Gichin) (1789-1818), 26 diaries, the eighth Teion (1802-1820, Shoya of Imatomi), 13, the ninth Nobuchika (1819-1822), 4, the tenth Sadayuki (1823-1861), 33, and the eleventh Sadauzu (1861-1872), 11 (Higashi 2008, 2009, 2010; Murayama 2009a, 2009b).

Of these diaries we were able to investigate those of Yoshiuz from 1789 to 1818. He served as Shoya for 30 years. There existed 24 diaries, one for every year except the years 1789 (Kansei 1), 1794 (Kansei 6), 1796 (Kansei 8), 1800 (Kansei 12), 1811 (Bunka 8) and 1813 (Bunka 10). Twenty-one diaries written from 1793 (Kansei 5) to 1818 (Bunka 15) were published in 20 books titled "Amakusa-gun Takahama-mura, Shoya, Ueda Yoshiuzu Nikki". Our research project has digitized these diaries, with a total of 1849 pages and more than one million characters, in a book format. With this digitization, we can use his diaries covering 24 years analytically, because we can access to the diaries more easily and systematically. These diaries were not merely memories, but functioned as documentation, manuals for administration, and evidence for the government in order to 'sustain a village community safety and peacefully' (= 'Mura-dyu Anzen').

3. Disasters in the Developing Economy in Takahama

Fig. 1 shows us the population change of Takahama from 1785 to 1818. The population of Takahama changed from a stagnation phase to a slightly growing phase. The population increased from 3,086 in 1785 (Tenmei 3) to 3,470 in 1818 (Bunka 15), an increase of 384. To consider the influences of disasters, we must observe the three decreasing phases of the population; the first phase from 1807 (Bunka 4) to 1809 (Bunka 6), the second from 1813 (Bunka 10) to 1814 (Bunka 11), and the third from 1815 (Bunka 12) to 1816 (Bunka 13). The population decreased by 63 in the first phase, by 41 in the second phase, and by 35 in the third phase.

Based on the records of disasters mentioned in the Shoya diaries over 20 years in 24 diaries from 1783 to 1818, cases of bad harvest, earthquake, fire, flood and severe wind were counted, and outbreaks of smallpox were described in terms of the number of patients. Table 1 shows that in 20 years there were six cases of bad harvest, 10 earthquakes, 10 fires, including three large fires, seven floods, and eight cases of severe wind, probably storms. Special outbreaks of smallpox were recorded two times, from 1807 (Bunka 4) to 1808 (Bunka 5) and in 1814 (Bunka 11). Fig. 2 shows the number of combined disasters for each year. No recorded years are excluded from the figure.

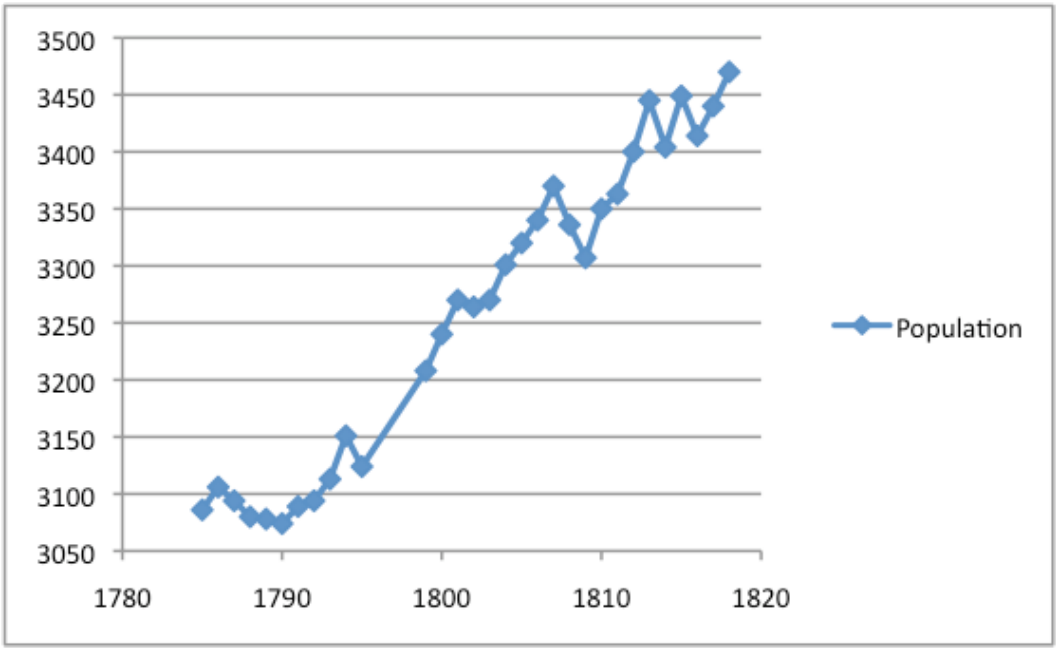


Fig. 1. Population in Takahama from 1785 to 1818
Sources: ASU 1001, 1002, 1004, 1005, 1007, 1009, 1011, 1016, 2965, 3716, and 4886

Year	Population	Bad Harvest	Earthquake	Fire	Floods	Severe Wind	Smallpox
1783		0	0	1	0	0	0
1784							
1785	3086						
1786	3106						
1787	3094						
1788	3080						
1789	3078						
1790	3074						
1791	3089						
1792	3094	1					
1793	3113	0	0	0	0	0	2
1794	3151						
1795	3124	0	0	0	0	0	1
1796							
1797		0	0	0	0	0	0
1798							
1799	3208						
1800	3240						
1801	3270	1	0	1	1	0	3
1802	3264	0	0	0	0	0	0
1803	3270	1	0	0	1	0	3
1804	3301	0	0	0	2	0	1
1805	3320	0	2	0	0	0	1
1806	3340	1	1	0	1	0	0
1807	3370	0	0	1	0	0	83
1808	3336	0	1	2	0	1	126
1809	3307	1	0	1	0	0	8
1810	3350	0	0	0	1	2	11
1811	3363						
1812	3400	0	0	1	0	0	1
1813	3445						
1814	3404	0	0	1	0	2	100
1815	3449	0	2	2	0	1	1
1816	3414	1	1	0	0	1	2
1817	3440	0	1	0	1	1	2
1818	3470	0	2	0	0	0	4
	Total	6	10	10	7	8	349

Table 2. Disasters in Takahama from 1783 to 1818
Sources: ASU Ueda-Yoshiuzu-Nikki. See Fig. 1 for the 'Population'.

