

**ENGINEERING SHANGHAI: WATER, SEWAGE, AND THE
MAKING OF HYDRAULIC MODERNITY**

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ENGINEERING SHANGHAI: WATER, SEWAGE, AND THE MAKING OF HYDRAULIC MODERNITY

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In Memory of My Grandparents

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The origin of this research is a myth. As far as I recall, I came up with this idea of studying city water infrastructures as a midway to combine my archaeology background and the new pursuit of STS and urban history. But my father insists that he is the one who crafted the theme in one of our many conversations. Either way, I owe a great deal to my parents, whose integrity, compassion, patriotism, and thirst for knowledge never cease to amaze me. Living up to their expectation is not easy. With this dissertation completed I hope I am half way there.

Six years ago, I decided to come to Georgia Tech for my PhD study. It turned out to be one of the best decisions I have ever made. I am most fortunate to study under Hanchao Lu, whose speak-only-when-you-have-the-material philosophy put this research on a solid ground. Dr. Lu never said no to my wildest ideas, yet he somehow effortlessly imparted his down-to-earth view of scholarship. Looking back, it almost seems magical. I enjoy great mentorship from John Krige, Laura Bier, Joe Brown, John Tone and many others inside and outside HSOC who took interest in my research and sit through hours when I rambled on about my disorganized thoughts. To this I am most appreciative. I am equally grateful for the friendship I had with my fellow graduate students, whose wisdom and companionship made long hour enjoyable and turned hardship into delight.

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LIST OF SYMBOLS AND ABBREVIATIONS

- Tls. Tael, weight unit for silver ingot currency used in imperial China, 1
Tael = 1.3 ounce of silver
- £ Pound Sterling, in the late nineteenth century $\text{£}1 \approx \text{Tls. } 4$
- \$ The British dollar, issued from a mint in Hong Kong from 1866 to 1868.
The value of dollar was not fixed (\$1 varied from more than Tls. 4 in 1877
to Tls. 1 in 1902).
- Cash Bronze coin of China, 1 cash = 1/1000 Tael of silver

SUMMARY

This dissertation explores the water technologies in Shanghai from the mid-nineteenth century to the mid-twentieth century and in what ways the infrastructures – the drainage system, the water supply, culverted rivers, the water closet, and the water-carriage sewer system – played a role in the shaping of the cityscape, economics, and politics of Shanghai. While previous scholarship has engaged the social aspect of city water engineering, especially with respect to hygiene and its relation to growing state intervention, this dissertation focuses on the engineering work itself, indicating that the concept of being modern might be an aspiration, but it was the material and practical aspects of water engineering that laid the ground and set the rules for government intervention. Only within the spatial and economic limits allowed by the engineering feasibility could the authorities materialize political influence.

Following the Introduction, Chapters 2-5 discuss components of the engineering system in Shanghai – drainage, waterworks, culvert, and sewage treatment. An exhaustive look at the technical details provides us with better explanations as to why foreign technologies were accepted and in what context decisions were made by authorities. Despite these works being the embodiment of state-of-the-art Western knowledge, what facilitated their local adoption were practical and mundane concerns. Chapters 6-8 discuss how economics competition and political struggle prior to WWII played out in the context of growing engineering sophistication between actors such as corporations, consumers, political authorities from the city to the state, and from Chinese to foreigners. Chapter 9 offers a criticism about the ill-fitting, conventional concept of modernity for China studies

and calls for a new theoretical framework within which the question of development could be answered in light of the incremental improvements in engineering practices.

The thesis of this research is to propose the concept of hydraulic modernity. The contention here is that practical aspects of the technocratic-engineering system of city water dictated the pattern of engineering works and consequently influenced how political and economic capital were organized for the system to achieve greater capacity and homogeneity, the two criteria used to measure the development of a system in this dissertation. The former indicates the maximum output of an engineering system and the latter points to the reduction of the number of heterogeneous interest groups inside a technocratic-engineering system in order to lower the risk of malfunction. Modernization of Shanghai was not driven by top-down infusion of knowledge, etiquette, and ideology, but a process of meticulous interconnection of layers of technocratic-engineering systems, upon which further institutionalization of social actors was able to come into being.

CHAPTER 1. INTRODUCTION

This dissertation tells a story. It starts in the 1840s and ends at the 1950s lasting a little more than a century. The story takes place in Shanghai, the commercial hub of China under the influence of colonial powers, but the protagonists are not politicians or military men who are often the ones most decorated in history. The narrative of this dissertation is technology-based. It is about water and associated technologies – drainage, water supply, waste disposal, the sewer system, and treatment plants, etc. It is about the initiators of these novelties – engineers, businessmen, sanitarians, etc., and about the role these technologies played in shaping Shanghai's cityscape and in making modernity the enduring ideology that dominated the embattled Middle Kingdom for the rest of the century.

Technologies for managing water in urban settings are not traditional subjects for historians, especially for those who study modern China. The reasons are twofold. On the one hand, China does not enjoy the same abundance of historical records on this matter as do Western countries. Frequent regime change throughout the twentieth century surely did not help. On top of this, the business data of early Chinese water companies is both incoherent and spotty. Today another challenge is that access to these materials in China's national and municipal archives is shrinking. The nature of the gaps in the Chinese historical data leaves historians with only one choice: to examine Western enterprises in China – especially in treaty ports such as Shanghai where the foreign presence clearly influenced the cityscape.

To focus exclusively on Western enterprises, however, means relying on an outdated methodology, one which had been shaken and criticized extensively by the work

of Paul A. Cohen. In his book *Discovering History in China*, Cohen criticizes the interpretation that once dominated the American intellectual world of China studies. That interpretation is that it was the West that played the active role in this period, and China took a much more passive or reactive part.¹ To focus on water-related technologies is significant and challenging because this is a field where several elements were required to initiate changes – engineering expertise, accounting skills, effective municipal authorities, and surplus capital for investment. While China of the nineteenth century had few, if not none, of them, the West had them all. To tell a story about technology is thus to tell a story of how the West impacted the Chinese unilaterally. In that sense, a technology-based narrative seems like the resurrection of what was deemed as a “biased” style of research that has long fallen out of popularity.

1.1 Literature Review

Practical difficulties regarding access to materials, compounded by a methodology issue that could be intellectually risky, create constraints for historians who dare to explore water-related technologies in China. So far there have been only two major works that address this subject matter. Kerrie L. Macpherson offers one of the finest elaboration on the development of public health in Shanghai between 1843 and 1893. Macpherson tracks down the birth of the first waterworks and first hospital in Shanghai, and attributes their success to Shanghai’s unique human resources. Missionaries, sanitarians, physicians, science translators, educators, foreign and local merchants, traditional Chinese medical practitioners, and administrators of the Municipal Council – Shanghai gave them the

¹ Cohen, *Discovering History in China*, 9.

platform that sped up technology spillover. Together these elites, both foreign and Chinese, formed a pragmatic governing body that brought about rapid change in cityscape and in administrative skills. One of the great features of Macpherson's work is that the effectiveness of technology and knowledge were not predetermined by their nationality, but was assessed based on how well it could be situated at local sites and in what ways it could advance the shared goals of governing.²

Ruth Rogaski examines public health issues from a rather different angle, which is by and large based on an etymology of hygiene in China and the way elites used this imported idea to assert control. Rogaski picks Tianjin as the site of interest because Tianjin was not only subject to the influence of western powers, but also was in close contact with the Japanese. A Japanese military presence had been in the city since the end of the Boxer Riots. Japanese technological prowess made a convincing case for the Chinese elites that modernity had little to do with race but more to do with organization of the government. Rogaski coins the concept "hygienic modernity" to interpret the marriage between intellectuals and government, between an ideology favoring science and the expansion of administrative power, and between a vision of the state and individuals. These conjunctions of discourse and politics manifested themselves in various measures taken in China's management of public health throughout the twentieth century.³

Recently, Chinese historians have also showed some ambition in attempting to explain rather than to describe technological development. But the results of these attempts are still limited. For example, Cunchao Jiao and Yexin Chen explain the slow adoption of

² Macpherson, *A Wilderness of Marshes*.

³ Rogaski, *Hygienic Modernity*.

plumbing fixtures and cesspools in Shanghai. Why were the British who had already witnessed the benefit of the technology at home reluctant to install more flush toilets in Shanghai? Jiao and Chen conclude that the stagnation in deploying these technologies was due to a profitable contract with nightsoil workers; the foreigners in Shanghai found merit and practicality in the old Chinese way of removing refuse, in contrast to the general Western conception of governance and hygiene.⁴

Social historians also frequently touch upon this matter of nightsoil as a way of discussing the interaction, or co-construction, between transplanted technologies and local conditions. Hanchao Lu depicts an early morning scene in Shanghai, in which residential alleys were awoken by the cries of nightsoil workers, and human-generated wastes were orderly removed from the residences to the nightsoil dock by hundreds of these coolies. Zhiliang Su and Shanmin Peng provide a summary of the development of public restrooms in Shanghai, suggesting their indispensability to urban modernization. Yinbo Gu describes the founding of the Beijing Waterworks Company and the contributive efforts of the Qing administration and nationalist merchants, making the Beijing waterworks an unusual success without immediate assistance from foreigners. In the case of the Hangzhou waterworks Wei Zhao and Hong He demonstrate that the founding of the waterworks did not lead to wide consumption of running water when the cost of piping and the high water rate were prohibitive for many. Lihong Du examines the backlash from nightsoil workers that the Beijing government faced when it decided to take over the nightsoil business in the 1930s. Kyu-hwan Sohn also explores the turbulent reform of human waste management

⁴ Jiao and Chen, “Reasons for Rejecting the New System of Nightsoil Disposal by Shanghai Municipal Council”.

in Beijing during the 1930s. Sihh analyzes the attitude of the police force, the struggle between urban and rural concerns, and government power at stake in the battle over nightsoil. Feng Xu's case study is based on a series of events in 1943 in rural Shanghai, in which the government-backed nightsoil workforce faced tremendous challenges when peasants reacted with physical and legal obstructions as they assumed that their agricultural interests were being undermined. Poon Shuk-wah looks at an unsuccessful reformation of waste management in Guangzhou and argues that despite the lack of actual improvement for undesirable public latrines, and despite the failure of substantial change in the organization of the labor force, the Chinese government managed to change citizens' conceptions of an urban culture that moved towards a focus on hygiene and proper manners.⁵

The historians above can be categorized into two groups: one that focuses on the evolving universe of thought and believes that the change of cityscape resulted from a change of ideas among intellectual and political leaders, while the other emphasizes the social reality which was unfavorable to change and is keen to explain why certain water-related technologies stuttered or did not make as much of a difference as previously thought. Rogaski and MacPherson represented the former. They both place the discussion of water-related technologies in the framework of medicine. Both rely upon records of physicians, translators, and later sanitarians and characterize these figures as the initiators of large engineering undertakings. Lu and Jiao and Chen represent the latter. They would

⁵ Hanchao Lu, *Beyond the Neon Lights*, 189-198; Su and Peng, "Gongce Bianqian yu Dushi Wenming"; Gu, "Beijing Waterworks Company"; Zhao and He, "A Research into Drinking Water in Hangzhou"; Du, "The Reform of Waste Disposal Management in Beijing City in the 1930s"; Sihh, "Official Management of the Nightsoil"; Xu, "Research on the Dispute over Cleanliness in Pudong District"; Poon, "Minguo Shiqi Guangzhou de Fenhui Chuli yu Chengshi Shenghuo".

argue that despite the presence of new technologies, life of ordinary people remained largely untouched. Lu's and Jiao and Chen's work deal with the traditional, labor-intensive nightsoil management in Shanghai and offer their own explanations for why it remained undisturbed. Lu hints at a chain of social interactions that was hard to displace, and Jiao and Chen look at economic incentives for maintaining the status quo.

The shortfall of previous research in this area is clear. Social historians are good at explaining the lack of changes but are not as good at explaining why and how the technologies eventually took over. Those who prioritize intellectual progress might be doing justice to the medical men and women regarding their role in a still-evolving scientific climate, but to see large engineering undertakings as a natural result of a change of mindset is simply ignoring the complexity and difficulties in manifesting ideas into reality. In other words, what we need is a technology-based narrative that can overcome the shortcomings of the two existing approaches. It should be able to not only track and explain how imported novelties became culturally acceptable to the Chinese and were mechanically integrated into the cityscape, but it should also be able to straighten out, to the fullest extent possible, the causal relationship between scientific ideas and engineering undertakings, with due attention given to engineers residing in Shanghai and their irreversible transformation of the city.

1.2 Pitfalls in Defining Modernity

In this dissertation, I put forth the idea “hydraulic modernity” as the central thesis based on the empirical data presented. But before elaborating on that argument, it is essential to first define the meaning of “modernity”. Modernity, the word, has origins in

the fields of art and religion where it is rhetorically used to signify the rupture of styles and ideas during the Renaissance and the Reformation eras. In the fields of history and sociology, particularly in the subdiscipline of the history of technology, modernity is associated with a host of phenomena that took hold in Western societies beginning in the early nineteenth century – industrialization, urbanization, wage labor, the division of labor, consumerism, secularism, etc.⁶ Due to its loose definition, modernity was commonly applied to a political concept of a society's level of development; meaning a historical sequence of improvements where the rest of the world follows the same steps of the West. This temporalized framework suggested that non-Western societies were at the beginning of a universal process rather than at the bottom of a global hierarchy that the West dominated through its absolute advantage in economic scale, finance, technology, and political influence. It indicated a natural progression of society where the same level of development could be reached all across the globe, sooner or later. Modernity, in such a progressive sense of the term, has been part of politicians' favorite repertoire whereas historians, sociologists, and anthropologists have spent years scrutinizing the relation of modernity, time, and space.

Zygmunt Baumann offers a philosophical explanation regarding this situated concept of modernity. He contends that the leading characteristic of modernity is the changing relationship between space and time. Modernity starts when space and time are separated from living practices and from each other. Human desire for velocity sparks ingenuity, imagination and resourcefulness. Time in its modern sense becomes the focus and the pursuit while space is subject to change, domination, and conquest. Baumann uses

⁶ Valade, "Modernity".

the metaphor of solids and liquids in his contention about the nature of modernity. The modernity of the nineteenth-century is physically akin to a solid – it is in rigid form, it has clear spatial dimensions, and the flow of time is irrelevant to it; the late twentieth-century modernity, however, is more sensitive to time like a liquid. Late twentieth-century modernity is characterized by mobility and inconstancy. It tends to break into smaller units, mirroring the social disintegration and plural interpretations of modernity by individuals. The “norm” of modernity, as was conceived a century ago, falls apart when technologies transformed activities such as war into processes full of ephemeral engagements, rather than committed efforts that demanded close administration and control. This transformation is best shown by the preference for missiles and air force over boots on the ground, representing the ability to penetrate space via time versus actually occupying the space.⁷ Anthony Giddens has a similar point of view in line with this concept of separating relationships between time and space. Giddens suggests that the separation of time and space is critical to the extreme dynamism of modernity. It detaches social activity from its embedding in the particularities of contexts of physical presence. It provides the gearing mechanisms for rationalized organization. Giddens points to the example of maps created by Western travelers and explorers and suggests that space can be established independently of any particular place or region through this cartographic technology. Locales are thoroughly penetrated by and shaped in terms of social influences quite distant from them while the relations that determine the nature of the locale are distanced and concealed.⁸

⁷ Bauman, 1-2, 8-14.

⁸ Giddens, 17-21.

Other scholars see modernity from a more practical perspective. James Ferguson argues that old-fashioned modernity goes wrong when thinking about time as a linear axis. For Ferguson, the non-linear disjuncture is particularly pronounced in the post-World War Two period. Ferguson contends that history is not a teleological unfolding or a gradual rise through a hierarchical progression. The variety of modes of development in Asia and Africa suggests that modernity is plural and fragmented and its history is marked by contingency. Ferguson deconstructs the concept of modernity by de-temporalizing the historical narrative, suggesting that the status and condition of different people and nations may change over time, but not always in a progressive way. This observation shifts the focus of modernity from serialized progression to the enduring hierarchy, exclusion, and abjection within the global community. “As understandings of the modern have shifted in this way,” Ferguson writes, “the vast majority of Africans today who are denied the status of modernity increasingly come to be seen, and may even come to see themselves, not as ‘less developed’, but simply as less.”⁹

Couze Venn and Mike Featherstone also take notice of the slow and uneven pace of change of social institutions in non-Western cultures. They suggest that cultures work in pragmatic ways rather than according to the rationalist re-descriptions generated by the discourse of modern governance. There exists a world of subjectivities made up of values, beliefs, and sensibilities that operate alongside and outside regulatory institutions. The assemblages of these mechanisms, with their multiplicity, specificity, and mobility, provides spaces and resources for resistance to hegemonic forces. Yet, these mechanisms are constantly under the threat of neo-liberal interventions which seek to homogenize them

⁹ Ferguson.

to make them amenable to economic calculations and governance. Time is therefore not essential. Locality is, and so is social structure.¹⁰

Although both explanatory approaches seek to reach a fuller understanding of the developmental process in the West and around the world, the convergence of the two could be problematic to investigating the history of modern China, the colonization of which never reached the level of that of British India. The resulting epistemology might force that investigation to conclude with a preconceived institutionalization of knowledge and society that perhaps only fits the reality of nineteenth-century Europe, its colonies to a lesser extent, and later, the United States.

The first approach prioritizes time over space. It creates a historical narrative that favors the progression of knowledge over time and plays down the potential mutation of knowledge during its diffusion from one place to another. The second approach rejects the model of ever progressing time and brings attention back to the non-Western places where the promised development is yet to be delivered. Since it focuses on how the global hierarchy is maintained through perpetual Western influence long after colonialism, this perspective attributes development or underdevelopment to local social structures.

Here is why using the term “modernity” without certain qualifications could be problematic when these two priorities are joined together. Taking note of social structures tends to be followed by an analysis of social actors in the process of development that seeks to find out which of them facilitate changes and which of them impede it. The task of identifying structures and actors is easier in the context of the Cold War as nation-states

¹⁰ Venn and Featherstone.

have become the norm of the international community. But problems arise when this method is applied to late imperial and early Republican China because it is difficult not to attribute the initiation of change to Chinese elites and dominant foreigners, and setbacks and obstructions to the masses, while the reality is that foreign and Chinese institutions blended. As historical investigations of the nineteenth and twentieth century cannot evade the unit of the nation-state, the story of development is given an undertone of a political battle where a clear-cut line existed between nationals of the East and West. Not only is this belief historically inaccurate, but the misconception is further compounded by the overruling power of the idea of modernity, which negates the role of geography. Many see the transfer of knowledge from the West to the rest of the world as a process little bounded by geographic specificity. Knowledge is seen as being produced as a whole by individuals under certain institutional conditions, and it can be exported as a whole. When it reaches the destination, it can be unpacked in its entirety, absorbed by similar local institutions, and utilized by those institutions and people as designed.

But “local” in the case of late imperial and early Republican China has more than one meaning. In this research, I do not mean the native population, as in “the Chinese” in the context of the “West vs. China.” The local here refers to European and American expatriates who had spent decades in Chinese treaty ports such as Shanghai and Tianjin and had grown used to those environments and conditions. It might be true that Europeans living in Europe saw Shanghai as nothing more than a dot on the map connected to global trade by increasingly fast shipping, a foreign port to be increasingly penetrated and dominated by Western influence. But those who actually lived in Shanghai might not agree with such a radically reductionist view. They too were the beings of locality. Their

understanding of the natural world was shaped by the conditions of the soil and the river, the location, climate, altitude, and other geographical specificities. Their take on scientific knowledge could deviate from the institutionalized orthodoxy and be subject to local and regional variation. In such cases, their knowledge would be pre-modern, not in the sense of pre-modern vs. modern or the non-West vs. the West, but rather as the kind of knowledge that existed in Europe before the scientific revolution spread a different version, such as germ theory and chemistry during aeration.

This character of pre-modernity in the diffusion of knowledge is not of a philosophical nature, but is rather a result of logistic difficulties. Anthony Giddens mentions *symbolic tokens* as the creation of disembedding mechanisms – the “lifting out” of social relations from local contexts of interaction forces their restructuring across indefinite spans of time-space.¹¹ Although money today might be a good example for Giddens, because it is largely independent of the means whereby it is represented, knowledge cannot be seen in the same way. Knowledge is neither symbolic nor a token. Paper currency itself is worthless, but knowledge is of concrete content. Issuance of money and its value are arbitrated by forces and institutions beyond the scope of individuals. Comprehension, interpretation, internalization, and application of knowledge, however, are activities carried out on the individual level, especially in places such as urban China at the turn of the twentieth century where public education was not widely available and the majority of Western expats did not undergo formal education in their youth. Shanghai and China sat at the periphery of knowledge production and Europe was the center. When new discoveries were made in Europe or when new scientific and medical theories came

¹¹ Giddens, 21-27

into being, it took time for the impact to be felt on the other end of the continent. Scientific journals needed to be read and shipped. New thinking needed to be discussed. Local conferences needed to be held. Funding for such organizations was intermittent.

Without schools, universities, guilds, societies, publications, and other elements of the European-style institutionalization of knowledge production, scholarly debate in Shanghai, as will be shown in the following chapters, often unfolded in a much less rigid manner. Older generations of Shanghailanders found it easier than in Europe to hold on to their outdated scientific beliefs. A handful of individuals were able to stall any paradigmatic shifts. Their seniority added to their advantage in guarding the incumbent understanding of the natural world, which came from their firsthand experience of living in Shanghai for years, even decades. This is especially obvious in the case of cleansing the Yangkingpang Creek that is discussed in Chapter 4. The older foreign residents insisted that sewer gas could give rise to a cholera outbreak, some thirty years after the discovery of *Vibrio cholerae* as the pathogen. What can we make of the stubborn believers of miasma theory? How do we categorize them in history if the labels we are familiar with were so often used with unintended connotations and the tendency of overgeneralization? Were they modern because they were British, or were they pre-modern because their “science” was outdated?

Knowledge is not something that always descends to specific localities without any adaptation. Knowledge is a part of the production of space before the locality is irreversibly changed by institutional infrastructures that induces flows of information that can be defined and regulated from afar, like the system of primary, secondary, and post-secondary education today. Therefore, during the late nineteenth and early twentieth centuries,

Western knowledge in the East tended to be less centralized, less consistent, and less authoritative than in the West. It tended more often to meet immediate practical needs than to follow disciplinary doctrines. This observation on how knowledge was put to use applies to both Westerners and Chinese in Shanghai. The unstable regime of knowledge at the time was not always a result of the resistance of indigenous wisdom to Western medicine and philosophy. The instability was also caused by a lagging diffusion and slow awareness of new discoveries, faulty scientific inference by local scientists, and contingent influencers residing inside the local political and scientific institutions – all of which pertained more to Westerners overseas than to the Chinese. Therefore, it is problematic when knowledge is treated by historians as intrinsically Western or modern, and thus unvarying, as if Westerners across the world subscribed to the same prescription of knowledge, or that the only circumstances when changes and adaptations occur is when the non-Western culture or actors are involved. Being a Westerner in the East did not qualify one as transcendently modern. The separation according to the nation-state is artificial. The opposition of the East and the West is political. The framework of modernity in historical research is intrinsically flawed because it tends to be too value-laden to be objective and too rhetorically powerful to be useful.

