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The United Nations University: 29th Floor, Toho Seimei Building, 15-1, Shibuya 2-chome, Shibuya-ku, Tokyo 150, Japan. Tel.: (03) 499-2811; Telex: J25442; Cable: UNATUNIV TOKYO

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THE EARLY HISTORY OF THE CONTROL OF WATER-BORNE DISEASES IN TOKYO

Hiromichi Ishizuka

Professor
Faculty of Social Sciences and Humanities
Tokyo Metropolitan University
Tokyo, Japan

CONTENTS

INTRODUCTION

In my previous report as part of the Project on Technology Transfer, Transformation, and Development: The Japanese Experience of the United Nations University's Human and Social Development Programme, 1979, I reviewed the history of the structure of dwellings and housing problems with particular reference to slums in Tokyo.(1)

My report stated that Tokyo from the second half of the nineteenth century through the early twentieth century was a backward city of a semi-colonial pattern centered around the Tsukiji Settlement (a foreign quarter remaining in existence until 1899, when foreign residents ceased to live in segregated zones) and the Ginza Brick Street (a Western-style downtown district) and involved slums everywhere in the urban area. Those urban slums, in part consisting of wooden-built one-storey multi-family tenement houses (known as nagaya), were hotbeds of the urban problem of distress of the lower class resulting from the excessive concentration of population and poverty and above all of the prevalance of infectious diseases and frequent fires.

This report focuses on urban slums in Tokyo and discusses infectious diseases, which were not discussed in my paper of 1979 — in particular water-borne diseases such as cholera, dysentery, and typhoid fever, which break out and prevail by way of drinking water and food contaminated with their germs — together with steps taken to cope with them, and analysing one aspect of urban problems facing the populace of that time.

This report begins by elucidating when and in what parts of Tokyo those diseases prevailed and how the Meiji Government's policy to "Enrich the

nation and strengthen its arms" affected the spread of these diseases. Then the systems of cure, quarantine, and prevention methods developed by the Government, or more specifically the Prefectural Government of Tokyo, including the development of waterworks facilities are discussed in an attempt to identify the historical characteristics of urban problems and urban policy in those days, with particular regard to Tokyo until early in the twentieth century.

The analysis attempted in this report will be based on my two previous papers, "Toshi kaso shakai to 'saimin' jukyoron" (1979; English version: "Slum Dwellings and the Urban Renewal Scheme in Tokyo," Institute of Developing Economies, Tokyo, 1981) and "Methodological Introduction to the History of the City of Tokyo" (1978), among various reports under the United Nations University's Human and Social Development Programme (The Japanese Experience Project, Technology and Urban Society Subproject). On the problem of improvement of the waterworks, reference is made to Nobuhiko Kosuge, "The Development of Waterworks in Japan" (1981), another report under the same programme of the United Nations University.

I. INFECTIOUS DISEASES AND THE "ENRICH THE NATION AND STRENGTHEN ITS ARMS" POLICY OF MEIJI JAPAN

If the end to Tokugawa Japan's self-imposed isolation in the mid-nineteenth century meant the completion of the development of a world market by western powers, it meant the beginning in Japan of "a period of great epidemics." The spread of infectious deseases, triggered by the migration of peoples and the distribution of commodities in different parts of the world, seriously affected the lives of the masses especially in backward countries of those days. The repeated global prevalence of cholera, which had been a mere endemic disease in the Bengal region of India, was a typical example.

Especially in India, fully colonialized by British capitalism, and East Asian nations, either semi-colonialized or otherwise subordinated by western powers, the infiltration and prevalence of those diseases were facilitated by the absence of established seaport quarantine authority on the part of local governments under the unequal treaties imposed on them by the colonial powers. In those days when the causes and infection patterns of the diseases were not understood even in advanced western nations, the people of Japan, one of the underdeveloped East Asian countries then, were virtually undefended against the threat of their spread.[1] Efforts at cure, quarantine, and prevention were inadequate both in farm villages and in cities, and public hygiene facilities including waterworks and sewerage systems were underdeveloped.

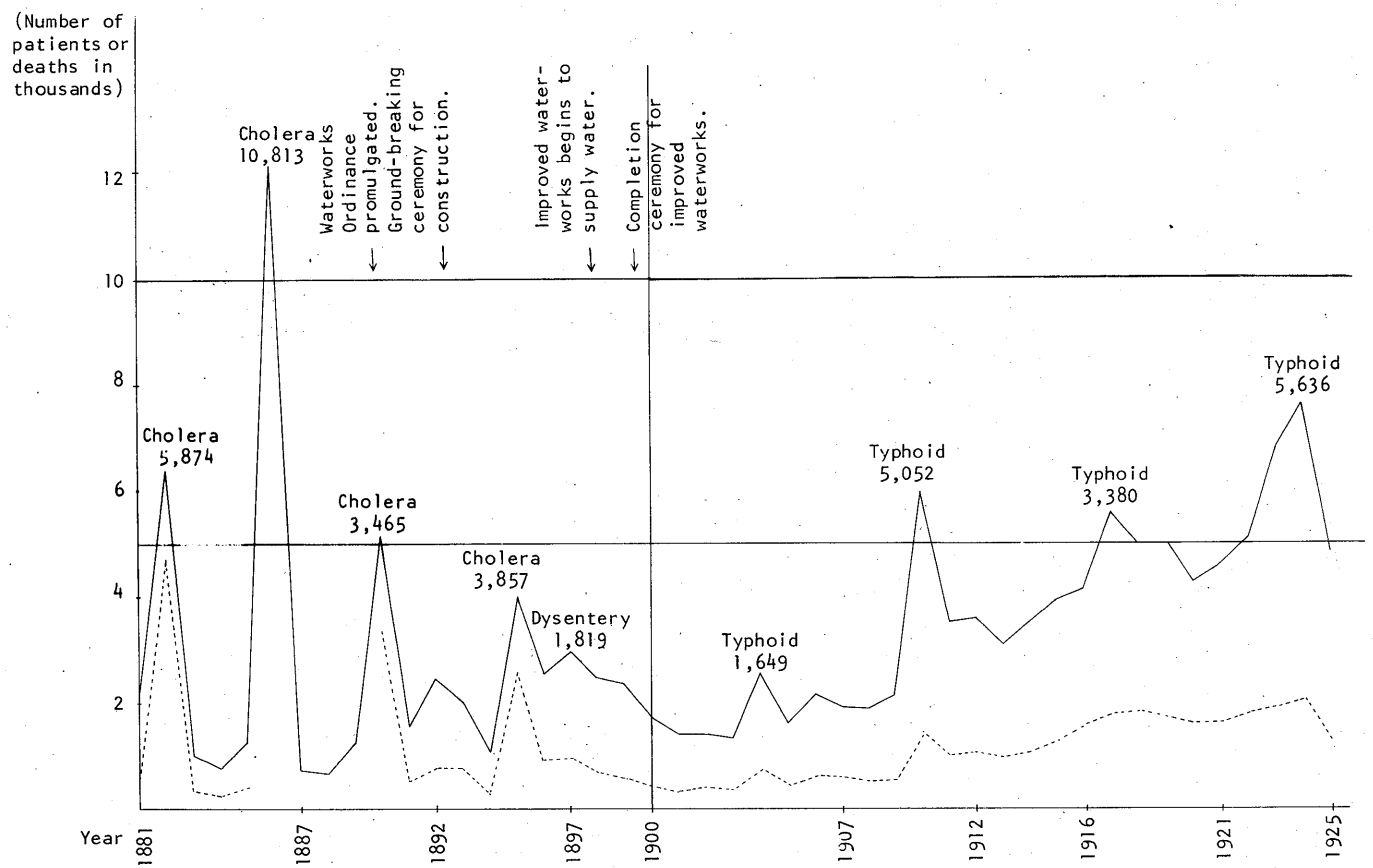
Moreover, after the formation of the new Meiji regime through the Restoration, the deployment of armed forces to suppress rebellions by former samurai at home (typically the civil war of 1877) and in major expeditions overseas (the Sino-Japanese War of 1894-1895 and the Russo-Japanese War of 1904-1905) contributed to the nation-wide spread of infectious diseases.

The prevalence of cholera in the Meiji era, in particular, was often triggered by the movements of troops, especially by the return of diseased soldiers from abroad, who brought back cholera germs with them.[2] Thus the extensive prevalence of cholera and other infectious diseases in those days was not always attributable to such externally imposed factors as the opening of trade ports and unequal treaties. It sometimes resulted from Japan's own military aggressions on neighbouring East Asian countries. As one historian said "The history of wars is the history of war-borne diseases."[3] (Translator's note: One Japanese word for "war" [sen'eki] is phonetically the same as another term meaning "war-borne disease.")

In the early Meiji years when the Government lagged behind in developing systems for the prevention of infectious diseases and public health, cholera, a typical international epidemic, joined such traditional bacterial diseases as dysentery, smallpox, and tuberculosis,[4] and these and other acute contagious diseases frequently affected the whole nation.

The Regulations concerning the Prevention of Infectious Diseases instituted in 1880 specified cholera, typhoid fever, dysentery, diphtheria, typhus fever and smallpox as legally designated infectious diseases. Various public health statistics on the national totals of sufferers and deaths from these diseases from 1876 on indicate that their numbers remain at a very high level every year until early in the twentieth century, though gradually decreasing from late in the Meiji era.[5] Cholera, among others, explosively prevailed once every few years. Figure 1 shows, in the context of this national trend, the yearly numbers of sufferers and deaths from water-borne diseases (cholera, dysentery, and typhoid fever) in the city of Tokyo from early in the Meiji period until about the end of the Taisho years. Only the water-borne diseases are discussed here because their trends will be related later to the problem of waterworks improvement. Trying to identify the structural characteristics of diseases and deaths, the reader may find from the chart that, in the urban part of Tokyo, like in the rest of the country, cholera extensively prevailed in cycles until the 1890s,[6] followed by an increase in dysentery victims for some time, and then typhoid fever became predominant among

FIGURE 1. Yearly numbers of patients of, and mortalities due to, water-borne diseases in Tokyo (15 ku) (1881-1925; Solid line traces numbers of patients and dotted line, mortalities.)