The diaries reported no serious nature-induced disasters that caused casualties such as floods, storms, earthquakes, or fires. Only the outbreaks of smallpox brought human deaths. In the first phase of the demographic crisis, 78 persons died due to smallpox, and in the second phase, 52 persons died. In the third phase we must consider the effects of the combination of disasters, such as the influence of large fires on subsequent living conditions and sickness outbreaks. One such fire occurred in Hama, one of the districts of Takahama, in which 115 houses, 107 huts, a Hachiman-shrine, an official bulletin board place, a Kannon-temple, and a

stock house all burned on August 1, 1814 (Bunka 11) (Map 2). 539 persons were displaced by the fire. On November 26 of the following year, 70 houses were burned in Moto-mukai (Map 3), also a district of Takahama, and 173 persons were displaced. Again on December 29 of the same year in the same district, 60 houses were burned. In these years a total of 245 houses were burned down. We also know the number of persons who were sick in these years. The living standard seemed to have dropped significantly in these years (Table 3). The number of sick persons in a given year is sometimes available because if people could not attend the annually organized census ceremony, they had to provide a reason.

The repeated fire disasters from 1814 to 1815 created incentives for the Shoya and his administrative colleagues to engage in improved town planning in order to stop the spread of fire. The diaries show us that the widths of alleys and lanes were expanded, and a new fire fighting organization, which was equipped with fire-fighting instruments, was introduced. Moreover, the system of mutual help between village communities called Sukui (=Save), which involved supplying food to people who were victims of fires and other nature-induced disasters, had been a long-time tradition. Pictorial maps were drawn of houses burned in major fire disasters to help contemporary populations to reconstruct the towns, but they also aid historians in the present to visualize the disastrous fires that occurred in the pre-modern world. Such a visualization of disasters was also possible in the case of the flooding of 1803 (Kyowa 3).

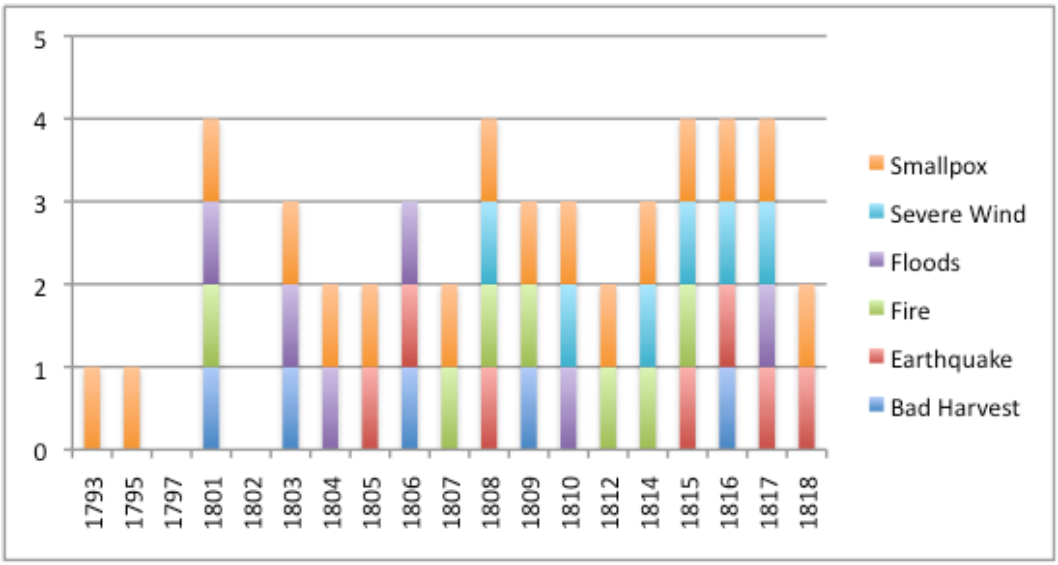


Fig. 2. Combination of Disasters in Takahama from 1793 to 1818
Source: ASU Ueda-Yoshiuzu-Nikki

Map 2. Burned houses in 1814
Source: ASU Ezu 55

Map 3. Burned houses in 1815
Source: ASU Ezu 57

Year	Sick Persons	Males	Females	Sex Ratio (Males to 100 Females)	Population
1810	275				3,350
1814	407	131	276	47.5	3,404
1815	370				3,449
1816	440	117	331	35.3	3,414

Table 3. Sick persons in Takahama from 1810 to 1816
Source: ASU Ueda-Yoshiuzu-Nikki

