

Public–Private Partnerships and Their Limitations in Sustainable Public Sewerage Industry: A Comparative Analysis of Three Municipal Cases in Japan

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Abstract: *Since the mid-1980s, many public water and sewerage business reforms have been carried out in countries around the world in the form of privatization and the introduction of market systems. In Japan, municipalities operate sewerage businesses as a public service, and their revenues are expected to decline in the future due to a decrease in population and the deterioration of existing facilities and equipment. Therefore, in this study, we investigated the administrative reform of the public sewerage businesses in Japan as a means of increasing business efficiency and achieving sustainable management. For our research method, we conducted a case study of three advanced municipal sewerage business reforms, which were aimed at introducing outsourcing through long-term concessions, but two were abandoned by the local councils in the middle of the process. The research shows that the limiting factors for these sewerage business reforms include the uncertainty regarding the required investment for heavy rain and earthquake countermeasures. With growing awareness of disaster prevention and mitigation, municipalities are expected to mobilize maximum resources in an emergency. Furthermore, facilities that were constructed in the 1960s to meet the needs of a growing urban population have deteriorated and become an "unmeasurable risk." The second point is the uncertainty about the amount and duration of the central government subsidies provided to municipalities. Due to growing interest in environmental changes caused by global warming, severe weather events attract greater public attention. New capital investment is required to strengthen the capacity of sewerage systems, especially in densely populated urban areas. Under the principle that rainwater treatment is a public expense, about half of the construction cost of sewerage facilities for rainwater is subsidized by the central government. This is a customary yet unstable fiscal policy, making it an uncertain factor in implementing long-term public–private partnership projects.*

Keywords: administrative reform, concession, publicly owned enterprises, public–private partnerships, public sewerage business

JEL Codes: D73, L33, R53

1. Introduction

Water is an indispensable resource for humans, and water services need to be developed by prioritizing the public interest from a long-term perspective (Koppenjan & Enserink, 2009). Historical experience shows that there are at least three models of water provision in practice: public, private, and community models. The

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public model dominates water services, but privatization and public–private partnerships (PPPs) have been introduced to increase efficiency.

Since the mid-1980s, liberalization has led to numerous water industry reforms, allowing for more privatized and commercialized services, thereby initiating the economic globalization process (Bakker, 2003, 2007; Swyngedouw et al., 2002). Municipalities are compelled to make trade-offs between environmental and social sustainability and economic sustainability. Thus, utilities may circumvent contradictions by finding creative solutions to operate within regulations, service delivery models, and municipalities (Furlong, 2012; Furlong & Bakker, 2010).

Monopolistic tendencies are the principal concern in privatization, as these may limit water access for low-income citizens and result in a lack of investment for improving water quality (Cesar, 2019). Some countries, such as the United Kingdom and France, find market competition beneficial compared to public monopoly. In other countries, such as Germany, municipalities create hybrid public/private firms that benefit from both market engagement and economies of scale available under monopoly production. Differences in national traditions of public intervention, institutional arrangements, and public service markets contribute to a great diversity in local public services. (Warner & Germà, 2008).

In Japan, the public water business has been managed as a “local public enterprise.” It is a part of the local government, but has introduced corporate accounting to ensure management efficiency and obtained funds through corporate bond issuance. Despite these reforms, a decrease in population and deterioration of existing facilities and equipment has increased the momentum for further public water administrative reform. The classification for the resource management reforms in the water sector was discussed by Bakker (2007), and Japan’s public water business reform continues to exhibit the organizational reform of corporatization under asset management via private sector partnership for more efficient management (Author, 2020). However, there is little research on private sector participation in the public sewerage business or analysis of a management and governance model for a sustainable sewerage industry. This study aims to fill these gaps in the research by analyzing reforms of the public sewerage businesses of three Japanese cities based on textual analysis and interview surveys.

2. Research Elaboration

The research methods included scrutinizing preliminary research and conducting comparative case studies of three municipal sewerage business reforms in the Japanese cities of Hamamatsu, Osaka, and Nara. These cities are the most advanced municipalities in Japan’s public sewerage business in terms of reforming their businesses through PPPs. This study consisted of two parts. First, we performed a textual analysis of relevant materials published by the national and municipal governments and the proceedings of local councils. Second, we conducted semi-structured interview surveys with municipal officers and, in the case of Osaka, with an affiliated company established to operate the sewerage business. These interviews were conducted in four phases from 2018 to 2021, with a total of 10 executives and other staff members.