1.3 Problems with Hygienic Modernity

The reason why this research does not move beyond the term modernity is that despite all its indefiniteness, it is still encompassing, transformative, and conveys an imagined cityscape that most readers are instantly familiar with. That transformation of Shanghai from a muddy hub to an economic engine is indeed a large part of what this dissertation intends to break down, understand, and represent. For these tasks, modernity

is the most convenient and necessary term. This, however, does not mean that the term could be used without us reflecting upon its content and scope. In this section, I will outline the content of *hydraulic* modernity and explain why this new term is complementary to the already popular idea *hygienic* modernity, which was first coined in 1999.

“Hygienic Modernity” is a concept presented in Ruth Rogaski’s award-winning book, and it has a major influence in the field of modern Chinese history. Rogaski uses modernity to refer to two aspects during the transformative century China experienced – from the late imperial era to the heydays of communism. The first is the evolvement of conceptualization of health and hygiene – how it changed from self-cultivation to science and disease control – with a critical turning point introducing the Japanese neologism *eisei* through the Japanese occupation in Tianjin after the Boxer Rebellion. The literal meaning of *eisei*, “defending the life,” bore a strong hint of militarism and the Foucauldian concept of “bio-power”, and the growing popularity of the *eisei* coincided with a period where factionalism, wars, and foreign occupation dominated China’s political stage.¹² Rogaski then moves from hygiene as idea to hygiene as public policy in the second half of her book and argues that hygienic campaigns were integral to the process of nation building, not only because mundane practices were tied to the rise and fall of the entire nation, raising the awareness of collectivism among an undereducated public, but also because the hygiene regime needed state intervention.¹³ The hygiene regime thus became a testing ground for the ambition and effectiveness of growing state power, from the Nationalist days to the Communist era.¹⁴ Rogaski seems to be purposeful trying to keep the concept of modernity

¹² Rogaski, 16.

¹³ Rogaski, 302, 163-4,

¹⁴ Rogaski, 234-236, 287-290.

as broad and flexible as possible. As a result, the contents and implications of the term change as the book proceeds. In the first half, modernity seems to be about medical theories and prescriptions from the West and that of scientific merit; in the second half, the synchronization of individual values and behavior and the will of the state is taken as a sign of modernity, hinting at the psychological aspect of nation-state building.

Overall, modernity in Rogaski's perception is an aspiration that the Chinese looked up to and the image of the West and Japan that Chinese elites tried to imitate. In the shadow was Chinese pre-modernity: the phenology-based medicine that could not stand the test of clinical trials and a society where people did not seem to be bothered by the absence of state power. The two themes are conflated under the banner of modernity, but they are considerably different from each other and should not be explained with the same social dynamics. The displacement or weakening of Traditional Chinese Medicine and the emergence of a centralized state hungry for power over individuals and influence among commoners were processes rooted in different contexts, practiced by different actors, unfolding in different realms, arising out of different concerns, and they set out to address different issues. It is questionable whether or not lumping them together with a fluid definition of modernity furthers our understanding in any meaningful way.

Medical practices could evolve without fierce promotion by state power. Small groups of multilingual elites, including missionaries such as John Fryer, were able to initiate changes. It is hard to determine whether the motivation of the promotional activities of foreigners in China was for spreading the gospel of modern science, for proving the merit in their religious beliefs, for market share and profit, or for all of the above. But in general, this transition of pharmaceutical business took place in the realm of the market. It

was, in the end, people's choice what type of medicine they trusted more. It was thus difficult to tell whether it was the intellectual progression of medicine and science, inspired by the vision of modernity, that led to acceptance and increasing consumption of Western medicines, or whether it was the observable effect, lowered cost, and growing availability of these novelties that created a generally friendly market. But one thing is for sure, without the growing market, the call for modernity in medicine was unsustainable. Elites' interpretation of the equalization of individual health and national power did not guarantee a smooth translation of meanings among commoners. When transactions happened, it was unlikely that this vision was what individual consumers were thinking, considering the level of education at the time and the limited capability of state propaganda. State intervention, on the other hand, operated in a completely different universe. The Republic of China was constantly on the verge of war due to foreign aggression and internal factionalism. This was what made a powerful central government imperative – it was of practical needs. Healthy bodies were needed for soldiers. Intense mass mobilizations were needed to keep the public mentally and socially prepared for conflict. Hygiene campaigns were merely a part of this trend. They were neither the cause, nor the result of it. It is difficult to measure the effectiveness of campaigns such as the New Life Movement during the Republican years and others during the communist years because none of them was set up for attainable goals. Politicians cared about the act of acting, yanking their chain of command, tightening the grip of administration, preparing the country for the worst. Unlike developments in medicine, this had little to do with market forces. The purposelessness of many of these campaigns proves that they had little to do with hygiene either.

In the story Rogaski tells, the pursuit of Chinese politicians and intellectuals was to make China Western/Japanese. The Chinese elites adjusted institution to mirror those of the West and of Japan, they translated Western scientific treatises, introducing Meiji thoughts on hygiene, hoping changes in society and in people's mindsets would follow as a result. These efforts brought far less than ideal outcomes because it was the wrong recipe to follow. These actors knew the goals, had the intention and ambition, but these alone were insufficient. Without the participation of market forces, without vibrant entrepreneurship and consumerism, without the presence of permanent hygienic infrastructures, the good will of social elites was meaningless. That is the reason the influence of Japan in Tianjin became the lynchpin to carry the narrative on. According to Rogaski's categorization of modernity, Japan was the only actor that possessed both up-to-date medicine and a high level of state power. Among all foreign powers, Japan's occupation in north China was most forceful and institutionally intrusive. Without a robust market economy that met people's need from bottom up, the transformation desired by the Chinese elites thus must go through the point of top-down power – Japanese occupation. No other authorities at the time provided executive power at a similar level and with a strong Japanese regime. Part of the public health agenda could be achieved through the mechanism of state power, such as vaccination. Vaccination was the practice that needed the least organic forces and social consensus. Vaccines were a purchased product from overseas. They could be distributed easily. The successful implementation of vaccination needed state power more than it needed market forces. Of all campaigns mentioned in Rogaski's book, vaccination seems to be the only story of success with measurable results.

In short, *Hygienic Modernity* is more about what the Chinese intended to do rather than what was done. It reveals the metamorphosis of elites' agenda over time, rather than showing how ordinary people came to accept the things and thoughts that were once so alien. Modernity according to Rogaski is so flexible that it can unite activities of a very different nature as one. As a result, "hygienic modernity" reconfigures economic and industrial development where intricate technological exchange happened between the Chinese and foreigners as a linear process of cultural adjustment largely on the Chinese side.

1.4 Hydraulic Modernity

Hydraulic modernity covers a different theoretical territory. To avoid the pitfalls of artificial construct of the nation-state as actors on the ground and of seeing knowledge as the invariant Western production, I would argue that modernity is not a conglomerate of abstract thinking, such as values, scientific beliefs, and nationalistic ideology that the state and individuals held in common. Rather, modernity is the tangible result of doing, without a set of pre-determined ideologies or political concepts. Modernity is the technocratic-engineering system itself, the operational logic of which is not imposed upon by external actors such as politicians or the state; rather, it is generated from within. It is defined by the material and practical aspects of the technocratic-engineering system – scale, physicality, effectiveness, interconnection, geographical context, engineering sophistication, financial sustainability, and the model of subscription. These aspects alone are forceful enough in shaping the ways in which governments assert, create, expand, and visualize their power as long as they need these infrastructures. They also set the spatial

and economic limits for any authorities and have the political influence confined within the range of engineering feasibility.

Hydraulic modernity is a form of modernity that is rooted in and is expressed through urban water engineering projects. The technocratic-engineering system first appeared in industrial cities, making hydraulic works one of the most critical components of modernity. The systems were also the most multi-functional in their employment, and they were the most critical to the survival and well-being of the populace. Therefore, hydraulic modernity was among the most definitive factors in the making of cityscapes, government, and economic patterns. In the case of Shanghai, all authorities that ruled or partly ruled the city – the British, the French, the Nationalists, the Japanese, and the Communists – shared the ambition of holding onto the entire technocratic-engineering system. The two Chinese governments even made attempts at social engineering that aimed at revolutionizing hygienic conducts and economic activities. The structure they intended to achieve mirrored the pattern of mechanical engineering of city water. This political scheme was not the outcome of a trendy ideology driven just by the development in science, medicine, and philosophy. Instead, it was the material and practical nature of engineering a system that provided the frame of reference, stimulus, and momentum for such political movements. The steel tower at the center that dispersed water to the immediate neighborhood, the rate meter that quantified each drop of consumption, the sewer system that simplified the manual management of nightsoil... the existence of engineering works convinced authorities that their administrative goals were within reach. In colonial Shanghai, hydraulic modernity was the blueprint intellectuals and politicians borrowed for

their vision of the city and the country. Engineering laid the groundwork for society, literally, not the other way around.

In this dissertation, the development of hydraulic modernity is measured by two criteria: capacity and homogeneity. First, capacity was an indicator of the maximum output that engineering projects could produce in their respective missions. An example of capacity was the largest amount of water a waterworks could fashion in a day, or the most waste the centrifugal pump could remove before its first pause for maintenance. Notice that capacity could also be applied to non-mechanical arrangements, such as measuring how much water could be delivered or how much nightsoil could be shipped away manually by coolies every day.

The increase in capacity associated with hydraulic modernity does not mean that old practices disappeared when the new technologies became available. The increase was materialized through addition rather than by elimination. To help a city sustain a population as large as possible without exhausting its environmental endowment, various methods could be employed. While water was pressurized for delivery to the hydrants for residents to collect, others were still pleased with buying water brought to their doors by the coolies. During the first half of the twentieth century, it could be inferred that cesspool, septic tanks, and water-carriage sewers coexisted next to each other. In places where vacuum wagons were too expensive to contract, nightsoil coolies laboriously carried out their mission of emptying pits and tanks. Therefore, this research does not see every advent of a new technology as a departure from the pre-modern past. Instead, it seeks to recover the technologic and economic context in which decisions were made. It seeks to understand

why the technocrats at the time believed that these solutions, which were often a combination of something old and new, were to maximize the capacity of the system.

The second criterion for the development of hydraulic modernity is homogeneity. Within a technocratic-engineering system of water, there were often multiple actors involved in multiple procedures. For example, along the chain of traditional nightsoil business were residents, coolies, peasants, foremen, the contractor, and the municipal government, each performing a few tasks in facilitating the shipment of nightsoil. Residents were obligated to show up at dawn to give the commodes to coolies. Coolies moved the buckets of ordure to the ports and sold them to farmers. Foremen were responsible for keeping the nightsoil business in order within an assigned area. The contractor offered a handsome deposit to be granted to run the lucrative business. The government weighed bidders against each other to decide on the most qualified and capable person and spent the deposit on keeping the streets clean. Given the number of actors with heterogenous interest to pursue, the system faced the risk of breaking down when one or more actors failed to fulfill their duties. For example, a resident who failed to wake up early tended to dump the waste into drains or rivers. A coolie unhappy with his salary tended to engage blackmailing for tips. Peasants needed less fertilizer during winter, leading to a large amount of unwanted waste stranded near the city. Foremen fought with one another when frictions happened on the border of their areas. The contractor might be mired in trouble for running a too exploitative ring. The government, foreign or Chinese, tended to make decisions that favored business profit over quality of public health. In other words, even though it might provide an acceptable capacity of waste removal comparing to the

water-carriage system, especially when the population was small and the season was right, the manual system was considerably more susceptible to glitches and errors.

Homogeneity of hydraulic modernity refers to the reduction of number of actors or procedures to safeguard the operation of a technocratic-engineering system. It could be achieved through technological innovation or through political restructuring. In the case of the nightsoil business, a system that moved wastes from the water-closet, through sewers, to the treatment plants would effectively circumvent the interference of interest groups in the middle, i.e. coolies, foremen, and the contractor, and put the waste matter of an entire city under government control. Or, a state-owned company could step in and get rid of the old labor system by putting coolies on the government payroll. The more homogeneous the system was, the fewer steps where malfunction could arise. From the chaotic and inconsistent policies during the final years of the Qing dynasty to the central planning of the People's Republic of China, the perfection of hydraulic modernity was not achieved by indoctrinating and educating the individuals in the state's goals.¹⁵ It was achieved by eliminating heterogeneous actors in the chain of command. Under the Communists' rule, such measures even included banishing private ownership of companies altogether.

Therefore, the history this dissertation tells is not about a kind of creative destruction the British brought upon the Chinese. Quite to the contrary, it is about an endless search for the most practical, the most effective, and the most cost-efficient solution regardless of where the possible measures came from. The advent of water supply in Shanghai did not spell the death of the water coolies' business. Nightsoil remained to be

¹⁵ Rogaski, 283

collected and shipped away as fertilizers until the 1980s despite the creation of the water-carriage system in the 1920s. As David Edgerton points out, culture has not lagged behind technology, rather the reverse; the idea that culture has lagged behind technology is itself very old and needs to be revised.¹⁶ The narrative of hydraulic modernity deals not so much with technology as the material expression of social meanings. Rather, this research is about how the technocratic-engineering system of city water was built and used by a variety of regimes and actors in the pursuit of greater capacity and higher levels of homogeneity.

1.5 Source Materials

Various type of source materials are used for this research. The first type is the English-language newspapers published in Shanghai; chief among them is *The North-China Herald*. *The Herald* was launched by British dealer Henry Shearman in 1850 five years after the creation of the British Concession in Shanghai. Beginning on July 1, 1864, *The Herald* became a daily newspaper. *The Herald* posted a record of every meeting of the Municipal Council. Every round of back and forth between directors was carefully documented. It also reported on the Land Renter's Meetings and Ratepayers' Meetings. Even the annual meeting of the Shanghai Waterworks Company could be found in its pages. *The Herald* was also a major source for the foreigners at the time to learn about news happening around the world, especially at home in Britain and in America.¹⁷

The second type of material comes from the Shanghai Municipal Archive. Although access to certain material was subject to government censorship, the Archive still

¹⁶ Edgerton, 212.

¹⁷ Shanghai shi wenshiguan, Vol.5, 1.

serves as a critical source for administrative data. It was particularly useful in finding the record related to Chinese businesses such as the Inland Waterworks Company and the Chapei Company of Electricity and Waterworks, as well as their correspondence with numerous authorities. The Archive is also the home of municipal administrative data for the Republic era and the Communist era, thus covering a field that was not so closely attended to by *The North-China Herald*.

The third type of material comes from the National Press Index Editorial at the Shanghai Library. This database is where popular readings during the late Qing and Republic era are kept –gossipy magazines, pamphlets, handouts, illustrations, story books, etc. The collection at the Shanghai Library thus sheds light on aspects of society that traditional press and municipal records do not pertain to and provides historians with an unfiltered reflection of public opinions at the time.

The fourth kind of source is local gazetteers. In the 1980s, Shanghai saw a growing volumes of such work produced by the Shanghai Academy of Social Science. China has a long tradition of compiling local gazetteers, but the ones written in the 1980s are specialized work on civil engineering, public works, utilities, disease control, and environmental protection. These gazetteers preserve firsthand knowledge of those who had worked in the field and tap inside information of the related municipal departments. Local gazetteers could be politically charged in some sections, but they are generally considered quality sources for empirical data, census, and business records.

Finally, this research uses archival primary and more recent secondary scholarly sources on city water. Scientific treatises published in the nineteenth and early twentieth

century on issues such as water supply and sewage treatment are among those sources. Many of them can no longer be seen as scientifically sound, but showing the flawed arguments is part of the efforts to recover the intellectual context in which major decisions were made in the past. The research of current scholars on the history of water technologies in other British-ruled regions will also be of interest to this dissertation.

1.6 Chapters

This dissertation is organized roughly in chronological order. Chapters 2-5 deal with the emergence of the various system of water-related technologies in colonial Shanghai, which began from the building of drains in the 1850s, to the expansion of water supplies in the 1880s, to culverting Yangkingpang Creek in the 1910s and to the 1920s when the water-carriage system of waste disposal was fully established in the International Settlement. Chapters 6-8 examines the actors and their actions in the context of city water engineering, such as how the British authorities used water infrastructures to expand territory and administration, how the Chinese merchants capitalized on their knowledge of water technologies in the struggle for sovereignty, and how water infrastructures provided the Nationalist government with a vision for, and the instrument of, effective governance. Chapter 9 is devoted to theoretical discussion regarding the shortcomings of the conventional concept of “modernity” and the advantages offered by the framework of hydraulic modernity. Chapter 10 is an epilogue that goes over the history of water supply and sewage disposal from the 1920s to the 1950s, with an emphasis on the viewpoints and ambitions of the Communists and the Japanese.

In more detailed summary, Chapter 2 (Drainage) tells the story of the early British attempts to build drains in their settlement at Shanghai. The British snatched a piece of land near Shanghai after the Opium War. For a long while, they struggled with the basic need for infrastructure. When it rained, water stayed. The British, out of sanitary concerns, needed to drain the swamp. The building of drains and gutters were at first done by individual property owners. The construction was so disorganized that the Municipal Council had to hire an engineer to craft a new general scheme, which evolved into a proposed reservoir, and later a scheme for waterworks, to flush the ill-designed drains. This was the beginning of an era when engineers became increasingly indispensable to the burgeoning city.

Chapter 3 (Waterworks) discusses the creation of the Shanghai Waterworks Company, one of the most important subjects in this dissertation. The old measures of fire prevention practiced in Shanghai were problematic and made it urgent for the British to build a new system to provide pressurized water. Struggles unfolded over whether the water supply should be provided by a private or public enterprise. The Shanghai Waterworks Company, a private undertaking owned by shareholders rather than the local government, eventually won out and successfully put fire incidents in Shanghai under control. Yet the very nature of the Company that helped it win the contract left SWW's relationship with local authorities in a delicate balance.

Chapter 4 (Culverting) goes over the history of the Yangkingpang Creek, a major river that flowed between the two foreign concessions. The Yangkingpang had been a major nuisance since the 1850s due to busy traffic. Although there had been cooperation between the two concessions in dredging the polluted river, the British and the French

could not agree on a final solution. The debate over the Yangkingpang revealed an uneven understanding of various schools of early-20th-century medical theories among foreigners in Shanghai. The culverting in 1914 not only ended the era of incongruous medical science in Shanghai, but also pushed forward the democratic process on the British side when the plural vote came under scrutiny after it was used repeatedly to obstruct the popular decision of culverting.

Chapter 5 (Sewage) discusses the problem of human-generated waste disposal. China had its own custom of handling nightsoil, which was to transport the urban waste back to the suburban farmland. The British authorities were never interested in displacing the practices more than reducing its offensiveness with regulations. The completion of the waterworks in 1883 posed a new challenge. The Municipal Council at first banned any use of water closets, but then had to lift the ban in 1914 when the buildings in Shanghai got taller and nicer. The Municipal Council spent another few years on evaluating the effectiveness of septic tanks but finally accepted the water-carriage sewer system and treatment plants with Active Sludge Process as the solution to the waste nuisance. By the end of 1920s, all parts of modern water-related technologies could be found in Shanghai.

Chapter 6 (Municipality) turns the focus to the inner working of the International Settlement of Shanghai. The profit-driven, private nature of the Shanghai Waterworks Company and the public concerns of the Municipal Council of the Settlement merged and clashed on many occasions regarding the water supply. When the Company needed to expand its service to the Chinese to survive, the Council helped with promoting it. The two sides worked together on regulating the laundry shops in the Settlement. However, every

time the Council revealed its intention to acquire the waterworks, the Company set up all sorts of legal and financial barriers to prevent it from happening.

Chapter 7 (Politics) takes a look at the top-down and bottom-up political activities of the Chinese and their connection to the Chinese water companies, including Inland, Chapei, and Western Waterworks. Among them, Chapei played a particularly active role in the Republic's ambitious campaign of taking back control of the British roads beyond the Settlement because the British administrative power over these roads was founded on their ability to supply water over long distances. On the other hand, with the rise of Chiang Kai-shek and the KMT, China entered a time of nationalism property owners were encouraged to resist British control over water supply issues, such as rate surcharges and installing meter systems.

Chapter 8 (Change) discusses the changes water technologies brought to Shanghai. Water supply was critical to up-to-date disease control in Shanghai in 1932. Traditional Chinese Medicine had its own way of treating cholera, but the 1932 anti-cholera campaign, when all parts of the city united around a central authority, was a clear turning point away from the herbal tradition. The water closet had become prevalent in popular literature. It was referred to in gender awareness and in political sarcasms. Familiarity with the water closet became an indicator of wealth and education. Public restrooms were even used as a social space where uncensored sexual and political dialogue took place. Hygienic behavior of the Chinese underwent visible changes.

Chapter 9 (Conclusion) is where I go over the term modernity, as is defined by Anthony Giddens. Giddens offers a series of elements of modernity that can be spotted in

the story told by this research, although applying them in the history of the late nineteenth century in China takes serious tailoring of their meaning. The conventional concept of modernity tends to emphasize the cancellation of space, intellectuality shared across the globe, and the powerful nation-state as the primary actor. Hydraulic modernity, however, takes the notion back to its roots when the conceptualization of modernity was less about the three features just mentioned – but was more embedded in geographic specificities of locality, bodily experience of comfort and convenience, and the multitude of grassroots actors in place of the nation-state.

CHAPTER 2. DRAINAGE

When Lieutenant-General Sir Hugh Gough anchored his fleet on the Wusong River on June 13, 1842, he saw on the right bank a tower, with flanking batteries on a tongue of land at a bend of the river. Finding the water on one shore shoaled three feet, inundating about two hundred yards from the bank, the General decided to take on the other shore, with batteries that covered the regular landing-place near the village of Wusong. At six o'clock on the morning of June 16, the warships moved to the appointed stations against heavy and well-directed fire and managed to silence the defense in hours. By the time the English troops landed at noon, the Chinese force, four to five thousand strong, had fled Suzhou of Jiangsu Province, with another portion falling back upon the neighboring city of Baoshan, then disbanded.¹⁸

The Chinese admiral Chen Huacheng 陈化成 (1776-1842) died in combat. At the age of seventy-six, Chen fought the invaders with every ounce of strength. He ordered rounds of shelling when the British ships approached. Although he kept losing artillerymen to the formidable foreign cannons, Chen fired dozens of rounds himself and allegedly inflicted damage upon two steamers. His leg was broken in the explosion, and his chest pierced by bullets; he died facing the ground, blood gushing out of his mouth. When the remaining soldiers saw the death of Chen, they cried bitterly and retreated. Wusong fell into the hands of the Englishmen, but her devoted defender, Admiral Chen, was soon made a hero. Upon his funeral, the Wusong natives poured their hearts out with odes, poetry, and

¹⁸ J. H. Schoedde, "Art. II. Capture of Shanghai and Chinkiang fu". *The Chinese Repository*, July 1, 1843: 341.

tears. The beloved late admiral was known for his integrity, discipline, and generosity. His loyalty was uncommon among the late Qing officials. The fact that he saw himself as one of the community was even rarer. A native folk ballad went: “Mandarins and soldiers suck on the marrow of the commoners, while His Excellency Chen drinks none other than the water of Wusong River.”¹⁹ The source of drinking water was indicative for one’s identity. In an agrarian society, sharing a water source was a symbol of belonging and a sign of commonality. Little did the British soldiers know that the water of Shanghai was tying their fate to that of the Chinese.

