



Water Supply and Samurai Residence in the Castle Towns during the Edo Period: The Creation of the Modern Urban Dwellers

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ABSTRACT

This article analyzes the publicness of early modern cities and the character of samurai residences as urban dwellers through the water supply and use of the Edo period in Japan. Firstly, in Edo, a megacity with a population of about one million, the Shogunate organized samurai residences (mainly those of feudal lords, Daimyo) into geographical organizations, and samurai residences paid for the repair of water facility and the water fee, just the same as the townspeople. Next, in Fukui (provincial castle town), samurai residence (Daimyo's vassal) organization for waterway didn't exist. The samurai residences were relieved of the burden of maintaining the waterways due to poverty. And, before the later Edo period, samurai vassals were not punished for violating the rules on water use, but they were eventually included in the punishment. The gap in feudal status between samurai and townspeople narrowed. It was a process of creating a modern urban society composed of equal dwellers. Although Edo and Fukui belonged to the same category as castle towns, the urban publicness and the position of samurai residences were different due to their dissimilar political positions as the Shogunate capital city and the Daimyo's provincial castle town.

Key Words: water supply, urban publicness, samurai residence, violators, castle town

I . Introduction

As is prominent in the history of urban water supply, many cities had waterworks in the ancient Roman Empire. In medieval cities, communal wells and water sellers provided drinking water to the dwellers. However, in Germany, where pumping technology had advanced with the development of the mining industry, water was pumped and used in public places by the end of the 15th century. In London, licensed water companies distributed water through wooden pipes to various parts of the city. One of the leading companies was *The Waterworks at London Bridge*, founded in 1581, which pumped water from the Thames River by water wheels and distributed it to the southern part of the city. In the early 18th century, there were at least nine water companies in London. This kind of private water company can also be seen in the United States.¹⁾

In Asia, Beijing, a megacity like Edo, did not have a piped waterwork system. Still, over ten thousand water sellers drew water from public wells and sold it to the dwellers for daily needs. The Qing government set up a water supply company, and the modern waterworks was laid in 1908.²⁾ Research on the history of water supply in various parts of the world has been accumulated. Still, most of them are centered on institutions and technologies, and there are not so many reports on the sociality – the relationship between water supply and dwellers.

In Japan, not a few early modern cities had large-scale water supply systems, which provided stable and smooth drinking water to dwellers. Over the years, various reports have been accumulated on Japanese urban history research, targeting Nara and Kyoto in ancient times, and Kamakura and some local port cities in the Middle Ages. Research on Edo, the core city of the Edo period, has been progressing in both histories using historical documents and archeology to excavate the remains. Especially around the 1990s, the research was fascinating, and the center was Yoshida Nobuyuki, who focused on the burden of the townspeople, and many papers and works were published while being

1) As for London, Broich, John (2013). *London: Water and the Making of the Modern City (History of the Urban Environment)*. Pittsburgh : University of Pittsburgh Press; Tomory, Leslie (2017). *The History of the London Water Industry, 1580-1820*. Baltimore: Johns Hopkins University Press. And as for the United States, Manfred, Blake Nelson(1956). *Water for the Cities: a History of The Urban Water Supply Problem in the United States*. New York : Syracuse University Press; Weidner, Charles H.(1974). *Water for a City: a History of New York City's Problem from the Beginning to the Delaware River System*. New Jersey : Rutgers University Press.

2) Xiong, Yuanbao[熊遠報](2000). Shindai Minkokuki niokeru Pekin no Mizubaibaigyo to 'Suidoro'[清代民国時期における北京の水売買業と「水道路」]. *Shakai Keizai Shigaku*[社会経済史学](*The Socio-Economic History Society*), 66 (2), 171-192.

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aware of Yoshida's "Yaku theory (役論)"³⁾. However, in general, research on the social structure of pre-modern cities is biased toward the townspeople. It cannot be denied that the analysis of samurai residences, which were critical urban dwellers, had stagnated.

This article aims at considering the urban public nature by analyzing the water supply. In the Edo period, there were several types of cities, such as castle towns(城下町, *Joka machi*, Shogun or Daimyos lived. Edo and Fukui so on), temple towns (寺内町, *Jinai machi*, formed around prominent temples), and port towns (港町, *Minato machi*, that were essential points of transportation, while Osaka, which was a substantial economic city larger than Edo, was also a kind of port city). This article focuses on castle towns that existed universally throughout Japan. Specifically, we will make observations on two cities, Edo and Fukui.

One of the characteristics of castle towns was that the residential areas were divided according to status and occupation. In other words, samurai lived in samurai mansion areas, and merchants and artisans lived in towns, while certain occupations, such as dyeing and blacksmithing, were concentrated in certain areas. And temples were also concentrated in certain areas. Even in such castle towns, where residents were divided regarding status and space, urban public facilities —waterways and bridges— were common to every group.

Firstly, Edo, where the Tokugawa Shogun lived, and Daimyos from all over Japan were gathered, was one of the largest cities in the world at that time. The population reached 1 million in the early 19th century —half of the population was samurai, while the other half was townspeople. We will consider how the water supply was managed in Edo, and what role the samurai residence —Daimyo (大名, the feudal lords, a territory of 10,000 Koku more) and Hatamoto (旗本, smaller than Daimyo, a vassal of the Tokugawa family reporting directly to the Shogun)— played, based on the residence of the Himeji Domain(姫路藩). The next is Fukui. The Fukui Domain (福井藩) had a large-scale castle town. The Daimyo was the Matsudaira clan(松平, Shogun's relatives). This article surveys the violations of samurai residences in the use of waterworks and their punishments in Fukui.

3) Yoshida, Nobuyuki[吉田伸之](1991). *Kinsei Kyodai Toshi no Shakaikozo*[近世巨大都市の社会構造]. Tokyo : University of Tokyo Press(東京大学出版会).

II. The activity of the waterworks and bridges organization in Edo

1. Outline of the waterworks and bridges organization

Research on the samurai residences in Edo, where Daimyo and Hatamoto lived, has been proceeding from various angles, such as excavating the remains, the mansion's ownership, or political functions. Still, the character of the samurai residence as a dweller has not been thoroughly investigated.

Therefore, in this article, we will analyze the Naka Yashiki of the Himeji Domain – the Daimyo was Sakai(酒井), its territorial size was 150,000 Koku[石] – in Kakigara-cho(牡蠣殻町). The Himeji Domain owned three residences: the upper residence (上屋敷, *Kami Yashiki*, its site area was about 30,000m²), the middle residence (中屋敷, *Naka Yashiki*, about 25,000m²), and the lower residence (下屋敷, *Shimo Yashiki*, about 80,000m²). The upper residence was located near the Edo Castle, where the Daimyo and his senior vassals were stationed, functioning as the center of political activities. The middle and lower residences were located away from the center of Edo and were used as places for recreation and fire evacuation. These types of Daimyo residences were the same in other Domains. The lower residence of the Owari Domain (尾張藩, Tokugawa clan families, territory size was 620,000 Koku, one of the most massive Domain), which had vast gardens and recreated a post town (宿場町, *Shukuba machi*) within its premises, was a famous one. Also, during the flowering season, it was not uncommon for the middle and lower residence to allow the townspeople to enter the residence and appreciate flowers.

Unlike the area around the Edo Castle, where many upper residences were concentrated, Kakigara-cho was an area where the middle and lower residences of each Domain, and relatively small Hatamoto residences, were gathered.

The middle residence of the Himeji Domain was managed by the magistrate of the middle residence(中屋敷奉行, *Naka Yashiki Bugyo*. He was in charge of the middle residence in general. Throughout this article, we simply abbreviated him as “the magistrate”). The magistrates made daily works records (『中屋敷奉行日記』⁴⁾, abbreviated as “The Magistrate Diary”). The Magistrate Diary

4) Himejihon [姫路藩], Naka Yashiki Bugyo Nikki[中屋敷奉行日記], 『酒井家資料[Sakaïke Shiryo]』, 姫路市立城郭研究室(Himeji Center For Research Into Castle And Fortifications). The name of the document, lumped together as Naka Yashiki Bugyo Nikki, has slightly different titles depending on each magistrate, such as On Naka Yashiki Oyashikibugyo Nikki[御中屋敷御屋敷奉行日記], On Naka Yashiki Oyashikibugyo Shojitome[御中屋敷御屋敷奉行諸事留], Kakigara cho On Naka Yashiki Oyashikibugyo Hikae[牡蠣殻町御中屋敷御屋敷奉行控], and so on. A total of

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had been kept intermittently from 1781 to 1860. And the Himeji Domain's middle residence was, in the Magistrate Diary, described as "Sakai Yashiki" (酒井屋敷), so it is abbreviated as Sakai Yashiki as follows.

<Table 1> Articles of the magistrate diary

contents	case
【external affairs】	
The waterworks organization	150
The bridges organization	107
Towns	4
Other samurai residences	16
Notification by Shogunate office	7
Tokugawa Shogun	113
Subtotal	397
【internal affairs】	
General matters	91
Magistrate's activity	43
Servants	98
Lord Sakai	32
Order to mourning	11
Subtotal	275
【others】	3
Total	675

Source: Himejihon [姫路藩], Nakayashiki Bugyo Nikki[中屋敷奉行日記], Sakaike Shiryo[「酒井家資料」], Himeji Center For Research Into Castle And Fortifications(姫路市立城郭研究室).

nine books (nine magistrates) remains.