3. Results

3.1. Case study 1: Hamamatsu City Government

The city of Hamamatsu has an area of 1,558.04 km² and a population of approximately 800,000. It is located between Tokyo and Osaka, both of which are Japan’s most densely populated areas. It is a transportation hub that connects the east and west of Honshu island with high-speed trains and highways. It is also an industrial city with three major industries: textiles, musical instruments, and motorcycles. Hamamatsu City Government (HCG) was the first city in Japan to begin operating sewerage facilities by the concession

method from April 2018. A merger of cities and towns in 2005 that led to immense expansion of the sewerage treatment area initiated the business reform. The newly transferred Seien area was the city's largest treatment area, accounting for approximately 50–70% of the entire city by both area and sewage treatment amount. Previously, approximately 70 people had operated these facilities, of which 50 were outsourced to the private sector for maintenance, and the remaining 20 were prefectural government staff and public corporation employees in charge of the construction design, operation management supervision, and budget and contractual work.ⁱ

The HCG decided to introduce the concession method for managing the terminal treatment plant and the pumping station, based on the cost reduction effect and the advantages of restricting an increase in staff. Except for the renovation of facilities (90% of the cost is borne by the city), the management of the target facilities is entirely entrusted to the owner of the operating right (Figure 1).

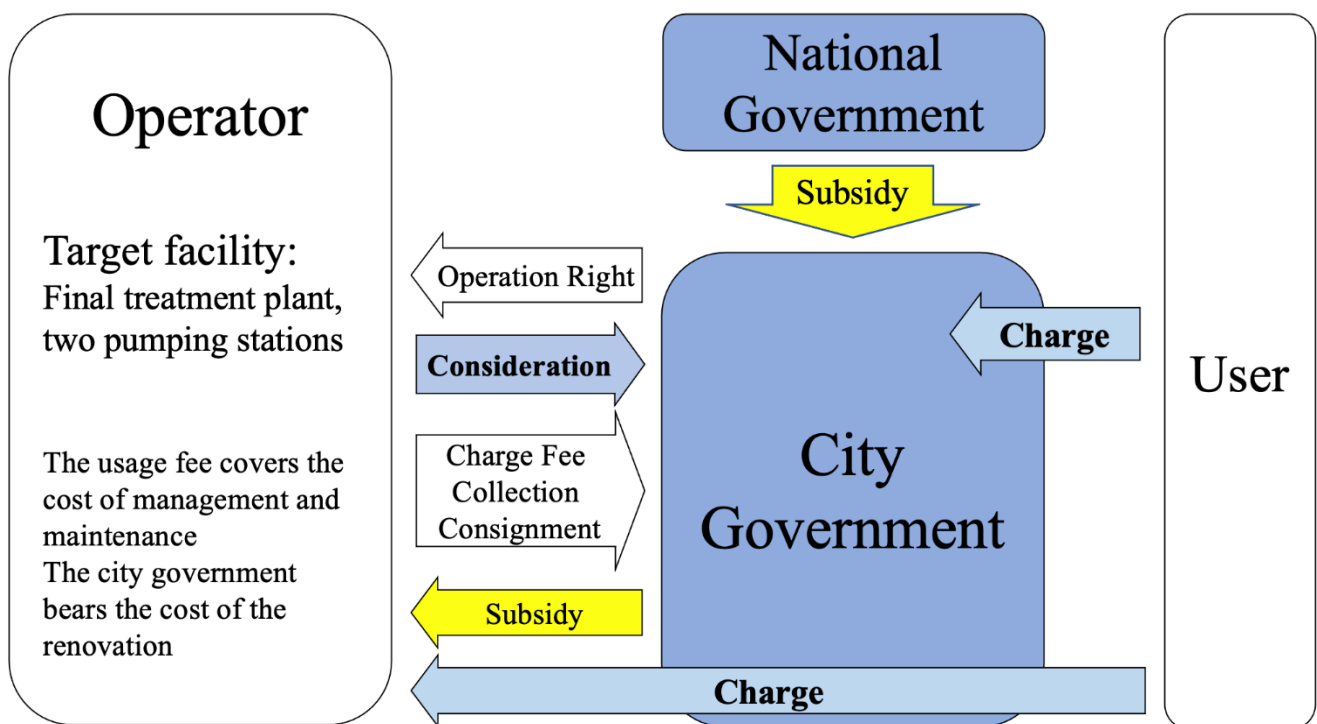


Fig. 1: Scheme of sewerage business concession for Hamamatsu city.