On June 19, the British troops boarded the steamers and headed south towards Shanghai along the Wusong River, with one column, Madras horse artillery, left on the ground. Hugh Gough was cautious with his move towards Shanghai, not because of the reported five thousand troops defending the city, for they were no match for his firearms, but because of the fact that Wusong village was connected to Shanghai also by a road. He was concerned about the possible abduction of valuable property when the Qing troops fled north. By pushing from both land and water, the General was in hope of intercepting the retreat and keeping Shanghai the commercial town it was. To his surprise, occupation of Shanghai was much easier comparing to the battle three days ago. Shots were heard on the way, but by the time his troops landed close to the city, Lieutenant-Colonel Montgomerie was already in possession of the place – he entered Shanghai unopposed as the Chinese authorities and troops evacuated the city the previous evening.²⁰

¹⁹ Yitian Lu, Vol. 7, Chen zhong min gong; “ART. IV. A memoir of Chin Chungmin (the hero of Wusong), who always followed a correct line of conduct. Translated for the Repository by Lao Mai”. *The Chinese Repository*, May 1, 1844: 247.

²⁰ J. H. Schoedde, “Art. II. Capture of Shanghai and Chinkiang fu”. *The Chinese Repository*, July 1, 1843: 341.

General Gough was greeted by a city abandoned by its wealthiest elite. Middle class and shopkeepers kept the city in order. Gough was able to induce many of the most respectable Chinese to take charge of large establishments, mostly pawnbrokers. “Shanghai appears a rich commercial city,” reported Gough, “with good walls in prefect repair, on which but few guns were mounted, and these all at gateways. The walls are three miles and a quarter in circumference; the population I understand to be from 60,000 to 70,000 souls. A very considerable trade is carried on at Shanghai. Its position as a commercial city nothing can exceed, being situated within sixteen miles up the [Wusong River], up which, for several miles above the city, ships of large burden can be brought with great facility.” Gough ripped Shanghai of its defense by destroying iron, powder and military stores and by embarking the four hundred and six guns they had taken along the way since the battle of Wusong.²¹

The battles of Opium War later moved on to Zhenjiang and Nanjing. The Celestial Empire had no choice but to sit at the table for negotiation. As a result, Shanghai would become one of the first five treaty ports opened to the world by the Treaty of Nanjing, and would rise to fame for her cosmopolitanism and depravities in seventy years. The river that ran across the city, the one that Admiral Chen drank from, the one brought the British troops in and connected Shanghai to the Yangtze River miles north, would later be known to the westerners, and to the world, as the Huangpu River.

2.1 Geography of Shanghai

²¹ Ibid.

Shanghai sits near the exit of the Yangtze River, the longest river in Asia. The Yangtze runs 3,915 miles from the Tibetan Plateau covered in snow to the cerulean East China Sea, then to the Pacific. Shanghai was founded on alluvial plain, which came into formation over centuries, and was known for her flat landscape and fertile country. Robert Fortune, botanical collector of the Horticultural Society of London, the one who famously “stole” the secret of tea from China, described Shanghai as he saw it during his trips in the 1840s:

“As an agricultural country, the plain of Shanghai is by far the richest I have seen in China, and is perhaps unequaled by any district of like extent in the world. It is one vast beautiful garden. The hills nearest to Shanghai are distant about thirty miles. These have an isolated appearance in the extensive plain, and are not more than two or three hundred feet high... All the rest of the country was a vast level plain, without a mountain or a hill to break the monotony of the view. The soil is a rich deep loam, and produces heavy crops of wheat, barley, rice, and cotton besides an immense quantity of vegetable crops, such as cabbages, turnips, yams, carrots, eggplants, cucumbers, and other articles of that kind, which are grown in the vicinity of the city. The land, although level, is generally much higher than the valleys among the hills or the plain around [Ningbo]; and consequently, it is well adapted to the cultivation of cotton, which is, in fact, the staple production of the district.”²²

The English settlers found a scenery they were familiar with – township neighboring a major river. “At Shanghai,” one wrote, “the river is as wide as the Thames at London Bridge.”²³ It was the Huangpu River, the waterway connected Shanghai to the Yangtze, the one that brought Western invaders upon the city, but also business opportunities. Unlike the Pearl River in Canton, Huangpu River was deep enough for large vessels, which made Shanghai the perfect place for transaction, storage, and refreshing. Seventy-five miles west to Shanghai was Lake Tai, the third largest freshwater lake in

²² Fortune, *Three years' wanderings*, 26.

²³ ART. II. Description of Shanghai, *The Chinese Repository*, Nov 1, 1847: 529.

China that takes up 869 square mile with an average depth of 6.6 feet. Lake Tai was known for its peaceful scenery. It supplied fresh water to the surrounding cities like Suzhou and Wuxi. During the nineteenth century, these cities were still far more administratively important than Shanghai. The British in Shanghai soon found the waterway that led to Suzhou, and then Lake Tai. In the early days, the English called it the Wusong. Later it would be named after its destination, the Suzhou Creek. Suzhou Creek and Huangpu merged at a point one and half mile north to the old Chinese city. Together they would make up the boundaries of the future British settlement, with the Suzhou Creek winding on the north and the Huangpu defining the east.

The actual city of Shanghai was surrounded by water flowing along the ditches passing under the walls. During the Ming dynasty when Japanese pirates infested the coastline, walls were erected and moats were opened out to defend the city against harassment. The design of these establishments followed the law of nature as the moats brought water in and out of the city following the ebb and flow of the Huangpu River. Four water gates, three on the east and one on the west, were constructed to control the flow of tide. Residents were supposed to drink the fresh water when the Huangpu grew and to discharge the waste in it when the river declined. However, by the time the British arrived, some three centuries after the walls were built, the water gates were left in poor condition. It could no longer be operated the way it was designed. Mud had accumulated around them and half-filled the several ditches. Three channels stretched from east to west. They were known to Chinese as pang, something inferior than river. These channels received the supply from the Huangpu River on the east, passing the moat under the wall, and extended to the western suburbs. All the channels were quite dry at low tide, yet numerous stone

bridges were constructed over them. The landscape of Shanghai resembled vascular network where there were simply too many smaller channels to be properly named.²⁴

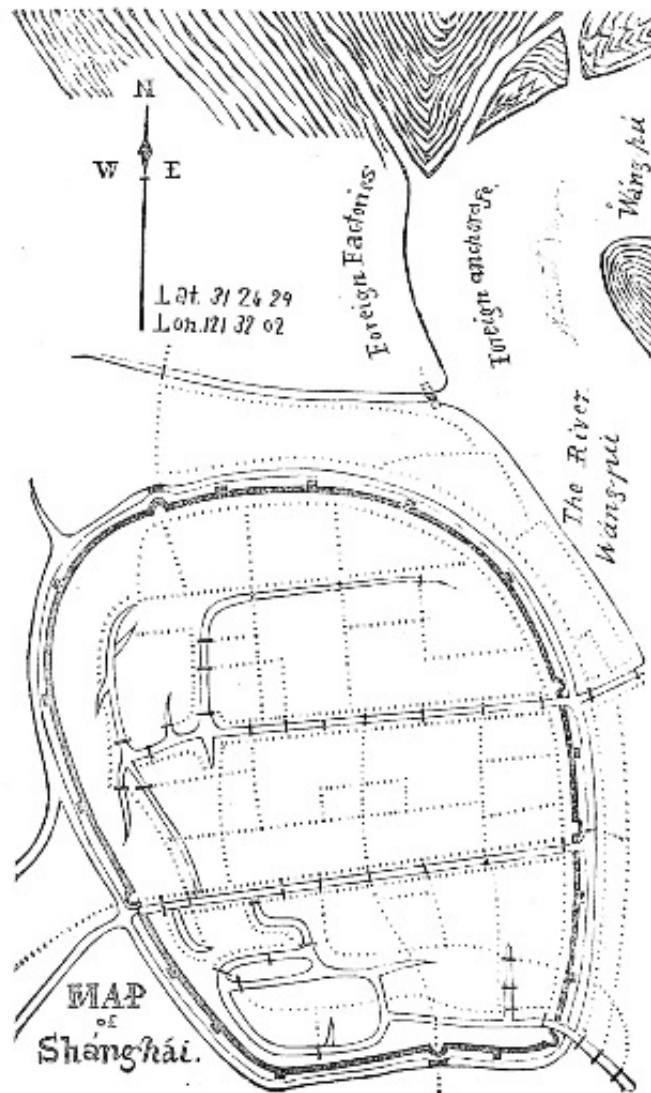


Figure 1 – Map of Shanghai. In the center is the walled Chinese city. To its east side is the Huangpu River. The small creek to the north is Yangkingpang. The British Concession sat north to the Yangkingpang. Source: “ART. II. Description of Shanghai”, *The Chinese Repository*, Nov 1, 1847: 529.

²⁴ Ibid.

In November 1945, the British in Shanghai and the Daotai of Shanghai, the regional magistrate, entered an agreement of twenty-three principles. This agreement would be later known as Land Regulation. These regulations served as the mini-constitution of then the British Concession. It laid down the price of renting the Concession, rules for property right, sanctions for running business, regulations for buildings, preserving the Chinese cemeteries, and many other fundamental regarding the bilateral relationship and the functioning within the Concession. The British Consul initiated the cause, but the Land Regulation underwent several major changes. The administrative institutions of the British Concession began to take shape as the time went by. The Land Renters' Meeting, and later the Ratepayers' Meeting, became the legislative sector that made policies into law. The Municipal Council, the governing body of the area, was born after the military conflict with native rebels in 1853. During the second revision of the Land Regulation, the Daotai was not consulted. He was presented with the rules as had been decided by the consuls of Britain, France, and America. His approval was not even sought for.²⁵ The American Concession joined the British Concession in 1863, thus forming the International Settlement. The Settlement remained to be governed primarily by the British, with only one American director sitting on the board of the Municipal Council. The Settlement had a core area that sat in between the two major creeks of Shanghai and vast northeast section along the Huangpu River where the American Concession used to be.

As for trading and currency, the British had been minting silver coinage in London since 1863. These coins were issued by the Hong Kong government for use in the Colony. They later ran a mint in Hong Kong for two years from 1866 to 1868. The British dollar

²⁵ Shanghai shi wenshiguan, Vol.2, 90-98.

became popular in China because the silver coinage was easier to carry than a string of copper cash. In China, the British dollars were accepted at their intrinsic value as silver. Since in China there was no fixed currency and the value of silver ingot was determined by supply and demand, the British found it difficult to fix the value of their dollar. Silver ingot, known as “sycee” weighed in the unit of tael, was the currency in China. One sycee equaled fifty taels. One tael weighed 1.3 ounce of silver. The value of the British dollar varied in accordance with the prevailing rate of silver. For the most part of the late nineteenth century, one dollar equaled four taels of silver. The Chinese also used copper coin called cash. One cash equaled one thousandth tael of silver.²⁶

2.2 No Drainage in the “Model Settlement”

The British did not settled in the walled city and lived side by side with the Chinese. They rent their own land north to the old city across a river. Shanghai soon became a popular spot in the Far East where thousands of ships went by the coastline of China paid their duly visit to the burgeoning portal city before entering the Yangtze. In return, the British businesses in Shanghai offered them their warmest welcome. By the late 1850s, miles north to the muddy walled-up Chinese town, business were booming, recreations of European taste sprawling. A casual visitor would find here well-arranged streets, commodious offices and godowns, a forest of shipping in the river, and the busy hum of commerce in the streets. In the rear of the Settlement, a race course was built to cater to the affluent. For sailors, however, the options were limited. They roamed the Settlement till they were weary and bored. They drank a pint of cold water from the river before they

²⁶ Wright, 114.

returned on board their ships, tired and hungry. At the time there was only one boarding house for the use of all the seamen in the port and a few low Chinese grogshops in the rear of the Settlement where drunkenness and irregularity were not uncommon.²⁷

Lack of accommodation for sailors caught people's attention after one of such "casual visitors" lamented the situation and suggested that if not probably addressed the shortage in housing might lead to corrupted behavior among young sailors. Weakened moral condition of Western seamen was after all detrimental to the spread of gospel. "The vast realms of China", someone wrote in *The North-China Herald*, a popular local English newspaper, "are destined to be opened up and a more enlightened civilization and a purer faith gradually introduced, cannot be carried on without the aid of Sailors."²⁸ The remedy lies in the establishment of one or more well-regulated licensed boarding houses under proper police control – a good "Sailors Home" supervised by a committee of gentlemen and established under Consular and Municipal sanction. The editor of *The North-China Herald* expressed their appreciation of the advice because the functioning of a maritime regime depended on the laboring of sailors, and since the commerce at Shanghai was bound to grow, it made sense to have such establishments erected. "Sailor's Homes," read the editorial comment, "are becoming very general in the large ports of England and American and the Model Foreign Settlement of Shanghai should not be behind in doing a good turn to our 'Hearts of Oak' to whom we are so much indebted for the possession of it."²⁹ The February 25, 1859, a public meeting was held at the Shanghai Library before noon where

²⁷ "The Sailor's Home", *The North-China Herald*, Feb 26 1859: 118.

²⁸ "A Casual Visitor, 'Sailor's Homes'", *The North-China Herald*, Dec 25 1858: 82.

²⁹ "Article 2 – No Title", *The North-China Herald*, Dec 25 1858: 82.

practicability of building a “Sailor’s Home” was considered.³⁰ Whether the boarding houses were built in the end was unclear, but the term crafted by the editor left a lasting impact on the young treaty port.

The term “Model Settlement” kept Shanghai moving forward. Decades later, Shanghai would be known to the world as the model settlement of Asia, but it was unheard of before 1858.³¹ Almost immediately, the term took on a different meaning. Originally, the word “model” alluded to the prospective of Shanghai becoming the beacon of Christian morality that shone over the backward oriental empire; but the term was quickly adopted by those who had long been grumbling about the undesirable sanitation in Shanghai. One contributor to *The North-China Herald* wrote: “They say this is Model Settlement. It may be in some points, but it has its faults.”³² What he was complaining about was the lack of real drainage.

2.3 Shanghai’s Drainage Problem

Built upon alluvial plain, Shanghai was endowed with the worst possible geology for proper drainage. Sewers that the Europeans were used to, that of Roman style – tunnel made of bricks, spacious enough for people to walk through – was difficult to build in Shanghai. For ages, Shanghai natives relied on natural waterways to drain the city. One describe Shanghai’s geography for drainage as following:

“It appears that Shanghai is situated upon a flat alluvial plain surrounded by Creeks and Canals and isolated pieces of water, but the latter are not of a large extent, and the former being mostly affected by the Tide and sometimes leaving stagnant water for several days together, vegetable

³⁰ “The Sailor’s Home”, *The North-China Herald*, Feb 26 1859: 118.

³¹ A Constant Reader, “Letter to the Editor 2 – No Title”, *The North-China Herald*, Jan 1 1859: 87.

³² D.R.A.I.N., “Letter to the Editor 1 - No Title”, *The North-China Herald*, 19 Jan 1861: 11.

substances being created in and about them with great rapidity in consequence of the natural fertility of the Soil, the moisture in the ground and the heat of the Climate. It also appears that no adequate or systematic provision is made for the drainage of the town, consequently stagnant and putrid water in a state of fermentation may naturally be expected to result from this latter cause.”³³

Fear of disease-causing miasma worried the British. Malaria seemed to be always around the corner. According to one of the authors of *The North-China Herald* in 1850: “The frequency of fever in this community, may be in some measure attributed to the want of thorough drainage. Not to mention the annoyance experienced by [everyone], in the daily perambulation of this locality, from the bad odour of uncovered ditches and drains, it is well known, that the miasma carried by such sources is highly detrimental to health, so that due regard for its preservation should, alone, counsel the community to take early measures to remove the causes of, perhaps, much illness to the residents.”³⁴

Starting from 1852, the Committee of Roads and Jetties, the department in charge of building roads and drains under the supervision of Municipal Council, took on the matter of poor drainage in Shanghai. In order to keep filthy ponds away from properties, the Committee order the property owners to elevate their compounds. The instruction triggered complaints, citing authorities’ indifference to the cost of such changes upon which the owner would bear. The Council’s reckless decision also put the policy-making process under question because interest parties were not involved in the creation of such policies. The Council and the Committee were also accused of filling up the drains that were built for sanitary reasons. The existing drains, however ineffective they were, remained the basic infrastructure to keep the compound dry. “Our Gardens,” complained by the same resident

³³ Joseph Gibbs, “Article 4 – No Title”, *The North-China Herald*, Jul 30 1853: 207.

³⁴ “Article 3 - No Title”, *The North-China Herald*, Oct 5 1850: 38.

calling for improved drainage in 1850, “now getting into something like order, will again become river mud; our pockets will be considerably lightened by the unavoidable expenses; and our ears, in summer, again saluted with a chorus of frog.”³⁵ Foreign residents in Shanghai demanded that the Committees under the Municipal Council be held accountable. They believed that the Committee of Roads and Jetties should not have any power to expend money for sewage purposes unless a special vote by the ratepayers was convened at a public meeting.³⁶

In June 1852, the Committee of Roads and Jetties moved away from the ditches already built by individual property owners, and began to call for sewers to be built under all roads planned. The first public meeting was held at the British Consulate on July 3, 1852.³⁷ One week later, at the second public meeting for the same purpose, the subject of drains was fully discussed and the resolution was passed that a system of drains would be built in the British Settlement in Shanghai. The scheme was to be designed by British civil engineer Joseph Gibbs. In his letter, Gibbs suggested that houses in Shanghai were not supplied with water by either wells or conduits. To keep the drains in a proper state, a continual scour was necessary. Scouring had been his biggest concern. Gibbs warned the foreigners in Shanghai against large drains because such drains without continually scouring would be enlarged and elongated cesspools and would perpetuate disease. Gibbs suggested to replace the existing sluice with well-adjusted doors to enable the scouring of canals so that they were kept free from mud. Gibb offers two major recommendations to the Municipal Council. The first was drains to be formed of well-glazed pottery or other

³⁵ Ways & Means, “Letter to the Editor 1 – No Title”, *The North-China Herald*, Feb 14 1852: 114.

³⁶ “Article 1 - No Title”, *The North-China Herald*, 14 Feb 1852: 114.

³⁷ “Circular”, *The North-China Herald*, 26 June 1852: 190.

hard tough durable material; the second was that the upper or commencing end of drains were to be placed so low as to be capable of receiving sewer water from the river during a part of all ordinary tides. The sluices were to regulate the inflow of water and to control the height. By this means these drains may be cleared from any deposit twice every twenty four hours.³⁸ Unfortunately, the Council followed neither of them.

It was not until almost two years later that the Council began to act on Gibbs' scheme. In April 1855, the Council passed a resolution that a circular be sent around asking for information as to the position of drains in the different properties in the Settlement, providing knowledge for a comprehensive plan to solve the problem of drainage.³⁹ Relying on cooperation from private property owners, the scheme developed at an unsatisfactory rate. By the end of the 1850s, streets in Shanghai were still often covered by dirt and water, especially during rainy seasons. "Every pedestrian in Shanghai knows how 'horribly muddy' some of our roads have been during the late rains," one resident wrote in 1859, "In many places the ground is covered with water whenever there is heavy shower or continued rain, and there on the surface it remains stagnant, for days or weeks to evaporate and fill the surrounding regions with deadly miasma. This ought not so to be, either on the roads, or on the grounds that are enclosed of due regard is to be had to the health of the resident community."⁴⁰ The public's patience was wearing thin. During the meeting of foreign land renters on June 16, 1860, the formation of a complete and uniform system of drainage topped the list of wanted public improvement. To reduce the cost of turning so many

³⁸ Joseph Gibbs, "Article 4 – No Title", *The North-China Herald*, Jul 30 1853: 207.

³⁹ Shanghai Municipal Archive, Shanghai Municipal Archive, *Minutes of SMC*, Vol. 1, 53.

⁴⁰ Viator, "Drainage", *The North-China Herald*, 12 Feb 1859: 110.

existing drains into one entirety, the British had to turn to local laborers.⁴¹ In May 1861, the Council began an opening bidding and attracted numerous local contractors. Shanghai became a hotspot of construction as male laborers around flocked to the city looking for a job.⁴²

2.4 Technical Challenges of Building Drains

The task of building a drainage system turned out to be a difficult one. Up to this point, most drains or drainage facilities were either built by property owners themselves, or by Chinese labors contracted by the Municipal Council. Downspout began to make their appearance in some of the buildings. Open ditches were conveniently built along the road according to the plan. But due to the flatness of land in Shanghai, building drains required more engineering expertise than the Council and the public had imagined. As many of the ditches did not have an ideal gradient, they ended up not working properly. Downspouts and other metal channels might be helpful for some, but they tended to injure the adjacent buildings by letting the storm water erode into foundations.⁴³ One contributor to *The North-China Herald* points out the technical difficulties of the work:

“We are planted, and vegetate here in a marsh. Consequently there is little or no fall for water towards the river (the great natural sewer). We are liable to inundation by high tides - which would of course increase the quantity of surface water. Our soil is a clay, through which water percolates but slowly. Hence no system of simple surface drainage is of use. ... When we look at the excessively level nature of the ground, we find there would be hardly sufficient slope in a long drain, say one from the head of the Mar-loo to the Yangkingpang, to enable even clean water to run freely over the numerous

⁴¹ “Minutes of a Public Meeting of Foreign Renters of Land within the limits, held at H.B.M.’s Consulate at Shanghai on the 16th day of June 1860”, *The North-China Herald*, 23 June 1860: 99.

⁴² Shanghai Municipal Archive, *Minutes of SMC*, Vol. 1, 170.

⁴³ “Article 6 - No Title”, *The North-China Herald*, 05 Jan 1861: 3.

inequalities which would necessarily be in its lower surface; to say nothing of those which would arise from an accumulation of filth.”⁴⁴

Some British even looked up to the Chinese, despite all their glaring evil and foul habits. They said when the British Settlement first built on this farmland, drainage was not a prominent problem because “the Chinese irrigators made the drainage wonderfully effective of the flat around” before they were recklessly filled up by the Municipal Council.⁴⁵ Land renters were at fault too. When a piece of land was purchased, the owner tended to fill up the ditches without providing any substitute. That was how the drainage problem developed to such extent. This had been more especially the case in the western part of the Settlement.⁴⁶ The drains built since the 1860s were epidemically dysfunctional. It was mentioned that along the Maloo, the main street at the time (later the famous Nanjing Road), gutters were choked up with putrid water.⁴⁷ Feverish epidemics loomed upon foreigners every summer with such poisonous odor filling the air. It was around this time that the foreign residents in Shanghai started to call for help from a professional civil engineer. “In securing the service of a Civil Engineer,” as one resident put it, “light and its antagonistic element, water, may both be controlled and directed by the same magic hand.”⁴⁸

The Municipal Council, however, was not interested in help from outside. A Road Inspector was appointed by the Watch Committee to oversee the drainage project. Apart from that, the board members mostly relied on their own experience. With Joseph Gibbs’ earlier scheme at their disposal, they did not even bother discussing the candidates for a

⁴⁴ D.R.A.I.N. “Letter to the Editor 1 - No Title”, *The North-China Herald*, 19 Jan 1861; 11.