Notes:
1. Source: Tokyo shi tokei nenpyo (Annual statistics of Tokyo City), 23rd ed.
2. The graph refers to the totals of cholera, dysentery and typhoid fever cases, both real and suspected.
3. No data are available on mortalities from 1886 through 1889.
4. The names of diseases and numerals at peaks in the graph (e.g. Cholera, 5,874) respectively indicate the disease among the three water-borne types having the greatest number of patients and the number of patients of that particular disease in each peak year.

the three water-borne diseases. One may readily infer that underlying those changes in relative weight of each of the three diseases, as will be described below, was the development of public hygiene measures to cope with the prevalence of infectious diseases and, closely related to them, projects to improve waterworks.

Incidentally, considering the methods of infection of water-borne diseases and factors affecting their propagation, there was an understandable difference in the occurrence ratio (and consequently in the mortality rate) of the diseases between the central and western yamanote areas of Tokyo — occupied by governmental and military establishments, diverted from former samurai's estates in the Edo period, and large residences of nobles, high-ranking government officials, and politically influential big merchants — and shitamachi districts densely populated by lower-class people living in back-street nagaya, each with its own typical form of housing and way of life (in terms of family structure, occupation, income, and spending level, and so on) which influenced the vulnerability of its dwellers to those diseases.[7] Lower-class urban communities had in common wooden-built row houses, called ordinary nagaya, partitioned nagaya, or communal nagaya (sometimes including cheap lodging houses known as kichin'yado), centered around wells and communal toilets,[8] and each house was inhabited by at least as many households as the apartments it was partitioned into.

Based on this difference in a real pattern (or urban structure), the numbers of cholera victims, as typical examples of sufferers from those diseases, per 10,000 inhabitants in their peak periods (1886, 1895, and 1907) are classified by ku (ward) in table 1. In every sample year, Nihonbashi, Kanda, and Fukagawa ku showed large numbers of victims, followed by Asakusa and Honjo ku.[9]

Among these ku, Nihonbashi in those days, whose commoners' district centered around old quarters established since the Edo period, was predominantly a commercial town, with a concentration of wholesalers' and brokers' offices.[10] At the same time, not to be overlooked was the presence of petty merchants and craftsmen (including the producers of

TABLE 1. Absolute numbers of cholera patients, together with their numbers per unit population, in 15 ku of Tokyo.

Ku	1886		1895		1907	
Kōjimachi	1,273	(53)	74	(10)	2	(0.4)
Kanda	1,621	(132)	235	(18)	6	(0.7)
Nihonbashi	2,363	(153)	211	(15)	11	(1.3)
Kyōbashi	1,594	(93)	129	(10)	8	(0.7)
Shiba	836	(75)	145	(12)	12	(1.2)
Azabu	151	(37)	50	(9)	7	(1.7)
Akasaka	67	(25)	22	(6)	4	(1.0)
Yotsuya	115	(37)	21	(6)	5	(1.2)
Ushigome	163	(37)	57	(12)	4	(0.7)
Koishikawa	197	(48)	68	(13)	3	(0.5)
Hongō	456	(73)	67	(9)	5	(0.6)
Shitaya	493	(63)	108	(12)	8	(0.8)
Asakusa	953	(80)	152	(11)	7	(0.5)
Honjo	723	(84)	165	(13)	11	(1.1)
Fukagawa	808	(118)	216	(23)	12	(1.6)
All Tokyo	10,813	(89)	1,720	(13)	105	(0.9)

Notes: 1. Source: Tokyo fu tōkeisho (Statistics of Tokyo Prefecture), editions of the corresponding years.
2. Figures, both in and out of parentheses, are the numbers of individuals.
3. Figures in parentheses refer to the numbers of patients per 10,000 inhabitants.
4. Gothic figures indicate the top three ku in each year in the number of patients per 10,000.

such sundries as clothing, toys, cosmetics, and stationery) living in slums. This feature was common to other downtown ku, such as Kanda and Asakusa.

Kanda ku was divided by the class of inhabitants into the western and eastern parts, the former consisting of former samurai's estates, including governmental and military facilities, and the latter with a concentrated population of lower-class merchants and craftsmen like the similar

district in Nihonbashi ku.[11] The Yanagihara bank (Kanda Hashimoto chō) of the Kanda River, in particular, was known for a cluster of the poorest people (beggar priests named gannin bōzu) densely inhabiting it.[12]

Asakusa ku, which consisted mostly of temple-owned estates in the north and an urbanized zone developed along the Riku'u Highway (formerly known as Ōshū Dōchū), had an outcast colony engaged in the leather trade (more specifically Danzaemon and his followers, comprising leather wholesalers and other inhabitants) and slums scattered all over the ward.[13]

Deserving special note in table 1 is the enormous number of cholera patients in Fukagawa ku. The ward was a part of alluvium (lowland) formed between the Sumida River (also known as the Ōkawa) and the Edo River.[14] There, commoners' quarters and samurai's estates were interlaced in the greater part, while some sections of the ward were originally developed as irrigated rice fields. As it was impossible to lay wooden ducts over and across the Sumida River to the Fukagawa and Honjo areas reclaimed from the sea, their inhabitants hardly had access to the Tamagawa and Kanda Josui, both traditional waterworks built in the Edo period,[15] and moreover it was also difficult to bore deep wells that could supply good drinking water in the areas. Therefore, the general populace had to depend for the supply of water on shallow wells that produced water only of dubious quality and on the water tankers of water mongers, licensed to operate by the bakufu (Shogunate government) subject to payment of duties. Early in the Meiji period, there was proposed a plan to build waterworks in the whole Kōtō area (east of the Sumida River), but it proved abortive, and after that, for instance in a 10-year period from 1889 on, the dwellers of the Fukagawa district bought water from a yearly aggregate of 78 ships on an average (totalling ¥78 in charges paid for the water) according to available statistics.[16] As a consequence, there was an absolute shortage of drinking water, and the media of water conveyance were dangerously contaminated with pathogenic bacteria, presumably inviting the occurrence of many cases of cholera in the Fukagawa area, as indicated in table 1.

As already pointed out, the variance of the prevailing trend of infec-

tious diseases (especially cholera) with locality, revealed by the ward-by-ward statistics, would have taken on even greater significance if the correlation between the incidence (and the mortality rate) of diseases and the living conditions of local inhabitants were more specifically analysed, particularly at the level of chō (subdivisions of ku), the unit in which urban slums formed themselves. However, neither the Government nor anybody else ever attempted to statistically grasp the details of the prevalence of diseases and classify the causes of death from the early Meiji era on in a chronological perspective, particularly to sequentially put together pertinent data regarding urban slums and their poverty-stricken dwellers.

The history of formal statistics on public health in Japan started with the institution of isei (the medical care system) in 1874.[17] Thereafter, under the direction of the Public Health Bureau of the Ministry of the Interior, statistical surveys were undertaken to help counter the prevalence of cholera and other infectious diseases, and at the same time the military authorities also prepared public health statistics for their own purposes. Early Meiji statistics on public health, especially on diseases, nevertheless were miserably inadequate and, moreover, even those inadequate efforts to compile such statistics were curtailed by a change in the government's policy on public health administration in the second half of the 1880s.[18]

The inadequate public health statistics (on diseases and deaths) in Meiji Japan in contrast to the elaborate compilation of data on deaths and the causes of death in the West in the latter half of the nineteenth century are due not to the unpredictable, sporadic, and fragmentary natural calamities (such as earthquakes, typhoons, and famines)[19] but rather to the basic posture of the Government which gave urgent priority to its policy to "enrich the nation and strengthen its arms."[20]

It is therefore impossible to determine the mortality attributable to each individual cause at the level of chō, the unit in which slums were formed, and instead we have to move to a later period, around 1920, and estimate the mortality by putting together, with some inevitable manipu-

TABLE 2. Mortalities in major slums, classified by major cause of death (in 1921).

Ku	Chō	Population	Place among causes of death: 1st — Pneumonia or broncho-pneumonia	2nd — Diarrhoea or enteritis	3rd — Pulmonary tuber-culosis	4th — Nephritis or the like	5th — Deformity or congenital weakness	6th — Cerebral hemorrhage	7th — Meningitis	8th — Beri-beri	9th — Measles	10th — Unexplained	Total mortality (women)	Mortality per 1,000 paupers
Kanda	Mikawa	2,000	5	4	6	8	1	2	6	2	2	2	56 (22)	28
Shiba	Shin'ami	1,571	7	6	10	10	3	4	8	5	1	2	85 (43)	54
Yotsuya	Tani	1,600	12	12	15	12	4	10	2	5	5	3	133 (63)	83
	Asahi	1,000	12	13	15	2	6	4	4	4	2	1	133 (51)	103
Koishikawa	Hakusan Goten	2,294	20	30	13	8	7	0	8	6	9	2	170 (77)	74
Shitaya	Kanasugi Hon	1,793	32	25	17	12	14	26	8	6	7	6	206 (94)	115
Asakusa	Tanaka	1,044	24	35	33	15	12	9	9	8	11	6	239 (115)	229
	Asakusa	3,783	33	29	13	7	3	6	10	8	5	7	153 (64)	40
Honjo	Matsukura	1,771	18	15	17	10	10	5	8	4	5	4	140 (67)	79
	Tomikawa	2,416*	34	32	27	22	18	19	19	13	11	20	287 (98)	119
Fukagawa	Saru'e Ura	3,365*	50	42	26	12	16	13	23	13	10	14	335 (161)	100
	Reigan	2,474	17	10	8	13	9	5	7	6	3	7	121 (50)	49

Notes:
1. Source: Tokyo shinai no saimin ni kansuru chōsa, 1921; 12 typical slums each having a pauper population of 1,000 or more were selected.
2. Out of the causes of death in the 34 chō classified as "paupers' quarters" in Tokyo shi tōkei nenpyō, 19th ed., the top 10 were selected, and the mortalities (totals of men and women) attributed to them in each chō are listed.
3. The pauper population of Tomikawa chō includes Nishi chō and Saru'e Ura chō includes Honmura chō and Azuma chō.
4. The total mortalities include deaths attributed to other causes than the top 10 listed in the table.

lation, statistical data from several sources.