(Source: Adapted by the author from Hamamatsu City Government (2017, p. 10))

After announcing the concession, the HCG started an open call for proposals in May 2016, and selected a consortium of five companies—Veolia, JFE Engineering, ORIX, Tokyu Construction, and Suyama Construction Group—in March 2017. In October 2017, the HCG signed a 20-year concession contract with the joint venture established by the consortium, Hamamatsu Water Symphony Co., Ltd. The concession was estimated to reduce the project cost by 14.4% (8.66 billion yen) by converting the total planned project cost of the direct management and concession method over the project period into present value. In addition, the HCG expected to earn 2.5 billion yen from the company in compensation for the operating right. There are five expected advantages of introducing this concession: reduction of electricity costs by long-term procurement and introduction of new technology; reduction of utility costs, such as chemical costs by global procurement;

reduction of repair and inspection costs by in-house production and specification changes; education and training by skilled technical staff; and an increase in regular employees.ⁱⁱ

3.2. Case study 2: Osaka City Government

Osaka is the central city of western Japan's Kansai region, which is the second most populous area after Tokyo. Approximately 2.75 million people live in its area of 225 km². The purpose of the organizational reform of Osaka's sewerage business consists of the following six points: First, it aims to maintain high-level citizen services, securing high-quality technology, accumulating new know-how, and acquiring the skills and know-how of the staff engaged in the sewerage business. Second, it seeks to implement project and business development through joint ventures with the private sector, which is difficult for public bodies. Third, it aims to implement water drainage and improve the combined sewer system at considerable time and cost to secure citizens' safety. Fourth, it seeks to improve the efficiency of the business under an increasingly severe operating environment owing to the huge amount of renewal of treatment and sewage facilities required, despite the decreasing trend of water consumption and revenue. Fifth, it aims to review the number of maintenance department staff, as they constitute a larger proportion than in other cities. Sixth, it is a response to the demand for sewer engineers and technicians.

The Osaka City Government (OCG) aims to introduce a "mixed operation rights system" as the final organizational form of the sewerage business. This system is a vertical separation system in which local governments own facilities and private companies carry out business operations and provide capital investment, such as financing the renewal of facilities. For facilities throughout the city area, external organizations manage the sewerage business, except for new construction, such as large-scale remodeling and reinvention, which requires policy approval. The contract period is assumed to be 20–30 years. As Figure 2 shows, the owner of the operation rights implements its business with the service purchase compensation (public expense) paid from the public sector and charges from service users (private expense).