⁴⁵ Young Cathay, “The Sanitary Condition of the Settlement”, *The North-China Herald*, 17 Aug 1861: 130.

⁴⁶ “Minutes: Report upon Drainage and Water Supply”, *The North-China Herald*, 05 Apr 1862: 54.

⁴⁷ “Sanitary Condition of the Settlement”, *The North-China Herald*, 15 Mar 1862: 43.

⁴⁸ “Article 6 - No Title”, *The North-China Herald*, 05 Jan 1861: 3.

possible municipal engineer (Gibbs was indeed a civil engineer, nonetheless he lived in Britain and had never visited Shanghai). In April 1862, the Watch Committee reported to the Council that Shakloo Road would be made the main street inside the Settlement. This road, running north-south across the entire Settlement, would have drains built under the surface so that the storm water was to be carried south to the Yangkingpang, north to the Suzhou Creek. Another two roads, Suzhou Road and Sikh Road running north-south parallel to the Shakloo Road, will have drains built along with them. Due to shortage of bricks, the Watch Committee had to planking over the wide and deep ditch as temporary measure until this shortage of supply was resolved. Once the three passages was built, they would be tidal drains, scoured by river two times a day through the flood gates at Yangkingpang. Tide would keep drains sufficiently free from noxious exhalations for purposes of health, even in hot weather.⁴⁹

At this meeting where the operable scheme of drainage was finally rolled out, Mr. Smith, one of the board members, offered an ill advice to the Council. Smith was called on for his scheme for a section of the large barrel drain along the center of Barrie Road. He remarked that this drain had been working for the last six years, and that there was neither a deposit in it, nor an accumulation of filth where it empties into the Yangkingpang. He explained that each tide at its flood dilutes the drainage of the whole neighborhood and ebbs with the mixture down the river. He also said that it was not requisite to obtain a fall, but that the tide would be more effectually perform what the slight fall would fail to do.⁵⁰ This advice was in contradiction with Gibb's early suggestions, but no one at the meeting

⁴⁹ Shanghai Municipal Archive, *Minutes of SMC*, Vol. 1, 254-257; "Minutes: Report upon Drainage and Water Supply", *The North-China Herald*, 05 Apr 1862: 54.

⁵⁰ Ibid.

seemed to understand the peril. Smith's advice would later become the biggest technical obstacle that the Council struggled with for years.

What had been planned by the Committee would cost Tls. 132,000 altogether, including three types of oval drains of different sizes – 3 by 5 ft. being the large one employed in the Shakloo and Suzhou Roads , etc., 1.5 by 2.5 the medium used in the Sikh Road , etc., and all the streets from East to West.⁵¹ Relying on loans rather than higher taxes, the work soon began in spring. At first, it was going well. By the end of August, the construction of the main street, both Shakloo Road and the drain was completed. After testing the work with water, the inspector found the result to his satisfaction.⁵² It was not long, however, before the Council found themselves caught by a tightened finance. Dealing with the pond of stagnant water amidst the construction, the Road Inspector suggested small ditches be built to connect the new drains. To clear out puddles on land that belonged to no one, the Council had to hire contractors, which added to the already high cost.⁵³ By the end of 1862, the Council was running out of money. The advertisement of loans for drainage in 1861 was not received well by the public. The response to this appeal fell far short of their expectations, and a sum of only Tls. 20,000 was realized. Those who invested

⁵¹ Some directors suggested that it was unfair to levy taxes on the current land renters for a project that would permanently benefit the Settlement. Therefore, the most equitable and easiest mode of finding the money was to obtain a loan. This matter underwent a lengthened discussion, and eventually, at the suggestion of the Defense Committee, the following resolution was unanimously adopted by the Council: that the permanent system of drainage to be adopted shall be that recommended by the Committee of Defense and estimated to cost Tls. 132,000; that a loan shall be proposed at 10 per cent interest and 10 per cent sinking fund, to be paid off year by year, 10 percent each year, the amount being called for as acquired by the progress of the work; that as soon as bricks can be obtained, the main drains shall be commenced on the Sikh , Suzhou Roads, to be continued earliest, as the cool weather of autumn allows the streets to be opened. The Council was even offered the use of a gun boat in the transport of bricks to Shanghai. Shanghai Municipal Archive, *Minutes of SMC*, Vol. 1, 254-257.

⁵² Shanghai Municipal Archive, *Minutes of SMC*, Vol. 1, 309-311.

⁵³ Shanghai Municipal Archive, *Minutes of SMC*, Vol. 1, 314-317; 431-433.

in bonds earlier in 1862 ended the agreement by the end of the year. The Council had no options but to sustain the project with Tls. 25,000 in the form of short term loans.⁵⁴

Status of land ownership in Shanghai added difficulties to the project. In early 1863, after the three main drains were finished, the Municipal Council found trouble in requesting property owners to connect the drains they built themselves to the municipal ones. The ideal procedure would be that the connection be done when the construction of main drains was still underway so that the road did not have to be opened up again once the municipal drains were in place. However, the Council found no such attempt for immediate connection was being made in streets where public mains were being laid. The Council then offered a temporary discount for those who would pay for the work upfront. It would be their responsibility to notice the inspector and to mark the spot for connection so that contracted coolies could be prepared for the work during the construction. Once the grace period was over, property owners needed to pay in full price to connect the drains.⁵⁵ Property owners, however, could not care less about the discount since they were able to find their own contractors and coolies to connect the drainage at the time and price they deemed suitable. Meanwhile, at the Chinese village inside the British Settlement (uncertain which part of the Settlement this refers to, but most likely Sinza in the north on the bund of the Suzhou Creek), the Health Inspector were busy urging Chinese houses to adopt measures at once to drain their land so that nuisance like muddy puddles would not be seen everywhere after every rainfall.⁵⁶ Yet warning was the only leverage the British authorities

⁵⁴ Shanghai Municipal Archive, *Minutes of SMC*, Vol. 1, 416-420; :Article 1 - No Title: Municipal Report for the Year 1862", *The North-China Herald*, Apr 11 1863: 58.

⁵⁵ Shanghai Municipal Archive, *Minutes of SMC*, Vol. 1, 456.

⁵⁶ Shanghai Municipal Archive, *Minutes of SMC*, Vol. 1, 470-471.

had over native residents. They, after all, did not have to rent land from the Municipal Council.

2.5 John Clark and the Scheme of Arterial System

Three years after the first calling for a civil engineer was seen in the press, with technical difficulties appearing at every construction site, the Municipal Council finally reckoned with the fact that the drainage project could not be done without the professional instructions from an engineer. In the fall of 1863, a newly arrived Englishman, John Clark, was appointed the Municipal Engineer, the first man to hold this title. Before coming to Shanghai on July 25, 1863, John Clark worked for the Great Northern Railway Company in the Great Britain. During the last two years of his employment, he was principal Assistant Engineer. For some time prior to his departure from England, he was engaged in visiting and inspecting works, expecting them to be of use after his arrival. John Clark assumed municipal duty on August 18. His arrival eased the pain of the embattled Municipal Council, who now came to realize that “the supervision of an experienced Engineer would have been desirable from the period at which the recent system of drainage commenced.”⁵⁷

Shortly after becoming the Municipal Engineer, Clark took on the mission of improving the existing drainage. At a meeting in September, Clark expressed his opinion that the present system, with slight alteration in the bottom of the drains, would suffice for a more comprehensive scheme. It was then decided by the Council that all connection with

⁵⁷ “Municipal Report for the Half Year Ending 30th September 1863”, *The North-China Herald*, Nov 14 1863: 183.

the main drainage must be made by the Municipal Council with the expense charged to the parties benefited.⁵⁸ The measure was to correct the earlier policies that aims to encourage immediate connection with lower prices. The arrival of civil engineer seemed to have empowered the Municipal Council to assert authority over the drainage matter. John Clark was swift in correcting some of the earlier mistakes. For example, the gradient of drains. When drains were under construction in 1864, Clark specifically ordered the one that ran under the Jiangxi Road across the Chinese houses to obtain as much fall as possible. This move indicated a clear departure from the earlier practices that just left drains without proper slope as long as they could be reached by river tide.⁵⁹

While Clark was righting the wrongs, the original drainage scheme proposed by the retired Road Inspector was still underway, carried out by the contracted labors across the Settlement. Clark later began to realize that ongoing construction must come to a full stop. At a meeting in April 1865, Clark complained that when he was hired, he was under the impression that no attempt at any regular drainage had been made. But upon his arrival, he found that a desultory and unconnected series of drains were already laid down at vast expense. The existing system of “surface drainage” is a threat to public health. Clark proposed the abolishment of entire system: “After your predecessors had expended upon [the current system] sixty five thousand Taels, it became my duty to endeavor to utilize it, and to execute what the future requirements of the settlement imperatively demanded, in a similar manner... I now admit with reluctance, that after persevering trial and experimental

⁵⁸ Shanghai Municipal Archive, *Minutes of SMC*, Vol. 1, 517.

⁵⁹ “Municipal Report: Engineer’s Department”, *The North-China Herald*, Apr 09 1864: 58.

observation, I have arrived at a conclusion that the present system cannot be made to suit the wants of the settlement...”⁶⁰

As John Clark saw it, drainage in Shanghai was troubled by two issues. The first was the cost. The current system, according to his estimation, would be too expensive to build and maintain once the settlement and its drainage extended westwards because as the population grew, the Settlement would need such drains of increased breadth, entailing a much higher price given they were made of bricks. The beds of the creeks would grow higher, meaning that in order to keep an adequate fall, more houses needed to be raised above the sea level. Therefore, the current scheme was financially unsustainable. The second was Shanghai’s flatness. At the central district of the settlement, all the present drains are too high for the house drainage from either side, unless the road and compounds be considerably raised to give the required fall. The problem with insufficient fall was not new to the Council. They had been recommending the raise of property owners’ compounds for proper drainage since the 1850s. Apparently, as was demonstrated in Clark’s report, few of them followed through. If these drains needed to be opened and attended by hand to clean out the filth, than the cost of maintenance would be one-fourth of the original cost of them.⁶¹

Clark then educated the Council about a system that was commonly used for towns situated in flat countries or below the level of the sea – the system he intended to carry out on his arrival before running into the patchwork that already existed – it was called the “Arterial system”. Two main sewers, egg-shaped, three feet three inches high, would have

⁶⁰ “Engineer’s Department: Report of Municipal Engineer”, *The North-China Herald*, Apr 08 1865: 55.

⁶¹ Ibid.

extended from the Bund up the Ningbo and Fuzhou Roads respectively; uniting before passing under the Defense Creek, and afterwards terminating on the bank of the Suzhou Creek at a pumping station, with tanks, engines, etc. complete. Under all the other roads, fifteen-inch glazed stone-ware pipes (area 176.71 inches) would have been laid at the proper gradients; taking all drainage and sewerage from the houses to right and left, and discharging into the two main sewers. The main sewers could be flushed from the Huangpu River, and the stone-ware subsidiary sewers from the Yangkingpang, Suzhou Creek, and Huangpu River. Clark also suggested that the cost of this scheme would be much lower in that only the main sewer would be expensive to build, with bricks, labor, and the cost of engine. The glazed pipes can be obtained from England.⁶²

What John Clark brought to Shanghai was the latest development in sewer building. The Council wanted to have obtained his service in the 1850s, but the knowledge of how to build a drain in its best form was not yet developed when the British in Shanghai began their constructions. The design of egg-shaped drain was invented by British engineer John Roe. It was endorsed by sanitarian Edwin Chadwick in his 1842 *Report on the Sanitary Condition of the Labouring Population of Great Britain* because Chadwick was convinced that water went through the egg-shaped drain at a relatively high velocity. The design was put in use on a larger scale when Joseph Bazalgette was building the integral sewer system

⁶² John Clark had envisioned a waterworks in the future. He suggested that at the pumping station, engines of small horse power would suffice at present, but should the whole of the settlement become as populous as the most densely populated part of London, engines of 200 nominal HP would be requisite. By slightly increasing this power, they could be made available at the same time for adjacent waterworks, which formed a concomitant of this scheme and which are so much required. The same staff, buildings would do for both the enterprises whereby a great saving might be effected. Clark also mentioned selling the sludge to farmers to sustain this project in the long run. As he envisioned, the drainage and sewerage, thus conveyed from the channels and house drains into the road pipe, and from that into the main sewer would, on its arrival at the well at the pumping station, have been raised by engines, deodorized, and sold. "Engineer's Department: Report of Municipal Engineer", *The North-China Herald*, 08 Apr 1865: 55.

for London in the late 1850s. Roe's egg-shaped sewers were applied to minor branches, while the main sewers were circular.⁶³ In a sense, there was no real shortcut for the crooked path the British in Shanghai went through in their building of drains.

2.6 E. H. Oliver and the Scheme of Reservoir

The meeting held in early April 1864, where John Clark provided the Council with the amazingly detailed drainage scheme, was supposed to leave an imprint on Shanghai's layout. It sure looked so when the Land Renters' Meeting quickly came into action at the end of the same month, by deciding that the British Settlement would introduce a proper system of drainage by means of glazed stone-ware pipes.⁶⁴ However, the municipal records suggested otherwise: Arterial System plan was not implemented. By the spring of 1868, four years after Clark's scheme was proposed and three years after his brief tenure as Municipal Engineer ended, no main drains were built running from west to east as was suggested by him; instead, seven main drains in the undermentioned roads comprised the backbone of Settlement's drainage system – the Sichuan, Jiangxi, Henan, Shandong, Shanxi, Fujian and Hubei Road – all of which went north-south, with outlets into the Suzhou Creek and Yangkingpang, which was obviously extension of the old pattern prior to 1864.⁶⁵

During this period, the population of the International Settlement grew substantially. In 1853, the Settlement housed a population of five hundred, less than 0.01% of the total population of Shanghai. By 1865-1866, 13.4 percent of the people in Shanghai

⁶³ Goldman, 96, 114.

⁶⁴ "Land Renters Meeting", *The North-China Herald*, 29 Apr 1865: 66.

⁶⁵ Shanghai Municipal Archive, *Minutes of SMC*, Vol. 3, 232.

dwelled in the Settlement.⁶⁶ After almost two decades of planning and construction, the existing drains seemed no better than receptacles of filth. They had to be dug out at intervals and had the thicker muck carted away. One of the defects in design that resulted such insanitation was that the level of the drains was too high to incur the pressure of water, even at spring tide, river water could not reach the outlet and go through them at all. Besides, some earlier features designed to prevent the clogging turned out to be doing the opposite. The Shandong Road drain, for example, was found to be from eighteen inches to two feet lower at some parts than at others, a possible design following the idea of “trap holes”, the consequence being an accumulation of deposit in each of the lower portions.⁶⁷

The young Municipal Surveyor, E. H. Oliver, resumed the responsibility of supervising drainage and other public works. He told the Council in his 1868 report that the defective gradients of the sewers in many instances damaged their utility. Oliver agreed on Clark’s condemnation on the deficiency of current system, but did not support his predecessor’s advice about the abolishment of the entire system. That was because a complete do-over would cost Tls. 200,000-250,000, noting that Tls. 65,000 had already been spent by Clark’s predecessors. Oliver suggested that the only course to be pursued is to endeavor to utilize the existing drains as far as practicable. Oliver put forth a plan that would make use of the existing drains, particularly the seven mains, but would bring water from sources other than natural rivers to scour them and to keep them clean. He suggested the construction of a reservoir – a large one, capable of supplying sufficient water to flush the drains, that the defective gradients be remedied where necessary by relaying the sewers.

⁶⁶ Zou, 15.

⁶⁷ “Shanghai”, *The North-China Herald*, Feb 19 1868: 78.

When the sewers were once laid, with a regular fall from the center of the Settlement towards their outlets, little difficulty would be experienced in keeping them clean by flushing them with water at regular intervals. The expenditure that was constantly incurred for cleansing would thus be saved. Oliver proposed the construction of altogether 11,200 feet relaying drains at the cost of Tls. 28,000, about merely one-tenth of the estimated cost in 1864.⁶⁸

Oliver proposed subsequently to the Council the scheme of reservoir, which would be likely built at the head of the Jiujiang Road, connected to an 8-inch iron pipe that went across the center of the Settlement. At every cross street it is proposed to have plug on the pipe, to which a hose could be connected for conveying water to any of the wells in case of fire. As the reservoir would be on a higher level than any of the roads in the Settlement, the water would have sufficient pressure to force its way through the required length of hose. The size of the cistern was to be 40 x 20 x 12 ft., capable of holding 60,000 gallons or 12 hours supply for one fire engine. The water would not only be useful for extinguishing fires, but also for flushing the main sewers, nearly all of which have a fall from the Jiujiang Road, and for watering the streets in summer. Oliver estimated that the cost of this scheme – 4,500 feet of piping and other related apparatus, one 10-horse power engine and freight, fitting up the engine and laying the pipes, and the reservoir made of bricks – would cost ratepayers Tls. 9,370, not including firemen's wages and rent of ground needed for the reservoir.⁶⁹

⁶⁸ Shanghai Municipal Archive, *Minutes of SMC*, Vol. 3, 232; "Shanghai", *The North-China Herald*, Feb 19, 1868: 78; "Municipal Council: Report of the Public Works' Committee. Report by Municipal Engineer", *The North-China Herald*, Oct 04, 1870: 261.

⁶⁹ Shanghai Municipal Archive, *Minutes of SMC*, Vol. 3, 232

The ideal site for reservoir, according to Oliver, needed to fulfill two requirements. First, it must sit at a relatively central point within the British Settlement so that each corner of the Settlement could be reached at a reasonable cost for infrastructure. If such spot could not be found, the reservoir located outside the Settlement would have to be connected to the central point by pipeline, which would incur higher cost and consequently a higher tax rate imposed upon the ratepayers. Second, the reservoir needed to be close to at least one source of water. This problem might seem easy to deal with at first glance because Shanghai was, after all, surrounded by rivers and creeks; however, it took more than just spotting a river nearby. It was due to the multiple usefulness of this reservoir that the source of water must meet more than one standard – it was to be ideally free from pollution of sewage and drainage, good enough for the community to drink; the volume of this source should be relatively independent from tidal influence so that enough water could be provided even when tide of the Huangpu retreated. It was for those concerns that Oliver picked the head of the Jiujiang Road – it was at the center of the Settlement; its adjacency to the Defense Creek, a relatively stagnant river that ran north-south, cutting into the east part of the Settlement, would not only provide the future reservoir with adequate water, but prevent the shortage when tide was low as most water in the Defense Creek stayed in the city. Unfortunately, the features that made the Defense Creek an ideal source also led it to its deterioration and, eventually, its demise. By October 1868, months Oliver's proposal, the Watch Committee had found that the Defense Creek rapidly shallowing due to mud accumulation at the bottom. The Watch Committee suggested that the original site needed

to be abandoned in favor of one upon the Suzhou Creek, which ran along the north side of the Settlement. This change of site would incur additional Tls. 4,000 for pipeline.⁷⁰

The Watch Committee saw this change as an opportunity to advance more infrastructural development in Shanghai. The Committee suggested to the Municipal Council at a meeting that the chief purposes of building a reservoir were the efficient flushing of the drains and the permanent supply of water to the firewells. If a reservoir was to be rendered really useful to the town, its consummation could only be the first step towards establishing regular waterworks. The Committee in fact had before them a formal scheme of waterworks, which was prepared at the request of the former Council. Once built, it would be capable of supplying six million gallons of water on a daily basis. The original estimated cost was £153,000 before it was reduced to Tls. 250,000, not including rent for land and cost of transporting more than 5,000 tons of the necessary plant. The original plant was located at the Defense Creek as well. Now that the reservoir needed a new site, the Committee intended to merge the tasks by tapping the purest water source in Shanghai.⁷¹

The locale chosen by the Committee was Longhua Pagoda, where another creek met the Huangpu River, more than six miles away from the Settlement. A plan of such scale could only come to fruition if it was able to receive consistent funding from more than just the current Municipal Council; if the enterprise could not be funded until the very end, the already incurred expenditure would render in vain. As for the ownership of the potential waterworks, the Watch Committee acknowledged that such works must be

⁷⁰ Shanghai Municipal Archive, *Minutes of SMC*, Vol. 3, 296-298.

⁷¹ Ibid.

opened for private enterprise. However, the Committee also suggested that if adopted as a public measure, it would be necessary for the Municipal Council to seek permission from the Land Renters to issue a loan of at least half a million of Taels. Due to the costly nature of the matter, the Council proposed to take no further action until opinions and instructions were made at the next Land Renters' Meeting.⁷²

2.7 General Scheme of Drainage

In the following years, however, no reservoir of the recommended scale by the Watch Committee was built. It was thrown out at the Land Renters' Meeting, thus the laying of drains continued.⁷³ E. H. Oliver was made the new Municipal Engineer, overseeing more egg-shaped brick drains being built on the west as the Settlement extended while some old ones being dug out and replaced. In their place would be the earthen drain pipes. The conditions were particularly bad for drains built by the native in the Chinese village in the north of the Settlement. The Municipal Council was informed that the present Chinese drains had neither brick nor stone bottoms; it was simply earth, and to utilize these drains would be equal in cost to making new drains. Not only that they could not be integrated into the system under construction, but to remove the accumulated filth from them by manual labor was costing the ratepayers two Taels for each ten feet. It was suggested that it would be better to obtain earthen drain pipes and placed them in the present beds.⁷⁴ The Council made several attempts of acquiring such articles from local manufacturers, but did not have any luck. After the Watch Committee stated that the there

⁷² Ibid.

⁷³ "Municipal Council: Report of the Public Works' Committee. Report by Municipal Engineer", *The North-China Herald*, Oct 04, 1870: 261.