Table-1 categorizes the contents of articles of the Magistrate Diary from 1781 to 1796. The “external affairs” was the relationship with the outside, and the “internal affairs” was the event inside the Sakai Yashiki. For example, the “Towns” is a negotiation with the townspeople around Kakigara-cho; in April 1792, the townspeople asked the Sakai Yashiki for permission to use the sewage system of Sakai Yashiki for cleaning. “Tokugawa Shogun” refers to the advance notification of the Shogun’s passage, and it was ordered to clean the road and was put on alert. Of the 397 entries in the external affairs, 257 entries were the waterworks and bridges organization, which is more than 60%, indicating the importance of its activities.

The waterworks and bridges organization have been known in previous research, but their specific activities are not adequately understood. In this article, we will observe the organization’s actual activities using the Magistrate Diary. However, the contents of the Magistrate Diary are significantly simplified at the end of the Edo period. So, we focus in detail on around 1790.

First of all, we will briefly explain the water supply in Edo. Most of Edo was a landfill, and it was difficult to obtain good quality drinking water from wells. Water was drawn from a distant water source, and the representatives were Tamagawa Canal (玉川上水, *Tamagawa Josui*) and Kanda Canal (神田上水, *Kanda Josui*). The Canals were excavated from the water source to Edo. In the city, stone pipes were buried underground, and woodwinds branched from there to supply drinking water to samurai residences and towns. The Tamagawa Canal is about 40 km from the intake to Edo, and the Kanda Canal is about 60 km. The water supply system was a large-scale and expensive system not found in other castle towns, so it was the pride of the Edo townspeople. Edokko(江戸っ子, townspeople born and raised in Edo) bluffed during in the suburbs, “I used water from the Kanda Canal for the baby’s first bath !”. It was a killer phrase to boast about the correctness of their origins.

The waterworks in Edo was under the jurisdiction of the Shogunate Construction Office(幕府普請役所, *Bakufu Fushin Yakusho*). They organized the samurai residences into the Waterworks Organization, and the samurai residences paid for the use of the water supply through the Waterworks Organization (上水組合, *Josui Kumiai*). The Shogunate Construction Office was responsible for the management and maintenance of the central part of the waterworks. Still, the restoration of each area was the Waterworks Organization’s responsibility, and the samurai residences paid for the restoration.

Regarding samurai groups in Edo, the Rusui associations(留守居組合, *Rusui Kumiai*) in which Rusui (Domain’s diplomats) of various Domains participate has been the center of previous researches. The Rusui association was the connecting body of the Domains based on the waiting room in the Edo Castle or the relationship of relatives, and the purpose was to collect political information. Domains voluntarily formed the Rusui associations, but the waterworks and bridges organizations were made by the Shogunate. The objective was to make the samurai residence partially bear the

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costs of maintaining public facilities, such as the waterworks and bridges.

<Table 2> Member of organizations

organization		Kakigara- Cho	Arame Bridge	Eikyu Bridge	Kawaguchi Bridge	Shiodome Bridge
【residence】	【stipend】					
[M]Sakai Yashiki	150,000	○	○	○	○	○
[I]Sakai Sakon	10,000	○		○		
[M]Obama	103,500		○			
[M]Taira	50,000	○				○
[M]Sekiyado	58,000	○				
[M]Oono	40,000	○	○			
[M]Tanabe	35,000	○	○	○	○	
[M]Kitsuki	32,000	○	○		○	
[M]Kano	32,000				○	
[M]Yamazaki	10,000	○	○	○	○	
[M]Hojo	15,000	○		○		
[M]Mutu Shimomura	10,000	○	○			
[H]Takeda K.	800	○	○		○	
[H]Simada K.	1,500	○			○	
[H]Toda D.	7,000	○	○		○	
[H]Kira K.	1,400			○	○	
[H]Kaneda T.	3,000	○	○	○	○	
[H]Mizuno W.	900				○	
[H]Toda N.	5,000	○	○	○	○	
[H]Hyuga Z.	1,000			○	○	
[H]Kurokawa T.	1,600	○	○	○	○	
[H]Ookubo.G	1,200	○	○	○	○	

organization		Kakigara- Cho	Arame Bridge	Eikyu Bridge	Kawaguchi Bridge	Shiodome Bridge
[residence]	[stipend]					
[H]Chimoto K.	1,000	○	○	○	○	
[H]Ono Z.	800	○		○	○	
[H]Meshikawa S.	700	○	○	○	○	
[H]Kaneda D.	300	○	○			
[H]Kamijo M.	100	○			○	
[H]Ootsu S.	300	○	○	○	○	
[H]Oguri D.	1,200	○	○			

note:①[M]:Daimyo middle residence,[I]:Daimyo living residence, [H]:Hatamoto residence. ② “Eikyu Bridge” is “Eikyu-Kitakobashi Bridge” correctly.

Source: Himejihon [姫路藩], *Nakayashiki Bugyo Nikki*[中屋敷奉行日記], *Sakaike Shiryō*[「酒井家資料」], Himeji Center For Research Into Castle And Fortifications(姫路市立城郭研究室).

The Magistrate Diary lists the waterworks and bridges organizations to which Sakai Yashiki belonged around 1780. According to Table-2, Sakai Yashiki participated in the Kakigara-cho Waterworks Organization, and four Bridge Organizations: The Arame Bridge (荒布橋), the Eikyu-Kitakobashi Bridge (永久北小橋), the Kawaguchi Bridge (川口橋), and the Shiodome Bridge (汐留橋). The Kakigara-cho Waterworks Organization consisted of 11 Daimyo residences and 14 Hatamoto residences. Perhaps because too many residences participated in the Kakigara-cho Waterworks Organization, some Hatamoto residences separated from the organization around 1795 and organized a new one. This table shows its members before the separation. While almost all samurai residences belonged to the Waterworks Organization, the Bridge Organization was made by a bridge. The number of participating residences greatly depended on the size of the bridge, with the largest Kawaguchi Bridge Organization having 20 residences and the tiniest Shiodome Bridge Organization having only two residences. These organizations were independent groups of each other. Still, the Magistrate Diary called them collectively as “the Waterworks and Bridge Organization (上水橋々組合)”, so in this article, we will follow suit as necessary. However, we will not discuss the Bridge Organization in this paper. The main subject of this paper is water supply, and the structure and operation of the Bridge Organization are almost identical to the Waterworks Organization. The analysis of the Bridge Organization will be presented at another time).

2. The activities of the Kakigara-cho Waterworks Organization

1) The Yearly Representative system

The samurai residence organization for the Tamagawa Canal was established around 1720 and the Kanda Canal in 1749. Around 1800, there were 25 organizations for the Tamagawa Canal. Regarding the Kanda Canal, there were 17 Waterworks Organizations, including the Kakigara-cho Organization.

The organization's daily business was the responsibility of the Yearly Representatives(年番, *Nenban*). They were representatives of the organization and the liaison between their samurai residence and the Shogunate). In the Kakigara-cho Organization, two Daimyo residences were paired up and served as the Yearly Representatives. In the early Edo period, the Shogunate appointed the Yearly Representatives, but by 1780 the turn of the Yearly Representatives was left to the organization, and the Shogunate only approved it.

In principle, Daimyo residences served as the Yearly Representative. For example, the Eikyu-Kitakobashi Organization consisted of five Daimyo residences (including Sakai Yashiki) and ten Hatamoto residences. The Daimyo residences took a turn as the Yearly Representative on a half-yearly basis. This was presumably because the Yearly Representative was burdened with office expenses and miscellaneous duties and that the small Hatamoto residence could not bear it. As a result, Sakai Yashiki (the largest resident in the area) was obliged to be the Yearly Representative of many organizations: in 1792, Sakai Yashiki served as the Yearly Representative of the Kawaguchi, Shiodome, and Eikyu-Kitakobashi bridges; in 1793, the Yearly Representative of the Kakigara-cho (waterworks), Kawaguchi and Shiodome bridges; in 1794, the Arame, Eikyu-Kitakobashi and Shiodome bridges.

The end of the year was the time for changing the Yearly Representative. In 1793, on December 29, Sakai Yashiki sent the documents of the Kakigara-cho Organization in a locked box to the next Yearly Representative, the Yamazaki residence. And Sakai Yashiki received the documents box of the Eikyu-Kitakobashi Organization from the Tanabe residence and those of the Aranebashi Organization from the Toda residence, the previous Yearly Representatives.

Much of the organization's administrative cost was the paper consumed, not collected from each residence but borne by the Yearly Representative. Also, it was an essential part of their work to entertain the Shogunate Officer, who visited the waterworks construction site for inspection, and Sakai Yashiki covered the cost of the feast.

2) The process of Mizugin (water fee) payment

Even in the period when Sakai Yashiki was not the Yearly Representative, they spent various expenses. There were three types of costs related to the Kakigara-cho Organization: Mizugin (水銀,

water fee paid to the Shogunate Construction Office), the expense of construction by the Shogunate Office (組合普請金, *Kumiai Fusinkin*, expenses incurred by the Shogunate to repair the core of the water supply system, with the organizations bearing part of the cost), and the expense of construction by the organizations and the town together (自分仕置金, *Zibun Fushinkin*).