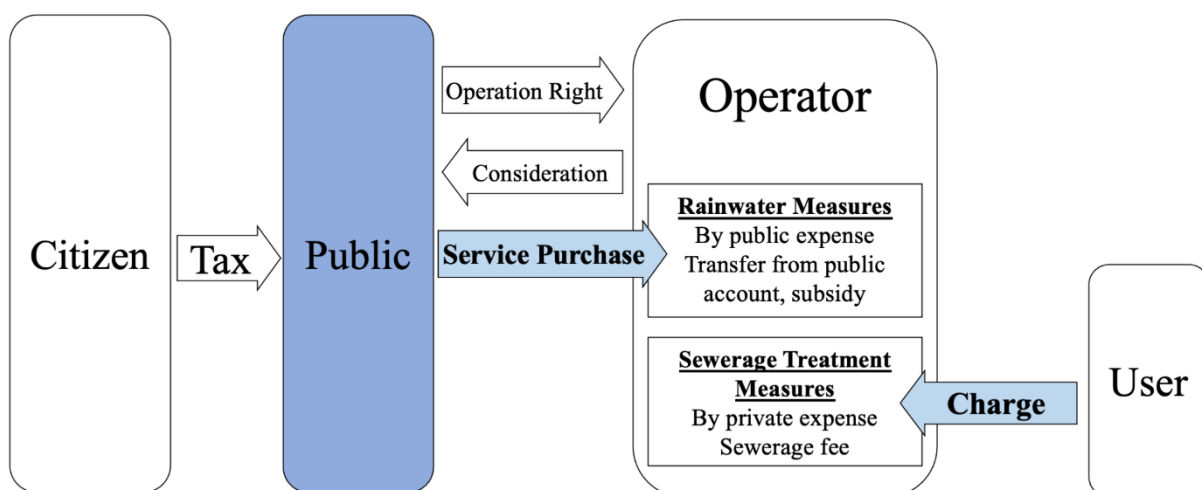


Fig. 2: Model of a mixed operation rights system for Osaka city.

(Source: Adapted by the author from Osaka City Government (2015, p. 57))

For the expected schedule of this organizational transformation, three steps are assumed for the transition of organizational reform (Table 1). Phase 1 involves comprehensive outsourcing, carried out on the operation and maintenance of sewerage facilities by the Urban Technology Center, an affiliated association of the OCG. In phase 2—the current stage— small, simple renewals will be implemented by the newly established city-

owned enterprise in addition to the comprehensive outsourcing of operations and maintenance. Finally, in phase 3, a mixed operation rights system will be introduced, and a range of facility renewals and refurbishments necessary for operation will be implemented.

Table 1: Steps for management reform of Osaka's public sewerage business

Business Area	Phase 1	Phase 2	Phase 3
Business Area A Public Administrative Specific Works	Public: Organized work related to comprehensive business development Operations involving the exercise of public authority based on the sewerage law		
Business Area B Construction	Public: New construction for anti-flood, combined sewerage improvement Large-scale update and renovation works		
Business Area C Operation and Maintenance	Private: Comprehensive outsourcing	Private: Comprehensive outsourcing Small simple renewal works	Private: Mixed operation right system Contract term 20–30 years
Expected Effects of Business operations	Reduction of maintenance costs		
	Revenue growth from domestic and overseas business development		
	Reduced construction costs		
Contracted Party	Affiliated general incorporated association	<ul style="list-style-type: none"> New entity (stock company) 100% owned by city government 	<ul style="list-style-type: none"> Stock company A part of the share is owned by private company

(Source: Osaka City Government (2015, p. 67), modified by the author)

In the Osaka city sewerage business budget in March 2016, the Osaka City Council stated that the city was responsible for managing the sewerage business, supervising it to protect citizens' safety, and ensuring more efficiency and sustainability for the future. Moreover, the council announced five resolutions on budget execution concerning the sewerage business organizational reform (Table 2). Thereafter, the Clearwater OSAKA Corporation was established on July 1, 2016, and operations started on April 1, 2017.

Table 2: Conditions of Osaka City Council for the sewerage business organizational reform budget

Maintain current service level	For outsourcing the sewerage business operation to a newly established company, the city must sufficiently supervise the company not only to make the management more efficient but also to acquire the knowledge and technology of the present staff.
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Secure a crisis management response system	The city must ensure that the safety and security of the citizens are maintained, fully considering crisis management, including disasters.
Reduce costs by private management method	With the establishment of a stock company, it is necessary to consider the introduction of a more effective performance procurement system and take measures to reduce the burden on citizens.
Accountability and information disclosure	It is necessary to report the business plan to the City Council immediately after the establishment of the corporation.
Thorough consideration of and accountability in promoting reform	The operating power system must be carefully examined, providing polite and sufficient explanations to Parliament.