⁷⁴ Shanghai Municipal Archive, *Minutes of SMC*, Vol. 4, 113.

was no prospect of obtaining such supply from the neighborhood of Nanjing, the Council was suggested to order the pipes from Hong Kong or England. Finding those received from Hong Kong were inferior, the Council moved on to order a supply of drain pipes from England under a limit of Tls. 2,000. Meanwhile, one of the Council members offered to explore the possibility of making these pipes near the Poyang Lake, the lake close to another British Settlement in the middle Yangtze where many pottery workshops sat around.⁷⁵

Eventually, the order of these articles was placed, and the tender went to a company located at Blaydon Burn near the Tyne River at northeast England – Joseph Cowen & Co., one of the largest brickyard in the world known for its excellent quality. The pipes occupied was as large as 20 Keels of Coal, and they took months to make.⁷⁶ Meanwhile, the Council in Shanghai passed a new regulation – Bye-Law XIV annexed to the Land Regulation, which required water spouts to be affixed to every house or building in, adjoining, or near to any street.⁷⁷

While the earthen pipes were in the making, the ratepayers was worrying about the bottomless cost of the drainage system. The budget of 1871 appropriated Tls. 18,400 for drainage items. It was considered highly necessary by some ratepayers that before going further, a plan should be submitted, and schedule of works be executed and proposed, published. E. H. Oliver, however, was not able to provide them with the scheme of drains. He promised to do so in October, 1870, but failed ‘owing to the want of some information’.

⁷⁵ Shanghai Municipal Archive, *Minutes of SMC*, Vol. 3, 502-503.

⁷⁶ Keel was the shipping unit used in northeast England. In weight, a keel of coal equals 21.5 metric ton of good, making the pipes over 430 ton in weight. Shanghai Municipal Archive, *Minutes of SMC*, Vol.4, 167.

⁷⁷ Shanghai Municipal Archive, *Minutes of SMC*, Vol. 4, 121

By this point, Tls. 55,000 had been wasted before John Clark came, Tls. 6909.15 spent in the Municipal year of 1867-68, Tls. 8213.85 in 1868-1869, and Tls. 20,606.31 in 1869-70. The ratepayers generally felt that before paying more, they should be able to see a furnished schedule. One ratepayer, displeased to see the large part of the debt that they were now paying off was incurred through drainage works, questioned the Municipal Engineer's devotion and qualification in this project. He suggested that in the present system, the resident Engineer followed out a plan not his own, and for the success of which he would not feel responsible. Was it not, too, this system which required an engine to be provided last year, to pump up water for the flushing of a portion of the drains? Since it was so difficult a matter to determine, it would have been wise to have spent some money in getting the advice of several men of experience, with reference, particularly, to the nature of the soil here. Another ratepayer claimed that the drains of the Sichuan Road in front of his property was working fine until being disturbed by the current work, which only added to the doubts about how the construction was carried out. The Chairman then asked for a show of hands for the resolution – that the Council (incoming) be requested to pledge themselves that no general scheme of drainage be further proceeded with, until full plans and schedules thereof be complete, and exhibited in the Council Room for a period of no less than 14 days, which shall be duly notified by advertisement so as to enable objectors to call a special meeting to discuss it if necessary. By a margin of sixteen to eight, the resolution was carried.⁷⁸

The report from the Municipal Engineer was published shortly after the meeting. E. H. Oliver expressed his frustration owing to the repeated changes of plans dictated by

⁷⁸ "Public Meeting: Rate-Payers' Meeting", *The North-China Herald*, May 28, 1870: 377.

the ratepayers and land renters in the past few years. He lamented the abandonment of reservoir on the basis of cost, and then, to avoid as much as possible the necessity of flushing, recommended the sewers to be made of longer size, thus necessitating a larger expenditure than he estimated in earlier report. He now estimated the cost of completing the present system of drains to be at least Tls. 54,600, which included completing main drains of Hubei and Sichuan Roads, as per budget, Tls. 15,000, drain-pipes and brick drains for all the main roads running East and West, not at present drained, about 2,640 chang, Tls. 39,600. Oliver suggested that before any additional drainage east and west is commenced, it was very important that the gradients of the main sewers should be made as accurate as possible. In answering skepticism rose from the previous meeting, Oliver was full of confidence: "I am glad to report that the relaid sewers have, up to the present time, answered extremely well, and I think will still further be improved if the Council carry out the bye-law (XIV) new regulations, making it compulsory to provide guttering along house eaves abutting on public thoroughfares, having down-pipes connected with the sewers."⁷⁹

⁷⁹ "Municipal Council: Report of the Public Works' Committee. Report by Municipal Engineer", *The North-China Herald*, Oct 04, 1870: 261.

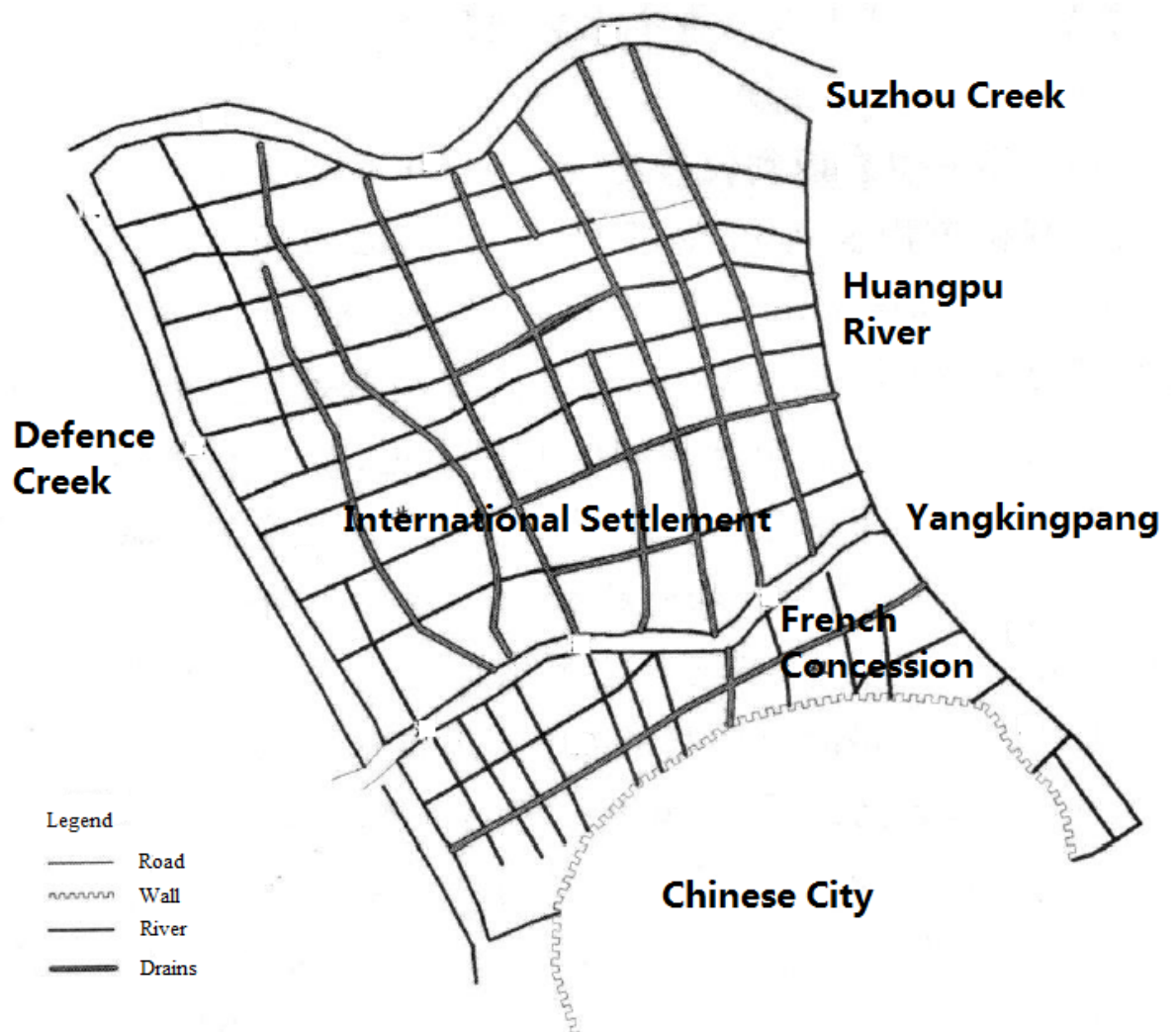


Figure 2 – Drainage Scheme in Shanghai by the 1870s. Source: Mou Zhen-yu, “The Management of the Water Environment in Shanghai Foreign Concession at the Early Period”, *Historical Research in Anhui* (Anhui Shi Xue), No. 2, 2010: 11-17.

2.8 Drains for Chinese Properties

With Oliver’s report reassuring ratepayers on the progress, the Municipal Council was empowered to advance the project with bolder moves. Starting from early 1871, the Council set out to fill in the so-called drains in some of the Chinese streets, which due to

their shabby design had become virtual cesspools.⁸⁰ But the sentiment was not shared by all land renters, particularly by those whose properties were effected under the ongoing construction. Their complaints continued. They argued that the Chinese drains might be very bad, but still they had a certain effect, and took off the water. After the Council's adjustment, water was staying in some of the houses from the back street. The Council had filled up the old drains without putting in new, and all the superfluous water from the surface of the road now ran under the houses, and remained there in a pestiferous state. What the Council needed to do was to leave the drainage as it was, merely to take off the surface ditches. But they had now succeeded in flooding large portions of land which before were drained.⁸¹ Later that year, the Oliver had to agree to leave the private drains alone in the Chinese quarters. As unpleasant as they were, there was not yet municipal drains to replace them.⁸²

The technical setback at the Chinese quarter did not stop the Municipal Council from attempting to assert more authority into the business of drainage. In August 1873, the Watch Committee suggested that Bye-Law VIII, attached to the Land Regulations, should be acted upon with a view to maintaining a sound sanitary condition in the Settlement, and to preventing as far as possible the overcrowding of Chinese houses. The Bye-Law in question states:

“...it shall not be lawful to erect any house within such limits, or to rebuild any house in the Settlement, until a drain or drains be constructed of such size and materials, and at such level, and with such fall as upon the report of the Surveyor, made to the Council, shall appear to be necessary and sufficient for the proper and effective drainage of the same and its

⁸⁰ “Summary of News”, *The North-China Herald*, Feb 08, 1871: 83.

⁸¹ “Public Meetings: Rate-payers’ Meeting”, *The North-China Herald*, May 12, 1871: 338.

⁸² “Municipal”, *The North-China Herald*, Sep 13, 1873: 213.

appurtenances; such report to be made within fourteen days after notice is given to the said surveyor of the proposed erection or re-building.”⁸³

In the recent execution of such regulation, however, the Watch Committee realized that many parts of this law, despite the good intentions, remained impracticable. For example, the Bye-Law did not state who was to give the notice of erection of new buildings to the Surveyor, nor did it define any penalty for not giving such notice by property owners themselves. It was unclear whether this duty of reporting fell upon the Police, who had by far never exercised their power in such manner. It also appears unreasonable to expect that owners of property would allow their land to be vacant and to be unprofitable until the Municipality had afforded them the means of drainage. The property holders would either to go to a great deal of expense in connecting with Municipal sewers not within one hundred feet of the property, or they drained into a cesspool.⁸⁴ Finally, regarding the Chinese quarter, the order that people intending to build Chinese houses within the Settlement shall communicate with the Engineer, was a good one; though it would be frequently inoperative. In the back quarters of the Settlement, where the building of new Chinese houses was most likely to occur, there were no municipal drains to connect with. The bye-law became a dead letter.⁸⁵

Given the inoperable nature of the newly introduced Bye-law VIII, the sanitary condition of Chinese quarter grew alarming to the medical men in Shanghai. In May 1874, a letter signed by nine physicians was presented at the Council’s meeting:

“We have come to the conclusion, after careful observation, that as long as natives are permitted to congregate in badly built houses crowded together

⁸³ John G. Purdon and John Wilson, “Public Meeting: Municipal Council”, *The North-China Herald*, Aug 30, 1873: 179.

⁸⁴ Ibid.

⁸⁵ “Municipal”, *The North-China Herald*, Sep 13, 1873: 213.

on low-lying and undrained land, it will be impossible to maintained in Shanghai those conditions which are essential to health, or to control the ravages of epidemic disease should it arise. We consider it our duty to remind the community that an epidemic, as for example of cholera, might at any time present itself, while there is a continual risk of smallpox and other diseases which we know to be constantly prevalent, breaking out with unusual violence.”⁸⁶

The medical men pressed on the Council the necessity of limiting the number of houses to be built on an assigned space, prescribing the minimum width of the streets to be constructed in newly erected quarters, settling a standard of construction with regard to sanitary needs, beneath which standard no house should be erected, and finally insisting upon the elevation and drainage of every plot of land prior to the beginning of building operations. In order to be able to act on these regulations, a raise in taxes on Chinese properties was proposed – the general municipal rate on rentals of native houses situated in the English Settlement, east of Henan Road, shall be 10 percent, instead of 8 percent, chargeable on native houses in the native quarters, to pay for the additional police supervision and sanitary inspection.⁸⁷

This suggestion was seriously debated at the following Municipal Council meeting in May 1874. One of the directors, Thomas W. Kingsmill, said that a somewhat similar resolution was brought before London three hundred years ago. The Act, as all others passed in defiance of the principles of political economy, proved ineffective. Kingsmill suggested that the foreign settlements at Shanghai at the present day were in a position similar to old London. Raising taxes hurt prosperity, and Shanghai was all about trade. Kingsmill said, “We had not come to Shanghai to reside in pleasant places; none of us

⁸⁶ “Public Meetings: Annual Meeting of Ratepayers”, *The North-China Herald*, May 23, 1874: 452.

⁸⁷ Ibid.

looked upon it as a paradise or likely to become one, but what we required were facilities for trade, and this was best left to the natural course of events.” The Chairman of the Council, Seward, suggested that the amendment could not become operative without the consent of the Chinese authorities. The Consuls would have to go to the Daotai and ask his assent, who most certainly would refuse. In face of such a refusal, nothing could be done. Director E. M. Smith said that with proper regulations, and proper supervision by inspectors of nuisances and so on, the Settlements could be kept in such a state that no one could find anything to grumble at. More money and energy should be applied to the Mixed Court and its co-operation in making Chinese conform to the regulations. If four or five cases were thus taken before the Mixed Court, in a very short space of time the Settlement would be changed. In the end, although many shared the sanitary concerns, the resolution on raising taxes on Chinese properties was postponed.⁸⁸

2.9 Death of E. H. Oliver

The attempted tax for sanitation did not succeed. Nevertheless, the fact that the Municipal Council began considering such measures marked the outstanding progress from two decades ago. Back then, the Council did not have any effective authorities over property owners. Drains had to be built by property owners themselves. Municipal drains were so problematic that the trust was shaky in the authorities and in the engineer. By the 1870s, the Municipal Council had gained substantial experience in governance and had to a great extent improved its image in public. This certainly could not be done without the help of the Municipal Engineer.

⁸⁸ Ibid.

In the next two years, E. H. Oliver went on with the general drainage scheme, overseeing all ongoing construction on the west side of the British Settlement. He worked laboriously and never let go a chance to inspect the arising challenges. In December 1875, Oliver was accompanied by two directors of the Council during his inspection of a new line of drains arranged to prevent the encroachment of the Suzhou Creek on the north.⁸⁹ This appeared to be the last occasion when he was fulfilling his duty as Municipal Engineer. He died suddenly on the morning of January 16, 1876, at the age of thirty-six.⁹⁰ The post of Municipal Engineer was not one which gave scope for a brilliant display of talent. The thorniest matters Oliver dealt with laid beneath the roads, yet his other achievements were even less known: Oliver was credited as designer of the Seamen's Church in Shanghai, a neat small church of 200 people with gothic windows of colored glass; he was also known for his instructions on architecture and engineering amidst the building of the Chinese Hospital in Shanghai.⁹¹ During his ten-year tenure working for the British Settlement, Oliver did not join clubs of any kind in Shanghai, which was unusual for foreigners in Shanghai, nevertheless reasonable considering his young age. To this day, no image of his could be found. The cause of his unexpected death remained a mystery.

The idea of public health surely had changed during Oliver's tenure. When he first started out the Municipal Surveyor in March 1866, the Municipal Council possessed no resource to facilitate his job apart from the salary. He had to rent a horse and dogcart, \$5 a day, at the generosity one of the board members. Oliver broke the shafts in an accident,

⁸⁹ "Public Meetings: Municipal Council for the Settlements North of the Yang-king-pang", *The North-China Herald*, Dec 09, 1875: 578.

⁹⁰ "Deaths", *The North-China Herald*, Jan 20, 1876: 45.

⁹¹ "The Seamen's Church", *The North-China Herald*, Aug 31, 1867: 227; "Public Meetings: The Chinese Hospital", *The North-China Herald*, Apr 12, 1870: 259.

tried repair the injured vehicle, but it broke again while being used by another gentleman. Oliver was accused in court of negligence because the shafts he replaced the original ones with were worthless. The Council had to step up to pay the \$78 claimed by the defendant.⁹² Ten years later, the Council was contemplating the idea of levying higher taxes for the purpose of proper drainage and sanitation, which was a testimony to the changing role the Municipal Council and how the expansion of infrastructure like imported earthen drain pipes, with ratepayers' financial interest involved, made the idea of public health a common cause.

2.10 Conclusion: Expertise

When the British came to Shanghai in the middle nineteenth century, they did not harbor any re-determined vision that resembled the ideology of modernity. The first mission was to survive the alien climate and pestiferous land. The idea of building a “Model Settlement” surfaced from a most trivial matter, yet it was used immediately to instigate infrastructural building in Shanghai.

The Municipal Council in the 1850s had little power. Property owners were arranging their houses and drains their own way. While having a scheme acquired from Britain, the Council did not have the authority to even enforce proper connection to the mains. This was a time when the Chinese houses had the better drains. These drains were made for the flat, rivery land of Shanghai and was able to carry away the impurity with the help of tides.

⁹² “Summary Jurisdiction Court”, *The North-China Herald*, Jan 26, 1867: 15.

The appointment of Municipal Engineers John Clark and E. H. Oliver helped create the scheme of arterial system. But drains continued to be built upon the inconsistent manner due to insufficient municipal fund. Their flaws began to show in the 1860s when lack of gradient and accumulation of filth began to concern medical men in Shanghai. Oliver proposed a reservoir for the purpose of scouring the drains with plenty of water. The scheme was suspended due to unfavorable finance, but later evolved into one of the underpinnings for the conceptualization of a permanent waterworks.

The period covered in this chapter marked an important transformation in hydraulic modernity. For about two decades, the British in Shanghai had been constructing drains based on none other than commons sense. Drains were believed to be structurally simple and straight-forward enough to be built by lay person. This turned out to be a serious mistake. Any kind of civil engineering required expertise. The Chinese were able to thrive on the seemingly impossible land because over time they had harnessed forces of nature and adapted to the uneasy geography of Shanghai. To survive on a land to which they were far less embedded, the British needed more than common sense to create anything of large scale. The fact that the Municipal Council began recruiting specialist from overseas showed that the city had entered a stage of development where expertise was needed before a system of engineering works could be conceived. Anthony Giddens points out that respect for technical knowledge usually exists in conjunction with a pragmatic attitude towards abstract systems. People made “bargain with modernity”, the nature of which was governed by specific admixtures of deference and skepticism, comfort and fear.⁹³ In the story of drainage building in Shanghai, the respect to technical specialism among foreigners in

⁹³ Giddens, 90.

Shanghai was not a creation of spill-over of science because by the mid-nineteenth century, the primary education, even in Britain, was far from being institutionalized to generate the impact needed. The British did not come to the East with unshakable faith in technical expertise. It was learned through trial and error in their own practices and was inspired by the primitive, yet useful, infrastructures of the Chinese.

The lesson the British learned from building a drainage system was that expertise was the first and foremost element in the creation of modernity. This progression seemed irreversible. Despite the untimely demise of E. H. Oliver, the general scheme of drainage continued. Within a month of Oliver's death, the Municipal Council sought out to Charles Hawksley, a far better recognized hydraulic engineer based in England, who approved of Oliver's early plans.⁹⁴ The position of Municipal Engineer would remain vacant for some twenty years, during which the engineering of drainage and water supply for the city of Shanghai would be led by a private venture, the Shanghai Waterworks Company.

⁹⁴ "Reviews", *The North-China Herald*, Feb 24, 1876: 163.

CHAPTER 3. WATERWORKS

Calls for waterworks in Shanghai first popped up in the 1860s. The mood was best showcased in a report in 1864, in which the Chinese were believed to be different in their ways of consuming water because they have existed for so many centuries without good water: “They that use filthy, standing, ill-colored, thick, muddy water, must needs have muddy, ill colored, impure and infirm bodies. And because the body works upon the mind, they shall have grosser understandings, dull, foggy, melancholy spirits, and be really subject to all manner of infirmities”. But the same could not be applied to foreigners. It was necessary to erect a waterworks just for the sake of foreign residents.⁹⁵

At the 14th regular meeting of the north-China branch of the Royal Asiatic Society in 1864, a paper titled “The Water We Drink in Shanghai” was presented by its author, Robson Lamprey, a physician who served the garrison in Shanghai. Lamprey said that in the water of Shanghai at least two kinds of impurities were easily found. First was “Nitrate of Lime”, derived from sewers and surface drainage. This material in small quantity was able to give good water unpleasant taste noticed in the river water. Second was alluvia matter, which gave water its muddy character. The Huangpu River contained from 20 to 25 grains per gallon of such matter suspended in it. Lamprey suggested that the Chinese had developed their own methods of water consumption to prevent transmission of disease. They boiled water before using. For foreigners in Shanghai, Lamprey recommended the filtering process, during which river or lake water ran through animal charcoal, reducing the level of impurity and particularly the risk of fever, dysentery and cholera. He also

⁹⁵ “Retrospect of the year”, *The North-China Herald*, Jan 09, 1864: 6.

recommended collecting rain water in Shanghai. Once properly collected, filtered, preserved in jars, and filtered again before use, it would be far better than lake or river water.⁹⁶

Overall, Shanghai in 1860s was a dangerous place to live in. An extensive report in 1869 written by physician R. Alex Jamieson shed light on the unfriendly environment. The “elements of disease and death” lurked in the air in the water. Fierce heat of the summer sun and the sudden and unexpected changes of temperature made people sick. While some agronomists might find recycling human-generated waste as fertilizer valuable, Jamieson accused the suburb of Shanghai of being “reeking fields covered from time to time with human excreta.” He pointed a series of chief causes of sickness: contagion, deficient water supply, including impurity in the supply, defective drainage, malarious air from the wet ground, overcrowding and defective ventilation, and prolonged retention of the dead before burial. Correcting them was Municipal Council’s duty and was right within its authority. He brought up the concept of “Public Medicine,” or “State Medicine” and wrote: “I have little doubt that the time will shortly arrive when the growing extent and importance of the settlements will induce the public to appoint a properly qualified health officer”⁹⁷

This prediction came true. Visible change already took place when Edward Henderson, a British-trained medical man, was appointed the Municipal Surgeon. An Englishman born in 1840, Henderson received medical training at Edinburgh Academy and University and obtained his degree of M. D. Ed. in 1864. He came to Shanghai four years

⁹⁶ “Royal Asiatic Society”, *The North-China Herald*, July 15, 1865: 111.