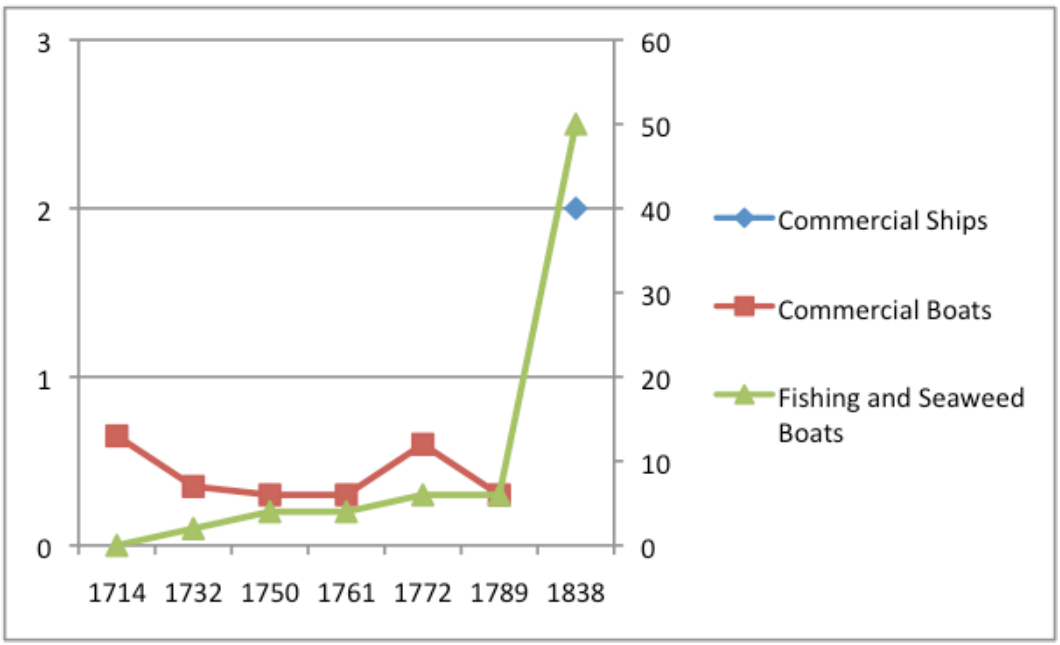


Fig. 3. Commercialization and fishery development in Takahama
Sources: ASM, see Fig. 1

We cannot find the word "famine" in the diaries. The word "bad harvest", Kyo-saku or Fu-saku, appeared every three years, six times over 20 years in the available diaries. In serious cases of "bad harvest," Shoya tried to entreat the reduction of the tax by the local government. The Shoya also strived to plant sweet potatoes in the village, and to have a sufficient harvest to take precautions against the possibility of epidemic and other disasters. There was no serious bad harvest during the period of the Shoya, Yoshiuzu Ueda. The Shoya played a decisive role in this by developing the village economy. He put forth initiatives to develop the fishery and pottery stone industries, and established a commercialized complex economy, because Takahama did not have enough rice fields to sustain the village population as an single agricultural economy.

Table 4. Increase of the number of transportation means

Year	Population (left bar)	Horses (right bar)	Cattle (right bar)	Boats and Ships (right bar)
1714	1272	109	16	13
1732	1804	134	8	7
1750	2400	135		10
1761	2557	138		10
1768				
1772	2875	125		18
1789	3078	117		12
1804				
1810				
1821	3559			
1838	3638	758		52
1868	3732	632	26	71

Source: ASM

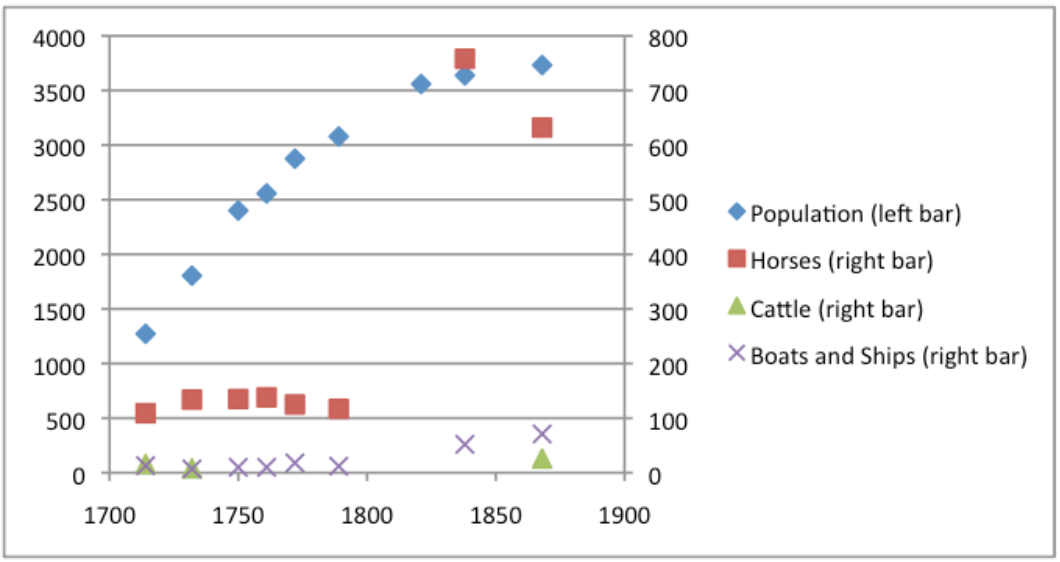


Fig. 4. Increase of the number of transportation means
Source: See Table 4

The village economy changed drastically from the end of the eighteenth century to the nineteenth century (Figs. 3 and 4 and Tables 4 and 5). Two big, nine-sailed and six-sailed commercial ships were introduced instead of six small commercial boats, and these supported the commercialized village economy, and also the fishing and marine production increased in these decades. The number of fish-

ing and seaweed boats increased from 6 to 50. A decisive increase of other transportation means such as horses, which increased from 117 in 1789 to 758 in 1838, also occurred. Such a dramatic increase of the means of transportation was likely one of the results of the commercialization of Takahama.

One of the results of the 'industrious revolution' can also be observed in Takahama in the form of a complex commercialized economy, in which the village community had a consistent economic policy managed by the Shoya, as well as a system of disaster management (Yamamoto, 1997, 28). Differing from the European type of pre-modern economic development, the peasants in Japan could maintain their initiatives in the agricultural sector (Saito 2008, 140-141). However, according to the environmental conditions, which determined which fields were agriculturally available, the balance between an individualistic peasant family economy and village communalism seemed to be different in each region. Takahama represents a case of relatively strong village communalism.

Table 5. Commercial and fishery tax ("Momme" = silver coin) on fishing-related commerce in villages of the Oe district.

Year	1789		1867	
Village	Commercial Tax	Fishery Tax	Commercial Tax	Fishery Tax
Sakitsu	27	465	0	465
Imatomi	0	0	0	0
Ooe	6	40	24	40
Takahama	45	0	177	50
Kozatoko	33	0	42	0
Simotsufukae	18	0	33	0
Tororo	6	0	0	0
Fukuregi	0	0	0	0
Total Amount	135	505	276	555

Sources: ASU 1009, ASO

For disaster management, each village had to prioritize the needs of the community as a whole. To be worthy for consideration, the management policy and style had to reflect the culture of each village in its treatment of each disaster such as floods, fire, and smallpox. Floods were not phenomena to conquer, but were considered sometimes to be useful, because they could bring fertile materials from the mountains; however, the damage that they caused had to be minimized. Fire was mostly a human-induced accident, which had to be prevented by all means.