Table 2 is a result of this synthetic process, giving the population in each slum area chō of Tokyo in those days, together with the mortality resulting from each major cause. The table shows that, in every slum area, the annual mortality was extremely large, both in absolute number and per unit population. The cause of death listed at the top is "pneumonia or bronchopneumonia" (undoubtedly including some cases of pulmonary tuberculosis), followed in the second place by "diarrhoea or enteritis" (as there is no heading for cholera, dysentery, or typhoid fever, they all must be included here) and in the third by "pulmonary tuberculosis" (the figures under this heading would be even greater if the deaths due to pulmonary tuberculosis counted in the first column were added). Significantly, in Tanaka chō, Asakusa ku, pulmonary tuberculosis, though not a water-borne disease, in 1921 alone claimed the lives of 33 out of 1,044 inhabitants (corresponding to 316 per 10,000).[21] The total mortality in the chō, including victims of water-borne diseases covered by the heading "dysentery or enteritis" and all other causes, amounted to 229. This means that in that single year approximately one out of every five people (about the size of an average household) in Tanaka cho died.[22] Tanaka chō, Asakusa ku, was a typical slum in those days, like Tamahime chō, Asakusa chō, Matsuba chō, and Kiyoshima chō in the same ward. According to Tokyo shinai no saimin ni kansuru chōsa (A survey on paupers in the City of Tokyo, by the Social Affairs Bureau of the Municipality of Tokyo, 1921), it was a fringe town formed in what previously had been an irrigated rice field area known as Tanaka Kochi, adjoining the licensed quarters of Yoshiwara and the flophouse area of San'ya. The spread of water-borne diseases, on top of tuberculosis propagated from one member of a family to another and externally, was a phenomenon common to other slums in the city, as revealed by their mortality rates listed in Table 2.[23]

When and after industrial capitalism established itself in Japan, there were at least 110 chō identified as slums in urban Tokyo (consisting of 15 ku then), and they were inhabited by a tremendous number

of poor people, referred to as hinmin, saimin, or kyūmin.[24]

One important aspect of this urban problem is that, from about the time of the Russo-Japanese War on, in response to the shift of Japanese capitalism to its monopolistic stage induced by the development of machine and chemical industries and along with the rise in the income level of workers employed by mechanized factories, the industrial labourers began to differentiate and separate themselves from the rest of the urban slum dwellers. This trend, however, meant that the whole population of slums, including its factory-employed segment, was either actually or potentially affected by the prevalence of infectious diseases even in that somewhat advanced stage of industrialization.

Since the early Meiji period, the Government had adopted a policy to reorganize paupers and odd tradesmen as the work force to man capitalistic production mechanisms, including both government-run and private factories. With the idea that "the poor are the hands and feet to help increase production and promote industry" for Japanese capitalism (in the words of a Diet (parliament) member in support of the Bill for the Relief of the Poor proposed to the first session of the Diet in December 1890,[25] they were regarded as necessary manpower for the process of capital accumulation and industrial build-up. Therefore, letting infectious diseases prevail in urban slums and affect, often fatally, their inhabitants meant allowing the very basis of the government's "Enrich the nation and strengthen its arms" and "increase production and promote industry" policies to be undermined.

In and after the 1870s, cholera and other infectious diseases repeatedly broke out in every ku of Tokyo, especially in the slum areas. Workers employed by private factories in those years were also affected. Out of the aggregate of more than 5,700 patients segregated in quarantine hospitals in 1882, 679 were identified as factory hands.[26] This figure suggests that the spread of that and other infectious diseases was having a serious impact on the manpower supporting the development of industry in cities.

During the Sino-Japanese War in 1894-1895, the Japanese army, partly on account of its lack of adequate sanitary equipment and medical knowledge, suffered a mortality of more than 17,000 including about 11,900 claimed by diseases in Korea, the main theater of war, and Taiwan which it later occupied. The heavy rates of infectious diseases which permeated the organization of the troops caused deterioration of their fighting functions. At about the same time, spreading from a repatriated second sub-lieutenant of the engineering corps who stayed at an inn in Jimbō chō, Kanda ku, Tokyo, the germs of cholera contaminated every ku of the city, and the disease remained prevalent for seven months thereafter, with more than 3,000 patients in Tokyo alone.[27]

Those repeated outbreaks of cholera, together with the persistent presence of the two other water-borne diseases, dysentery and typhoid fever, even after the turn of the century, to which was added tuberculosis, the "national disease" of Japan, induced government leaders to realize that "public health" was the very basis of the nation's development. Early in the Meiji period, Nagayo Sensai+ (the founder of the public health system in Japan, who had been a physician retained by the Omura Fief and later became a bureaucrat serving the Ministries of Education and of the Interior) had translated the English terms "sanitary" and "health" into "eisei" (literally meaning the fundamental way to defend life).[28] The subsequent statement by Gōtō Shinpei, a high-ranking officer of the Interior Ministry, that "The prosperity of the Empire depends on nothing but eisei"[29] was a typical manifestation of this realization.

The Meiji Government thus was obliged to take steps to improve public health (especially in the areas of quarantine and preventive hygiene) as a prerequisite to its "enrich the nation and strengthen its arms" policy, and this is one of the reasons why the army sent medical officer Mori Ōgai to Germany to study public health.[30]

The above-described circumstances would also explain the attention then focused on the improvement of waterworks as the core of urban environ-

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+ Japanese personal names are written in the traditional Japanese order, with the family name first.

mental sanitation, among other urban renewal projects, and the urgent need for its implementation felt by national government leaders and the competent officials of the prefecture and municipality of Tokyo.

II. MEASURES TO COPE WITH WATER-BORNE DISEASES AND PUBLIC HEALTH IN CITIES

Anti-cholera Measures and the Populace

The circumstances under which the rulers of centralized absolute monarchies in Europe, based on their belief that "the welfare of society was identical with the welfare of the state," thought over the policy problem of "What course must the government pursue to increase the national power and wealth?"[31] had something in common with the circumstances under which the bureaucracy of Meiji Japan, in pursuit of their "Enrich the nation and strengthen its arms" policy, deepened their concern about public health (measures against infectious diseases in this particular context) in the second half of the nineteenth century. The repeated outbreak and prevalence of cholera necessitated remedies, quarantine, and prevention. In this sense, anti-cholera measures must have constituted the starting point of government reaction to public health problems and at the same time, as far as urban slums were concerned, one aspect of urban policy to cope with one of the major urban problems.

The public health system in Japan began with the promulgation in August 1874 of Isei (the medical care system),[32] consisting of 76 articles, modelled after the medical care systems of Western Europe, especially of the Netherlands, learned through the overseas fact-finding trip (from April 1871 through September 1873) by the government mission led by Iwakura Tomomi.[33]

Until the Ministry of the Interior was established under the Ōkubo administration (Japan's first centralized bureaucratic Government set up in 1874) mainly to take charge of family registration and police functions to control the people and of the promotion of industry to foster

capitalism,[34] the Ministry of Education had been responsible for medical care and public health administration. Medical administration, together with medical education based on West European medicine, was the province of the Ministry of Education set up in the framework of the new government structure comprising three councils and eight ministries following the abolition of fiefs and establishment of prefectures. The systems of public health administration, education in Western medicine, licensing of medical practitioners, and separation of dispensary from medical practice were founded under Isei.[35] Thus, a centralized mechanism of public health administration was institutionalized, with the Ministry of Education at its core exercising authority through the Bureau of Public Health, local government officials, and "medical supervisors" (local practitioners of medicine). However, considering that more than 80 per cent of physicians in those days practiced Chinese medicine,[36] it was not only extremely difficult to fully implement Isei, modelled after the medical care system of Western Europe, but the new system proved virtually ineffective partly because the public health administration of the central government was transferred from the Ministry of Education to the Ministry of the Interior immediately after the latter's establishment in 1874.

After public health administration was transferred to the Ministry of the Interior, its importance was well recognized, as suggested by this statement in an official document, "All activities for enlightenment including education and the promotion of industry inevitably have to be expanded or contracted according to the pace of public health administration".[37] At the same time, Isei, which previously had been applicable only to the three prefectures of Tokyo, Kyoto and Osaka under the province of the Ministry of Education, was expanded to cover the whole country under the control of the newly established Bureau of Public Health, and in Tokyo its implementation was assigned to the Tokyo Police Board, to which particular importance was attached among all police organizations in the country.

From then on, the Ministry of the Interior, paying attention to urban slums as well, on the one hand, concentrated in itself the administrative

authority to relieve the "helpless poor" (the lowest-class people),[38] and, on the other, put into force its public health policy, backed by a coercive police power. Thus, the responsibility for anti-cholera measures in Tokyo then rested, under the superior control of the Ministry of the Interior, both with the Tokyo Police Headquarters (established in January 1877) and with the Prefectural Government of Tokyo.

On the propagation of cholera, whose mechanism belongs to common knowledge today, there had been no unified theory until the mid-nineteenth century even in Europe. In Japan in the early Meiji years, there was a confrontation between two views held by specialists in medicine or public health regarding the outbreak and prevalence of cholera, one attributing it to "Miasma" (the local condition of atmosphere, i.e., poisonous atmosphere) and the other to "Contagion" (infection by way of a specific communicating agent).[39]

It was under such circumstances that Japan was faced for the first time with a nation-wide spread of cholera triggered by the civil war of 1877 and propagating from Nagasaki to Yokohama and further to Tokyo. Common people were able to take no proper remedies or precautions but merely relied on prayers and charms and were thrown into a panic by groundless rumors.[40] The central Government then issued "Guidelines on the Prevention of Cholera" (August 1877). It was the first, systematic set of such instructions, conveyed by the Ministry of the Interior to the public through prefectural Governments (except that of Tokyo) and the Tokyo Police Headquarters, and subsequently, with partial amendments, developed into the "Regulations concerning the Prevention of Infectious Diseases" (July 1880). The earlier guidelines set forth measures for the quarantine of ships at open ports, registration and isolation of patients and detailed rules on prevention, to which were later added provisions for the establishment and administration of quarantine hospitals, cleaning, and other environmental or preventive steps.[41]

Thereby were instituted, at least in form, legal arrangements for the quarantine and prevention of cholera through local administrative bodies. However, since most of the personnel then directly engaged in the cure,

quarantine, and prevention of cholera were the practitioners of Chinese medicine as stated above, their activities inevitably concentrated on the isolation of patients.

It is pointed out that, in the developing process of modern medicine, the means mainly resorted to before society's self-defence against diseases shifted its emphasis from the cure of patients to active prevention had been to "isolate" or even to "destroy" patients,[42] and this suggests the real character of the anti-cholera policy taken by the Meiji Government.