The Mizugin was the most common expense, and the stipend of the residence owner determined it. While Hatamoto residences and other residences where the residence owner lived were assigned to the total stipend amount, the middle and lower residences were assigned half of the original amount. For example, the Sakai Yashiki was allocated 75,000 Koku, half of the 150,000 Koku of the Himeji Domain. The Mizugin paid by the Sakai Yashiki in 1793 was silver 114.975 Monme[匁] or 0.0015 Monme [匁] per Koku. Water supply is the basis of urban public functions, and for this reason, the Shogunate suppressed the price of the Mizugin to a cheap level.

The process of the Mizugin payment was as follows. In 1793, on September 29, the Shogunate Construction Office notified Sakai Yashiki, the Yearly representative of the Kakigara-cho Organization, to submit the Mizugin and the relevant documents through Sakai's upper residence. On the same day, the magistrate, together with the Yearly Representative's partner, the Kitsuki residence, informed all the residence of the Kakigara-cho Organization to bring Mizugin to Sakai Yashiki by the 2nd of next month. And,

October 1

The magistrate went to the upper residence and asked to prepare the Mizugin ledger submitted to the Shogunate Construction Office. And he handed the previous year's ledger to the Secretary (右筆, *Yuhitu*).

October 2

The magistrate collected the Mizugin from the residences of the Kakigara-cho Organization.

October 3

The magistrate received the new Mizugin ledger in the upper residence. The Secretary of the upper residence prepared the Mizugin ledgers because the upper residence should audit the expenditure, and documents to the Shogunate Construction Office need to be made of high-quality paper. However, the middle residence had only inferior popular ones.

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October 4

The magistrate received the signature of the Yearly Representative's partner early in the morning and brought the ledger to the upper residence.

October 7

The diplomats (留守居) in upper residence presented the Mizugin to the Shogunate Construction Office. The magistrate received the Mizugin ledger (maybe an old one), and the partner of the Yearly Representative confirmed it.

The process of the Mizugin payment is described above. As we have seen, the upper residence was deeply involved in the Mizugin payment. The Shogunate's point of contact was the upper residence where the Daimyo lived and represented the Domain. If the middle or lower residence were to have direct contact with the Shogunate Offices, this would have deviated from the principle of the Shogunate system, which guaranteed the independence of the Domain.

The Domain had a high degree of autonomy. Although the Shogunate had the power to confiscate a territory (改易, *kaieki*) or to order the changed territory (転封, *tenpu*), it could not interfere in the internal affairs of the Domain. Likewise, in Edo, the Shogunate Officials were not allowed to enter the samurai residences without permission from the Domain, so they could not arrest a person who had escaped into the Daimyo residence. If someone ran into Daimyo's residence, the proper attitude of the Domain was to refuse to hand him over for maintaining the samurai's honor (but it has been said to be on a case basis). The Tokugawa Shogun had strong power but was not an autocrat, simply a *Primus inter pares* (first among equals) as a matter of law.

We can understand that the upper residence was to contact the Shogunate on waterworks issues by the principle of such a Shogunate system. The Shogunate Construction Office was not to contact the middle and lower residence directly.

3) Jointly repairing waterways by samurai residence and the towns

The area around Sakai Yashiki was a mixture of samurai residences and towns. There were places where the waterworks were managed together with the townspeople. We will observe the specific restoration of the waterworks around one of these places, the Ryokan Bridge(龍閑橋).

On September 30, 1793, the town's Yearly Representative (年番名主, *Nenban Nanushi*) informed Sakai Yashiki that the waterway had been damaged and overflowed with water, and asked for an inspection. Sakai Yashiki confirmed that the cover and gutter of the waterway were damaged and requested payment for repairs from the samurai residence belonging to the Kakigara-cho

Organization. Besides repairing, cleaning was also performed, and the total cost was silver 657 Momne[匁], which the town paid 60%, and the samurai residence (the Kakigara-cho, Hama-cho, and Motoyagura Organizations) paid 40%. The towns were Honfuna-cho, Hama-cho, Kodenma-cho. The Koku of the town was calculated to be 100 Koku for a 2-Ken [間] frontage (About 6 meters). The samurai residences were about 760,000 Koku, and it is assumed that this was added to the total estimates to determine the proportion of repairing costs to be borne.

Sakai Yashiki collected the repairing expenses from the samurai residences and gave the sum to the towns' Yearly Representative. In this joint management between the samurai residences and the towns, the samurai residences only had to bear the costs, while the towns were responsible for making arrangements for the restoration.

Finally, we need to explain the role of the Shogunate Construction Office in the restoration work. In 1792, the Shogunate Construction Office warned that the repair works were not being done in a manner worthy of the cost, and that it would make frequent inspections during the work from then on. In some cases, they specified the kind of materials used. In 1795, when the town reported to the Shogunate Construction Office to use vertebrate wood to repair the water flume, as the town ran out of red pine. The Shogunate Office rejected it and ordered red pine used as before. Still, the Shogunate Construction Office did not necessarily insist on the use of high-quality materials. When the Kakigara-cho Waterworks Organization wanted to replace the waterworks with stone gutters, the Shogunate Construction Office ordered the restoration to be done in the wood as in the past, because it was too costly. Following precedent was one of the essential principles of the Edo period, and this is also evident in the restoration of the waterworks.

3. The activity of the Bridge Organization

The year of the birth of the Bridge Organization (橋々組合) is obvious. In 1688, the Shogunate decreed that the samurai residence should repair the bridges around them, and the towns should repair those in the towns. The Shogunate formed the samurai residences organization for each bridge; for example, concerning the Jizo Bridge (地藏橋), the Shogunate had previously restored it, but since then, the nine samurai residences in the vicinity formed an organization to manage and to provide maintenance to the bridge.

The basic system of the Bridge Organization was the same as that of the waterworks. In 1794, when the Shiodome Bridge Organization – only the two residences : Sakai and Ando – needed to repair the bridge, Sakai Yashiki (the Yearly Representative at the time) was in charge of negotiating with the Shogunate Construction Office, drawing up plans for the repair, selecting contractors by tender, notifying the residents in the neighborhood, supervising the work, collecting money and

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paying the contractors.

However, there were some cases of outsourcing in the Bridge Organization. In the Arame Bridge Organization, they had an agent named Settsunokuniya Mohachi (摂津国屋茂八), who was paid with gold seven Ryo[兩] a year to manage and repair the bridge. The townspeople offered Settsunokuniya to fix the bridge, and the Arame Bridge Organization entrusted Settsunokuniya with all the repair work. Also, the Yearly Representative usually delivered circulars to each samurai residence, but Settsunokuniya brought them to each samurai residence in the Arame Bridge Organization. The organization's role was limited to expenditures and auditing, and Settsunokuniya took over the work that was to be done by the organization. This outsourcing was not known to exist in the Waterworks Organization.

In the Bridge Organization, we cannot observe the joint construction with the town. Of course, the samurai residences were not unconnected with towns. When the townspeople restored two bridges in 1795 and 1832 respectively, Sakai Yashiki gave a total of silver eight Mai[銀8枚, about gold six Ryo] to the townspeople who asked for congratulations. These were no small sum. There is no example of the townspeople giving congratulatory gifts to a samurai residence, so the gift was a unilateral grant from the samurai residence to the townspeople. It is assumed that this was because samurai residences also used the bridge. Besides this, there might be a sense of maintaining dignity as the ruling class.

III. Water Supply Management System in Fukui

1. Overview of the Fukui and Shibahara Canal

Edo was not the only city to have a water supply system. Many cities in various regions had waterworks, especially in those where good quality drinking water could not be obtained from wells, and it has been said that waterworks were developed.

In this section, we will analyze the waterworks of the Fukui Domain (福井藩). Specifically, we will focus on the punishment of the vassals for violations in water use, and examine the nature of the vassals as urban dwellers and the actual state of public functions in the early modern city. The waterworks were an essential public facility that covered the whole city, and it was used not only by the vassals but also by the townspeople, so it was possible to contrast the two on the same cases. We analyze the vassals and compare them with the townspeople when possible. In this section, when we

simply say “Fukui,” it means the castle town Fukui, not the Fukui Domain.

The Fukui Domain was a vast Shinpan (親藩, blood relatives of the Tokugawa Shogun) and had a very close relationship with the Shogunate. The first Daimyo, Yuki Hideyasu (結城秀康), held 680,000 Koku in Echizen region (越前), but it was reduced to 250,000 Koku in 1686 because of the insanity of the sixth Daimyo, Tsunamasa (綱昌). Later, it was restored to 300,000 Koku, and in the late Edo period, it remained at 320,000 Koku until the Meiji Restoration(明治維新, *Meiji Ishin*). The lineage of Yuki Hideyasu was severed with the death of the 11th Daimyo Shigemasa (重昌) in 1758 at the age of 16, and after that adopted children from the Shogun’s family became Daimyos of the Fukui Domain.