Smallpox was considered to be a terrible disaster that was thought to be not fully preventable; it was only considered possible to prevent its unlimited spread. It was important in the case of smallpox to calm the anxieties of the population and to control the spread of unrest.

Because of the desire for rain during a drought, prayer rituals and ceremonies asking for rain were the main religious response under such conditions. For this purpose, and also to avoid smallpox, people requested the religious authorities to perform prayer rituals and ceremonies. Professional prayers earned a living for providing these performances.

It is necessary here not only to divide disasters into the two categories of rapid-onset hazards and slow-onset hazards, but also to distinguish between tangible physical hazards such as the destruction and burning down of houses and intangible psychological hazards such as anxieties and traumas (see Fig. 6).

4. Anxieties and Fears of Smallpox and its Casualties

Using well informed, quantitatively analysed demographic sources, Sköld reported the historical change in smallpox mortality. In Sweden, although 300,000 persons died from the disease between 1750 and 1900, mortality declined sharply at the beginning of the nineteenth century (Sköld 2002, 75-76). Crude death rates declined continuously between 1750 and 1900 (Sköld 1996, 27-36). In Japan, smallpox epidemics were the worst in Japan's history in both infection rates and mortality rates in pre-modern times until a vaccine was introduced after 1849 (Sakai 2008, 202-204). Smallpox is often assumed to have been one of the main causes of human death in pre-industrial Japan (Fujikawa 1969; Fukase 1999). Unlike in Sweden, inoculation was never widespread in Japan, though it was introduced to Japan in 1744 from China. Smallpox in Japan was not entirely endemic, because many people evaded infection. Smallpox infection was seen as a religious issue, and spontaneous recovery was desired.

Watanabe (2009) described two types of smallpox outbreaks in Japan. Outbreaks of smallpox have been recorded since the eighth century and occurred repeatedly in most areas of Japan during the early modern period. The interval between outbreaks in this historical period has had two patterns. In one pattern, observed in densely populated areas, outbreaks occurred after short intervals of less than 10 years. In these areas, smallpox was endemic and most of the infected were children (Suda & Soekawa 1983; Kawaguchi 2001). In contrast, the intervals between outbreaks observed in remote areas, where the population was dispersed over large geographic areas, were generally more than 10 years and up to 20. The infected included not only children but also young adults and even mature adults (Kobayashi 2000). Smallpox was not endemic in this pattern, and outbreaks were

associated with the contingent introduction of pathogens from other areas, which exposed many people to infection. Watanabe applied the model of the spread of measles in communities of different population sizes developed by Cliff and Haggett (1989) to these patterns of smallpox outbreaks in early modern Japan, where mass vaccination was not yet available. Watanabe (2009) suggested that periodic mass variolation of children was carried out to mitigate the impact of an epidemic in one part of the Ryukyu Islands, where the latter type of outbreak was prevalent (Kobayashi, 2000). On the other hand, Watanabe (2009) also suggested that, in areas where it was endemic, the smallpox pathogen might have circulated gradually.

Map 4a. A pictorial map of Takahama, measured in 1808 (Bunka 5) and drawn in 1823 (Bunsei 6)
Source: ASH 12-8-1

Watanabe (2010) studied how the smallpox pathogen was actually transmitted. In doing so, she focused on the transmission process of smallpox during the 1790s in a rural area of northeast Japan, where the disease was endemic. She analysed a series of records prepared by a local administrator, which described not only the expansion of outbreaks among these settlements but also the sequence of disease onset among individual patients. She also clarified the pathogen's transmission pattern. This pattern focused on the contacts between groups of children in adja-

cent settlements as a possible cause of the spread of the disease. In her paper, Watanabe described the association between the speed of smallpox transmission and children's range of movement. The lack of medical understanding about contagiousness increased the fear of smallpox, especially in remote areas, where the second pattern of smallpox outbreaks predominated. According to a contemporary Japanese work, "Toso-Mondo" (The Smallpox Dialogue) (Higaki 1952, 7), in Amakusa those infected with smallpox were isolated and abandoned by the population out of fear of contracting the terrible sickness. Fathers, mothers, and other family members who became infected were banished. Even if they recovered, they could never return to their homes if they had been away for more than 100 days.

Map 4b. Shoya and four mountain huts in Takahama
Source: N. Higashi identified the places of the houses and huts from historical records.

From the carefully kept population records of the time, we know that in Takahama (Map 4a), 183 people contracted smallpox in the five-month period between December 1807 and April 1808, and 78 of them died of this disease. Before the introduction of a vaccine, the only way to bring an outbreak under control was to quarantine the infected. According to historical sources, there were quarantine huts in Amakusa from the start of the 18th century (Higaki 1952, 7).

Table 6. Death by smallpox in Takahama from 1807-1808

	Reported in Diary	Dec 15, 1807	Dec.25, 1807				Dec.27, 1807	Dec.29, 1807			Jan.9, 1808	Jan.26, 1808	Feb.11, 1808			May 19, 1808*****	May 19, 1808
		A fisherman, Keisuke, died on Nov.28, 1807	until Dec. 16	Dec.17-23	[Total]	Total (reported on Dec.26 at Tomioka Office)					Dec.14 - Jan.6	Total (reported on Jan.26 at Tomioka Office)			Total (reported on Feb.12 at Tomioka Office)	Feb.17 - Mar.7	Apr.7-25
Houses		20		8	[31]	36					45				51	6	11
Patients		about 40	51	10	[76]	80	80→86			113	126	150			151****	15	17 (shipped to other countries)
	Male					39						63			64	8	7
	Female					41						87			87	7	10
Died		3			[16]	16	19 (reported on Dec.28)	16 (until Dec.24)+5 (on Dec.25)=21*			38 (until Jan.8)	55 (until Jan.22)	[4***]	[57 (until Jan.26)]	61	12	5
	Male					8						23	[2]	[22]	24	6	1
	Female					8						31	[2]	[35]	37	6	4
Quarantined Patients	Total	61		25				Dec.27	Dec.28	Dec.25-27					[151]	[15]	[17]
Mountain Hut				10		64	64[+4+2]	3	3	[11**]	87	95				15	
	Houses	12						2	2		32					6	
	Male					31						40				8	
	Female					33						55				7	
	Nursing										67						
Exclusion Hut				15		101	[118]			[118]	118						
	Houses				[28]												
	Persons				[over 200]												
	Care										20						
Shipped	Total																17
	Male																6
	Female																11
Nursing+Care						120		120									21
	Mail																11
	Female																10
Recovered															90	3	12
	Male														40	2	6
	Female														35	1	6
Doctor						1		1			1						
Catering						1		1			1						
Watchman						1		1			1						
Total						304	about 330				333						