Specific steps applied to common people infected by the bacteria in Japan were primarily their coercive internment in hibyōin (quarantine hospitals to accommodate patients of infectious diseases), ensured by the power of the police. In Tokyo, hibyōin were newly established from around 1877 on at Tomioka Monzen in Fukagawa, Oimatsu chō in Asakusa, Atagoshita chō in Shiba (all by the Prefectural Government of Tokyo), Mukōgaoka neighboring Morikawa chō in Hongō, a neighboring lot to the branch prison at Ichigaya Tomihisa chō, a former battery site at Susaki in Kita Shinagawa, and a school site at Midori chō in Honjo (all by the Tokyo Police Headquarters), and all of them were either demolished or integrated with others in a year and a half or so.[43] Each accommodated from 20 to 30 patients, or sometimes more, and most of them were shabby, makeshift barracks located in out-of-the-way sites adjoining public facilities or in the outskirts of urban Tokyo. Later on, in or after 1886, permanent hospitals to accommodate patients of infections diseases were opened in Komagome, Honjo, Ōkubo, and Hiro'o.[44]

Records on the patients interned in these hospitals reveal that "Eight or nine out of ten were paupers who, living in insanitary, small backstreet tenements in densely populated areas, could not afford to buy even antiseptics";[45] as listed in table 3, they had been engaged in manual labour, factory work, commerce, or agriculture. In other words, presumably they were manual labourers, workers at small factories, craftsmen, and petty merchants, most of whom were slum dwellers engaged in fragmental business or odd jobs.[46] Physicians having no adequate medical

TABLE 3. A breakdown of cholera patients accommodated in the Fukagawa Quarantine Hospital (July-October 1880)

Sex	Occupation	No. of patients	Age	Result of treatment
Male	Miscellaneous	1	Below 20	Cured
Male	Manual labourer	1	" 30	"
Male	Factory worker	2	" 40	"
Male	Manual labourer	1	" "	"
Female	Factory worker	1	" "	Dead
Male	"	1	" "	"
Male	Misc.	1	" "	"
Male	Farmer	1	" 50	Cured
Male	Manual labourer	1	" "	"
Male	Misc.	1	" "	Dead
Male	Merchant	1	" "	"
Male	Misc.	1	" 60	Cured
Female	"	1	" "	"
Male	Factory worker	1	" "	"
Male	Manual labourer	1	" "	"
Male	Factory worker	1	" 70	"
Female	"	1	" "	"

Source: Public Health Section, Kaigiroku, 1881 (in the collection of the Tokyo Metropolitan Archives).

knowledge gave no proper treatment but left to chance the patients accommodated in "small and unclean rooms," and sometimes merely suspected cholera patients caught true cholera "in hospital."[47] Internment in these hospitals thus was tantamount to weeding out the needy. In consequence, "cholera riots" broke out in many areas over the exercise of police power to forcibly intern patients in hospitals,[48] and eventually patients were allowed to be confined at home.

In urban slums in the areas where cholera patients emerged to be interned in quarantine hospitals, for instance, in Hashimoto chō, Kanda ku,[49] or Kotobuki chō, Asakusa ku, "Dwellings are built very close to one another and very poorly structured, and inhabitants are generally poor, mostly engaged in manual labor or dealing in waste cloth or paper... drinking water from Kanda Jōsui or wells"; if an infectious disease broke out, "most people, hating to be interned in a quarantine hospital, would make every effort to conceal their illness, clandestinely washed their clothes by a river or a well, or threw their excrement into a ditch or a sewer".[50]

As the Tokyo Police Headquarters coped with this situation by the exercise of its power and coercive intervention into the very depth of people's everyday lives even in disregard of the human rights of the patients, requiring immediate reporting of infection, disinfecting the living environment, and isolating the patients,[51] the administrative authority of the Prefectural Government on public health in effect became subordinate to the police power. In Tokyo, moreover, the overlapping authorities of the Tokyo Prefectural Government and the Tokyo Police Headquarters over the direct application of anti-infection measures to the populace invited confusion in public health administration, and the Ministry of the Interior, instructing the two offices to clearly "divide duties" between them, set up a Tokyo Local Public Health Society under the Central Public Health Society provisionally established within the ministry in July 1879. After some trial and error, the Tokyo Local Public Health Society was formally institutionalized under the Regulations concerning Local Public Health Societies in April 1880. For the first time, a local public health system, covering Tokyo as well, was established along a line of administrative authority, descending from the Ministry of

the Interior to the Chief of the Public Health Section of each prefecture, members of the section, and further to public health commissioners in towns and villages (either paid or unpaid). Along with that, the responsibilities of the Prefectural Government and the Police Headquarters for quarantine were co-ordinated, and the Tokyo Quarantine Office was newly set up in July 1882, together with public health associations organized in the spirit of "neighborhood solidarity" at the town and village level. However, the Tokyo Quarantine Office was closed only three months later, and thereafter the quarantine office was transformed into a temporary body set up only during peak periods of cholera prevalence. The system of public health commissioners at the ku, town, and village level had its own contradictions, too.

The numbers of public health commissioners appointed in different parts of Tokyo in 1880 are listed in table 4. While it is unknown how the number of four to seven per ku was then considered adequate, the commissioners selected were either shizoku (former samurai) or heimin (commoners), i.e., men of repute belonging to the upper stratum of urban inhabitants, typically owners of housing lots, house owners, and well-off merchants.[52] These commissioners, however, failed to understand "the true meaning of public health," were unwilling to commit themselves to the "prevention of infectious diseases" and would "resign in the evening from the office of public health commissioner to which they were appointed in the morning," and the system of public health commissioners itself was accordingly unstable and was eventually abolished in August 1885.

It was already revealed in table 1 and elsewhere that the nation-wide epidemic of cholera was repeated after 1882, especially in 1886, 1890, and 1895.

During those periods of cholera prevalence, anti-infection activities at the local level remained disparate, differing from one area to another, and left to spontaneous organization of volunteers. Next, with the presence of slums in various ku of Tokyo kept in mind,[53] some specific instances will be summarized below:[54]

TABLE 4. Numbers of public health commissioners in different ku, towns, and villages of Tokyo (in 1880)

	Population per area (ku, town, or village)	Name of ku	No. of commissioners per area	Total no. of commissioners
15 ku	80,000 and above	Kanda, Nihonbashi, Kyōbashi, Shiba, and Asakusa	7	35
	60,000 - 79,999	Honjo	6	6
	40,000 - 59,999	Kōjimachi, Hongō, Shitaya, and Fukagawa	5	20
	20,000 - 39,999	Azabu, Akasaka, Yotsuya, Ushigome, and Koishikawa	4	20
6 gun (counties)	4,000 and above		6	-
	3,000 - 3,999		5	-
	2,000 - 2,999		4	-
	1,000 - 1,999		3	-
	Less than 1,000		2	-

Sources: Tokyo fu shiryō (Historical documents on Tokyo Prefecture), Tokyo fu tōkeisho (Statistical documents on Tokyo Prefecture), 1882, and others.

Nihonbashi ku: Dozens of "landlords' agents or prominent citizens in the ku" were mobilized, out of whom "patrolmen" were selected to patrol the areas assigned to them with a view to preventing infectious diseases and maintaining sanitary conditions. They were held responsible for inspecting the conditions of sewers and lavatories, surveying the circumstances of the issuance of free medical care tickets to the needy[55] and reporting on suspected cholera patients to the nearby police box.

Asakusa ku: "Lecture meetings" were held to let the citizens know how to prevent infection with cholera, and thousands of printed copies of "manuals" were distributed to all the households. Medical care was provided free of charge to "poor people," and the treatment of "garbage pits" and the improvement of lavatories were undertaken.

> Fukagawa ku: With the already established "public health society" as their core, "branches of the public health society" were set up in different parts of the ku to sponsor lectures on the prevention of infectious diseases, and "patrolmen" were appointed to supervise work on sewerage. On the other hand, "part-time staff physicians" were appointed to provide medical treatment to "needy patients," to whom "temporary free medical care tickets" were issued. At the same time, guidance was given to the management of restaurants, vaudeville houses and theaters in the ku, and well water was tested.[56]

As these instances suggest, anti-infection measures then applied to slums in Tokyo placed emphasis on the improvement of environmental sanitation in back-street nagaya, implemented through the upper stratum of local inhabitants (land owners, tenement owners, or their agents known as ōya).

However, affected by the armament expansion program of the central Government backed by Finance Minister Matsukata Masayoshi's fiscal policy, public health administration under Yamagata Aritomo, who took office as the Minister of the Interior in 1883, was obliged to make a retreat. Yamagata's militaristic policy, giving top priority to kyōhei (strengthen the arms), was generous about military, police, civil engineering and other related expenditures, but cut back spending in education, public health, and hospitals.[57] As a matter of fact, the system of local public health commissioners and the local public health societies were abolished in 1885.

Furthermore, with the new Cabinet system in the same year, the public health administration of the central Government was reduced in scale, and similar functions at the prefectural level were also either scaled down or totally abolished. Anti-infection duties were transferred to the mechanisms of administrative police established at the prefectural, county, and ku levels, and thus local public health administration was deprived of its implements at the very local level.[58]

Nagayo Sensai, then holding a leading position in public health administration, pointed out that infectious deseases could be coped with in the

following three ways:[59]

1. Remove the causes for the prevalence of infectious diseases by thorough improvement of waterworks, sewerage, and other urban sanitation facilities and of public health;
2. Strictly enforce quarantine at seaports, and
3. When an infectious disease is prevailing, sterilize, intercept, and isolate its patients.

Whereas the anti-infection measures traditionally taken by the central Government or the Tokyo Prefectural Government had placed their greatest emphasis on the third method, the setback public health administration suffered in or around 1886 was further intensified in spite of the subsequent improvement of laws and regulations concerning infectious diseases. The centralization of public health administration by the state power was perfected by the incorporation of this aspect of administration into the functions of the police as a result of the amendment of the local civil service system in 1893, and the skeleton of the Japanese sanitary police system was thereby established. In other words, it has to be pointed out that the keynote of public health administration in Japan, under the fukoku kyōhei (Enrich the nation and strengthen its arms) policy of the central Government, failed to be oriented toward the first and most important among the three ways proposed by Nagayo, i.e., the unrooting of infectious diseases by the improvement of urban facilities and living environment, or overall urban restructuring, though waterworks at least were improved.