Firstly, we will observe the demographic composition.⁵⁾ By the fragmentary historical records of the population of Fukui, the number of townspeople was 25,231 around 1600, 21,622 in 1717, and 21,589 in 1785. There was a detailed survey in 1847 by the Domain, and the number of townspeople was 19,789. Throughout the Edo period, the population of townspeople in the castle town Fukui is estimated to have been about 20,000. Along with the survey result, I added the number of vassals from the list of vassals in 1852 as shown in Table-3 (The number of “family” include the “patriarch”. And the Sotu vassals who lived in the village are excluded).

<Table 3> Population of Fukui in the end of Edo period unit: persons

status	patriarch	family[m/f]	servant[m/f]
samurai vassal	802	3,939[1,974/1,965]	3,452[1,739/1,713]
senior class	71	445[211/234]	2,807[1,489/1,318]
middle class	601	2,924[1,487/1,437]	518[201/317]
lower class	130	570[276/294]	127[49/78]
sotu vassal	1,898	4,984[2,552/2,432]	39[3/ 36]
townspeople	—	19,789[9,931/9,858]	—
temple,shrine	—	480[450/30]	—
Total : 32,683[16,649/16,034]			

5) Fukuihan [福井藩] Koka Yonen : 1847 *Fukuihan Ninbetsu cho : Gokachusuezuemade Edojofu dodan Chozai narabini Jisha Fuchuryo Ninbetu cho*[弘化四年,福井藩入別帳：御家中未々迄江戸定府同断町在并寺社府中領人別帳], in *Matsudaira Bunko*[『松平文庫』], Fukui Prefectural Archives (福井県文書館). This document can be found in *Fukui Shishi*[『福井市史』](1983), *Shiryohen*[資料編], 4, 149-176.

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note:[m/f]means [male/female].

Source: Fukuihan [福井藩] *Fukuihan Ninbetu cho*[福井藩人別帳], *Matudaira Bunko*[『松平文庫』], Fukui Prefectural Archives (福井県文書館).

The vassals can be divided into two main groups: the samurai (侍) and the Sotu (卒, foot soldiers [足軽, *ashigaru*], kitchen staff, and other menial jobs). Furthermore, samurai vassals were subdivided into three categories - senior, middle and lower. The most senior samurai vassal was the State Elder, Honda Kuranosuke (国老, 本多内蔵之助), who the Shogunate sent to supervise and guide the Fukui Domain. He was not necessarily a pure vassal of the Fukui Domain, as he held 20,000 Koku in Takefu (武生, a small castle town near Fukui) and received a residence by the Shogunate in Edo. In other words, Honda had his Domain within the Fukui Domain.

There were 71 senior-class samurai vassals including the chief retainer (家老, *Karo*) and the leaders of the guard corps (番頭, *Bangashira*), 601 middle-class vassals including the guard corps (番士, *Banshi*, they were the core of the samurai vassals), and 130 lower-class vassals (physicians, construction workers, etc.). The total number of samurai vassals was 802. Sotu vassals were 1,898. These numbers were only the patriarch (family heads) who served the Domain and did not include their family members.

According to Table-3, the samurai vassals' total number of family members was 3,939, and their servants were 3,452. Some of the servants were samurai guarding the head of the family. Still, most of the servants were employed to do miscellaneous work in the mansion - cleaning, cooking, caring for horses -. Their original status was townspeople or farmers. Honda Kuranosuke held 1,333 servants. The 71 senior samurai vassals employed 2,807 servants (an average of 40 per family). However, the number of servants in the middle and lower vassal classes fell sharply to an average of less than one per vassal. And 1,898 Sotu vassals hired only 39 servants.

Regarding family size, the average of senior samurai vassals was 6.3, middle-class samurai vassals 4.9, lower-class 4.4, and Sotu vassals 2.6, indicating a proportional relationship between the salary and family size. Except for servants and temples, the ratio of gender was not so different.

The total population of Fukui at the end of the Edo period was 32,683, with the vassals numbering 8,923 (27.3% of the population), the vassal's servants 3,491 (10.7%), the townspeople 19,789 (60.5%), and the temples and shrines 480 (1.5%). Throughout the late Edo period, the population of castle town Fukui is estimated to have been about 30,000. As mentioned above, the Fukui Domain was reduced in the late 17th century, and yet, it was mainly in the rural areas. The population of the castle town was not so much affected.

In 1601, Yuki Hideyasu (Daimyo) ordered Honda Tomimasa (本多富正, the State Elder) to make the Shibahara Canal(芝原上水, *Shibahara Josui*) to provide drinking water for castle town, Fukui.

The Shibahara Canal was drawn from the Kuzuryu River (九頭竜川). It flowed for about 10 km from the Matsuoka Big Weir (松岡大堰, starting point of the Canal) to Fukui, diverting agricultural water to the 53 villages along the way. In farming areas, water mills were built along the Canal to produce rapeseed oil, and the Canal was used to transport timber. At the entrance of Fukui, the Canal was divided into two lines and then into a narrow waterway. The waterway flowed like a capillary through the castle, the samurai residences, and the towns. The water was used not only for drinking but also for domestic purposes. Furthermore, in Konya-cho (紺屋町, a district where dyeing artisans lived), the water had an industrial purpose for dyeing. But dyeing pollutes the water, the time for dye cleaning in the waterway was limited from midday to evening for dye cleaning, and Konya-cho was placed on the outskirts of the castle town, at the end of the waterway route.

The Shibahara Canal is not a ditch buried under the ground like the Edo waterworks, but an open ditch with the water surface exposed from Matsuoka Big Weir to the interior of the castle town. The Canal's width from the Matsuoka Big Weir to Fukui was three Ken [間, about 10 meters], and narrowed the width of the waterway as it branched off at various points in the castle town until it was two Shaku [尺, about 60 centimeters] wide at the end. This was a device to keep the water speed. At the junction of waterways, stones or boards were placed in the water to regulate the distribution of water volume. The waterway was settled at one end of the street in the samurai residence areas, and the middle of the road in townspeople areas. Water was brought in from the waterway to the interior of the samurai residences and the back alleys of the town by wooden (or bamboo) pipes.

In the towns, the waterway was located in the middle of the street, and because it was an open ditch, it sometimes interfered with traffic and events. As a market was held on the 7th of every month in town, the townspeople asked for the Domain to use wood to cover the waterway. And in winter, Fukui is a heavy snowfall area, with over two meters of snow piling up even in the mid-city. As a result, some townspeople could not distinguish between the waterway and the road at night, and they slid down into the waterway and died. So the Domain ordered the waterway to be dug up.

The system of drawing water into the samurai residence from the waterway was called Sensui (泉水). Sensui was the equipment where a hole was drilled in a part of the waterway's stone wall and to bring water into the residence by wooden pipes. It was a privilege reserved for samurai residence, and if the Sotu vassal got the mansion with Sensui, the Domain ordered Sensui immediate closure. It was not rare for vassals to buy and sell mansions in secret, and it is thought that there were cases where a rich Sotu vassal purchased the poor samurai vassal's mansion. Of course, it was customary that the Domain ordered vassals to move their residences because of changes in position or status. The Domain had the ownership of residence, and the vassals only had the right to live there.

Sensui could either return the water to the waterway again, or discharge it into the sewage at the

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mansion's back. The amount of water taken was regulated by setting the dimensions of the Sensui entrance. Naturally, only the samurai residences facing the waterway had their own Sensui, while those away from the waterway were supplied by wooden pipes. In the town area, there were stone steps (河戸, *Kawato*) leading down to the waterway to draw water directly, and a trough (食水溜, *Meshimizu-Tamari*) buried in the waterway to make it easier to draw water.

In the early Edo period, the Waterworks Magistrate (上水奉行, *Josui Bugyo*) and his two foot soldiers administered the Shibahara Canal. The term “the Waterworks Official” (上水方役人, *Josuikata Yakunin*) sometimes appeared in documents, means the Waterworks Magistrate and his foot soldiers. And to improve the administration system, in 1768, the Domain appointed one Waterworks Superintendent Officer(上水掛目付, *Josui Kakari Metsuke*)among several superintendent officers. He directed the Waterworks Magistrate and foot soldiers. The Waterworks Superintendent Officer was abolished in 1813, but was re-established the following year due to confusion over the water use (in the following, when we say merely “the Superintendent Officer”, it means the Waterworks Superintendent Officer).

In 1768 and 1814, the decree was issued on water use. These were not a repudiation of an existing policy or a fundamental policy change, but rather a clarification of established practices, following precedent and reinforcing measures in that direction.

We will analyze the “Waterworks Record” (「上水掛り御用留抜書」⁶⁾). This document was compiled by Asai Masaaki (浅井政昭), appointed the Waterworks Superintendent Officer in 1848, and contained articles from 1675 to 1849 (after that year, some pieces were added by other persons). Asai was a close associate of Daimyo Matsudaira Shungaku (松平春嶽, famous wise Daimyo at the end of the Edo period. He rebuilt the Domain's finances by incorporating the commodity economy and modernized military power). Asai was a capable bureaucrat, but he died in 1849 at the age of 37. Even today, many documents compiled by Asai exist in addition to The Waterworks Record.