*9 patients died before giving medicine, 12 oned died after medical treatment
**a female patient with her baby
*** died at home
****one patient coming to the mountain hut on February 2
*****102 days after staying in the mountain hut

Source: ASU Ueda-Yoshiuzu-Nikki

In comparison with Takahama, Sakitsu, a village close to Takahama, suffered a dramatic population loss because of three outbreaks of smallpox in 1801, 1813, and 1834. The population was reduced from 2,400 to 1,400 during that time. In another paper, we attempted to determine the differences between Sakitsu and Takahama that led to their markedly different experiences with smallpox (Murayama and Higashi, 2011).

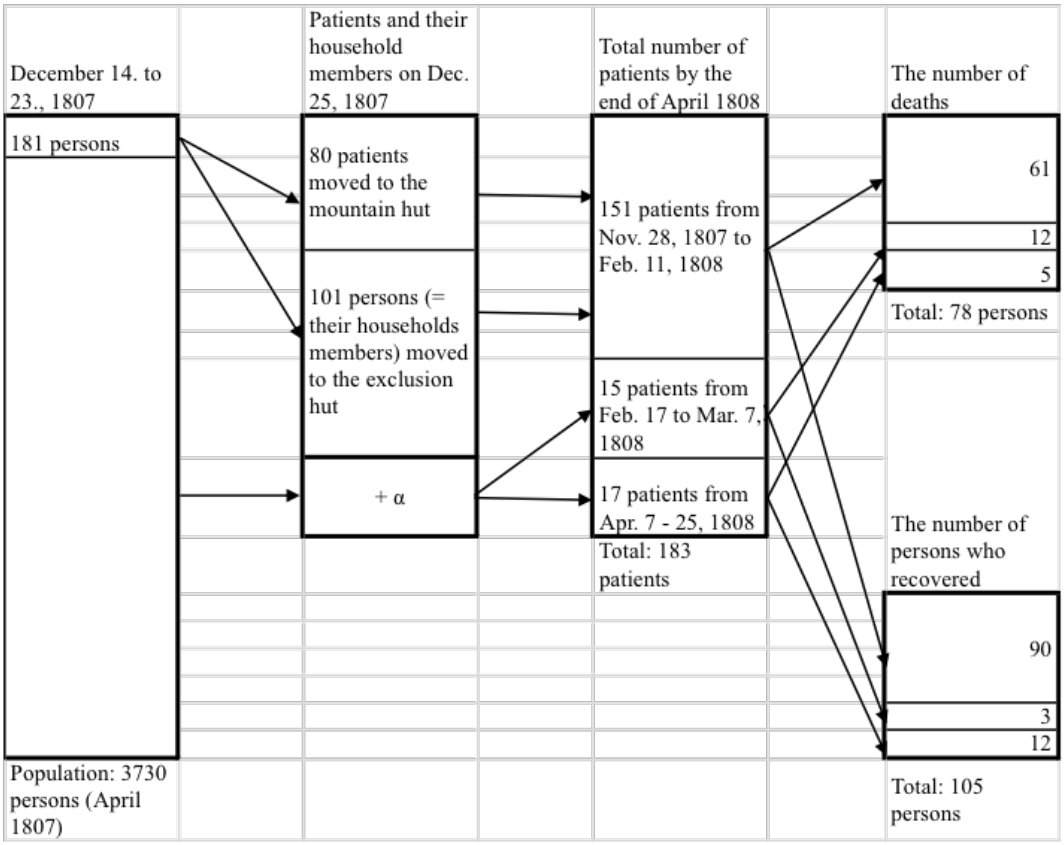
Historical sources of information on the smallpox outbreak in Takahama (Map 4a) from 1807 to 1808 show that there were two types of quarantine huts. One of them, called “Yama-goya” (mountain hut), was built in a mountainous place, and the other, “Nozoki-goya” (exclusion hut), was built within the village on the way to “Yama-goya” (△ in Map 4b). The sources list the name, sex, age, and familial relationships of each person infected with smallpox.

The presence of smallpox in Takahama in 1807 began with the death of a man named Keisuke in December. He lived on Suwa-no-tori (= Suwa Street), a district in the village, which had 122 households and a total of 540 persons. Keisuke’s cause of death was not known; however, many people who attended his burial and had also had direct contact with him while he was sick showed symptoms of smallpox simultaneously. The number of patients increased to 75 by December 14 (Table 6).

The quarantine policy was effective in limiting the number of victims. Prompt isolation of the infected, along with all the members of their households, from the other village inhabitants was effective in controlling the unrestricted spread of

smallpox. Rice, miso, and other foods were sent from Takahama and other neighbouring villages. The doctor was effective. On the other hand, famous Shinto priests were also invited to participate in a mysterious prayer to help eliminate the sickness from the village.

Fig. 5. Effects of the quarantine policy in Takahama



Sources: ASU 2100, 2101; ASU Ueda-Yoshiuzu-Nikki

The local governor, the Shoya in Takahama, decided to quarantine all of the infected in mountain huts and to quarantine all members of their households in exclusion huts. With the inclusion of five additional residents who showed smallpox symptoms by that time, a total of 80 infected residents were moved to the new mountain huts. A doctor, Keniku Miyata, who visited the village by chance, was begged to care for the infected. Because the infected were mostly quite poor, the village decided to pay the cost of their medical treatment and food.