(Source: Sourced by the author from Osaka City Council. Gian Dai 130 Go Heisei 28 Nen Osakashi Gesuido Gigyo Kaikei Yosan nitaishuru Futai Ketsugi [Incidental resolution for Bill 130, 2016 Osaka City Sewerage Business account budget]. Retrieved from <https://www.city.osaka.lg.jp/shikai/page/0000349891.html> (Accessed May 17, 2021))

3.3. Case study 3: Nara City Government

Nara city, located 30 km east of Osaka city, has a population of approximately 360,000 across an area of 276.94 km². It is a historical region as Nara was the capital of ancient Japan 1,300 years ago. The Nara City Government (NCG) identified four problems with the city's water and sewerage business. First, there is an increased need for renewal due to aging facilities; second, revenue has decreased owing to the declining population, especially in the eastern region; and third, there is a shortage of professional technical staff and difficulty in recruiting new and mid-career staff (Tsujii, 2017).

The NCG considered introducing a concession system that is not a pure business consignment but instead chose to promote facility renovation and flexibly encourage the vitality of the private sector, yet guaranteeing publicity and accessibility rather than completely leaving it to the private sector. In this scheme, a PPP company is established as a concession-type trustee; the city invests 51% and seeks remaining investment from private companies. The NCG controls the management of the new company and secures technology succession both by dispatching staff from the NCG Public Enterprise Division and utilizing the technology of the private partners.ⁱⁱⁱ

The concession scheme for the NCG is shown in Figure 3. The contract period is expected to be 15 years, and only the operating right will be held by the private sector, while the facility will be owned by the NCG. Approximately half of the PPP companies' staff are expected to be dispatched from the NCG. New investments in business operations will be implemented by the company.

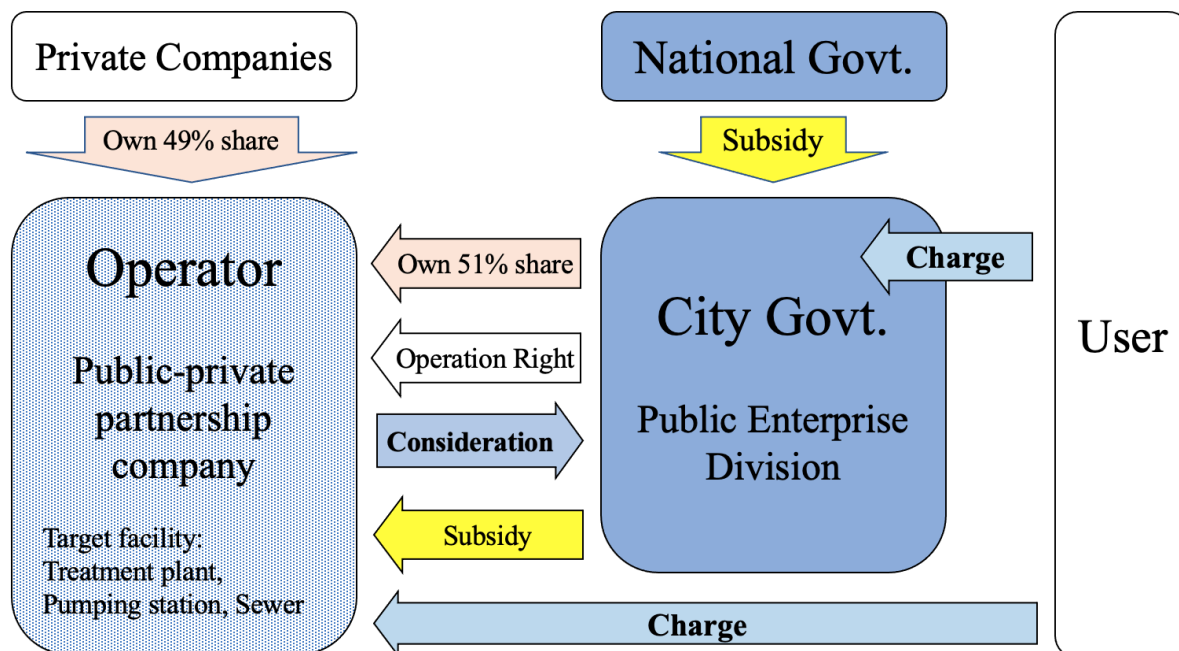


Fig. 3: Scheme of Sewerage Business Concession for Nara city.

(Source: Adapted by the author from Nara City Government (2017, p. 13).)

In this way, the NCG has been preparing to introduce a concession, although the draft ordinance for introducing it was rejected by the city council in March 2016. The city council criticized the draft as follows.