The Waterworks Record is divided into two parts: “The Record : The Old Cases”(「上水掛り旧例考」, *Josui Kakari Kyureiko*) and “The Record : The Recent Cases”(「上水掛り近例考」, *Josui Kakari Kinreiko*). “The Old Cases” is divided into two periods: 1675-1767 and 1768-1813. Up to 1767, the descriptions were very simple and short, with a few lines per year or no description at all, and Asai included only those of particular interest to him. However, since 1768, pages were allocated to each

6) Asai Masaaki[浅井政昭, *Josui Kakari Goyotome Nukigaki*[上水掛り御用留抜書], *Matsudaira Bunko*[松平文庫], Fukui Prefectural Archives (福井県文書館). “The Record : The Old Cases”(「上水掛り旧例考」, *Josui Kakari Kyureiko*) is available as a digital image in the page of “画像”. Retrieved from https://www.library-archives.pref.fukui.lg.jp/archive/da/detail?data_id=011-320799-0.

year, and the content and variety of articles became massive.

Around 1810 was temporary confusion in the waterworks administration, and even in “The Record : The Old Cases”, there is a blank page for 1811, and only a few lines for 1812 and 1813. After 1813, when the Waterworks Superintendent Officer was re-established, Asai changed the document’s name to “The Record : The Recent Cases”, and the descriptions became more detailed again.

The contents of The Waterworks Record include various matters such as the appointment of staff, laws, regulations governing the control of water supply, punishments, repairs and maintenance of waterway, disputes over the distribution of water, and social events such as the cleaning day throughout the castle town.

2. The burden of samurai residence

Unlike in Edo, in Fukui, there was no routine financial burden on samurai residences and townspeople. This is because the water supply in Edo was a wooden pipe buried underground, which inevitably rusted and broke, and the wooden pipe needed to be replaced periodically. Fukui’s waterway, however, was a ditch made of stone walls, and damage rarely occurred. For this reason, Mizugin (water fee) like that in Edo, cannot be observed in Fukui. Of course, this didn’t mean that samurai residences and townspeople were not related to maintaining and repairing the waterways. In this section, we will analyze the actual situation of the burden.

In September 1735, in the conference room of the castle, the chief retainer Okabe Sazen (家老, 岡部左膳) told the Waterworks Superintendent Officer as follows.

The stone wall of the waterway in front of Kawai Jozaemon (川合定左衛門)’s residence had collapsed, and Kawai was unable to repair it by himself. So, he asked the Domain to repair it. We approved his request. The Domain would not repair the stone wall of waterways on the mansion side no matter how much it was damaged, but would repair the roadside stone wall if the resident has difficulty repairing it.

Specifically, what follows reveals the Domain’s support in repairing the waterways by a samurai residence. When Wanibuchi Saburobei (鰐淵三郎兵衛, about 10 meters stone wall in front of the mansion collapsed) and Sakakibara Shichizaemon (榊原七左衛門, about 25 meters similarly) asked the Domain to repair the stone wall of the waterways in 1781, the Domain gave them large amounts of stone and clay, as well as bearing the costs of transporting them. Although the Domain made this repair a self-initiated repair (手前普請, *Temae Fushin*), the samurai residences only provided labor for the repair, which they presumably used their servants for, and no monetary expenditure. Thus, we

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can understand that the burden on the samurai residences was substantially reduced.

In the above-mentioned repair by Wanibuchi, it is unclear whether it was the stone wall on the roadside or the mansion side. Although the chief retainer decided in 1735 that the Domain would repair the stone walls only on the roadside, the following case shows that this principle was abandoned later. In 1785, Sakakibara Kohachiro (榊原小八郎) reported to the Domain that the stone wall at the Sensui (泉水) entrance was damaged so severely that it leaked a lot, and he could not repair it by himself. The Domain gave him materials for repair on the reason that there was a precedent. In this case, “Sensui” had been written in the documents, confirming that the damage was to the stone wall on the mansion side and its repair. Wanibuchi Saburobei (hereditary stipend 150 Koku), Sakakibara Shichizaemon (100 Koku), and Sakakibara Kohachiro (300 Koku) were all senior samurai vassals, and it means that the Domain was responsible for repairing all of the waterways throughout the samurai residence area in the late Edo period.

In addition to repairs, the cleaning of the waterway in front of the mansion was also the responsibility of the samurai residence. According to The Waterworks Record, in 1705, the Domain ordered each samurai residence to provide labor to clean the waterway from April 29 to 30. The Domain stopped the water supply since the evening of April 28. The waterway needed to be cleaned regularly because of the inevitable accumulation of sand and reduced water flow; in 1801, the Domain designated the 5th, 15th, and 25th of each month as the “cleaning day”, and they ordered the samurai residence to remove the sand accumulated on the waterway. In 1823, the Domain changed the cleaning day to only the 15th of every month, but in 1829, they returned to the previous three days of every month because the cleaning was not well enough.

An important point is the labor force engaged in cleaning. The cleaning of the waterways in front of the mansion was the responsibility of each samurai residence, and in principle, the residence provided the labor - presumably their servants. However, in the late Edo period, the Domain and town laborer assisted in cleaning the waterway of the samurai residences area.

In 1793, sand was accumulated in the waterway of Edo-machi (江戸町, a district of samurai residences). Principally, each samurai residence should provide its labor force. But the Domain ordered a 50% salary cut for seven years from the same year on, so many samurai residences had no servants. Therefore, the Domain decided to send 15 Domain’s laborers (荒子, *arashiko*) to clean it up. It should be noted here that the reason for the Domain to shoulder the labor was the vassals’ poverty due to the salary cut. As described below, the poverty of the vassals became chronic in the late Edo period, and it is assumed that the Domain’s provision of labor was a regular practice.

The Domain was not the only one that supported the samurai residences. In 1829, the Domain ordered the towns laborer to clean the waterway of the samurai residences area, and at the same time,

the Domain notified each residence to send their servants with both groups to mix and clean. It was no longer possible for the samurai residence alone to manage and maintain the waterway.

However, the villages undoubtedly had to bear the most severe burden in maintaining the Shibahara Canal. Maintaining the 10km-long waterway from the Matsuoka Big Weir to castle town Fukui required enormous labor borne by the villages. In 1802, gravel accumulated in the Canal, causing the water to overflow and damage the road, making it impassable. Therefore, a wealthy farmer in the Matsuoka-Tuga Village (松岡柵村) called out to villages and gathered 3,000 laborers to dredge the Canal and repair the road with gravel. The Domain rewarded him with only ten bales of rice. Villages regularly contributed many laborers to repair and clean, thereby maintaining the Shibahara Canal.

In April 1847, heavy rains filled the Shibahara Canal intake with sand, so the Domain ordered 53 villages in the area to dredge. The project's cost was about gold 70 Ryo, which was huge, the Domain paid half of the cost, and the 53 villages bore the other half. In addition, 138 laborers from the 53 villages worked on this project, and the Domain paid their wages. This was a rare case of the Domain bearing the financial burden. Furthermore, there was also a case in 1768 when the villages provided 50 laborers to clean the waterways in Fukui. Such burdens were probably regarded as a kind of land tax to be paid by the villages.

Although the Shibahara Canal was used for irrigation in rural areas, the Domain stipulated that its primary purpose was to supply drinking water to the castle town. The town and samurai residences did not bear any costs for the management and maintenance of the rural route that formed the bulk of the Shibahara Canal, even though they were the largest beneficiaries of the Shibahara Canal. Behind this was a sense of feudalism that placed cities, especially samurai residences, above farming villages. However, such a way of bearing the burden ended with the Meiji Restoration. The following article is a proclamation issued to the vassals in 1868.

Now the Restoration is proceeding. Up to the present, the villages have been repairing the Shibahara Canal. However, considering that the water is being drawn to Fukui, the vassals must also bear the burden of its expense from now on.

In this proclamation, the Domain clearly defined the burden of samurai residences. This meant the abolition of the privilege of samurai residences in the feudal system. After this, the Fukui Domain ceased to exist with the return of the feudal Domain to the Meiji Government (版籍奉還, *Hanseki Hokan*) in 1869 and the abolition of Domains (廃藩置県, *Haihan Chiken*) in 1871, and the modern Fukui Prefecture was born (the same area as today, was established in 1881).

3. The punishment of violators

1) Crackdown on violators

The most crucial purpose of the Shibahara Canal was to provide a smooth and sufficient supply of drinking water for the castle town. So, the Domain had established rules for water use, prohibiting pollution, unreasonable abstraction, and punishing violations of these rules. In 1675, the first year of The Waterworks Record, the Domain decreed: “As we have already ordered, it is strictly forbidden to pollute the waterway”. Frequent orders were issued to prohibit the dumping of filth into the waterway and washing hands and feet there. Sometimes accompanied by the magistrate, foot soldiers patrolled the castle town at least twice a day, and they caught violators.

In the 1768 reform, the Domain appointed the Waterworks Superintendent Officer to oversee the water use administration, and also strictly regulated the size of the Sensui in samurai residences. The Domain prohibited the illegal practice of burying weirs in the waterway in front of the mansion to increase the amount of water taken into the premises. In August of the same year, the Waterworks Magistrate went around to the samurai residences to check the size of the Sensui, and ordered the owners in violation to take corrective measures. Besides this, the Domain added detailed regulations covering all aspects of the water usage, such as stipulating the width of waterways, setting the standard amounts of fine, dealing with the dead body who had drifted away, and dredging waterways.