Of the 80 patients first diagnosed, 16 had died by December 23, which corresponds to January 20, 1808. Six of these 16 fatalities were due to the severity of their illness, and these 6 died before they could be moved to the mountain huts. The other 10 persons died in the huts. The record of the persons who were moved to the huts shows only the death date for those who died before December 23. All

of the others on the list were identified using Shumon-cho, and their death dates were confirmed. By the end of January 1808, 16 more persons had died. Of the 80 residents infected with smallpox, a total of 32 (40.0%) appear to have died as a result of the disease.

A total of 101 persons lived in the exclusion huts in the village according to the diary of December 25, 1807. They were the household members of the 80 patients in the mountain huts. If they exhibited symptoms of smallpox, they were moved immediately to the mountain huts (Table 6).

More than 80 of those who were quarantined in the exclusion huts contracted smallpox. Even if only one member of a household was recorded as a patient on the list, it is possible that by January 1808 all of the household members had died. A man named Fukuhei had 6 other people in his household. All seven of them died between December 17 and January 28. Only his daughter, Iwa, who died on December 22, was listed as one of the 80 infected patients. However, before her death, Fukuhei's niece, Tama, who was 7 years old (sai in Japanese), had already died on December 17. This shows that the list was not perfect, and that there were some village members who were not listed but who died in the early phase of the outbreak. However, almost all of the patients and their family members were identified to prevent the wider spread of smallpox.

A total of 166 patients were moved to the mountain huts. The last 15 of these patients were quarantined after the doctor, Keniku Miyata, had left the village at the end of January 1809. Of these 15 patients, only 3 recovered, and 12 (80.0%) died. On the other hand, when the doctor was caring for the patients before that time, 61 out of 151 patients (40.4%) died due to smallpox. The reason for this difference is unclear.

After the beginning of April 1808, those newly identified as infected were not quarantined in the mountain huts but rather were transported out of the region by ship, while their household members lived for some time on an exclusion ship. A total of 17 patients were shipped in this way. Of these 17 patients, only 5 (29.4%) died. The total number of people infected from December 1807 to the end of April 1808 was 183, of whom 78 (42.5%) died. This rate was not as high as that of Sakitsu in 1834. The quarantine policy in Takahama could be judged to be quite effective at preventing the greater spread of the disease.

This quarantine policy could be translated into action and could bring an effective result only when human capital management was successful. The policy was not perfect, but almost all of the names, sexes, and ages of the village members and their family relations were quite correctly and precisely registered, and the people who came into the village and left the village were also controlled. Such management was the foundation of communal politics in a village society.

5. Flooding as an Endurable Disaster

While smallpox brought the village directly to a demographic crisis, floods and storms destroyed the infrastructure of the village economy. However, no such disasters caused any loss of life, and the number of people who lost their homes was small. People in these villages were familiar with such nature-induced disasters as floods and storms. This is a crucial difference with modern nature-induced disasters, because most people in pre-modern times never lived in areas that have been flooded (see Maps 5a, 5b, 6a, 6b, and 6c.).

Map 5a. Cooperated water construction places in Takahama, 1803, drawn and painted before the beginning of July 1803.
Source: ASU Ezu 2

Map 5b. Floods on May 10, 1803, drawn and painted before October 9, 1803.
Source: ASU Ezu 3

Nature-induced disasters such as earthquakes and storms were recorded in the

diaries at the tops of the diary records, because the Shoya briefly recorded the weather of the day after the date description using terms such as 'fine', 'cloudy', 'rainy', 'storm', 'north wind', 'south wind', 'severe wind', 'earthquake in the afternoon', and so on. Earthquakes were recorded on the same line as ordinary weather information. Earthquakes occurred ten times, and large earthquakes occurred twice; however, the village was never damaged seriously in the period under study. The eight incidences of severe winds that were recorded also caused no serious damage in the village.

Map 6a. Shirasu before 1803. (Source: ASU Ezu 2)

Map 6b. Shirasu in 1807. (Source: ASU Ezu 3)

Map 6c. Shirasu in 1814. (Source: ASU Ezu 4)

Floods repeatedly damaged the infrastructure of the village, especially the infrastructure used for agricultural production. The diaries recorded the damage caused by the floods precisely. From the descriptions in the diaries, we can determine the learning process of the village administration. The most crucial point is the visualization of the damage by means of measurements and mapping, which was performed for the first time after the year 1803 (Kyowa 3), when one of the most serious floods occurred.

Table 7. Damage due to floods in 1801 (Kansei 13), 1803 (Kyowa 3), and 1817 (Bunka 14)

Floods in Jun 13, 1801			Floods in May 11, 1803			Floods in Jun 6, 1817		
Type	Number	Scale	Type	Number	Scale	Type	Number	Scale
River Banks	8	234 m	River Banks	38	1411.2 m	River and Tide Banks	41	1148.4 m
			Tide Banks	2	63 m			
						River Schelves	14	8,424 m
						Mizu-Hane	4	81 m
						River Weirs	14	1,568 m
Shirasu Banks		360 m	Shirasu Banks	2	270 m			
			Rice Fields	1,118.0 a	became river	Rice Fields	346.5 a	became river
			Rice Fields	1,287.0 a	flooded with water	Rice Fields	693,0 a	flooded with water
			Other Fileds		sweet potatos	Other Fileds	198.0 a	land slide
			Houses	2	collapsed	Houses	4	collapsed
			Huts	1	collapsed	Huts	3	washed away
			Houses	8	walls collapsed			
						Fishing Boats	16	washed away

Source: ASU Ueda-Yoshiuzu-Nikki

According to the flood records in the diaries, flooding on a relatively large scale occurred three times in the time period studied. In 1801, floods damaged eight riverbanks in 234 meters and some of Shirasu banks in 360 meters. Shirasu was the name of the coast of Takahama, where banks were built for a port and a

shipping line on the Takahama River, from which boats could travel both downstream and upstream. The floods of 1803 damaged Takahama much more seriously, as they damaged not only the river and tide banks and the Shirasu banks, but also rice fields and other vegetable fields. Also, two houses and one hut collapsed, and the walls of eight houses were swept down. However, there were no casualties due to the floods.