⁹⁷ R. Alex Jamieson, “Memo. on the Sanitary Condition of the Yang-King-Pang and Hongque Settlements at Shanghai”, *The North-China Herald*, Mar 22, 1870: 208.

later at the age of twenty-eight in hope of a decent job. Upon his arrival, he joined the medical firm founded by a Shanghai-based physician and became a partner of his. Henderson soon became an extremely popular figure among foreigners in Shanghai.⁹⁸ Although he was not yet given the title Municipal Health Officer, Henderson could often be seen attending the Council's meeting when the directors were in need of consultation on medicine. His job as Municipal Surgeon required him to offer medical services to the members of the Municipal Council and troops inside the Settlement. But he was also in charge of the inspection of nuisances and drainage, and the sanitary condition of public buildings. Bearing duties of both Surgeon and Health Officer, Henderson was only paid for the former. In 1870, the Council added a grant of Tls. 500 under the Sanitary Department of the budget as a reward to his service, making Health Officer, for the first time, paid staff of the Municipal Council.⁹⁹

Henderson played a critical role in the establishment of water supply in Shanghai. Kerrie MacPherson argues that he and other physicians in Shanghai and China pioneered the campaign for a pure water supply.¹⁰⁰ But the waterworks in Shanghai was more than just bringing potable water to urbanites for better health. When the scheme of waterworks was under discussion in 1869, it was expected to take on at least three tasks – to flush the drains so that no filth could stay, to quench the thirst of a growing foreign population, and to contain the ravaging fire problem inside the settlement and beyond. As this chapter will reveal, fire incidents might have played a bigger role in the creation of water supply.

⁹⁸ "Obituary: Dr. E. Henderson", *The North-China Herald*, Mar 08, 1913: 682.

⁹⁹ "Public Meeting: Rate-Payers' Meeting", *The North-China Herald*, May 28, 1870: 377.

¹⁰⁰ MacPherson (1987), 84-85.

3.1 British's Shanghai Fire Brigade

On January 31, 1853, a fire took place in a principal street of the walled Chinese city of Shanghai at night. Forty houses were destroyed. This was the earliest record of major fire incident in Shanghai since the advent of *The North-China Herald*. Following the tragic loss of lives and property, one well-traveled Chinese living in Shanghai appealed to the foreigners for help. In his letter to the editors of *The Herald*, the native named “Indigena” suggested that although China had its own fire engines, aka ‘water-dragons’, they were of little or no service during a conflagration. He said that during his recent stay in England, he had the opportunity of seeing some of the fire-engines there used, the structure and working of which exceeded all praise. He suggested that foreigners who were noble-minded and generous-hearted might set up an establishment in Shanghai, with station house, English fire-engines, and brigade. He was hoping that the Chinese officials would be provoked to follow the example and be a little more prompt and liberal in providing means and measures for the benefit of their own people.¹⁰¹

During the late nineteenth century, Shanghai had seen the creation of a handful of prototype Chinese fire brigades. These brigades were often subdivision of a charity group, the self-organizing force within the community headed by prominent local merchants. In case of fire, these brigades would strike the gong loudly, gather the crowd, and lead them to the scene to help with the fire.¹⁰² For the foreigners in Shanghai, the misfortune of the native were not their primary concern. The Shanghai Municipal Council did not authorize the purchase of a powerful fire engine for use in the foreign settlement until early 1864

¹⁰¹ “Letter to the Editor 2 - No Title”, *The North-China Herald*, Feb 05, 1853: 107.

¹⁰² Shanghai shi gongan shi zhi bianzuan weiyuanhui.

when their own settlement started to suffer from fire-induced property loss. It was also suggested that a regularly organized fire brigade be formed. With clothes adapted to enable them to penetrate and the axes and saws that could tear down buildings and limit the flame, they were expected to do a better job than their part-time predecessors, the policemen.¹⁰³ But the Council was unable to find enough people to make of a separate unit. It was then decided that these men of the fire brigade would perform constable duty until the occasion of a fire occurred.¹⁰⁴

A fire breaking out in the Maloo in June 1865 caused great loss of property. The number of foreign police available for fire, sixty of them, were too few to take charge of the fire engines. Superintendent of Police suggested a Volunteer Fire Brigade be established. At the breaking out of a fire, the members of the Volunteer Fire Brigade would be called by the police as far as practicable, and the Brigade would be the only one to direct the pulling down of houses with the necessary ropes, hooks, axes and such to arrest the progress of the fire.¹⁰⁵ But the Council could not even pay for the cost of such establishment. The directors intended to leave the matter of expense in the hands of the insurance companies, who would certainly benefit from the creation of such group. In the end of 1865, the Watch Committee was in contact with a host of insurance offices for the purpose of organizing a Fire Brigade and was expected to lay before the community a scheme for that purpose.¹⁰⁶

¹⁰³ "Daily 13th February", *The North-China Herald*, Feb 13, 1864: 26.

¹⁰⁴ "Municipal Report: Engineer's Department", *The North-China Herald*, Apr 09, 1864: 58.

¹⁰⁵ C. Penfold, "Copy of Report of the Superintendent of Police, alluded to in the Report of the Watch Committee", *The North-China Herald*, June 17, 1865: 94; "Summary of the Week", *The North-China Herald*, June 17, 1865: 94.

¹⁰⁶ "Watch: Municipal Notification", *The North-China Herald*, Dec 23, 1865: 244.

Shanghai's first Hook and Ladder Company, was formed in the summer of 1866. The foreman of the Company, a former foreman of a fire brigade at New York, would be leading the thirty-one men registered under the Fire Department at the Municipal Council. The Company would be called the "Fire flies"; on assembling, the word of command would be "Hook it," to which all present would reply "Axe." The younger members of the corps were called lads, and the rest ladders. The major task of this Brigade was not putting out the fire, but to arrive at the scene promptly upon hearing the alarm and tear down buildings with the six axes, six hooks and ladders, and a truck with ponies that were assigned to them. Their duty was partly recorded in the general advice for fire safety at the time:

Don't man the pumps, it's awful work my dear
And here you get no shillings and no beer
But while such arduous toil as this you shirk
Carry an axe, it always looks like work
If skippers aren't before you, take the hose
And don't the least mind other people's clothes
Don't try to put it out, the place is slow
And fires are some excitement as you know¹⁰⁷

The French Municipal Council at the time was open to admit the British Fire Brigade, allowing operation within the limits of their Concession, but the Chinese authority seemed uninterested in such arrangement. The Company could not do duty there unless specially requested.¹⁰⁸

By October 1866, upon the arrival of the two fire engines ordered earlier by the Municipal Council, the Fire Brigade finally came into its full formation. It consisted of eighty members. The Hook and Ladder Company that came months before also became a

¹⁰⁷ "Shanghai Fire Brigade", *The North-China Herald*, June 30, 1866: 104; Shanghai Fire Brigade, *The North-China Herald*, July 07, 1866: 108.

¹⁰⁸ "Shanghai Fire Brigade", *The North-China Herald*, July 14, 1866: 111.

part of it. The Council purchased the engines from Augustine Heard and Oc., the biggest American trading company in China, and was about to receive additional supply of hose, leather and web from the United States. The Engine stationed in the British Settlement had been named “Shanghai No. 1” by the residents of this settlement, and the other “Shanghai No. 2” in the former American Settlement (northeast part of the International Settlement). On the alarm of an outbreak of fire being given, the Police on duty would summon as many members of the Fire Brigade. They would ring the bell in the church compound, continue to attend at fires, and act jointly with the Fire Brigade.¹⁰⁹

3.2 Shanghai’s Fire Problem

Shanghai’s unique geography kept haunting the city. Although surrounded by rivers and creeks, the residents often found these waterways running dry or shallow when the tide was low, leaving the fire engines with little water to pump. In an earlier scheme, the superintendent of police once recommended that one of the Engines be placed on a boat and kept afloat so that it would be able to provide a stream up to two thousand feet long in any direction.¹¹⁰ In the end, the Municipal Council decided to build “firewells” across the Settlement where water for emergency was stored. According to this scheme, all major junctions within the British Settlement, where most valuable properties were located, would be fashioned with enough water in case of fire.¹¹¹

¹⁰⁹ “Municipal Council”, *The North-China Herald*, Oct 06, 1866: 160.

¹¹⁰ C. Penfold, “Copy of Report of the Superintendent of Police, alluded to in the Report of the Watch Committee”, *The North-China Herald*, June 17, 1865: 94.

¹¹¹ Most firewells were located in the Central District of the International Settlement. They were situated as follows: Junction of Fuzhou and Henan Roads, Fuzhou and Jiangxi Roads, Fuzhou and Sichuan Roads, Jiujiang and Sichuan Roads, Peking Sichuan Roads, Jiangxi and Nanjing Roads, Henan and Nanjing Roads, Shanxi and Nanjing Roads, Fujian and Nanjing Roads. See “Municipal Council: Council Room Secretary to the Municipal Council Shanghai Rules”, *The North-China Herald*, Oct 06, 1866: 160.

The newly formed Fire Brigade soon proved its worth. On the evening of January 10, 1867, between 9 and 10 p.m., a fire broke out in the block of houses to the west of Fujian Road, bordering the Yangkingpang. Both the engines and many members of the Hook and Ladder Company were quickly on the spot. Although at one time it seemed likely that the whole block of buildings between the Hubei and Fujian Roads must have gone, the fire got under control after consuming merely one section of the block.¹¹² In November, another large fire broke out in a godown at Tung-ka-doo, a southeast port of the Chinese settlement. Because the building was used as a storage of oil, the stockpile continued to fuel the flame. The godown next to the building on fire also contained large amount of oil. Six Chinese fire engines were employed, directing their tiny streams at once. The British Fire Brigade joined in later and eventually put out the fire the next evening. The losses experienced by the Chinese merchants were heavy, but the Daotai acknowledged the services of the Fire Brigade by a letter: “His Excellency the Daotai wishes to express his sense of the valuable exertions of the Fire Brigade at the great fire at Tung-ka-doo. He considers that their efforts were displayed in such a manner as to knit faster the bonds of international amity.” As a token of gratitude, the Qing official sent a present of four sheep and two boxes of wine to the Brigade.¹¹³

The scheme of firewells was faced with technical obstacles. Municipal Engineer E. H. Oliver designed them in a way that when the tide flowed into the drains, the firewells, connected to the main drains, would also be filled with water. However, these wells could not be filled properly in that only at two seasons in the year the tide were of sufficient

¹¹² “Summary of the Week”, *The North-China Herald*, Jan 12, 1867: 6.

¹¹³ “Summary of News”, *The North-China Herald*, Nov 23, 1867: 368.

height to go through the drains. This idea had to be abandoned. Oliver then proposed to the Council two possible plans and the Council picked up the following one: to form in different parts of the Settlement seven reservoirs, each capable of containing eighteen hours supply of water for one fire engine's continuous pumping. Some could be open reservoir and underground hardwood reservoirs to save cost, but at least four needed to be of brick, with a timber covering occupying the sites rented for the purpose. The total cost would be around Tls. 7,950. Comparing to the second scheme of a central reservoir, of which the estimated cost was Tls. 9,370, the first scheme was obviously more cost-effective.¹¹⁴

By 1870, the Shanghai Fire Brigade had developed to a group comprising 150 men. During a torch-light parade of the Brigade in the summer of 1870, the 150 foreign men were asked whether they would be willing to join the Shanghai Volunteer Corps, to which they gave a unanimous shout of assent.¹¹⁵ Meanwhile, in the Chinese settlement in the south, manpower was spent on something else. When, for example, a summer fire in 1870 burned down a large portion of Chinese buildings at the junction of the Canton and Fujian Roads, a shed was erected at the site of the incident. For several days Taoist priests had been performing religious services to the God of fire, with a view to aver similar calamities in the future. Several private families also have been holding special services for the same purpose – to propitiate the deity who was supposed to have control of fire.¹¹⁶

The International Settlement, however, was not since immune to tragic accidents. The year 1870 was marked by one fire after another. At some point, three fires occurred

¹¹⁴ "Municipal Report", *The North-China Herald*, Feb 19, 1868: 79.

¹¹⁵ "Summary of News", *The North-China Herald*, July 07, 1870: 2; "The S. V. C.", *The North-China Herald*, June 30, 1870: 478.

¹¹⁶ "Miscellaneous", *The North-China Herald*, June 16, 1870: 449.

within the matter of a week – three Chinese hongts were burned down in Fuzhou Road, six houses were burned down at the junction of the Canton and Fujian Roads, and another near the French Cathedral, by which some 150 houses were destroyed.¹¹⁷ Some of the most important buildings in the Settlement were also affected, including the British Consulate at the Bund. About midnight on the night before the Christmas Eve, 1870, the night watchman observed smoke issuing from the roof over the southeast corner of the British Consulate. The fire was caused by cinders carelessly raked from the grate of the room dropping on the supports of the floor. Half an hour after the first alarm, the room was shrouded in the accumulations of smoke. The gentlemen in the various departments of the Consulate who were on the spot hastened to secure property and papers that were deemed valuable, which included numerous important registers. Soon the smoke permeated the whole building. The staircase was burning. People had to escape from the verandah by a ladder. The Shanghai Fire Brigade were more tardy than usual in coming up. The companies did not arrive till the whole building was in a blaze. The fire engine, Shanghai No. 1 could not bring a stream on the fire. By 3:30 a.m. the fire had done its worst, burning down the roof of the Consulate with loud crashes.¹¹⁸

After the destruction of the British Consulate, the Municipal Council became more interested in securing a stable water supply. The Shanghai Steam Navigation Company (S. S. N. Co.) imported from Yarrow and Hedley of London a steam river launch in 1872. During the trial trip round the harbor, the Fire Brigade was capable of throwing two streams

¹¹⁷ “Summary of News”, *The North-China Herald*, May 28, 1870: 372.

¹¹⁸ “The Burning of the British Consulate”, *The North-China Herald*, Dec 28, 1870: 462.

of water about 200 feet vertically.¹¹⁹ But in the inner part of the Settlement, foreigners had to depend on the firewells.

3.3 Firewell and Its Problems

The poor condition of the firewells were not unheard of. The first problem was its very limited capacity. When the Fire Brigade was in the course of extinguishing the fire at the Lane Crawford Co's auction rooms and godowns in Jiangxi Road in February 1875, it occurred that the supply of water in the firewells were short, and that the water that was there was in a foul and dirty condition, containing much mud. The fire resulted in Tls. 50,000-60,000 worth of property loss. The Council believed that the speedy exhaustion of the water resulted from more than the usual number of engines stationed on the scene.¹²⁰

The second problem with firewells was that their locations were not always clear to every firefighter. On September 10, 1879, a fire incident claimed the life of four Chinese residents in the Settlement, making it one of the most tragic in the early history of the Settlement. At the beginning, a native policeman observed smoke issuing from the upper windows of a ship in the Guangxi Road. Flames then burst through the doors below. The policeman alarmed the neighborhood and ran to the nearest police station to dispatch the telegraphic news. The Fire Brigades were speedily on the spot, but then they ran into difficulties obtaining water. While the policemen were at the back of the premise busying obtaining water from a well, the fire engine was trying to obtain water from the pond in the adjacent compound of the Polytechnic Institution. Just when the firemen were about to

¹¹⁹ "Clippings", *The North-China Herald*, Feb 01, 1872: 93.

¹²⁰ "Miscellaneous: Destruction by Fire of Messrs. Lane Crawford and Co.'s Auction Rooms", *The North-China Herald*, Feb 18, 1875: 149.

make a hole through the bamboo fence for the hose, the watchman of the Institution told them there was now no well there or water to be had on the premises. Upon learning this, the foreman ordered the engine to be removed to the Defense Creek. The information provided by the watchman, however, was false, and by the time when the fire engine was relocated to a proper source of water, fifteen minutes had been wasted, during which the fire progressed greatly. The body of a man was found protruding from the debris of the shop in which the fire had originated. The removal of this led to the discovery of three other bodies, all within a few feet of each other. They were subsequently identified as poultry dealers, who at the time were sleeping in the room. When they rushed downstairs with a view to escape by the front door, they were overpowered by the smoke and flames.¹²¹

Yet the British authorities kept building firewells larger in size. By 1879, sixty-one firewells could be found within the limits of the International Settlement, of which the depth of water varied from 7.5 to 16.9 feet.¹²² Some of them were so large, like the one at the junction of the Fuzhou and Shanxi Roads, it comprised ten chambers and took months to build.¹²³ By the late 1870s, the Fire Brigade tested the India-rubber hose to accommodate to the growing horsepower of fire engines.¹²⁴ But despite the glamorous appearance of the Shanghai Fire Brigade, the premium for fire insurance had not been lowered materially since the creation of the Brigade. The ineffectiveness was indisputably clear.

3.4 Fire Premium Remained High

¹²¹ "Another Fire in the Settlement - Four Lives Lost", *The North-China Herald*, Sep 16, 1879: 272.

¹²² "Public Meetings: Municipal Council", *The North-China Herald*, Sep 16, 1879: 280.

¹²³ E. H. Oliver, "Municipal Council - Engineer's Report", *The North-China Herald*, Jan 23, 1873: 78; E. H. Oliver, R. I. Fearon, M. Coryell, "Municipal Council", *The North-China Herald*, Mar 27, 1873: 276.

¹²⁴ "Clippings", *The North-China Herald*, Dec 1, 1876: 551.

In 1868, two years after the Fire Brigade and the Hook and Ladder Company was formed, it was reported that rates of premium on fire policies were still strangely prohibitory. The primary source of the price hike was the Chinese houses, most of which were not only largely made of wood but poorly structured.¹²⁵ The situation remained such for another two years. From 1866 to 1870, at least 436 Chinese houses within the limits of the Settlement had been on fire against 13 foreign ones, meaning that the larger part of the expenditure on the Fire Department were used for the benefits of the Chinese living inside the Settlement. At the time, the Fire Department could only obtain at most Tls. 2,000 a year, which was not sufficient if the service was to be improved and expanded. Therefore, it was brought up at the Municipal Council's meeting that since the Chinese residents benefited disproportionately from the setup of the Fire Brigades, the Daotai should be the one who funded the organizations to their finest state, or helped erect iron tanks twenty or thirty feet from the ground, as was done in the French Concession, to give a strong head of water.¹²⁶ The proposal was certainly unrealistic considering that Chinese living inside the Settlement were by no means under the jurisdiction of the Chinese magistrate. The Municipal Council of the International Settlement in the end had to look inside the community to find additional source to make up for the growing expense resulted from a larger Fire Brigade and their better equipment.

The matter of who should bear the cost of fire prevention infrastructures had been under discussion numerous times. In 1867, months after the formation of the Shanghai Fire Brigade, it was pointed out at the Municipal Council's meeting that lack of water could be

¹²⁵ "Shanghai, January 31, 1868: imports", *The North-China Herald*, Jan 31, 1868: 47.

¹²⁶ "Public Meeting: Rate-Payers' Meeting", *The North-China Herald*, May 28, 1870: 377.

removed by the introduction of more firewells and the acquisition of steam fire engines, which could only be paid for when the revenues were satisfactory. The purchase of a steam-powered fire engine alone would require Tls. 2,000.¹²⁷ The total sum could be unfair to those who did not have any land or houses in Shanghai and whose tax paid to the Council would be employed for the protection of properties of others. The ideal situation, therefore, was believed to be that the sum would be covered by the contributions from the insurance companies at Shanghai. The chief engineer of the Fire Department, in addressing the money required for a new bell tower and other necessary means to fight fire, urged the insurance companies of Shanghai follow the example of companies in England by supporting the cause because it was to them that the cause of fire prevention was most valuable.¹²⁸ For the newsmen and the general public in Shanghai, it was only reasonable that the insurance companies ought to pay up the cost of improvement in fire control.¹²⁹

However, the insurance companies did not share this view. Their opinion on this matter was best illustrated by the 1875 exchange between the Shanghai Fire Brigade and the Royal Insurance Company at Shanghai. For years, the Fire Brigade had suggested to the Company the desirability of their making some contribution. The Company, however, did not consider such municipal expenditure fell within the scope of an insurance company's business. Seizing on the latest occurrence of fire at a Japanese office building in March 1875, the Brigade suggested that the service they provided that had prevented the

¹²⁷ Land Renters' Meeting, *The North-China Herald*, May 6, 1867: 48.

¹²⁸ Miscellaneous, *The North-China Herald*, Mar 1, 1870: 152.

¹²⁹ Summary of News, *The North-China Herald*, 22 Mar 1870: 199.

spread of fire and serious loss of insurance companies like the Royal and should receive more recognition. To this, the manager of the Royal Insurance Company replied:

“We note with pleasure that the Fire Brigade rendered very efficient service at this fire, and we shall, of course, be glad to contribute our quota of the expenses of the Brigade turning out and extinguishing the same. The usual method of apportioning these expenses is to divide the amount pro rata over the insurances covering property endangered by the fire, and the value of the uninsured property also in risk of the fire. Any further general support to the Fire Brigade, it is out of our power to render, because, as we have previously advised you, the English companies have very determinedly set their faces against any such payments, as they consider donations or contributions of this kind do not fall within the scope of an Insurance Company’s business. We could not, consistently with our tariff obligations, act singly in the matter.”¹³⁰

What could be inferred from the statement was that a large portion of Chinese buildings, facing higher risk of fire, yet uninsured, should not be of the Company’s concern. The fact that insurance companies like the Royal were willing to offer limited contribution to the Fire Department could be interpreted as a demonstration of the limitation of private enterprises’ interest in municipal and public matters because they were after all profit-driven, not responsible for the greater good of the entire community; however, in all fairness the situation at Shanghai did pose a challenge for companies of such kind. Given that Chinese residence took up the majority of incidents of fire, and given their relatively low financial standing, unwillingness to insure their properties, and problematic structure and material of their buildings, it would make little economic sense if insurance companies paid for the expenditure of the entire Fire Department.

Therefore, the solution to the fire problem in Shanghai laid beyond the scope of a self-sufficient virtuous cycle that involved property owners, insurance companies, and

¹³⁰ Public Meetings: Council Meeting, *The North-China Herald*, 18 Sep 1875: 282.

municipal authority. To rid of the easily bottled-up firewells, Shanghai needed a network of water under pressure that traveled through every point of commercial interest in the Settlement. “When are we going to have anything done about waterworks?” asked one contributor of *The North-China Herald* as early as in 1871, “Successive Councils have introduced the subject, shied at it and passed it on to their successors, who are really hand it over with equal delicacy to their successors.”¹³¹ It looked that with defective drainage and uncontrolled fire, the need of building a system of water supply finally became pressing.