However, there was no end to the violations. The Waterworks Record includes many articles on punishments for violations. For example,

28 April, Okachi, Niwa Yozaemon (丹羽与左衛門)

Fine: silver one Ryo

The waterworks official discovered that this person was polluting the waterway. We punished him.

This article is on April 28, 1817, in which Niwa Yosaemon, a member of the Okachi (御徒, Sotu vassal : foot soldier), was fined silver one Ryo for polluting the waterway.

The majority of the articles on punishments were brief, and Asai, who compiled The Waterworks Record, only outlines the offense if it was a common one. Still, he occasionally added his opinions to explain the punishment, and wrote down significant cases without omission. As a result, we can fully observe the punishment policy and the long-term trends of the punished persons.

First of all, from 1768 to 1848, the punished persons were classified according to their status, as shown in Table-4. Each period is divided as far as possible into five years, and some years have

been adjusted for the sake of convenience, as the year 1814, the year of the significant reform, was chosen as the epoch. In this table, there were a total of 73 punishments from 1768 to 1813: 36 for townspeople, 19 for farmers, 10 for Sotu vassals, and 2 for samurai's servants. In this period, most punishments were meted out to townspeople and farmers, and there were many cases of Sotu vassals. The status of Sotu vassal was no samurai⁷⁾, but more close townspeople and farmers, and was thus punishable in the same way as townspeople and farmers.

<Table 4> Punished status

Period	towns people	farmer	sotu vassal	samurai vassal	servant	other
1768~1769	7		2			
1770~1774	5	1	1		2	1
1775~1779	2					
1780~1784	4	5	1			
1785~1789	5	3	1			
1790~1794	7	5	3			2
1795~1799	3	1				
1800~1804	3	4	2			3
1805~1813						
Total	36	19	10	0	2	6
1814~1819	12	7	2		1	2
1820~1824	2	5	2	1	1	1
1825~1829	3	3	2	1		2
1820~1834	6	4	2	1	2	
1835~1839	3		5	1	2	

7) There was a difference between samurai and Sotu vassal, for example, although samurai lived in a detached mansion, Sotu vassal lived in a tenement house. In addition, samurai status was hereditary, while Sotu vassals were contracted only for one generation (in reality, however, Sotu vassals changed also into hereditary).

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Period	towns people	farmer	sotu vassal	samurai vassal	servant	other
1840~1844	12	4	4	3	1	
1845~1848	19	11	8	1	2	
Total	57	34	25	8	9	5

unit:case

Source: Asai Masaaki (浅井政昭), *Josui Kakari Goyotome Nukigaki* [「上水掛り御用留抜書」], *Matudaira Bunko* [「松平文庫」], Fukui Prefectural Archives (福井県文書館).

We cannot observe the punishment of samurai vassals before 1814. And also, punishments of their servants were rare, only two cases, who dumped water into the waterway on the same day in 1774. That is to say, and before 1814, the samurai residences and their servants were exempted from punishment for violating the regulations on water use. In effect, the samurai residences were not subject to punishment.

2) Details of violations

In the castle town, the violation of the water usage rule was mainly pollution. The first rule in 1673 was the prohibition on the dumping of filth, and later, there were many records of violations, such as washing clothes, vegetables, and fishing in the waterways. But Fukui is a region of heavy snowfall where vegetables were scarce in winter. The Domain allowed for “the daikon washing day” to secure food supplies. All at once, in the whole castle town, townspeople and vassal’s servants washed muddy daikon (大根, Japanese radish, it was dried for long-term storage or made into pickles) in the waterway. And the Domain ordered each town to clean the waterway afterward. Articles about “the daikon washing day” appear around November of every year. It was an annual event that graced the castle town in early winter.

We can ensure the reality of the violations from the notice boards (制札, *seisatu*). At the end of the Edo period, the Domain set up 29 notice boards in various parts of the castle town – it is assumed that there were notice boards before that; we do not know how many there were. The notice boards forbade bathing, the inflow of sewage, and the dumping of rubbish into the waterways. It indicated that such actions were carried out. In addition to the signs set up by the Domain, in 1796, one of the merchants asked to put up a signboard to warn people who were dumping rubbish into the waterway around his house at night, and the Domain permitted it. The variety of violations did not change over time throughout the Edo period.

The Shibahara Canal was used for agricultural purposes in the rural areas and supplied water

to 53 villages. Violations in the rural areas included taking more water than prescribed, building weirs without permission, and timber rafting. During the droughts, conflicts over water distribution between farming and drinking water led to large disturbances. In the summer of 1817, when the Domain had excavated a source of waterways to relieve the shortage of drinking water in the castle town, hundreds of farmers from the surrounding villages re-filled it because of the lack of agricultural water. The Domain put down the disturbance and expelled the ringleaders from their villages. At the same time, the villages submitted apologies to the Domain.

The Domain prioritized drinking water for the castle town at the expense of agriculture, and clearly defined this policy in the statement of December 1846. In brief, the Domain would reduce agricultural water in a shortage of drinking water in the castle town. And if the drought were severe, it would suspend agricultural water entirely. The top priority of the Shibahara Canal was to supply drinking water to the castle town. For this reason, the Waterworks Magistrate also had jurisdiction over the use of the Shibahara Canal for agriculture. As can be seen in Table-4, he punished many farmers.

Interestingly, droughts of the Shibahara Canal occurred more often after heavy rains than rainless days. Heavy rains destroyed the Matsuoka Big Weir, the source of the Shibahara Canal, preventing water from flowing into the waterways. The immaturity of construction technology was affecting the drinking water in the castle town.

3) Method of Punishment

Various punishments were imposed upon offenses with varying severity. The most severe punishment happened in September 1697. The waterworks official found a boy catching fish with a net in the waterway. He served the Tagaya Gondayu (多賀谷権太夫, hereditary stipend 650 Koku), a senior samurai vassal. The boy was not punished because he was a child. And Tagaya was not punished either, but the servant, who lent the net to the boy, was sentenced to death. This was the only case of a death sentence for violating the rules on water usage, and yet, the execution was not carried out by the Domain and has been interpreted as a private punishment by Tagaya.

There was also a case of expulsion from the castle town in March 1792, when one townsman spoke abusively against the waterworks official. Other cases involved the confiscation of water facilities. For example, in Ichijo-machi (一条町), where there was a big Kawato (河戸, stone steps leading down to the waterway), the waterworks official tried to catch a person polluting a waterway. Still, the person ran away and could not be arrested. Ichijo-machi, which was supposed to be responsible for the management of the big Kawato, replied that they could not take responsibility because it belonged to Uo-machi (魚町), so the Domain ordered the closure of the big Kawato in May

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1830 (Uo-machi submitted an apology in September and was allowed to use it again).

However, these were exceptional cases. Common punishments were “confinement (押込, *oshikome*, house arrest)”, “fine (罰金, *bakkin*)”, “apology(一札, *issatsu*, submit a written apology paper).” and “scolding (叱り, *shikari*)”. Many of these were given alone but sometimes combined, such as “confinement and fine” or “fine and apology.

Among these punishments, confinement was applied to particularly egregious violations. The following is typical cases of confinement.

October 23

five days of confinement: Okeya Sokuro(桶屋惣九郎), Esashi-machi(餌刺町)

This person apologized when the water official found him polluting the waterway, but he had a history of polluting many times and had been fined before. So, we ordered him confinement at this time.

This article is 1846 on. The Domain ordered confinement to Okeya Sokuro (townsman), who repeatedly polluted the waterway. In this way, the Domain ordered confinement for multiple violations, malicious violations, or those who rebelled against the waterworks official when they were caught. The 40 cases of confinement before 1813 consisted of 22 townspeople, 9 farmers, and 7 Sotu vassals. There were no cases of confinement ordered to samurai vassals or their servants.

Since the early Edo period, fines have been the most common punishment. In 1675, the chief retainer instructed the waterworks official to be fine those who dumped filth into the waterway. In 1717, the Daimyo audited the waterworks officials. He reprimanded that although the waterworks officials had collected many fines previously, they collected fewer fines in recent years. So, the Daimyo urged them to be more diligent. Ordinary violations were dealt with by fines, and the 1768 reform set the fine for waterway pollution at silver three Monme[匁] - this was not an enormous fine for ordinary people. However, the fine was five Monme, seven Monme, and ten Monme; there were many cases where the fine was increased or waived. For example, on October 3, 1826, Yoshidaya Sohachi (吉田屋惣八, townsman) should have been fined for his wife’s frequent waterway pollution, but the Domain waived the fine and only scolded him because he was so poor. Or in 1830, the Domain ordered Okadaya Sokichi (岡田屋惣吉, townsman), whose wife had polluted the waterway, to pay a fine silver one Monme. Asai commented, “There has never been a fine one Monme, and until now, those who could not pay the fine were dealt with by scolding, but the one Monme first appeared in that year.

In this way, punishments were not regimented strictly but were decided flexibly, considering the economic situation. “Silver three monme” is interpreted to have been just the base-level amount.