According to the diaries, several heavy rains occurred over a period of more than ten days caused the floods in 1803. After a heavy rain on April 29, it was reported in the diary that on May 1 the river was swelling and seemed to exceed the banks, and several parts of the banks were also damaged. The flooding occurred on May 10. This information was reported on the day following the floods, May 11. Prompt and speedy inquiries regarding the damage places were done by cooperative village residents. In the case of the floods on June 13, 1801, it took one week for people to report the damage. For the visualization of the disaster, a new pictorial map was prepared. Such a pictorial disaster map was the first village product for the cooperated water management. The mapmaker was a painter of ceramics, Takeshiro (Hayashi 2009). The ceramics were original products of Takahama, and excellent stone for ceramic production was locally mined, a practice that exists until now. Ceramic stones from Takahama were also exported to famous ceramic production areas in Kyushu such as Kutani-Yaki.

The date that the pictorial map was drawn and painted is not recorded on the map; however, the Hachiman-Shrine, which was burned in 1814 (Bunka 11) and rebuilt in a new location, is shown in its original location, suggesting that the map was drawn before 1814. The descriptions in the diary suggest that the map was drawn and painted after the floods and before October 9, 1803.

Map 5a was attached to the flood damage records dated May 11. This map was, however, an older map, which was drawn and painted before the beginning of July1803. Map 5b seems to be the work of Takeshiro. All of the water-related structures were measured and described on the map before October 9, 1803. All of the communal water management sites were shown, and the measured lengths of the structures were also drawn on the map in their proper locations. The shapes and locations of the rivers and roads also corresponded approximately to their real sizes and locations.

Map 6a and Map 6b show that the portal function of the Shirasu was improved for village sea transportation. The diary reported that the stone bulwark was broken down by the storm tide on July 21, 1814 (Bunka 11) (Map 6c). Village members repaired the bulwark, which had been constructed after the flood disaster of 1803. This bulwark and the stone construction, Ishi-gaki, of the Hachiman Shrine were reconstructed before the autumn of 1805 (Bunka 2), more than two years after the flooding damage of 1803. All of the other damaged dikes and weirs were repaired before April 28, 1805 (Bunka 2).

In the 26 years from 1793 to 1818, there occurred three periods of relatively severe flooding which damaged the village infrastructure; however, the local government supported the village population with financial aid only for the floods of 1803. In a comparison of the floods of 1803 (Kyowa 3) with those of 1817 (Bunka 14), it is cleared that the flooding in 1803 caused much more serious damage to rice production. A total of 1,118.0 a of rice fields broke away, and they became river, while 1280.7 a of rice fields were flooded with water. The damage to the rice fields caused by the flooding of 1817 was much less significant. The total of 346.5 a of broken-down fields corresponded 30 % of the damage in 1803, and the 198.0 a of fields filled with water represented 54 % of the 1803 damage.

It is clear that the turning point in the governmental decision to provide support was the damage done to the rice fields, because the floods of 1817, which could not have any governmental support, washed away 16 fishing boats, which were anchored on the river, and damaged a considerable number of water-related structures such as river shelves, Mizu-Hane (= Construction for Changing Stream), and river weirs, but the rice fields were not seriously damaged. In principle, the village had to manage the damage by itself; however, if the disaster damage exceeded the capability of the village community, and especially if the rice fields were damaged, the government provided support. Such cases can be traced back to 1708 (Houei 5) (ASM Meisai-cho; Chino 2006, 327; Suzuki 1986; Oukuma 2004). Takahama received governmental relief funds in 1708 (Houei 5), 1709 (Houei 6), and 1713 (Syotoku 3), once between 1716 (Kyoho 1) and 1737 (Genbun 2), again in 1770 (Meiwa 7), and one last time from 1803 (Kyowa 3) to 1804 (Bunka 1).

The flooding disaster in Takahama, however, should be perceived not as an abnormal occurrence, but as a normal event, which can be termed a frequent life experience (Bankoff 2009, 265). The occurrence of repeated events had led to the existence of a reasonable framework for recovering and reconstructing damaged agricultural fields and water-related structures, not only by the village residents but also by the local and regional governments.

6. Conclusion

Not all of the disasters in early modern times led to demographic crisis. The smallpox crises in Takahama resulted in the loss of population, but the population recovered soon afterward in each case. No casualties were caused by natural disasters such as floods and earthquakes. Because floods were repeated tangible events, people never lived in flood-prone areas, which were mostly suitable for rice fields (see Map 5b).

On the other hand, one district of the town burnt down in the course of two years, and 245 houses were lost. These repeated fire disasters from 1814 to 1815 seriously damaged the residents' quality of life. The Shoya and his administrative

colleagues decided to widen the alleys and lanes in the town in order to prevent the spread of fire, and a new fire fighting organization was introduced. These were responses of the village's self-governing bodies to the challenges of disasters.

Self-reliance and voluntary management in the village were the basic principles of disaster management; however, reciprocal relief between villages and governmental relief were institutionalized in catastrophic cases. The floods of 1803 (Kyowa 3) seriously damaged the agricultural infrastructure, and the village was supported by the government funds for wages, which were paid mostly to village residential workers to reconstruct water-related structures. In comparison with European cases of disaster management, the role of the 'nation' was not large in Japanese traditional societies, while in Europe national borders and nationalism played a decisive role, for example, in the case of straightening the Rhine, especially in the border areas between France and Germany (Blackbourn 2008, 16-17), and also in Switzerland, where the development of ways to manage the frequency of floods "evolved in tandem with Swiss nationalism" (Pfister 2009, esp. 28-30; Cioc 2002, 48-54).