Water and sewerage are important infrastructure facilities in daily life and should be treated equally in a city-wide plan. There are still many issues to be solved, such as the fact that only a part of Nara city is the target area, and that the proposal is too sudden, and that understanding has not yet spread (Liberal Democratic Party).

The area plays the role of the city's water source pond. Local residents have made efforts to protect water sources, and complained that privatization is turning their backs on this effort and letting the city abandon the area (Communist Party).

This privatization is a sudden proposal, and there is a lack of explanation for the relevant areas, so it cannot be said that the residents have fully understood it. A polite explanation of the relevant areas and the overall picture of the plan should be given, and the ordinance should be proposed only after the understanding and cooperation of the residents (Nara Mirai no Kai [Nara Future Association]).

After the rejection of the draft concession ordinance, the NCG introduced a comprehensive business consignment for the water and sewerage business for 2.5 years from October 1, 2018. It is examining whether to grant a concession to the joint company that has been entrusted with the consignment, Nara City Sewerage Service, which consists of six private companies. The contents of the comprehensive consignment work are general management of water and sewerage; terminal treatment plant operation management; planned maintenance work, such as patrol/inspection, resident/accident response, sewer inspection/cleaning, emergency/disaster response, sewerage treatment plant and pumping station renovation design and construction; and minor maintenance work. The envisaged cost is approximately 555 million yen.^{iv}

4. Discussion

This section compares the cases of sewerage business reforms in the three local governments based on the interview survey, and examines the conditions under which PPPs for sewerage business reforms can create a sustainable sewerage industry. As shown in Table 3, the balance sheets of all three municipalities discussed in this study are expected to deteriorate in the future owing to their declining populations and aging facilities, and the momentum for improving management efficiency has increased. The reforms in Hamamatsu and Nara cities were triggered by the 2005 merger of cities, towns, and villages, but in the case of Osaka city, there is a more positive reason, namely, awareness of the business opportunities for wide-area expansion of public sewerage projects. Osaka and Nara city governments have tried to introduce a concession, but have not yet obtained the consent of the local government council.

Table 3: Comparison of three local governments' sewerage business reform

Municipality	Hamamatsu city	Osaka city (phase 2)	Nara city (after the concession ordinance was rejected)
Motivation for reform	Area expansion due to merger of cities, towns, and villages Need for new personnel and efficiency	Wide-area business opportunity	Deterioration of future income and expenditure Lack of staff
Entrusted business content	Narrow (treatment plant/pumping station operation management)	Wide (treatment plant/pumping station operation management)	Wide (treatment plant/pumping station operation management, sewerage maintenance)
Target area	Partial areas (50–60%)	All city areas	Partial areas (3%)
Contract period	20 years	5 years	2.5 years
Entrusted organization	5 private companies form a joint venture	Municipally owned enterprise	Municipal and private joint company (city owns 51%)
Effect amount (within contract period)	8.6 billion yen	5.5 billion yen	n.d.
Degree of aging facilities	Medium	High	High
Stormwater and sewage classification	Clarified	Unclear (combined sewerage)	Clarified
Predictability of renovation and renewal costs	High (relatively clear amount of renovation and renewal required in the future)	Low (aging facilities/heavy rain countermeasure costs)	Medium (aging facilities)
Future prospect	Concession verification	Concession introduction	Concession introduction

(Source: author)

The comparative analysis lists four factors as reasons for Hamamatsu being the only city to introduce a concession. Firstly, the scope of work targeted for the Hamamatsu concession was limited to the treatment plant and pumping station. Secondly, there are few aging facilities in areas where concessions were introduced, and it was easy to calculate the long-term estimate of the cost of future renovations and renewals subsidized by taxes. Third, the Hamamatsu city management did not implement reform of the water supply business, as users have a stricter perspective on privatizing drinking water. Reform of only sewerage management is more likely to be acceptable to users than its reform with water supply. Fourth, the Hamamatsu concession was introduced in the newly merged area, which had been operated by a wide-area public administrative body until then, and thus, did not share a sense of community with the rest of Hamamatsu city.

Based on these considerations, the limiting factors of Japan's reform of its public sewerage business management can be summarized by the following five points, as shown in Table 4.