3.5 Finding the Right Scheme

It had become imperative by the middle of the 1870s that Shanghai needed a waterworks. For more than half a decade, a project for this purpose was consistently obstructed due to its exorbitant cost. The issue of waterworks was first brought up in a Council’s meeting in 1869 when a director named Yates proposed the Council to authorize the construction of the works in accordance with the plan given by E. H. Oliver. Yates suggested that provided the cost did not exceed Tls. 65,000, the Council should be able to obtain the required amount by issuing debentures with rate of interest and time of payment that the Council found expedient. This motion stirred up waves of opposition among other directors. Some argued that the Council could not spare such amount on account of its current revenue. Even when the waterworks was built with loans, the water rate generated through subscription might only be able to pay for the interest, but not the capital. Others

¹³¹ What People are Saying, *The North-China Herald*, 28 Dec 1871: 999.

argued that the proposed intake at Suzhou Creek was too easily exposed to contamination from the town. This would only lead to worse health of the community, not better.¹³²

It is worth noting that it was brought up at this meeting that European residents already had their own fresh water supply. It was a small establishment capable of fashioning water for the hundreds of foreign subscribers. The coolies employed by this company would make delivery to the door and collect a ticket in exchange for certain amount of water. The rate varied from \$60 to \$140 per annum depending on the amount of water consumed.¹³³ Therefore, a municipal waterworks was set to be disproportionately beneficial to the Chinese living at the back of the Settlement. The 1869 plan of waterworks, although drawn at a moment when the Council was in need of large amount of water for flushing the drains, won no allies other than Yates. The motion was put to the meeting and could not find a single seconder.¹³⁴

Although the motion was not approved, the idea of building Shanghai a waterworks was not entirely abandoned. Municipal Health Officer Edward Henderson was ordered to contact scientists in Britain as early as in the spring of 1870 in discussion of the best source of water provided a waterworks was to be built in the near future. Water sampled at more than a dozen locations were sent to London for analysis. The specialist that the Municipal Council sought out for help was Edward Frankland, member of the second Royal Commission on the Pollution of Rivers who studied London's water quality for decades. Dr. Frankland is chemist to the Registrar-General, and was one of the principal witnesses

¹³² Land Renters' Meeting, *The North-China Herald*, 05 June 1869: 260.

¹³³ Mixed Court, *The North-China Herald*, 16 Sep 1879: 285.

¹³⁴ Land Renters' Meeting, *The North-China Herald*, 05 June 1869: 260.

examined before the Royal Commission appointed to report on the London water supply in 1869. He was also known for making special analyses of various samples of the Thames water, thus was trusted to weigh on the issue of Shanghai's water supply. The water of the Huangpu River and Suzhou creek was, according to Dr. Frankland, 'tolerably soft', meaning that it contained little lime salt. Water then was divided into three classes depending on how much organic matter they contained - reasonably safe, suspicious or doubtful, and dangerous. Frankland was happy to inform the Municipal Council that none of the samples of the Shanghai water contained chemical evidence of previous sewage contamination. They were all considered safe.¹³⁵

The result of Frankland's analysis was published in *The North-China Herald* on January 11, 1871, together with a memorandum by Henderson. Water of the Tianshan Lake in the west countryside was agreed by both being of best quality for household uses, followed by the river at Songjiang, a county at the upstream of the Huangpu River. But the two experts disagreed on whether the Suzhou Creek, or the Longhua Pagoda should be the next in line.¹³⁶ The public chimed in. Some suggested that the Suzhou Creek was too narrow and slow flowing that it would easily succumb to accidental pollution when the tide was not right. Songjiang, the upstream county along the Huangpu River, was a place where deflected drainage of the upper districts through the numerous creeks flowed into the Huangpu in that neighborhood. A supply from Songjiang would invariably carry the waste of upper districts into the Settlement and exposed the foreigners to the pollution. Tianshan Lake, on the other hand, although it was as pure as the Loch Katrine in England, it had the

¹³⁵ "Shanghai Water", *The North-China Herald*, Jan 11, 1871: 25.

¹³⁶ "The Ratepayers' Meeting", *The North-China Herald*, May 11, 1872: 363.

disadvantage of being situated at too low a level to permit of the water being led down by its own gravitation.¹³⁷

It was then up to the Council to select the site for the waterworks based on not only the chemical quality of water, but more importantly, the engineering feasibility and the estimated cost. E. H. Oliver took occasion during his furlough in early 1872 to visit many of the more important waterworks in America and England. He reported to the Council that basing his calculation on a consumption of 1,000,000 gallons a day, he proposed three schemes – 1. From Fenghuang Shan located in Songjiang County; 2. From Longhua; 3. From the section of the Huangpu River near Yangtszepoo at the east end of the International Settlement. Fenghuang Shan was the farthest and Yangtszepoo was the nearest, so the estimated cost was Tls. 514,814, Tls. 397,529, and Tls. 295,386 respectively. The Council, with little surprise, favored the Yangtszepoo scheme.¹³⁸

3.6 Municipal Scheme Failed

The enthusiasm for the waterworks did not last long. To keep great interest in such an expensive project was not easy. The matter of waterworks did show up again until the

¹³⁷ “Shanghai Water”, *The North-China Herald*, Mar 29, 1871: 218.

¹³⁸ “The Ratepayers’ Meeting”, *The North-China Herald*, May 11, 1872: 363. The Yangtszepoo scheme did not sit well with many ratepayers. They believed that the Council needed to take into consideration the expected growth of the city so that the intake would not be soon contaminated by sewage. Others worried that Oliver underestimated the growth of Settlement and the demand in the future. The Yangtszepoo as intake was too close to the current boundary. They argued that E. H. Oliver’s estimation of the quantity of water necessary for daily uses was 60 gallons for each foreigner, 10 for each Chinese; the Work Committee believed that half the amount was enough. But the water companies supplying London provided an average of 26 gallons for each individual daily, and foreigners living in Shanghai would need more water – most used some 20 gallons every morning for a bath. As for the Chinese, it was suggested that once they began to see the value of waterworks water beyond its price, the consumption would grow tremendously. The Settlement, according to Oliver’s number, was the home of 68,500 Chinese, but the real number could be up to 75,000. The potential growth of subscribers to the waterworks needed to be taken into consideration so that the project was not cut too find and had to be rebuilt over again. See “What People Are Saying”, *The North-China Herald*, May 11, 1872: 365.

Meeting of Ratepayers held on May 18, 1875, two months after the office of Mitsubishi Bank was burned down. It was at this meeting that the Council was asked to take the initiative in the matter by obtaining tenders from responsible firms for carrying out the proposed works.¹³⁹ A group of residents furnished a scheme. They were confident that it would succeed but only to see it firmly rejected by the Municipal Council, who affirmed that they and they alone should take up the water question.¹⁴⁰

The Municipal Council shot down a private scheme. It contracted Laidlaw and Sons Co., a major iron pipe manufacturer in Glasgow, Scotland, to draw a plan, including budget and floor plan. Laidlaw and Sons Co. might be the expert in water supply, but they were not immune to difficulties in operation. The senior partner of the company, who had taken the matter of water supply in Shanghai under his immediate charge, was prevented by family affliction for lengthened period from attending much to business, causing much delay to the work.¹⁴¹ The Company were also short of the local knowledge about Shanghai. The fact that no agent of theirs seemed to have come to Shanghai for surveying suggested that the plan was entirely produced based on what was sent to them, most likely early reports written by the Municipal Engineer. Furthermore, the devoted young engineer, capable public servant of the Settlement, E. H. Oliver, died in January 1876. Such major disruption must have added to the uneasiness of the long-distance communication.

Therefore, when the Municipal Council finally received the letter from Laidlaw and Sons Company in March 1877, they were in no better position in evaluating the scheme of

¹³⁹ "Public Meetings: Municipal Council", *The North-China Herald*, Feb 05, 1880: 97.

¹⁴⁰ "Public Meetings: Annual Meeting of Ratepayers", *The North-China Herald*, Mar 14, 1878: 260.

¹⁴¹ "Miscellaneous: Shanghai Water Supply", *The North-China Herald*, Jun 16, 1877: 595.

water supply. Three months later, the entire scheme was published in *The North-China Herald* for the public to review. The works designed by Laidlaw and Sons Co. would consist of three settling reservoir, each $200 \times 150 \times 12$ feet, three filters, each $160 \times 80 \times 8$ feet, and one pure water reservoir, $160 \times 80 \times 15$ feet, with cast iron columns and girders and strong roofing, covered with earth sown with grass. Two sets of horizontal engines were arranged, one 15 H.P. for pumping water from river to settling reservoirs and filters; and one 30 H. P. condensing engine for forcing the water into the town. The water would be conveyed to the town through main pipes, which would be 14 inch in diameter; other smaller pipes varied from 12 to 8 inches in diameter. The overall estimated cost was £66,800, of which the pipes alone would cost £29,430.¹⁴²

¹⁴² “Miscellaneous: Shanghai Water Supply”, *The North-China Herald*, Jun 16, 1877: 595.

Our estimate for the above quantity of Pipes delivered and laid complete, including Special Pipes, Valves, and Hydrants, is		£29,430.0.0
3 Settling Reservoirs	8,270.0.0	
3 Filters	9,760.0.0	
Pure Water Reservoir	4,945.0.0	
2 Sets Engines and Boilers, with Pumps complete in all 80 H.-P. effective	5,840.0.0	
Engines & Boiler House, Chim- ney, Workshop and Stores.	3,200.0.0	
Connecting Pipes, Valves, &c., from River to Engine and to Reservoirs and Filters...	830.0.0	
Piling, &c., for protecting pipes into the River.....	885.0.0	
Contingencies.....	3,640.0.0	
		<hr/> £66,800.0.0

Taking the Committee's Estimate, dated
1875, for our data, the cost would be as
under, viz :—

667 yards, 18" suction pipe (this size in
place of 21" we consider ample.)
8,800 do. 18" pipes and specials.

9,467 yards, weighing 2,012 tons will cost delivered....	£20,780.0.0
Laying Pipes, Mason Work, Mud Cutting, &c....	200.0.0
Piling to support pipes	315.0.0
Outer piling for protection of pipes	367.0.0
Laying 5 miles of pipes	2,975.0.0
Stand pipe	700.0.0
Contingencies.....	2,530.0.0
	<hr/> £27,867.0.0

Figure 3 – Details of Laidlaw and Sons Co.'s scheme. Source: "Miscellaneous: Shanghai Water Supply", *The North-China Herald*, Jun 16, 1877: 595.

The scheme drawn by Laidlaw and Sons Co. was not founded on a definite location of water source. It was again up to the Municipal Council to decide on this matter. The acting Municipal Surveyor reminded the Council that it would be much more convenient and economical to have the works situated within the limits of the Settlement. He, after correcting the wrongs in the original scheme, concluded that the plan would cost less than

E. H. Oliver's estimation in 1875 if the works was erected on the Suzhou Creek. The surveyor went on to ask for the Municipal Council's permission of giving R. Laidlaw & Son all the information they asked for, concerning the population, quantity of water required, position of creeks, levels, etc.¹⁴³

The 1877 scheme was under public scrutiny for nine months. In March 1878, the Council finally sought for the approval of ratepayers to proceed with the plan. James Hart, one of the directors proposed the motion that the Council be empowered to accept Laidlaw & Sons' tender for the construction of waterworks and to raise the requisite funds by the issue of debentures. Hart said it had been some time since the Council and ratepayers was in possession of the plans. If they obtained the water from Longhua, the cost would be Tls. 355,000; from the Suzhou Creek, or from Yangtszepoo, Tls. 250,000. The Council intended to establish a compulsory water rate to fund the construction throughout. But difficulties might lie within the Chinese residents, from which the Chinese authority would most likely prohibit tax of this kind to be levied. If the Council was unable to obtain adequate funding, the scheme had to be undertaken by private enterprises.¹⁴⁴

In opposition there was Kingsmill, who condemned the vagueness of the current scheme. He suggested that even when compared to that plan rejected by the Council in 1875, the papers of Laidlaw & Sons could not even be viewed as a tender – “They did not know sufficient about the work to be taken in hand at Shanghai, to make a tender. They did not know where the water was to be brought from, and all they had done was to say that they would do something if they could get the people of Shanghai to bind themselves to

¹⁴³ Ibid.

¹⁴⁴ “Public Meetings: Annual Meeting of Ratepayers”, *The North-China Herald*, Mar 14, 1878: 260.

them and nobody else.”¹⁴⁵ Kingsmill contended that if the Council really wished to do anything with respect to waterworks, they must proceed on a very different principle. They should themselves know what was required, should define the point of intake, and give plans and specifications in detail for the whole of the works. When this was done, they could then place the work on the market for tenders.¹⁴⁶

The frustration from the ratepayers were not hard to understand. After decisively rejecting a possible private enterprise, the Council was utterly unprepared for the task. The Laidlaw and Sons’ scheme did not pay any attention to the special geographic conditions of Shanghai and entailed no estimation on the financial sustainability of the project. The Council, on the other hand, not only failed to provide in time the necessary information, rendering the plan useless, but was entirely ignorant in handling technical issues. For example, one director questioned the possibility of one of the proposals – the Longhua scheme as its location required the Council to build a road in connection between the waterworks and the Settlement. Since this road must be built beyond the limits of the Settlement, it would need the permission from the Chinese authorities. Considering there was no such likelihood, the Longhua scheme had to be abandoned. This was done after the Company spent lengthy analysis and estimation on the Longhua plan. As director R. W. Little put it, it seemed that the Council did not wish to pass the proposed motion. He proposed an amendment, that the word “not” be inserted between the words “be” and “empowered,” in the resolution, which would then read that the Council be not empowered

¹⁴⁵ Ibid.

¹⁴⁶ Ibid.

to accept Laidlaw and Sons' tender. The chairman put the amendment to the meeting, and it was carried. A municipal scheme of water supply was thus put on hold indefinitely.¹⁴⁷

3.7 Creation of the Shanghai Waterworks Company

From the first failed attempt in 1869 to the debacle in 1879, the Municipal Council was unable to make any progress in supplying the Settlement with adequate water. The drainage system in Shanghai was still seriously defective. Buildings of the Settlement were still under the threat of fire. Now that the 1879 ratepayers meeting humiliatingly ended the Council's full control over water supply issue, the field was again open to private contenders.

In January 1880, a group living in Shanghai took the cause into their hands. After the 1879 ratepayers meeting, this group of gentlemen initiated a Joint Stock Company for the purpose of constructing a complete system of waterworks for Shanghai. The Company was to be based in London, England. Most shareholders would be based in Shanghai, but the rest in London. This scheme had some chief features. The works were to be of the most approved modern design and construction, and of a capacity to meet future as well as present requirements. The water would be taken from the Huangpu River at a point considerably below the Settlements and Shipping. The water supplied would be thoroughly filtered. Mains and service pipes would be laid down in all streets when demand exists. Hydrants for the purpose of extinguishing fires, and for the sanitary and other public requirements, would be placed in suitable positions throughout the Settlement. The water would be supplied under what is known as the "Constant Service System", and under such

¹⁴⁷ Ibid.; "Mixed Court", *The North-China Herald*, Sep 16, 1879: 285.

pressure as would admit of consumers having it laid on in all rooms in their houses; the public and private hydrants and fire plugs in case of need, at any hour of the day or night. Provision would be made for an ample supply of water for all Municipal and domestic purposes. It was also proposed, as part of the constitution of the company, to give the Municipality the right to purchase the Company's works, or to lease the water supply, on equitable terms to be mutually agreed upon.¹⁴⁸

This group of gentlemen, to whom Shanghai and China would owe its first waterworks, came from all stripes of society. Alexander McLeod, the president of the Shanghai Waterworks Company, was born in the Isle of Skye, Scotland. He had a humble background. When in London during his early years, he received his education at the charity Bluecoat School at Christ's Hospital in London. In 1864 the young Alexander joined the Peninsular and Oriental Steam Navigation Co. At the age of twenty, he came to Hong Kong. Two years later, he joined Gibb, Livingston & Co. in Hong Kong(仁記). McLeod worked his way to the partner of the Company in 1872, and then proceeded to Shanghai. When the Shanghai Waterworks Company was commenced, McLeod was under forty whilst becoming the president.¹⁴⁹ Robert Ernest Wainewright was a preeminent lawyer in Shanghai. Contrary to McLeod, Wainewright was born to a wealthy family. His father was a member of a firm of solicitors. A Londoner and a lawyer by birth, Wainewright was educated at the North London School, and at University College, London. He came to Shanghai in the early 1870s to join a law firm where his great endowments as a lawyer put him in the front rank. Wainewright had been involved in many of the high-profile cases

¹⁴⁸ "Public Meetings: Municipal Council", *The North-China Herald*, Feb 05, 1880: 97.

¹⁴⁹ "Obituary: Mc. Alex. McLeod", *The North-China Herald*, Jan 06, 1912: 18.

since his arrival at Shanghai. By the 1880s, he was thought the nominal leader of the Shanghai bar. Inside of what would later become of the Shanghai Waterworks Company, Wainewright would operate as the legal adviser who drafted contracts and represented the Company in various legal cases.¹⁵⁰ Robert Mackenzie was a good friend of Wainewright. He was the head of the firm of Mackenzie and Co. in Shanghai. Mackenzie, born in Forfarshire, Scotland in 1836, was first taught the business of a farmer, and then accepted the stewardship of an estate in Ireland. While he was working there, his brother James Mackenzie, who had already established the company in Shanghai, asked Robert to join him. He came to Shanghai in 1861 at the age of twenty-five, working for Mackenzie & Co., who were doing a large business for the British Navy as ship-chandlers, auctioneers, and contractors. Tall, bright, young, handsome, Mackenzie partook in many social activities in Shanghai and became a popular figure in the Rowing Club, the Race Club, the Fire Brigade, and later the Municipal Council, where his connections were further solidified.¹⁵¹ S. D. Webb was an American businessman who had become member of the Municipal Council since 1874. After returning to the U. S., Webb would later become president of American Asiatic Association in New York.¹⁵² H. R. Hearn was director of North-China Insurance Company since 1880, also a socialite among the Shanghailanders – he was member of Shanghai Racquet Club, Shanghai Cricket Club, and later Shanghai General Chamber of Commerce.¹⁵³

¹⁵⁰ “Miscellaneous Articles: The Death of Mr. R. E. Wainewright”, *The North-China Herald*, Mar 18, 1892: 335.

¹⁵¹ “Miscellaneous: The Late Mr. Robert Mackenzie”, *The North-China Herald*, Feb 26, 1892: 247.

¹⁵² “Prince Pu Lun: Son of the Sun, Brother of the Moon, and Second Cousin of the Stars Drops in On New York and the Foreign Devils Kowtow to Him”, *The North-China Herald*, July 22, 1904: 203; “Municipal Council”, *The North-China Herald*, June 27, 1874: 593.

¹⁵³ “North-China Insurance Company”, *The North-China Herald*, Apr 24, 1880: 357; “The Shanghai Racquet Club”, *The North-China Herald*, 29 July 1881: 116; Shanghai Cricket Club, *The North-China Herald*, 04 Apr

The Provisional Committee of Shanghai Waterworks presented their proposal to the Municipal Council in February 1880.¹⁵⁴ The scheme was in competition with other three. By the middle of June 1880, all four were shown to the public in *The North-China Herald*. With the exception of McLeod's plan, all were drawn on the supposition that the ratepayers would authorize the Council to provide a water supply for the Settlement.¹⁵⁵ These three schemes, although disagreed on daily consumption and water rate, shared two things in common. First, all of them agreed that the water intake was to be at the Huangpu River. The section below the harbor, in other words north to the settlement, was relatively free of chemical substance and the suspended matters could be easily rid of with various

1883: 377; Shanghai General Chamber of Commerce", *The North-China Herald*, Mar 23, 1887: 321; "Shanghai Land Investment Company, Ltd.", *The North-China Herald*, Mar 28, 1890: 379.

¹⁵⁴ "Public Meetings: Municipal Council", *The North-China Herald*, Feb 05, 1880: 97.

¹⁵⁵ The public schemes were provided by G. J. Morrison, T. W. Kingsmill, and T. J. Waters. Morrison's scheme included the construction of ponds, filters, and reservoirs at Yangtszepoo. The plant would cost the Council Tls. 400,000. The supply at first should be 1,500,000 gallons per day. The charge was to be based on the rental – on Chinese houses, 5% on rental; on foreign houses in the Settlement, 5% on rental if the rental was under Tls. 400 per year, and varied rates for more expensive houses. The annual income based on such rate would be Tls. 66,500. With the 7% interest rate on the Tls. 400,000 and the annual working expenses of 28,500, the waterworks was expected to bring in Tls. 10,000-worth of surplus revenue every year. Kingsmill's scheme provided for the supply of 2,750,000 gallons per day. He proposed no special arrangement of filters, believing sand filters had proven quite sufficient for the purpose. But Kingsmill recommended larger settling reservoirs to remove as much suspended matter as possible before passing the river water to the filters. Hydrants were proposed for watering the streets and for a supply of water in case of fire. The scheme provided three settling reservoirs of 88,000 square feet each. To supply the settling reservoirs from the river, two centrifugal pumps are provided, and the reservoirs were placed at such a height that the subsequent work of filtration will be provided for by gravitation. Kingsmill envisioned a system of constant supply of water, supported by higher engine power during the peak hours between 7 and 10 a.m. The cost was estimated at Tls. 550,000. The rate would be 3 percent of rental per annum in addition to other sources of income. T. W. Water's scheme included a water supply for the entire city of Shanghai, including the French Concession and the native city. In addition to the establishment on the side of the Huangpu River, Water recommended boring an artesian well to meet the needs. The estimate of the daily foreign consumption was 40 gallons per head, 80,000 gallons per 24 hours, 150,000 gallons for Municipal purposes, and 600,000 gallons by the Chinese based on a native population of 200,000 and three gallons per head, making the gross total of 1,000,000 gallons of daily consumption. The pumping station would comprise three settling tanks, four filtering tanks with brick sides and bottoms, two centrifugal pumping engines for raising the water from the settling tanks to the filter, and three Cornish steam boilers. It was estimated that a capital of Tls. 250,000 would enable the Council to complete the works, and that the water rate of 2.5 percent per annum on the present rental, together with other available sources of revenue would enable them to pay 6 percent interest on the required debentures and to provide a sinking fund of Tls. 7,000 per annum, which would complete the redemption in 21 years. See "Schemes for the Shanghai Water Supply", *The North-China Herald*, June 15, 1880: 523.

kinds of filters. It seemed that after ten years of back and forth the contention about the best source of water finally came to an end. The second thing was that none of the three plans was financially self-sustainable on its own. The extremely high upfront cost could only be paid off in the long run with more municipal revenue. Thus, this economic factor alone was able to put McLeod's scheme ahead of the game. The capital of their proposed company had been fixed at £100,000 (Tls. 400,000), in share of £20 each, and will be offered for subscription in Shanghai and in London. The 8% interest on capital, the sinking fund for maintenance and renewal, and the working expense in general added up to Tls. 65140; meanwhile the income – 2.75% on the rental of foreign houses, 3.66% on the rental of Chinese houses, and the amount paid by the Council for municipal purposes like water roads, flushing drains and extinguishing fire, plus some extra income from the French Concession – stood at Tls. 65,902.50.¹⁵⁶ Therefore, not only was the initiation of the proposed waterworks did not ask a penny of public money, but it was set to sustain itself if the market was properly covered. The Municipal Council, unlike in other occasions, needed to pay for the water of municipal usages. But this surely was not considered outrageous by most foreigners who believed that government too was obliged by the rules of market.¹⁵⁷

¹⁵⁶ "Schemes for the Shanghai Water Supply", *The North-China Herald*, June 15, 1880: 523.