4) The change at the end of the Edo period

(1) The Reform of 1814

In 1814, the Domain declared to reform the waterworks administration. This reform was essentially to tighten the loose situation by following rules made in 1768 and clarifying them. Specifically, that was the re-establishment of the Waterworks Superintendent Officer, which had been abolished the previous year, strict adherence to water usage rules, investigation of Sensui, and cleaning the waterways. A few years before 1814, the waterworks administration was in turmoil, and the reason for this is not apparent. However, according to documents that recorded the actual situation inside the Domain, the vassalage was remarkably confused at that time.

Due to the prolonged decline in the price of rice, almost all Domains fell into economic distress in the late Edo period, and the wrinkles of this distress were passed on to the vassals in the form of salary reductions (借知, *shakuchi*).

To briefly explain the samurai vassal stipend system, the essential words are hereditary stipend (家禄, *karoku*) and salary rice. The hereditary stipend was given to senior and middle samurai vassals for generations, also used as an identity marker. This is a remnant of the fact that vassals were initially given fiefdoms. The hereditary stipend of 100 Koku meant a net income (salary rice) of about 40 Koku. The halving of the salary was for the net income and did not affect the hereditary stipend, which would be 20 Koku.

Fukui Domain forced a 50% salary cut in 1761 for several years, and from 1772 onward, a continuous 50% and 8% cut were implemented alternately. The vassalage became increasingly dissatisfied, and in the winter of 1805, a severe and unprecedented incident occurred.

In November 1805, The guard corps (番組一統, *Bangumi Itto*), which were the core of the samurai vassals and 680 out of about 800 samurai vassals belonged to it, asked the Domain to provide them with allowances, because they were suffering from unbearable poverty due to the consecutive years of salary reduction. This was not the first time they asked for relief from the Domain. They requested an allowance in 1753 because of the falling price of rice (which was directly related to their cash income), and the Domain granted it. Such relief from the Domain was not uncommon.

However, in 1805, the Domain rejected their request, so the guard corps decided to boycott the New Year's celebration, remove decorations from their mansions, and hold a vast rally to appeal to their open defiance. This was an uproar bordering on rebellion. Surprised by the seriousness of the situation, the Domain executives sent an urgent message to the Daimyo in Edo. The Daimyo

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promised extra pay in a letter, and the disturbance was finally calmed down. In the following June, nineteen vassals were punished.

Nevertheless, none were punished severely, such as committing seppuku (切腹, forced suicide) or banishment. The punishment was only a salary reduction.⁸⁾ Perhaps due to this incident, the 50% cut was not enforced for the next 20 years, even though the Domain reduced salaries slightly.

Probably, this trouble was merely one example of the vassalage dissatisfaction that surfaced. The Domain needed to regain control of vassalage. The renewal of the waterworks administration in 1814 was likely a part of the rebuilding of the Domain management.

(2) The expansion of punished subject

While the 1814 reformulation emphasized the compliance of rules made in the past, we can find various changes in The Waterworks Record. The most significant change was the expansion of punishments. The Domain was pushing forward with a policy of expanding the punishment subject, so samurai vassals and their servants were punished.

Until that time, the Domain punished the Sotu vassals in the same way as the townspeople and farmers, but the samurai vassals were not applicable. There were no articles about the punishment of the samurai vassals, and it is unlikely that this was due to the arbitrary intentions of Asai. We can presume that the samurai vassals were never punished. In the background, it has been thought that there was a feudal status system in which samurai vassals were not treated at the same level as the Sotu vassals or townspeople because their status was completely different. But, from 1814 to 1848, shown in Table-4, The Waterworks Record contains eight entries on the punishment of the samurai vassals (including their families).

In addition, there is no case of the samurai residence's servants except for two in 1774, suggesting that the Domain excluded servants from punishment as well as the samurai vassals. In short, the samurai residence (the samurai vassals and their servants) was not a punishable offense. But there are nine cases about the punishment of servants after 1814; thus, the punishment of the samurai vassals and their servants was the most remarkable change.

Firstly, we examine samurai vassals. Table-5 shows the nine samurai vassals who were punished in eight cases. The first punishment was made in May 1822, when the waterworks official punished the sons of two samurai vassals bathing in the waterway. Although this was an informal reprimand

8) Yamazaki Hidetune [山崎英常], *Zoku Katatunboki Vol.4* [続片鱗記](第四卷), Fukui City History Museum (福井市立郷土博物館). This document is available as a digital image. Its URL is as follows (as of October 2021). <http://www.history.museum.city.fukui.fukui.jp/archives/henroki/index.html>

and did not result in any official punishment, it was the first case that the Domain punished the samurai vassals (to be accurate, members of their families). Also, in June 1838, when one samurai vassal was punished, the Waterworks Magistrate himself took charge of the case, indicating the strong will of the Domain to arrest the samurai vassals.

<Table 5> Punished samurai vassal

year,month	Name	salary	reason	punishment
1822, 5	Matsubara D.	20,4	bathing by son	Private scolding
"	Yanagisita K.	25,4	"	"
1825, 3	Suzuki S.	18,3	pollution by mother	Silver 1 Ryo
1830.12	Matumura I.	15,3	pollution by wife	Silver 3 Monme
1838.6	Ono S.	20,3	pollution	Silver 2 Ryo
1842.9	Nomura Y.	20,4	pollution by adopted son	Silver 10 Monme
1843.6	Miyoshi K.	18,3	(unknown)	Silver 1 Ryo
1843.8	Oono K.	—	illegal construction	Silver 5 Monme
1846.8	Suzuki S.	18,3	pollution by wife	Silver 5 Monme

note: "salary" means hereditary stipend.

Source: Asai Masaaki (浅井政昭), *Josui Kakari Goyotome Nukigaki* [上水掛り御用留抜書], *Matudaira Bunko* [松平文庫], Fukui Prefectural Archives (福井県文書館).

The punished samurai vassals mainly were the middle and lower classes. Even in cases where family members were in violation, the samurai vassal was punished as patriarch. The means of punishment were mainly fines, not severe punishments such as confinement.

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<Table 6> Punished samurai vassal

year, month	Employer name	Employer salary	reason	punishment
1774.6	Eguchi G.	250	pollution	silver 3 Monme
1774.6	Okada T.	—	pollution	silver 3 Monme
1814.7	Ishii Z.	20,3	pollution	silver 3 Monme
1822.5	Kaneko Z.	100	pollution	silver 3 Monme
1830.5	Hirayama T.	—	pollution	confinement 2days
" .8	Akao K.	15,3	raft floating	silver 10 Monme
1840.7	Nakayama C.	100	bridge construction	silver 2 Ryo
"	Seki Y.	18,3	"	silver 5 Monme
"	Abe K.	,5	fishing with a net	(unknown)
1841.8	Oguri S.	200	pollution	confinement 7days
1845.5	Koma T.	1600	pollution	scolding
1848.6	Sugayama H.	100	pollution	Silver 3 Monme

note: "salary" means hereditary stipend.

Source: Asai Masaaki (浅井政昭), *Josui Kakari Goyotome Nukigaki* [上水掛御用留抜書], *Matudaira Bunko* [松平文庫], Fukui Prefectural Archives (福井県文書館).

Table-6 shows the 12 servants punished in 10 cases (there were two cases of punishment of servants in June 1774, but this was judged to be an exceptional case). They were ordered to confinement, fines, and scolding for polluting the waterways mostly. Their employers were the samurai vassals, except for one Sotu vassal(Akao[1830]) and one of the unknown details(Okada[1774]. Hirayama[1830], whose "salary" was unknown, was a doctor of surgeon : lower samurai vassal), not only the middle or low-class vassals, but after 1814, five cases were higher classes with 100 Koku or more. There were also vassals of the highest class after chief retainers. Table-7 below shows seven punished servants, including senior samurai vassal's servants, in the 29 fines collected in 1849.

<Table 7> Fines in 1849

month. day	[status] punished person (S:Employer status and salary)	reason	fine : Monme
1.27	[T]Aoki S./Mother	washing potato	5
"	[T]Sanaya Y./manservant	washing fish	3
4.22	[S](Wakita O./samurai vassal/100)	dumping of twigs	15
5.11	[T]Kaziya Z./family	frequent pollution	16
5.12	[T]Yurukiya F.	dredging sand	1.8
7. 1	[-]Souji S./family	washing cloths	4.3
7. 7	[T]Oomonziya D./wife	washing rice	10
7.31	[T]Carpenter B.	discharging muddy water	20
"	[T]Nakamura .G /son	washing pot	3
8. 1	[T]Wataya Z.	washing small bucket	3
"	[T]Kanamonoya Z./wife	washing food box	3
8. 3	[S](Yashiro G./Sotu vassal ?)	washing cloths	20
8. 4	[T]Tabakoya I.	washing cooked rice tub	3
8. 6	[T]Yoshida K./mistress ?	washing cloths	20
8. 9	[T]Kasaya C./wife	discharging flowers	4.3
8.15	[S](Sagawa T./samurai vassal/100)	mowing	5
9.15	[S](Nishio K./samurai vassal/350)	dumping of garbage	5
9.29	[S](Ando T./sotu vassal ?)	washing radish	4.3
"	[S](Hahakabe K./sumrai vassal/400)	dumping of garbage	5
9.30	[T]Monzo/wife	washing radish	8.3
"	[T]Oonoya K./mother	washing pot	8.6
10. 1	[SV]Yamamoto Y./mother	washing greens	5
10.12	[SV]Yamamoyo Z.	washing silk thread	4.3
10.13	[S](Suganuma I./samurai vassal/1,000)	washing radish leaf	4.3

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month. day	[status] punished person (S:Employer status and salary)	reason	fine : Monme
10.14	[T]Yaoya C./daughter	washing board	3
10.15	[T]Fukushimaya T./wife	washing radish leaf	8.6
—	[T]Yoshimuraya M.	washing	5
12.12	[T]Wataya R.	dumping snow	8.6
12.13	[T]Kawakitaya S.	dumping snow	8.6

note:①[T]is townspeople,[S]is servant,[SV]is Sotu vassal. ② “salary” means hereditary stipend.