Table 4. Limiting factors in the reform of public sewerage business management

Ensuring redundancy	Uncertainty in heavy rain and earthquake countermeasures <ul style="list-style-type: none"> • Larger risk of facility operation and maintenance compared to Europe and the United States Sewerage business environment
Aging machinery and equipment	Uncertainty in repair amounts and related expenses <ul style="list-style-type: none"> • Operation based on the experience of skilled staff • Facilities that are aging and have exceeded their duration
Compensation from taxes	Uncertainty in the amount and period of subsidies from the national government <ul style="list-style-type: none"> • Rain water treatment by public water, especially in urban combined sewers • National subsidy for facility development for heavy rain countermeasures
Integration with water business reform	The impact of greater resistance to water business reform <ul style="list-style-type: none"> • Refusal to privatize drinking water
Equal service and accessibility	A sense of inequality between areas where public-private partnerships have been introduced and areas where they have not

(Source: author)

The first factor limiting reform of the sewerage business is the uncertainty regarding the investment required for heavy rain and earthquake countermeasures. Compared with Western countries, Japan's climate is characterized by the requirement to respond to earthquakes and heavy rains that exceed mechanical equipment capacity in peacetime. When considering reforms of Japan's public sewerage business, water and sewerage facilities need to be resilient, and redundancy is required to withstand natural disasters. Moreover, owing to growing interest in environmental changes caused by global warming, severe weather events, such as typhoons and heavy rains, have attracted greater public attention. New capital investment is required to strengthen the capacity of sewerage systems, especially in densely populated urban areas.

In addition, in the event of an emergency, the local government, which is the facility owner, can mobilize the maximum amount of resources (Hart, 2003). With growing awareness of disaster prevention and mitigation among the public, municipalities are expected to mobilize maximum resources in an emergency. As a result, the potential loss of know-how owing to significant outsourcing is also criticized.

A second limiting factor is the aging of machinery and equipment, which varies depending on the device. Many municipalities operate machinery and equipment beyond the endurance year based on the know-how of veteran staff. Even operating municipalities cannot estimate this risk. At the introduction of a concession, the contracted company is more sensitive to this risk to the local government and has high motivation to undertake regular planned maintenance with updates after a certain period, instead of fixing simply when a problem occurs. This raises the costs of construction investment spending.

Third, in Japan, under the principle that rainwater treatment is a public expense, local government taxes are used as a source of funds, and approximately half of the construction cost of sewerage facilities for rainwater is subsidized by the central government. This is a customary, yet unstable, fiscal policy. It acts as a hindrance to long-term PPP contracts of more than 10 years. Fourth, there is deep opposition, including emotional opposition, to integration of water supply business reform with sewerage business reform, including the introduction of PPPs as privatization of the water supply business. Fifth, from the perspective of providing equal services and accessibility, citizens may oppose the introduction of PPPs in only a part of city areas.

5. Conclusions

In this study, we focused on the conditions for introducing a PPP approach, especially in the form of a concession to manage the sewerage business. We identified three uncertainties as limiting factors for PPPs. The first is uncertainty over the service level for ensuring sustainability and the aging of machinery and equipment; the second is uncertainty over the principle of rainwater public expenditure and the national government's subsidy system; and the third is uncertainty of residents about the relevance of the water business and the provision of equal services.

In Asia, the prevalence of managing publicly owned enterprises with capital participation from private companies is increasing (Jensen, 2017). Furthermore, aggressive corporate development of publicly owned enterprises and their expansion outside their regions are increasing with the advancement of urban entrepreneurialism (Tremml, 2019). In Japan, where disaster risk is higher than in Western countries, sewerage projects are required to have higher redundancy and a higher public commitment.

Although significant private consignment and privatization are difficult in Japan, it is realistic to provide services by public or publicly owned enterprises. Furthermore, management efficiency is expected to improve as publicly owned enterprises compete to expand their jurisdictions. The national government is required to support the establishment of such publicly owned enterprises and develop a transparent and stable subsidy system over the long term. For future research, we would like to undertake a comparative analysis of the governance of sewerage business management by publicly owned enterprises in Japan with overseas cases.

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