Slums and the Improvement of Waterworks and Sewerage

It is pointed out that "the availability of water supply and sewerage outlets has been one of the most vital factors determining the location and conditioning the development of cities," and therefore "the water supply and sewerage systems, which ... constitute a cyclic process of their own in the city, can be regarded as the most fundamental urban facility."[60] The fact that one of the most basic elements determining what a given city is like consists in the availability of clean water

(drinking water) supply and the disposal of sewage (water discharges resulting from everyday human life) is an unchanging truth, common to the ancient and modern times, the East and the West, every state and every nation.

During the period of some three centuries from the founding of the city of Edo early in the seventeenth century until the extensive establishment of modern waterworks in the Western style, which was not achieved until long after the Meiji Restoration and the renaming of Edo to Tokyo, the demand of the citizens of Edo or Tokyo for clean water was basically met by the supply and distribution techniques of Edo Suidō (waterworks) including Tamagawa Jōsui, together with wells bored everywhere outside the reaches of the suidō. As discussed above[61] the dwelling style of back-street nagaya, in each of which a few or more families (sometimes together with lodgers) of lower-class people clustered, shared a set of water supply and drainage facilities which respectively consisted of a well and a common lavatory located close to the well (though one of the jōsui was accessible in some areas). These were nothing but a form of common use of facilities, restricted by the factor of water.

It was already pointed out,[62] however, that in Japan, despite the presence of rich and good "water resources,"[63] the water supplied from waterworks was contaminated and unclean as the basic water conveyance and distribution facilities were open conduits in many parts, and, moreover, pipes or aqueducts, diversion boxes, and supply gutters, all built of wood, were partly worn out and decayed.

The situation is described in a report by a competent official in charge of the third major ku (the later Yotsuya-Shinjuku area), when urban Tokyo was divided into major and minor ku (1872-1878), on the findings of his survey, a part of which is quoted below.[64]

Tamagawa Jōsui:
- "Over a distance of about one cho (about 109 meters) outward from Ōkido in Yotsuya, when it rains, filthy water flooding roads, rotten matter, and even the excretions of oxen, horses, dogs, and cats all flow into the jōsui.

- "From Ōkido to Daita Village, waste matter flowing (with water) include old straw mats, straw sandals, tree twigs, wild grasses, tree roots, often decayed dead bodies of dogs and cats, and sometimes even rotten human corpses."

Kanda Jōsui:
- "From the water source to the dam at Sekiguchi cho, filth and waste water from every lot of farmland all flow in.
- "Downstream from around Yodobashi, houses adjoin (the jōsui), and their joist supports sometimes stand in the jōsui."

Instructions on the management of the waterworks should have been made well known since the Edo period, but the extreme state of contamination reported here seems partly attributable to the accelerated expansion of urban Tokyo into its outskirts.

In 1905, when the municipal project of waterworks improvement (or construction) had already been complete and every ku was beginning to be supplied with water from the new system,[65] a public health scientist (Tōyama Chinkichi) revealed the results of his examination of drinking water (see table 5). The table shows that the quality of water supplied from old waterworks was close to that from wells in terms of the number of bacteria contained. These findings, together with the above-quoted report on Tamagawa and Kanda Jōsui, indicate that the water then available, typically from the traditional Edo waterworks, was too unsanitary to be left as it was if citizens' wholesome life was to be ensured, and the improvement of waterworks was inevitably considered the most urgent aspect of environmental hygiene by the central Government, local administrations, and the general public.

However, if on the other hand, the virtual reduction of Tamagawa and Kanda Jōsui to sewerages by the disposal of filthy matters into them was largely attributable to drainage from newly settled households resulting from the accelerated "urbanization," the improvement of waterworks should not be considered separately from the treatment of sewage.

Since "settlements" established in cities and ports opened to foreign trade (including Tokyo, Yokohama, Ōsaka, Kōbe, and Nagasaki) constituted the centers of commercial and cultural activities by aliens when Japan

TABLE 5. Results of drinking water examination in Tokyo City (in 1905)

	Total quantity of solid matter	Number of bacteria		
		Maximum	Minimum	Average
Water from old waterworks	71,950	61,600	1,600	6,591
Well water	385,754	83,200	60	6,392
Water from new waterworks	55,918	1,254	0	34

Notes: (1) Source: Chinkichi Tōyama, Tokyo shi kairyō suidō no eiseigaku-teki kōsatsu (A hygienic study on the improved waterworks of Tokyo City), 1905.
(2) The "number of bacteria" refers to the number of colonies of bacteria per cubic centimeter.

was exposed to the danger of semi-colonization by Western powers from late Tokugawa years through the Restoration phase,[66] it is no wonder that demands for the construction of waterworks and sewerages first arose from those settlements where they wanted to maintain their Western way of life. Japan's first modern waterworks built in response to those requirements was the Yokohama waterworks completed in 1887. In the foreign settlements at Tsukiji, Tokyo, and Kōbe as well, waterworks and sewerage had presented major problems since the earliest days of their opening to foreign trade, and in Kōbe, with a dam newly built for waterworks, the supply of water was started in 1900.[67]

Because the lives of common people were menaced and often destroyed by the prevalences of infectious diseases and foreign residents, especially those living in the settlements, demanded the construction of waterworks and sewerage facilities, the central Government, then intending to amend unequal treaties, also considered it an urgent task to improve urban facilities in Tokyo, the capital city of Meiji Japan.

In this context, the improvement of waterworks was a rather exceptional event when, as stated above, the government's fukoku kyōhei policy gave little regard to the amelioration of urban facilities needed by the

populace or of their living environment. Even Yamagata Aritomo, who advocated cutbacks on expenditure for education, public health, and hospitals, was so much alarmed by the extensive spread of cholera in 1886 that he was obliged to recognize the importance of waterworks improvement, "because the frequent prevalences of cholera have taught us the bitter lesson that there is nothing else than this project (waterworks improvement) to rely on for the prevention of the diseases."[68]

During the early Meiji era, the control over waterworks in Tokyo was transferred from the Ministry of Civil Affairs to the Ministry of Industry, the Ministry of Finance, and finally to the Prefectural Government of Tokyo, and these offices gave serious concern to the maintenance of the waterworks from the beginning, as suggested, for instance, by the instruction issued in 1872 forbidding their contamination.[69] Under those circumstances, in January 1874, the newly organized Ministry of the Interior intended to improve water supply facilities by replacing their traditional wooden pipes with steel pipes, and had C. J. Van Doorn, a Dutch civil engineer in its employment, draft a systematic proposal entitled Tokyo suidō kairyō ikensho (A proposal on the improvement of waterworks in Tokyo).[70] This document, based on the principle of public operation of water service, explained the need for modern, pressurized water supply facilities in which steam-driven pumps, hydrants, filters, and steel piping for water conveyance would be arranged, with reference to examples in Western Europe, and described in detail the technology of those facilities. This proposal could be regarded as the starting point of waterworks improvement projects promoted by the central Government.

Two years later, the Prefectural Government of Tokyo too appointed waterworks improvement commissioners to study problems involved in the planned improvement and put together Tokyo suidō kaisetsu no gairyaku (An outline of the proposed improvement of waterworks in Tokyo) by September 1877. The purport of this document is based on Van Doorn's proposal with only minor modifications, but is unchanged in keynote.

After these developments, there was organized the Tokyo City Replanning Committee, responsible for the improvement of waterworks among other

things, under the Ordinance on the City Replanning of Tokyo in October 1888,[71] marking the formal institutional inauguration of the project which would be continued for 30 years.

Incidentally, in those days a group of bourgeois led by Shibusawa Eiichi, a member of the Tokyo City Replanning Committee, submitted to the Ministry of the Interior a proposal to set up a private Tokyo Waterworks Company, but the Government confirmed its policy of public operation of water service by promulgating the Water Service Ordinance by Imperial Order No. 9 in February 1890. Five months later, the design of improved waterworks by the Tokyo City Replanning Committee was approved by the central Government. The committee's plan envisaged the supply of water, tapped from the Tama River, to a population of 1.5 million (the actual population of the city in 1888 was a little over 1,298,600) at a daily rate of 2.6 cubic shaku (1 shaku = about 30.3 centimeters) per head. The planned facilities included a main purification plant (at Sendagaya Village) and branch plants to be newly established, equipped with a sedimentation basin, pumping machines, and some 4,400 hydrants, and connected by steel-built main and branch pipes. The whole system was supposed to be built in five years at a total cost of ¥6.9 million (to be financed by the flotation of public bonds).

The replanning of Tokyo City was the first urban renewal project in Japan, specifically modelled after the redevelopment of Paris by the Second French Empire, and intended to adapt the capital of the nation to the needs of the fukoku kyōhei policy of the central Government.[72] Centering around the rebuilding of roads, the project would mainly involve the improvement of existing or the construction of new gutters, bridges, parks, railways, markets, crematories, cemeteries, and other urban facilities (see table 6). As such, it would not be inconsistent with the construction of the Ginza Brick Street, urban remodelling of Hashimoto chō in Kanda ku and westernization of Misaki chō in the same ku,[73] all undertaken since early in the Meiji era to clear the city of slums, but was an urban development project "from above" rather authorizing those attempts.

TABLE 6. Total expenditure of the Tokyo City replanning project, with an itemized breakdown.

	Sum (¥)	Proportion of total (%)
Urban replanning	37,299,611	-
Breakdown: Roads	25,959,115	51.3
Gutters	1,915,934	3.8
Bridges	248,062	0.5
Rivers and moats	1,508,315	3.0
Parks	62,661	0.1
Provision for refund of municipal bonds	5,850,000	11.6
Miscellaneous	1,755,524	3.5
Improvement of waterworks	9,188,672	18.2
Expansion of waterworks	1,239,744	2.5
Improvement of sewers	2,855,505	5.5
Total	50,583,532	100.0

The improvement of waterworks, as a "temporary project," not only constituted a part of the overall urban replanning project, but also was an object of concentrated expenditure especially immediately after the Sino-Japanese War of 1894-1895. Although the improvement of roads accounted for a major part of the total expenditure of the urban replanning project, the amount spent in the amelioration of waterworks was nearly nine times the investment for roads during the four-year period from 1896 through 1899.[74]

However, the standards of steel-making technology and metallurgy of the Japanese industry in those days were still inadequate for ready mass production of steel pipes and their accessories for use in waterworks. After a controversy over whether to locally produce or import these items, Japan Cast Iron Company, which contracted to manufacture and supply them, failed to fulfill its obligations under the contract on account of its inadequate production capacity and, besides that, the adverse effects of the imminent Sino-Japanese War, including a sharp rise in prices of raw materials, such as coke, and in wages, and the drafting

of many skilled workers by the military. This trouble later developed into what is known as the "waterworks scandal," in which municipal councilmen were bribed by the steel pipe supplier wishing to have the delivery terms eased.[75]

TABLE 7. Use of tap water in slums (in 1911).