Source: Asai Masaaki (浅井政昭), *Josui Kakari Goyotome Nukigaki* [上水掛り御用留拔書], *Matudaira Bunko* [松平文庫], Fukui Prefectural Archives (福井県文書館).

The punishment of the servants did not immediately mean the punishment of those who hired them, the samurai vassal. However, it is significant that violations in the residences of the senior samurai vassals, who had not previously been punished, came to be subject to punishment. By punishing only the offending servants and not samurai vassals who hired them, the Domain cleverly placed all the samurai residences within the framework of punishment while maintaining the pride of the samurai class.

(3) The fines and apology

In the reform of 1814, the Domain changed the rules of punishment and simplified its procedure. In 1846, regulations were revised again. Before 1846, the chief retainer required a report from the Waterworks Magistrate on all confinement and fines. After this year, the waterwork magistrate was obliged to report only the confinement of Sotu vassals. In the case of townspeople or farmers, the reporting requirement was unnecessary. Moreover, the magistrate could determine fines at his discretion immediately.

Here we will take a closer look at the reality of the fines. In the 1814 reform, the Domain stipulated an amount of fine as follows.

For townspeople, the fine is silver three Monme[匁], as before.

The same applies to vassal's servants.

Foot soldier (Sotu vassal) is to be fined silver one Ryo[両].

The punished person was classified as townspeople, vassal's servant, and the foot soldiers. The

former two fines were equal in value at silver three Monme, and the unit was the ordinary “silver Monme”. However, foot soldiers used a particular “silver Ryo” (generally used for gold). The conversion rate was silver one Ryo = silver four Monme three Bu[銀4匁3分], which was higher than that of townspeople and vassal’s servant. Before this, there were no cases where the “silver Ryo” was used, and all were in the regular “Monme”. So, presumably, this “silver Ryo” was an expression to emphasize the difference in status.

But this application was soon abandoned: in December 1820, a Sotu vassal was ordered to pay a fine of three Monme for polluting the waterway. Asai commented on the article that the provision had been abandoned early as that time. After this case, we can still observe the fines with the “silver Ryo” from 1814 to 1848, nine townspeople, three farmers, nine samurai’s servants, and one temple. Even more noteworthy are the samurai vassals. In the reform of 1814, the samurai vassal was not listed as a target for fines, but, as shown in Table-5, we can confirm seven samurai vassals were ordered to fine after 1814.

The Waterworks Record does not include all the punishments and fines, but for 1849, it has a detailed record of fines from January 27 to December 13, summarized in Table-7. The total number of fine cases for the year was 29. Five were for the samurai vassal’s servants (including senior samurai residence), two were for the Sotu vassals (and two others were presumed to be their servants), and the rest were for the townspeople. There is no “silver Ryo” in the fines, all standardized as “silver Monme”. Nevertheless, nine cases in which the fine was silver four Momme three Bu [= silver one Ryo], or double the amount[silver eight Momme six Bu]. These are applied to six townspeople, one samurai vassal, two Sotu vassals, and one unspecified. The status of the punished persons was mixed. In addition, although the fines for the Sotu vassals were higher than those for townspeople in the 1814 regulations, there is no clear correlation between status and the fine amount. It suggests that the violation detail, not status, was the determining factor in the fine. Incidentally, a part of collected fines was used to pay for the remuneration of the foot soldier’s services and the cost of lanterns, candles, and other supplies for the waterworks official.

Also, we can observe the reduction of status differences in “apology (一札, submit a written statement of apology and remorse)”. The most significant change was the Sotu vassal. Table-8 shows that there were 28 apologies altogether. And before 1835, there were 15 cases, among which 3 townspeople, 11 farmers, and 1 unspecified. There were no Sotu vassals. But after 1835, there were 13 cases of apology: 5 townspeople, 4 farmers, and 4 Sotu vassals. In short, the Domain included the Sotu vassals in the subject of apology. This is another example of the reduction of status differences. However, there is no case of a samurai vassal or their servants being ordered to submit an apology. It is unclear whether this was due to a short observation period or because a samurai vassal was still

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granted status privileges in the apology.

<Table 8> Apology

period	towns people	farmer	sotu vassal	samurai vassal	servant	others
1768~1779						
1780~1789		4				
1790~1799		2				
1800~1813	1	1				1
1814~1824	2	2				
1825~1834		2				
1835~1848	5	4	4			

unit:case

Source: Asai Masaaki (浅井政昭), *Josui Kakari Goyotome Nukigaki* [上水掛り御用留抜書], *Matsudaira Bunko* [『松平文庫』], Fukui Prefectural Archives (福井県文書館).

IV. Implications: comparison between Edo and Fukui

As the term suggests, a castle town was a city with a castle. In the late Edo period, among the total 260 Domains, nearly half were small Domains with less than 30,000 Koku, and many small Domains had only encampments (陣屋, *Jinya*), no castles. However, in a nutshell, a castle was a facility with large stone walls and turrets in preparation for battle, while the encampments were simply administrative offices. In political functions and town structure, there were no differences between the two, so we can understand that there were over 200 castle towns in Japan.

Although Edo has been the largest city at the top of the castle towns, there was an intrinsic discrepancy between Edo and the local castle towns in the samurai residence's use and burden of water supply. The two were not contiguous entities, but disconnected, because Edo was the actual capital of Japan. In the strictest sense, the capital is a product of the modern state, and the standard view is that it did not appear in pre-modern times. Still, at least, there is no denying that Edo was the political center.

In Edo, concerning water supply and usage, the Shogunate managed and maintained the central part of the water supply channel. However, the samurai residences were responsible for their living area and spent the necessary money. The Waterworks and Bridges Organization worked within the framework set by the Shogunate and played an essential role in maintaining the urban public functions of the megacity of Edo.

The urban system in Edo was robust and stable, and the roles and duties of the samurai residences did not change even at the end of the Edo period. Shogunate did not provide any relief to them. Shogunate was not obligated to protect the samurai residences in Edo because the samurai residences were mainly the Daimyo's mansion and not the Shogunate's vassals. For the Shogunate, Daimyo, especially the Tozama daimyo (外様大名, some of the powerful ones overthrew the Shogunate in the later years), were simply nominal vassals.

Edo seems to have been more advanced than Fukui in realizing the "principle of the fair burden on the beneficiary" for public facility – water supply. However, the Daimyo's residences in Edo were the equivalent of embassies today, and they were special existence. On the other hand, in the Fukui Domain, with the collapse of the vassal system, which was the basis of the feudal system, samurai residences who were dwellers, accepted the principle in the Meiji Restoration. In feudal and modern societies, the dweller's burden of public facilities is different. This change in the Fukui Domain can be one of the proofs of the establishment of modern society.

However, in Fukui, the situation was different. In the beginning, it was the duty of the samurai residences to repair the waterways facing their mansions, but the Domain began to supply the repair materials. Furthermore, the burden of cleaning the waterways in the samurai residences area was also shifted to the towns and farmers by the Domain's order, as they could not provide the necessary labor force. The background to these changes was the growing poverty of the vassals by severe salary cuts. As a result, they were not able to hire sufficient servants. It is presumed that the impoverishment of vassals was common to all Domains, so this situation was not unique to the Fukui Domain.

In terms of the fact that samurai residences were responsible to manage and maintain urban functions, and that this obligation was carried through to the end of the Edo period, Edo seems to have been more advanced than Fukui in realizing the "principle of beneficiary pays". However, in the Fukui Domain, due to the collapse of the vassal system, which was the basis of the feudal system, samurai residences accepted the "principle of beneficiary pays" in Meiji Restoration.

In addition, as is clear from the analysis of punishment in water usage, the privileges of the samurai residences were gradually revoked, and they became closer to the townspeople and farmers. In this way, the case study of Fukui can be evaluated as nothing other than the process of the creation of modern urban society, in which dwellers on equal-footing fulfill their burdens fairly. Still, in Edo,

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we cannot observe any punishment cases of samurai residences for water supply and usage. This is because it was difficult for the Shogunate to order fines or punishments for Daimyo residences, which were equivalent to independent governments, due to the principle of the Shogunate and Domain system. The treatment of Daimyo residences did not drop to the same position as that of townspeople or farmers, as the samurai residences in Fukui.

Ethical considerations

Ethical issues (including plagiarism, informed consent, misconduct, data fabrication and/or falsification, double publication and/or submission, and redundancy) have been completely observed by the author.

Conflict of Interest

The author has no conflict of interests to declare.

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