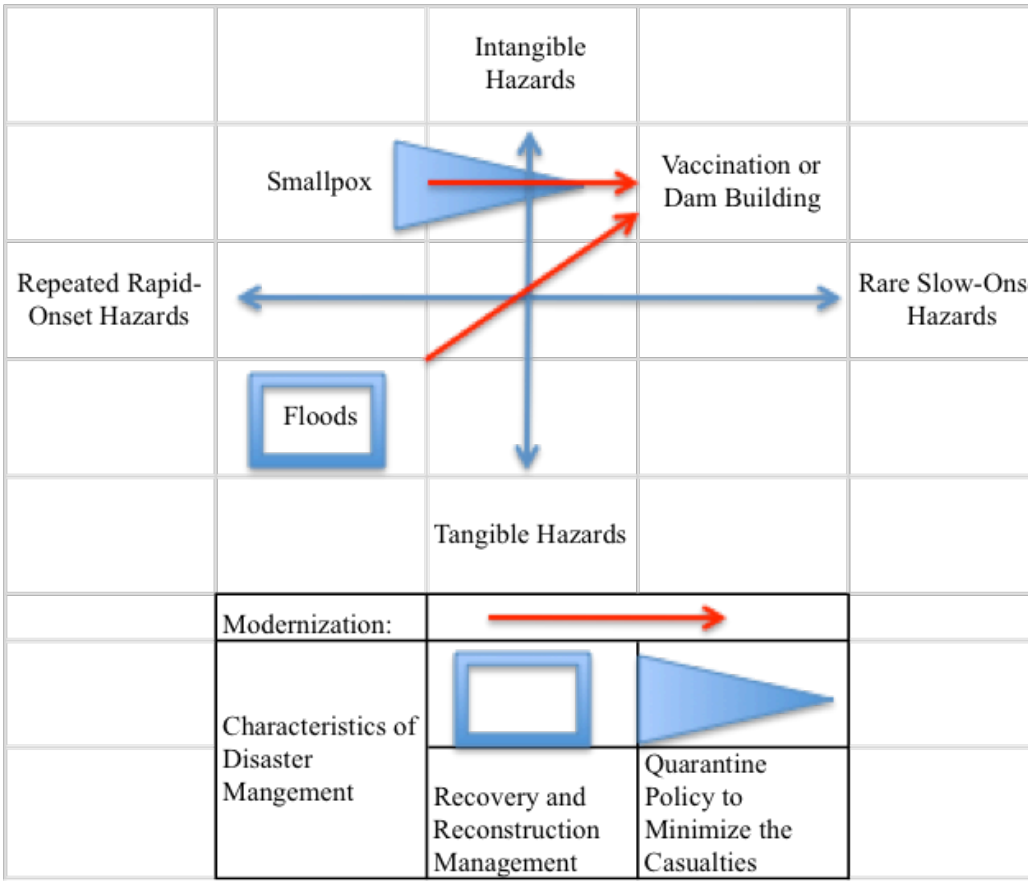


Fig. 6. Typology of nature-induced hazards

Historical sources are objects to be analysed for the purpose of finding historical evidence; however, the existence of such sources can also be treated as evidence that can be used in an analysis of the principles of a society. Shoya's diaries in Takahama were administrative ones that reflected and embodied the administrative institutions of the village. The village was a communal unit for paying tax, and also an innovative locus of disaster management through which traditional knowledge, information, and technologies evolved and accumulated.

The principle aim of the smallpox quarantine policy in Takahama was to minimize the casualties. This aim was successfully pursued only if all of the residents in the village and also the visitors were identified not only personally but also in terms of their family relations, because not only were the patients quarantined by themselves in mountain huts, but their household members were obliged to move to exclusion huts. For smallpox management, to identify residents was a fundamental policy that was practiced thoroughly using original population registration systems in pre-modern Japan.

The flooding was recognized as a customary repeated event and was considered not to be conquerable, but rather as a phenomenon to be utilized and managed to minimize the damage and promote the quickest recovery possible. The village residents were able to repair most of the damage by themselves. However, if rice and other agricultural fields were seriously damaged, tax reduction and relief funds were provided to reconstruct the damaged water-related structures. To obtain governmental support, precise notification of the damage was required. Such a notification made possible the speedy mapping and resolution of the damage. The village government of Takahama, whose actions could be traced through the diaries, clearly developed more sophisticated methods in the ages of the Shoya, and Yoshiuzu Ueda from 1793 to 1818. Water management in Takahama evolved in tandem with the flooding and was never intended to overcome the floods as a natural force. The modern idea of dam building to prevent flooding is very different from the disaster management practised in Takahama (Blackbourn 2006, 189-249).

Also, communalistic efforts of the village residents were crucial for the speedy recovery from flooding. The Shoya's diaries showed no delay in the recovery and reconstruction projects, and sufficient labour supplies for the tasks were gathered. The flood risk management was systematically organized. This recovery and reconstruction management was also based on the human capital management system of the village. The registration system of the residents provided the ages, sexes, and family relations of all the inhabitants, who were registered by each household annually, and births, burials, and migrations were also tracked in every case. The potential labour supply to fulfil the needs of disaster management could thus be grasped easily and systematically.

According to Pfister, disasters can be categorized in a typology of 'rapid-onset' or 'slow-onset' hazards. The floods were 'rapid-onset' and 'tangible' hazards because the residents could recognize the causes and reasons for the flooding and could also observe the processes by which damage occurred. As for smallpox, the village residents could observe the symptoms of the patients and dying individuals but never know the causes of the symptoms. The people suffered from extreme anxieties and fears related to smallpox. Smallpox can thus be categorized as an 'intangible' hazard. The patients were quarantined as a way to diminish the casualties. However, once it was learned that immunized people would not contract smallpox, such immunized inhabitants in the village could nurse the patients.

Smallpox in Takahama may be, therefore, better categorized as a 'repeated' rapid-onset hazard, although Pfister categorizes epidemics as 'slow-onset hazards' (Table 1). The disaster typology of 'rapid-onset' and 'slow-onset' hazards can be revised by adding the categories of 'repeated rapid-onset' or 'rare slow-onset' hazards, and a new axis of 'intangible' or 'tangible' hazards must also be added. These two axes constitute a quadrant typology of nature-induced disasters (Fig. 6).

The relation of human capital management to the process of the 'industrious revolution' is not clear. The efficiency of human capital management as a means of disaster management was historically proved. However, for example, the gap between modern dam building and traditional water management in Takahama can be noted, but cannot be discussed in relation to the distinction between 'industrial' and 'industrious' revolution. Much more detailed analysis is needed for that task.

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