Ku	Chō	No. of households					A/B x 100 (%)
		Tap water (A)	Well water	Both	Unknown	Total (B)	
Shitaya	Kanasugi Shita	251	487	21	1	760	33
	Ryūsenji	195	503	1	2	701	29
	Iriya	157	176	0	1	334	47
	Mannen	401	204	17	14	636	63
	Yamabushi	354	141	2	3	500	71
Asakusa	Kamiyoshi	8	36	2	0	46	17
	Shintani	11	41	2	0	54	20
Total		977	1,588	45	21	2,031	32

Notes: Source: Ministry of the Interior, Saimin chōsa tōkei-hyō, 1911. Only nagaya are counted, but not single-family one-storied houses.

At any rate, after not a few turns and twists, the waterworks improvement project was completed in December 1898, about four years behind schedule, at a cost ¥2 million greater than the initially budgeted sum. The improved system began to serve such areas as Nihonbashi, Kanda, and Shitaya, and its coverage was gradually expanded afterwards. Although such typical slum areas as Mannen chō and Yamabushi chō, both in Shitaya ku, seem to have been given priority in the distribution of water, as the percentages in Table 7 suggest, the average rate of access to tap water in slums in Tokyo City was little more than 30 per cent even in the late Meiji era. Moreover, even though the improvement of waterworks did make progress, that of sewers remained virtually unlaunched. The concern of the Prefectural Government of Tokyo about the improvement of sewers was aroused by a record prevalence of cholera in 1882 and reflected in an instruction issued by Interior Minister Yamada Akiyoshi in April the

following year regarding the improvement of the water supply and sewer systems in Tokyo. Yamagata Aritomo, who succeeded Yamada as Interior Minister, also requested a subsidy to finance those projects, which was eventually granted.

Thus in 1884, provided with technical advice by Dutch engineer De Rijke in the employment of the Ministry of the Interior, the Prefectural Government of Tokyo launched a project to improve sewage gutters in then particularly densely populated, and heavily infected, areas such as Nabe chō, west of Kaji chō and north of Ryūkan chō and Shin machi, all in Kanda ku (the area surrounding the present-day Akihabara Station of the Japanese National Railways and that today known as Soto Kanda, both slums in those days, densely populated by poor craftsmen). The project was to lay brick-built trunk main and ceramic branch main pipes, connected to each other, so that sewage and rain-water could be drained through them, but it had to be suspended in its third year as subsidization by the central Government was discontinued. This is how what was known as the "Kanda sewerage" project started and failed.[76]

Some time later, in the process of the urban replanning of Tokyo, sewer design commissioners were appointed, and they submitted a survey report. The proposed sewer system would only cover rain-water and filthy water, not human waste which was then valued as fertilizer, and again its implementation was put off in favour of the improvement of waterworks, which was considered a more urgent necessity. Still later, for instance in 1904, a design was contemplated for the sewer system of Tokyo City, but this and other similar plans made little progress.

The improvement of water supply facilities, which we have seen, coupled with the development and extensive use of vaccines, the institution of the Sea Port Quarantine Law (in 1899) and seaport quarantine stations made possible by the revisions of unequal treaties,[77] and the amelioration of other underlying conditions contributed to curbing the outbreaks of water-borne infectious diseases, as figure 1 suggests.

The contributions of improved waterworks, nevertheless, should not be so emphatically appreciated. Among the legally specified infectious diseases, cholera was certainly contained by the late Meiji period as figures in table 8 indicate, but it has to be noted that many users of municipal waterworks were still attacked by other water-borne diseases, typhoid fever and dysentery (also see figure 1).

TABLE 8. Cases of infectious diseases, classified by sources of drinking water (1910).

	Municipal waterworks	Wells	Unknown	Total
Cholera	1	-	-	1
Dysentery	747	168	24	939
Typhoid fever	3,882	977	193	5,052
Smallpox	5	-	-	5
Scarlet fever	462	121	42	625
Diphtheria	721	179	59	959
Total	5,818	1,445	318	7,581

Notes: Source: Tokyo-shi tōkei nenpyō.
"Dysentery" patients include suspected cases.

In particular typhoid fever, which, like cholera, is an infectious disease orally communicated by way of bacterium-contaminated food or drinking water, manifests no acute symptoms unlike cholera, and its germs multiply, and sometimes almost permanently stay, in the bodies of patients. For this reason it was difficult to isolate the bearers of typhoid fever for a sufficiently long period and therefore to completely eliminate this disease by medical techniques then available.

Moreover, not only had the improvement of sewer systems come to a deadlock, but even the Waste Disposed Act and the Sewerage Act, both taking effect in 1900, did not apply to human waste. The urban remodelling of Tokyo without solving the problem of human waste disposal seriously handicapped the subsequent anti-infection system. Underlying this problem was the fact that the excretions of urban dwellers constituted

night soil indispensable for farming, which was an object of the negotiable right to collect. In particular the right to dispose of the waste of backstreet nagaya tenants was monopolized by urban landlords, who could earn substantial profits by selling the excretions of their tenants at auction.[79] It was no wonder that the improvement of lavatories (and sewers) made little progress as long as there was a class (landlords) who would benefit by its stagnation.

At any rate, since preventive measures taken in Japan against the outbreaks of infectious diseases did not presuppose the overall remodelling of cities, centering around the improvement of water supply and sewer systems, but tried to avert immediate crises on a stopgap basis, they left many difficulties to be tackled by the later generations as far as the solution of urban problems was concerned.

NOTES

1. G. Rosen, A History of Public Health, 1958, p. 275. See Ishizuka Hiromichi, "Meiji shoki no Tokyo ni okeru korerabyō taisaku to minshū - toshi seisaku-shi kenkyū oboegaki (1)", (Anti-cholera policy and the townspeople of Tokyo in the early Meiji period: Notes on the historical studies of urban policies [1]) in Jinbun gakuhō, no. 114 (Tokyo Metropolitan University), 1976, p. 87.

2. Among the soldiers and war-service labourers who participated in the civil war of 1877 and returned from the cholera-swept island of Kyūshū where the war was fought, there were 2,062 patients of the disease (of whom 1,046 died) in the Army and 74 (of whom 22 died) in the Navy. In addition, 59 of the crew members of Mitsubishi Company's fleet which took charge of the transport of war supplies also contracted the disease (of whom 25 died). They spread the germs in the Kansai district via Kōbe, the port of call for both the Navy's and Mitsubishi's fleets. This was how the nation-wide spread of cholera in 1879 (involving some 162,600 patients - the greatest number throughout the Meiji and Taishō periods) started. Again during the Sino-Japanese War of 1894-1895, the Japanese troops sent to Korea and Taiwan suffered some 11,900 deaths from diseases contracted at the front, and moreover repatriates from the war included the first patient who triggered the extensive prevalence of cholera in Tokyo and elsewhere (Tokyo-shi shikō (Historical materials on the City of Tokyo), 3rd volume on Hensai (Disasters), p. 1068 ff., and the Ministry of Public Health and Welfare, Isei hyakunen-shi (A 100-year history of the medical system), volume on Shiryō (Reference materials), p. 545. Reference is also made to Ishizuka, "Tokyo shiku kaisei jigyō-shi kenkyū josetsu - jōsuidō kairyō jigyō to shikai, bourgeoisie no ugoki o megutte" (An introduction to the historical study of Tokyo city replanning projects: Waterworks improvement and moves by the city council and bourgeoisie) in Toshi kenkyū hōkoku, no. 55 (Tokyo Metropolitan University Urban Study Committee), 1975, p. 27.

3. Tokyo-shi korera ryūkō hyakunen-shi (A 100-year history of the prevalence of cholera in the City of Tokyo) in the Public Health Section, Municipal Office of Tokyo, Taisho jūichi-nen Tokyo-shi korera ryūkō-shi (An account of the prevalence of cholera in the City of Tokyo in 1922), p. 181.

4. See Tachikawa Shōji, Nihon-jin no byōreki (Chūō Koron-sha, Tokyo), part 2.

5. For immediate reference, see "Tokutei densen-byō kanja-sū, shisha-sū no nenji suii" (Annual numbers of patients of, and mortalities from, specified infectious diseases) for the years 1876-1973 based on the yearly editions of the Ministry of the Interior, Eisei-kyoku ninpō (The annual report of the Public Health Bureau) and the Ministry of Public Health and Welfare, Eisei nenpō (The annual report on public health), Fig. 4-4 on p. 26 of Eisei tōkei kara mita isei hyakunen no ayumi (A 100-year chronology of the medical system from the viewpoint of hygienic statistics), an appendix to Isei hyakunen-shi cited above. After the later Meiji years, the total number of patients of the aforementioned six infectious diseases, especially of typhus, abnormally increased in 1945, but that will not be discussed here.

6. For instance, the annual total of cholera patients in the whole country surpassed 10,000 ten times between 1877 and 1916. The years in which the diseases prevailed mainly in Tokyo were 1882, 1886, 1890, and 1895 (see table 3-4 on page 136 of Ishizuka, Tokyo no shakai keizai-shi (A socio-economic history of Tokyo; Kinokuniya Shoten). This means that, not unexpectedly, the prevalence of cholera concentrated in Tokyo in some years but not in others, although the capital city generally reflected the national trend.

7. Comprehensive historical records of the situation include the Ministry of the Interior, Saimin chōsa tōkei-hyō (Statistical tables on paupers), 1912, and the Social Affairs Bureau of the Municipality of Tokyo, Tokyo shinai no saimin ni kansuru chōsa, 1921, and data they contain are partially used in Tsuda Masumi, Nihon no toshi kasō shakai (The society of the urban lower strata in Japan; Mineruba Shobō), Ishizuka, Tokyo no shakai keizai-shi, and Nakagawa Kiyoshi, "Senzen ni okeru toshi kasō no tenkai — Tokyo shi no baai" (The development of the urban lower class in the prewar period — the example of Tokyo) in two parts, Mita gakkai zasshi, June and August 1978. Reference is also made to Ishizuka, "Methodological introduction to the history of the city of Tokyo," cited above.

8. How directly the sanitary conditions of a community can be affected by the location of waterworks and sewerage close to each other is well illustrated by the following: When cholera broke out in Kobe in 1896 and in a certain part of the city the sewerage was cleaned, with bricks laid on the bottom to prevent the leakage of filthy water, nearby inhabitants immediately complained that their wells dried up. In other words, the drainage from their kitchens and even lavatories was recirculated into their drinking water (Eisei Tokei kara mita isei hyakunen no ayumi, cited above, p. 72). The presence of similar circumstances in Tokyo in those days is suggested by, for instance, the following statement in a historical document: "Yanagi chō (in Koishikawa ku) is an area where there were irrigated rice fields previously. The land is very low and wet. Wells to draw drinking water from are like stagnant pools, into which so much filthy water infiltrates that five inhabitants of the same block have been successively attacked (by cholera)" (the Ministry of the Interior, Korera-byō ryūkō kiji [Accounts of the prevalence of cholera], 1895).

9. Though some doubt the significance of ward-by-ward statistics, consideration of the urban structures and features of different ku (Ishizuka, Nihon shihonshugi seiritsu-shi kenkyū - Meiji kokka to shokusan kōgyō seisaku [A historical study of the development of Japanese capitalism: The Meiji State and the policy of increase of production and promotion of industry], Yoshikawa Kōbunkan p. 338 ff.) and concurrent reference to table 2 would help clarify the implications of those data.

10. Chūō ku-shi (A history of Chūō ward), Vol. 1 (1958), p. 489 ff.

11. Chiyoda ku-shi (A history of Chiyoda ward), Vol. 2 (1960), p. 165 ff.

12. Ishida Yorifusa, "1881-nen no Kanda Hashimoto chō kairyō jigyō ni kansuru kenkyū" (A study on the improvement project of Kanda Hashimoto chō in 1881), Parts 1-3, in Nihon Kenchiku Gakkai ronbun hōkokushū, Nos. 288, 290 and 291, February, April, and May 1980, in which the "improvement project" of Hashimoto chō is analysed, touches on its situation.

13. For immediate reference, see Ishizuka, Tokyo no shakai keizai-shi cited above, p. 51 ff.

14. Kaizuka Sōhei, Tokyo no shizen-shi (A natural history of Tokyo; kinokuniya Shoten), p. 119 ff.

15. As one of the latest studies on waterworks in Edo, Itō Kō'ichi, "Edo no suidō seido" (The waterworks system of Edo), in Nishiyama Matsunosuke, ed., Edo chōnin no kenkyū (Yoshikawa Kōbunkan), Vol. 5, is recommended for ready reference. Basic historical documents are contained in Tokyo-shi shikō, 1st volume on Jōsui (Waterworks), and elsewhere.

16. Fukagawa ku-shi (A history of Fukagawa ward), Vol. 1 (1926), p. 310, and Kōtō ku-shi (A history of Kōtō ward) (1957), pp. 901-902. It has to be pointed out that, as some of the dwellers of back-street nagaya were too poor even to buy clean water and used to drink water from contaminated wells, they successively caught cholera and the general affairs section of the Prefecture of Tokyo, on October 17, 1877, instructed the ward office to supply water free of charge (Tokyo-shi shikō, 3rd volume on Hensai, pp. 1091-1092).

17. For ready reference on isei, which will be taken up in greater detail later on, see Kawakami Takeshi, Gendai Nihon iryō-shi (A history of medical care in present-day Japan; Keisō Shobō), p. 109.

18. Hosoya Shinji, Meiji zenki Nihon keizai tōkei kaidai shoshi (A bibliographical introduction to Japanese economic statistics in the first half of the Meiji period), volume on Fukoku kyōhei (Enrich the nation and strengthen its arms), vol. 1, no. 2, p. 281.

19. In his "Tensai bunka to kokushi-byo bunka" (Natural disaster culture and black death culture) in Rekishi Kōron, vol. 3, no. 1, featuring the Meiji Restoration and the modernization of Japan, Sabata Toyoyuki

pointed out that West European nations compiled elaborate statistics on mortalities and causes of death to forecast any repetition of the extensive prevalence of the black death (pest) in the fourteenth century, and that man's helplessness against sudden and unpredictable natural disasters invited the inadequacy of statistics in Japan.

20. Because of the need to press ahead its fukoku kyōhei policy, the Meiji Government gave priority to the compilation of statistics on population, land, and industry, which would directly contribute to solidifying its financial basis, and belittled those on public health, including data on diseases (especially infectious ones) and mortalities. For further reference on statistics in Japan, see the Japan Statistical Research Institute, Nihon tōkei hattatsu-shi (A history of the development of statistics in Japan; Tokyo Daigaku Shuppankai).

21. The highest rate of mortality from pulmonary tuberculosis in Tokyo, which was 42 per 10,000, was registered in 1916. This suggests how abnormal the situation in Tanaka chō was (see also Table 4-4 in Ishizuka, Tokyo no shakai keizai-shi, cited above).

22. According to Ishihara Osamu, Jokō to kekkaku (Workwomen and tuberculosis), 1913, the number of tuberculosis patients is 4.6 times the mortality from the same disease.

23. In his "Hingai jūgo-nenkan no idō" (Shifts in a 15-year period in slums) in Taiyō, Feb. 1912, Yokoyama Gennosuke referred to notable phenomena in the outskirts of Tokyo in those days, including an increase in people engaged in odd jobs. Presumably there was an inflow of population into Tanaka chō mentioned above and elsewhere to make up for the large mortalities.

24. Ishizuka, "The slum dwellings and the urban renewal scheme in Tokyo," cited above, pp. 174-175.

25. The Poor Relief System Study Group of the Japan College of Social Work, ed., Nihon no kyūhin seido (Poor relief systems in Japan; Keisō Shobō), pp. 98-100; Sumiya Mikio, Nihon chinrōdo-shiron (An historical treatise on wage labor in Japan; Tokyo Daigaku Shuppankai), pp. 103-105.

26. An occupational breakdown of patients segregated in quarantine hospitals will be referred to later on.

27. Tokyo-shi korera ryūkō hyakunen-shi cited above, pp. 182-183.

28. In the first volume of his autobiography entitled Shōkō shishi, in the Japan Society of Medical History, ed., Igaku koten-shū (An anthology of medical classics), vol. 2, Nagayo recalls that eisei (pronounced weisheng in Chinese) derived from weisheng chih ching (the fundamental way to defend life) referred to in Chuang-tzu, a Chinese classic (pp. 25 and 30 in Nagayo's book).

29. Tachikawa Shōji, Byōki no shakai-shi (A social history of diseases; Nihon Hōsō Shuppan Kyōkai), pp. 212-214, based on Goto's

lecture on "Sanitation and capital" in February 1896.

30. The circumstances are described in detail in Miyamoto Shinobu, Mori Ōgai no igaku shisō (Mori Ōgai's ideas on medicine; Keisō Shobō). Mori's writings on medicine and public health problems are put together in Ōgai Zenshū (A complete collection of Ogai's works; Iwanami Shoten), vols. 28-34.

31. G. Rosen, op. cit., p. 110. It has been pointed out that in Western Europe from the sixteenth century on, on the one hand there were absolutist states (including Prussia and Austria) where public health administration was developed in a centralized way and, in other countries, public health policy was implemented in a way conflicting with the system of powerful local autonomy, as in the U.K. (the people took it as "interference" by the central government, and therefore objected to and tried to obstruct it; H.E. Sigerist, Civilization and Disease 1943). As will be stated in detail later on, the public health administration of Meiji Japan belonged to the first category both in character and in lineage of public health science it inherited. For immediate reference on the British situation, see Takei Yoshiaki, "Igirisu sangyō kakumei-ki ni okeru kōshū eisei mondai" (Public health problems in the period of the Industrial Revolution in the U.K.) in Shakai keizai shigaku, No. 40-44, December 1974.

32. The original text is incorporated into Isei hyakunen-shi cited above, the volume on Shiryō, p. 36 ff.

33 Ōkubo Toshiaki, ed., Iwakura shisetsu no kenkyū (A sudy on the Iwakura mission; Munetaka Shobō), Tanaka Akira, Iwakura shisetsudan (The Iwakura mission; Kōdansha), etc.

34. See Ishizuka, Nihon shihonshugi seiritsu-shi kenkyū, cited above, p. 29 ff.

35. For immediate reference on Isei, see Kawakami, Gendai Nihon iryō-shi, cited above.

36. Kan'i (practitioners of Chinese medicine) accounted for 81.4 per cent of the medical profession totalling 28,262 persons in all Japan in 1874. Even in 1900, out of the total of 40,924 medical practitioners in this country, 53.6 per cent consisted of those who had "long been practicing" medicine (most of whom presumably were kan'i). These percentages have an important bearing on the standards of medical service in Meiji Japan (Table 12 in Isei hyakunen-shi, the volume on Shiryō, cited above).

37. An inquiry by the Ministry of the Interior dated February 4, 1876 (incorporated into Hōki bunrui taizen; A classified collection of laws and regulations), part 1, division on public health, general section, pp. 7-8.

38. The coverage of the "poor relief" measures taken by the Government in those days was confined to "single, old or infant, disabled or

invalid" persons not supportable by any blood relative or community (the poor relief system study group of the Japan College of Social Work, ed., Nihon no kyūhin seido, Keisō Shobō, pp. 61-63).

39. Kawakita Yoshio, Kindai igaku no shiteki kiban (The historical basis of modern medicine; Iwanami Shoten), p. 1010 ff.

40. For instance, "cholera dance" and "dancing prayers" became popular, and many rumors circulated. According to typical rumors, foreigners spread cholera by having foxes possess their human victims, or policemen went around throwing "poison" into wells (Chōya Shinbun, a daily newspaper, September 21, 1879). Against this general background, there were also published many "trifling books" on folk remedies or preventive methods with little, if any, scientific grounds. To cite a few examples, they included Kawashima Yoshi, Korerabyō: Ishi no kuru made (Cholera: Before the doctor comes), 1877; Nikaidō Yasunori, Koei manroku (Random notes on cholera), 1879; Hosokawa Junjirō, Korerabyō nintai ryōhō (Curing cholera by patience), 1882; Nakata Sōkichi, Korera yobō hitokuchi banashi (Anecdotes on the prevention of cholera), 1882, and Katsuzawa Giichi, Korerabyō no utsuran yobōgusa (Cholera-preventive herbs), 1887. For further reference, also see Ogi Shinzō, Tōkei jidai, The age of Tokyo; Nihon Hōsō Shuppan Kyōkai) pp. 109-111.

41. Hōki bunrui taizen, part 1, division on public health, section on diseases and prevention, p. 8 ff.

42. G. Rosen, op. cit., p. 14.

43. Tokyo-shi shikō, 3rd volume on Hensai, p. 1067, and Tokyo-fu shi (A history of Tokyo Prefecture), part on administration, vol. 6, pp. 662-663.

44. See the chronological table in Tokyo Metropolitan Komagome Hospital, Komagome Byōin hyakunen no ayumi (a pamphlet).

45. See "Tokyo chihō eisei kaigi hikki" (A transcript of the Tokyo district conference on public health) in the Public Health Section, of Tokyo Prefecture, Kaigiroku (Minutes of meetings), 1882.

46. Though the classification of patients referred to in table 3 by the social class they belong to is not too clear, occupational breakdown becomes clearer by around 1916. For example at Honjo Hospital (in August-October 1916), of its total of 180 isolated patients, 53 sailors and craftsmen constituted the biggest occupational group, followed by 35 having no fixed occupations, 20 day laborers and coolies, 11 factory workers, and 10 fishmongers. The rest included confectioners, wooden sandal makers, porters, store clerks, printer-stamp makers, boat keepers, peddlers, hoopers, carpenters, brass-smiths, weavers, gardeners, hosiers, tailors, water sprinklers, noodle vendors, rickshawmen and midwives, all seemingly belonging to the lower class of the urban population (Taishō jūichi-nen Tokyo-shi korera ryūkō-shi cited above, pp. 288-289).

47. Public Health Section, Tokyo Prefecture, Eiseikai shorui (Documents of the Public Health Society), 1887. In his article entitled "Korera no yobō ni tsuite" (On the prevention of cholera; in Dai-nihon shiritsu eiseikai zasshi, No. 146, 1895), pp. 651-652, Nagayo Sensai described the situation in those days: "From the structures of hospitals to physicians, nurses, medicines and instruments, everything was so extremely inadequate, and moreover... (patients were) received, or rather dumped, into small and filthy wards... not a few of them passed over to the majority without having been even touched by a physician or given a drop of medicine."

48. In 1877 (Okayama and Chiba Prefectures), 1879 (10 in Niigata, 6 in Aichi, 2 in Gunma, and 1 each in Saitama, Kyōto, Kanagawa and Fukui Prefectures), 1880 (Gunma Prefecture), 1882 (2 in Kanagawa Prefecture), 1886 (in Kanagawa Prefecture), and 1890 (in Okayama and Nagasaki Prefectures), according to Aoki Kōji, Meiji nōmin sōjo no nenjiteki kenkyū (A chronological study on peasants' riots in the Meiji period; Shinseisha).

49. See the paper by Ishida Yorifusa referred to in note 12.

50. Ministry of the Interior, Korera-byō ryūkō kiji, 1880 (incorporated into Tokyo-shi shikō cited above, third volume on Hensai, pp. 1100-1103).

51. People severely resented the government's anti-cholera measures in those days, as reported, for instance, in a representation (in December 1879) from the Central Public Health Society to the Ministry of the Interior, saying: "The implementation of preventive measures, where especially strict, is quite annoying, disturbs people's life, damages their assets, and eventually invites extreme resentment" (Hōki bunrui taizen, part 1, division on public health, general section, p. 65). During the prevalence of cholera in 1882, there came into vogue a popular song whose verse goes: "I don't like them/Damned policemen/After them comes cholera" (Soeda Azenbō, Ryūkōka Meiji-Taishō-shi [A history of popular songs in the Meiji-Taishō periods, Shunjūsha]). This reflects the complaints of common people in those days.

52. Kaigiroku, 1881.

53. On the positions of slums in Tokyo in earlier Meiji years, see Ishizuka, "The slum dwellings and the urban renewal scheme in Tokyo, 1868-1923," cited above.

54. "Tokyo-fuka kaku gunku akueki yobō keikaku no gaikyō" (An outline of infectious disease preventing programs in the counties of Tokyo Prefecture), in Dai-nihon shiritsu eiseikai zasshi, appendix to No.38, July 31, 1886, pp. 3-13.

55. See Kitahara Itoko, "Seryō no ronri - toshi ni okeru hinkon to byōki eno shisaku" (The logic of free medical care: Governmental actions taken against poverty and diseases in cities) in Nihon shakai-shi kenkyū published in commemoration of the 70th birthday of Professor

Haga Kōshirō (Kasama Shoin).

56. The same literature contains accounts on Kōjimachi ku, Kyōbashi ku, Shiba ku, Azabu and Akasaka ku, Honjo ku, Higashi Tama and Minami Toshima gun, Minami Adachi gun and Minami Katsushika gun.

57. Yamagata Aritomo, "Chihō keizai kairyō no gi" (A proposal on the improvement of local economies) in Oyama Azusa, ed., Yamagata Aritomo ikensho (Hara Syobō), p. 155.

58. Hosoya, op. cit., p. 281.

59. Nagayo Sensai, "Korera-byō no yobō wa ikanaru hōshin o toru bekika" (What policy should be taken in preventing cholera?) in Dai-nihon shiritsu eiseikai zasshi, No. 46, 1887, pp. 15-18, and Kawakami, op. cit., p. 132.

60. Kosuge, op. cit., p. 2.

61. Ishizuka, "The slum dwellings and the urban renewal scheme in Tokyo," pp. 18-20.

62. Japan Waterworks Association, Nihon suidō-shi (A history of waterworks in Japan), volume 1 on particulars; Waterworks Bureau of the Tokyo Metropolitan Government, Tokyo-to suidō-shi (A history of waterworks in the Metropolis of Tokyo), and so on.

63. To take an example from Western Europe, in particular the UK, though the stink and contamination of the Thames flowing through London had reached their extreme by the mid-nineteenth century, 82 million gallons of water was daily tapped from the river to meet the drinking and other livelihood needs of the citizens, only limited classes of whom could afford to buy clean water from water companies (R.J. Mitchell and M.D.R. Leys, A History of London Life, 1958). The water supply situation in the approximately contemporary Edo or Tokyo was by no means inferior to that in London.

64. A report by Okumura Noboru incorporated into Tokyo-to suidō-shi cited above, pp. 115-116. Though not dated, this report presumably was prepared in 1873 or 1874.

65. As the waterworks improvement project in Tokyo was completed, water supply was started in December 1898 to a number of ku. By August 1899, the whole areas of three ku, Nihonbashi, Kanda, and Shitaya, and parts of five others, Kōjimachi, Hongō, Asakusa, Honjo, and Kyōbashi, were reportedly covered by the municipal water service (Asahi Shinbun, a daily newspaper, August 22, 1899).

66. Ishizuka, "Methodological introduction to the history of the city of Tokyo" cited above.

67. Nihon suidō-shi, volume 1 on particulars, cited above, p. 800; Tsukiji kyoryūchi (The Tsukiji settlement), Tokyo toshi kiyō, No. 4, p. 261, and The Japan Chronicle, Jubilee Number 1868-1918.

68. Yamagata Aritomo, "Tokyo shiku kaisei suidō-sai rishi hojo no ken" (Regarding the interest-subsidization of the water service system in the urban replanning of the City of Tokyo), November 5, 1888 (in Kōbun ruizyū, A collection of official documents, volume 14).

69. For further details of the history of waterworks improvement in Tokyo, see Tokyo-to suidō-shi, cited above, Satō Shirō (former director of the Waterworks Bureau of the Metropolitan Government of Tokyo), Tokyo no suidō (Waterworks in Tokyo; Tosei Tsūshinsha), and Ishizuka, "Tokyo shiku kaisei jigyō-shi kenkyū josetsu - jōsuidō kairyō jigyō to shikai, bourgeoisie no ugoki o megutte," cited above.

70. Besides Van Doorn, British, German, and Belgian engineers participated in the designing at the request of the Municipal Government of Tokyo. The findings of the comparative assessment of their designs are contained in Tokyo-shi shikō, third volume on Jōsui, pp. 381 ff.

71. Tokyo City Replanning Committee, ed., Tokyo shiku kaisei jigyō-shi (A record of Tokyo city replanning), chapter 1, section 2.

72. Ishizuka's paper referred to in note 39, pp. 23-24.

73. See Ishizuka, "The slum dwellings and the urban renewal scheme in Tokyo," Ishida's paper referred to in note 12, and Suzuki Masao, Meiji umare no machi, Kanda Misaki chō (A town of the Meiji-born: Kanda Misaki cho; Seiabō).

74 See table 2 in Ishizuka's paper referred to in note 2.

75. Ishizuka's paper referred to in note 44, pp. 30-32. How the man in the street then took the "waterworks scandal" is suggested by the following popular song entitled "Tekkan jiken" (The steel pipe incident), recorded in Soeda Azenbō, Ryūkōka Meiji-Taishō-shi cited above: "The plan to kill the subjects/Of Edo Castle by poisoning/ The waterworks on which a million human lives depend/has come to naught like bubbles in water/With the arrest of another Marubashi Chūya(a wellknown rebel in the mid-seventeenth century who conspired against the Tokugawa Shogunate)..... The charlatan of the company/ Contracting to supply steel pipes for the waterworks/long awaited by Tokyo citizens..... And those members of the honorable city council/Who were tempted by bribes into the scandal..... They will soon be punished with hard labor."

76. Satō, op. cit., p. 524 ff.

77. Isei hyakunen-shi, cited above, pp. 137-140.

78. It was pointed out that landlords had earned undue profits totalling ¥1.8 million by selling Tokyo citizens' waste amounting to some 4,370,000 koku (1 koku = about 180 liters) in 1902 (Rōdō sekai, The world of labor, a periodical, December 13, 1902).