¹⁵⁷ As for its capacity of producing fresh water, McLeod's plan set the onset of water supply at 1.25-1.5 million gallons per day, but the work was designed to supply from 2,800,000 to 3,000,000 gallons per day. The plant purified the water in the depositing tanks and filters. After clarification the water was to pass into a reservoir, and to be pumped into a tower tank placed in a central position in the English Settlement, having an elevation of 100 feet. The tower tank was to be of capacity of 116,500 gallons, and through it the whole area of the Settlement was to be supplied through 40,772 yards of mains and service pipes and 210 hydrants in the English Settlement; 15,218 yards of pipes and 70 hydrants in Hongkou, the area previously known as the American Settlement; and 17,791 yards of pipes and 100 hydrants in the French Concession – overall, 42 miles of pipes and 380 hydrants. See *Ibid.*

The scheme drawn by the Provisional Committee of the Shanghai Waterworks Company, after five weeks of intense negotiation with the members of the Municipal Council, had prevailed by the end of summer. On December 16, 1880, the shares of the Shanghai Waterworks Company were allotted for the first time. As was planned, 5,000 shares were issued, each worth £20.¹⁵⁸ The Provisional Committee of the company was disbanded in January 1881, and the formal contract between the Council and the now Shanghai Waterworks Company was signed shortly after, stipulating that the waterworks must be finished in five years.¹⁵⁹

On February 28, 1881, the Shanghai Waterworks Company held its first general meeting. The meeting did not take place in Shanghai, but at the new Exchange Buildings, George Yard, Lombard Street, in the city of London. It was reported at the meeting that the application for shares amounted to something considerably beyond the number to be allotted, and the large number of shares applied for were by the native bankers and merchants of Shanghai. When McLeod had the Company arranged in London, it was in fear of the insufficient fund came out of Shanghai alone; as it turned out the interest in the undertaking in China was unexpectedly great. Progress had been steadily made in Shanghai as the land necessary for the waterworks and the water tower had been secured. Contracts for the necessary pipes, pumping engines, and boilers had been completed and the first shipment of such would be made early March. But the technologically challenging portion of work would have to wait till the arrival of the chief engineer J. W. Hart.¹⁶⁰ On June 24,

¹⁵⁸ “Stock Quote 4 – No Title”, *The North-China Herald*, Dec 16, 1880: 575.

¹⁵⁹ Shanghai Municipal Archive, *Minutes of SMC*, Vol. 7, 391; “Public Meeting: Municipal Council”, *The North-China Herald*, Jan 27, 1881: 70.

¹⁶⁰ “Clippings”, *The North-China Herald*, Apr 08, 1881: 361; “The Shanghai Waterworks Company (Limited)”, *The North-China Herald*, Apr 19, 1881: 376.

1881, J. W. Hart arrived at Shanghai by the mail steamer *Yangtse*. Two months later, he began his work, with roads opened up and pipes laid, all being done under the authorization of the Municipal Surveyor.¹⁶¹ The waterworks in Shanghai was finally on its course of realization.

3.8 Building the Water Supply

What the Shanghai Waterworks Company had in plan was a conglomeration of state-of-the-art British engineering technologies. Laidlaw and Son Co., despite losing the bid for the general scheme of water supply earlier, managed to win the contract for pipes. They would be supplying about 27,000 pipes for Shanghai, from a diameter of 20 inches for the mains, to the smaller sizes for the service pipes, weighing altogether over 5,000 tons. The two pairs of horizontal compound condensing engines would be provided by Hathorn, Davey and Co., a British manufacturer of steam engine based in Sun Foundry, Leeds. Each pair of these engines was designed to raise 75,000 gallons of water per hour to the height of 100 feet, into the water tower in the Settlement. One of these engines was to be of Davey's patent automatic class, by which speed varied with the amount of water consumed by means of an automatic valve. The same class of engine was working at some waterworks in England, like in Croydon, a town south to London, and abroad, and had given the highest satisfaction everywhere. The other was of the rotative class, the high and low pressure cylinders being placed on separate bed plates, with the flywheel between

¹⁶¹ "Summary of News", *The North-China Herald*, June 24, 1881: 594; "Public Meetings: Municipal Council", *The North-China Herald*, Aug 05, 1881: 146.

them. There were to be three large Cornish boilers, with centrifugal engine, and other accessory machinery.¹⁶²

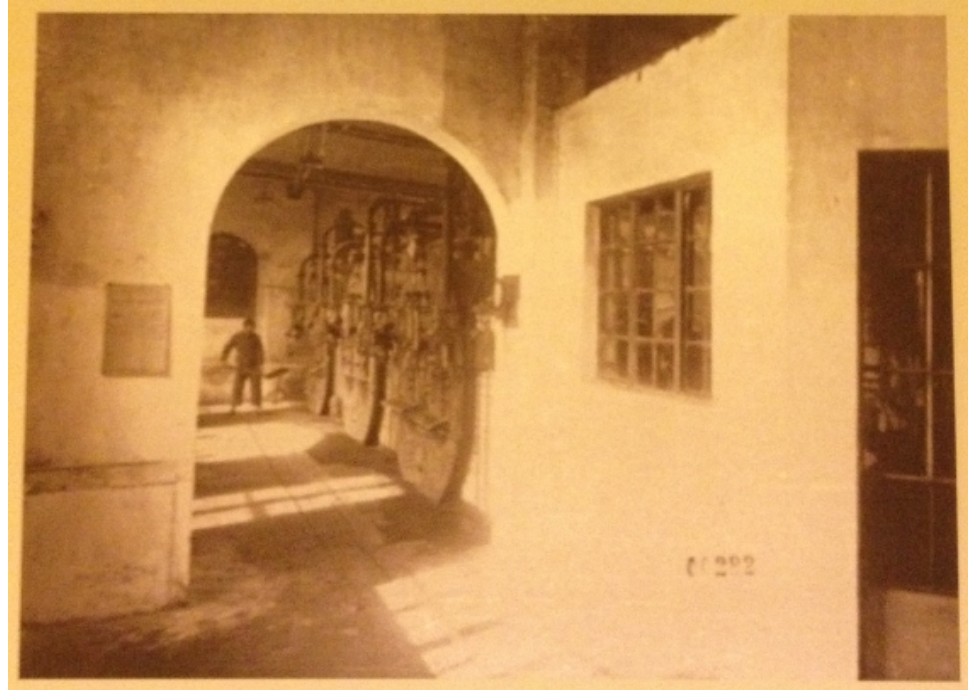


Figure 4 – Engine Room 1 at the Yangtszepoo waterworks. The three large Cornish boilers can be seen inside the room. Courtesy of the Author at Shanghai Technology Museum of Water Supply

The real challenge, however, was dealing with the Municipal Council. For one thing, all construction done within the Settlement needed to be sanctioned by the Council. Shanghai Waterworks Company's effort of laying pipes in the Settlement put the already fragile drainage system under stress. During the process, numerous complaints were filed by foreign banks to the Municipal Council. The Council in some occasions had to intervene and mediate plans for compensation.¹⁶³ But struggling with the technical flaws amidst the construction was nothing compared to a complete overhaul demanded by no other than the

¹⁶² "Article 1 - No Title", *The North-China Herald*, Feb 15, 1881: 139.

¹⁶³ Shanghai Municipal Archive, *Minutes of SMC*, Vol. 7, 474, 482, 486, 500.

Municipal Health Officer, Dr. Edward Henderson. By April 1882, Henderson suggested to the Council that the unusual humidity and heat in Shanghai during summer would give rise to the tropical fever when the infestation of germ was hard to subdue. The filth hidden in the soil of Shanghai could be disturbed by the ongoing pipe-laying and these matters would spread into the air through evaporation, breathed in by foreigners, causing various kinds of diseases. Therefore, Henderson urged the Council to revoke the permit given to the Shanghai Waterworks Company so that before the weather turned warm in the following months, the constructions across the Settlement would be held in abeyance. Henderson's advice received support from the medical community in Shanghai, many of whom signed on the letter presented to the Council. By the end of April, the Council informed the Company that the extension of permit would not be granted to them based on concerns about public health, and the current permit granted to the Company would expire after May 5. No work involving opening the ground should continue after this date.¹⁶⁴

¹⁶⁴ Ibid., 505; R. F. Thorn, "Public Meetings: Municipal Council", *The North-China Herald*, Apr 28, 1882: 459.



**Figure 5 – Chinese coolies laying water pipes. A hydrant can be seen on the left side.
Source: Wan, 1910.**

This proposed overhaul, which could last for up to four months, irritated the Shanghai Waterworks Company. When the Company entered the contract with the Municipal Council, the former guaranteed the completion of a general system of water supply for Shanghai in five years or they would be liable to a penalty of £5,000, enforced by the Council. If what Henderson proposed became customary, the Company would

expect to lose one-fourth of its time and became more likely to be fined. At the meeting of the Municipal Council in the following month, the Company complained that the action of the Council, if persisted in, would subject the Company to a considerable loss and that it would be necessary to modify Clauses 2 and 16 in the Deed of Covenant, to provide for an extension of time for the completion of the Works.¹⁶⁵ The Company suggested that the risk to public health of the work was blown out of proportion by the Health Officer. Some of the ditches for laying pipes were merely two and half feet deep, hence only the surface of the road was dug up. Even hazardous elements existed, the effect of them would be very limited.¹⁶⁶ The demands met the Council's downright refusal, who claimed that it retained absolute right to hold back the permit and to follow Henderson's instruction, which was backed by almost the entire medical community.¹⁶⁷

Interestingly, some of the residents were in strong support of uninterrupted work and they saw the current situation of the Shanghai Waterworks Company as "a very hardly used body of men". Among these voices were the residents on the Bubbling Well Road, the road which extended beyond the limits of the Settlement yet under the authority of the Municipal Council. The Bubbling Well Road, unlike the roads inside the Settlement, was relatively new. The demand for pure water for domestic purposes were desperate. Many residents saw the agricultural pursuits of the peasantry near them, particularly the usage of human waste, contributive to the likelihood of the outbreak of fever. Comparing to that, what the Waterworks Company planned to do would in no way materially increase the risk

¹⁶⁵ "Public Meetings: Municipal Council", *The North-China Herald*, May 05, 1882: 483.

¹⁶⁶ Shanghai Municipal Archive, *Minutes of SMC*, Vol. 7, 506-507.

¹⁶⁷ *Ibid.*, 508.

for health. Rather, spending the summer without fresh water supply would pose some real danger to the neighborhood.¹⁶⁸

Henderson, however, insisted that the health of the community would suffer, should the Council permitted the Waterworks Company to continue to lay their pipes in the streets of the Settlement. At the Municipal Council's meeting in June, Henderson elaborated on the reasons why such activities should stop during summer:

The principle of avoiding, as far as possible, any disturbance of the soil in malarious districts is well established, and is, at the present date, usually acted on by sanitary authorities. The diseases which are supposed in such localities to originate on the soil, as a result probably of a fermentative process in the animal and vegetable matter which it contains, are the various forms of malarial fevers, diarrhea, dysentery, and it is said, cholera. Last year, with an unusually high general death rate, dysentery assumed in Shanghai, in one or two instances an uncommon malignancy of type; malarial fevers were prevalent, especially among those living in the outskirts of the Settlement; out of a total of 111 deaths from all causes, thirteen deaths were registered to cholera. We have literally no winter, and there is reason to fear that such a complete absence of cold weather may render the hot season now before us unusually trying - in other words - may favor the development of those forms of disease which are usually encountered in Shanghai during the summer months.¹⁶⁹

Same medical thinking was apparently shared by the doctors at England. The Reuters reported that in Queen of the British Empire's most recent visit to Riviera, southeast of the England, it was urged by the local authorities that all work that entailed the disturbance of soil should cease: "Dr. Budd, who knew more about fever than any living member of our profession, used to lay the greatest stress on the danger of disturbing old accumulations of possibly infected soil. It is like the turning up of ground wherein the seeds of noxious growth lie inert because they chance to be buried too deep to germinate. When brought

¹⁶⁸ "The Shanghai Waterworks' Co.", *The North-China Herald*, June 02, 1882: 586.

¹⁶⁹ "Public Meetings: Municipal Council", *The North-China Herald*, June 09, 1882: 629.

near the surface they burst into activity. It would be well... to refrain from disturbance of any kind in the neighborhood where Her Majesty proposes to sojourn.”¹⁷⁰ The doctor mentioned in the piece was William Budd. Budd’s epidemiologist views remained influential after his death in 1880.

Henderson won. By the middle of June, the Waterworks Company had halted all ongoing works. They were also ordered to seal the excavated road for the time being. As the Company had trouble summoning a labor force that could meet the urgent need, they turned to Council for help, and expressed the willingness to pay for the cost incurred by these works.¹⁷¹ The water supply in Shanghai was subsequently built in such fashion with all excavation being avoided during summer time. Against all odds, the Company managed to finish the project before the agreed deadline.

3.9 The Opening of Shanghai Waterworks

On a summery Friday afternoon in 1883, the city of Shanghai was graced by arguably the most powerful Qing official at the time, Li Hongzhang. General Secretary Li was the Viceroy of Zhili, the province surrounding Beijing, the Empire’s capital, the most high-profile reformer during the Self-Strengthening Movement, and the founder and de facto commander-in-chief of the Qing navy, the Beiyang Fleet. Li Hongzhang was invited by American Consul General to pay a visit to some of the principal foreign industries of Shanghai. The tour started at half past three. The General Secretary had his first trial of a European open carriage. The party first drove to Russell & Co.’s silk filature where Li was

¹⁷⁰ “Summary of News: Reuter’s Telegrams”, *The North-China Herald*, June 16, 1882: 638.

¹⁷¹ Shanghai Municipal Archive, *Minutes of SMC*, Vol. 7, 525.

told that five hundred and fifty women were employed, besides a large number of men. Li asked the foreigners whether the Chinese learned their duties quickly and inquired about the form of contract under which the foreign employees were brought about. He visited the reeling room, godowns and engine rooms.¹⁷²

After a brief refreshment, Li Hongzhang left for the waterworks of the Shanghai Waterworks Company. Here Li was greeted by McLeod, the president of the Company, Wainewright, their legal adviser, and J. W. Hart, the Engineer-in-Chief. Li was of great spirit when he was invited to come out on to the bridge where the water was turned on to the cylinder, then to the water tank. Li had fully explained to him the course which the water took, the system of filtration, and the manner in which the water was pumped up to the tank. Li examined the machinery closely and passed a great deal of intelligent criticism on all he saw. Just as he admittedly confessed that a European open carriage was far superior to customary Chinese way of conveyance, Li Hongzhang was highly gratified at his visit at the waterworks. He openly expressed a wish to have similar enterprise started at Tianjin. Upon leaving, he tendered his good wishes for the success of the enterprise and his hope that the promoters would reap a rich harvest and that the Company, under his auspices, would take advantage of this establishment to extend their operation into other Chinese cities.¹⁷³

Before the coming of Chinese General Secretary, the Shanghai Waterworks Company had a perfectly successful trial of the pumping engines on May 23 already and

¹⁷² "Reports: The Grand Secretary Li", *The North-China Herald*, July 06, 1883: 19.

¹⁷³ "Li Hongzhang's Tour of Inspection", *The North-China Herald*, July 06, 1883: 6; "Reports: The Grand Secretary Li", *The North-China Herald*, July 06, 1883: 19.

filled the tower situated at the heart of the International Settlement.¹⁷⁴ Neither did General Secretary know that he was not the one who launched the waterworks into full-scale function. Days after his visit, an overflow from the mains was caused by the test scouring, and flooded part of Jiangxi Road where the Company's headquarter was located, so the Company had to postpone the service.¹⁷⁵ It was not until the next month, August 1883, that the Shanghai Waterworks Company began supplying water to the Settlement. By that time, numerous applications had been made to have water laid on to private houses, and the Company had been executing these orders as quickly as possible. As for the laying of water pipes throughout the Settlement, it began even earlier. But on a symbolic level, with the erection of steel water tower on the Jiangxi Road, the symbiosis of foreign technology and Chinese authority persisted.

¹⁷⁴ "Summary of News: Latest Intelligence", *The North-China Herald*, May 25, 1883: 574.

¹⁷⁵ "Summary of News", *The North-China Herald*, July 13, 1883: 34.

上海之建築 (四十二)

英界自來水塔

英界四川路自來水橋南境有高峰雲霄之自來水塔。塔身高英尺一百尺。塔上下全以純鐵造成。以大鐵柱為幹。以小鐵條為枝。自下而上。有屈曲之鐵梯。塔頂安一大水櫃。櫃以鋼板築成。櫃中蓄水二十萬加倫。按該公司開創於一千八百八十一年。係股分有限公司。在英京商部註冊。開辦之始。先集資本英金十萬磅。復陸續增添。至今日已集足資本金三十二萬七千磅。每股英金二十磅。共計一萬六千三百五十股。蓄水池。吸水

機。在楊樹浦路。光緒三十三年。復建新水塔於新開蘇州河旁。至吸水機。每日盡其馬力。可吸水一千六百七十五萬加倫之多。現在英美兩界。裝設龍頭之家。計西人一千九百零五戶。華人四萬零八百六十九戶。餘若絲廠打米廠麵粉廠工部局之救火龍頭。合而計之。每日用水至七百萬加倫。公司寫字房在是塔之旁。經理完善。獲利甚豐。故現在自來水股票之價值。每股值銀四百三十七兩。較諸原股。已不啻二倍之。今繪是圖。為各省辦自來水者告。

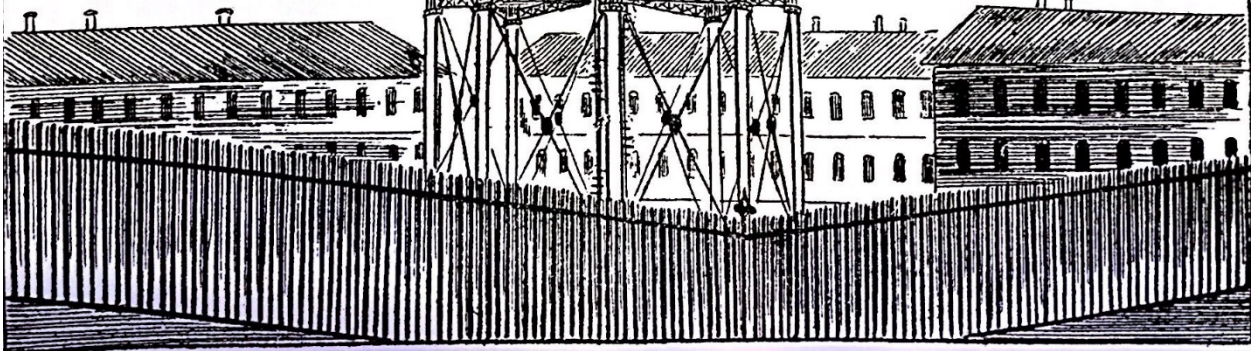


Figure 6 – Water Tower. Source: Sun, 1909.

The stagnant number of subscribers worried the shareholders of the Company after its completion, but for the Municipal Council, selling water to the Chinese was not of their interest. Possessing a general system of water supply served two municipal purposes: to extinguish fire and to flush the drains. The existence of waterworks had proven its value shortly after its establishment. On the morning of July 26, 1883, a fire broke out in a large ship at the southwest corner of the junction of Henan and Canton Roads at 3:30 p.m. Fifteen

minutes later, volumes of flame were issuing from every window of the corner ship. This, weeks after Li Hongzhang set the waterworks in motion, was the first fire at which the Waterworks Company's appliances have been brought into use. At first, the hydrants were used to keep the firewells supplied with water; later on, when the hoses were fastened directly to hydrants, the water was turned into its full force. The supply of water throughout was abundant, and the stream was as high and as far as they could with a manual engine.¹⁷⁶

Since the beginning of 1883, the cost of fire insurance started to decline. The North British & Mercantile Insurance Company had been lowering their charges for insurance against fire ever since May 1881, two months after the first general meeting of the Shanghai Waterworks' Company was held in London. "There can be no doubt" stated the agent of the insurance company in *The North-China Herald*, "that the reduction in rates authorized by the Home Fire Offices in the following May was largely brought about by the prospect of shortly seeing in active work the excellent system of water supply which now exists."¹⁷⁷ As for scouring the drains, it was established by the medical community before the inception of waterworks that when the foreigners in Shanghai were able, through the projected waterworks, more thoroughly to flush the sewers, the occurrence of what was known as the "Shanghai Fever" would be reduced.¹⁷⁸ The Municipal Council purchased water from the Shanghai Waterworks Company on a monthly base, and a large quantity was regularly used in scouring the drains.

3.10 Conclusion: Globalization

¹⁷⁶ "Destructive Fire in Canton Road", *The North-China Herald*, July 27, 1883: 114.

¹⁷⁷ "Correspondence: Fire Insurance", *The North-China Herald*, Jan 23, 1884: 103.

¹⁷⁸ "The Customs Medical Reports", *The North-China Herald*, Sep 14, 1872: 214.

Drainage problem alone was not enough reason to build a costly waterworks. Neither was concern over clean potable water for a small population. Nevertheless, the idea of public health was gaining ground in Shanghai. The Municipal Council created the salaried position of Health Officer for the task, but it was not until the fire incidents became so common that the Council proceeded with the waterworks scheme.

The British authorities formed a fire brigade in 1866. To extinguish the blaze, fire engines pumped water from firewells that were situated at key locales across the Settlement, holding barely enough water to use. Firewells were cheap and easy to build, but premium of fire insurance remained outrageous. After consulting with chemists in London, the Municipal Council chose Yangtszepoo – of abundant clean water and well within the Council's jurisdiction – as the intake and the site for the waterworks.

From 1875 to 1879, the Municipal Council tried to create a municipal scheme of water supply but failed. The contracted Scotland-based pipe manufacturer had too little local knowledge to create a practical plan. A group of Shanghai-based foreign entrepreneurs thus took over and formed the Shanghai Waterworks Company in 1881. By 1883, the waterworks and the water tower had become the monument of Western power, commanding great amount of attention and aspiration from the officialdom and the business world of China. Upon the completion of waterworks, hydrants were erected in replacement for firewells and drains began to be frequently scoured.

The creation of water supply in Shanghai was an example of globalization, but not the intensification of worldwide social relations, which link distant localities in such a way

that local happenings are shaped by events occurring many miles away and vice versa.¹⁷⁹ The conventional wisdom suggests that under globalization local events were connected to other localities at an indefinite distance away via an abstract system of information and symbols. This is best represented by the mechanism of global finance in which, for example, a debit crisis in Greece is able to hit the Eurozone and the US dollar holders in China will receive an instant boom in value. However, engineering technologies work in a context from which it cannot be disembedded.

As is shown by the case of water supply in Shanghai, local transformation must take place within the realm of locality. Laidlaw and Son Co. lost the bid because they failed to send their agents to Shanghai to obtain firsthand knowledge of geography. The Shanghai Waterworks Company managed to erect the establishment because they recruited an engineer from Britain and J. W. Hart, the Engineer-in-chief, who spent time in Shanghai, studying local environmental conditions before rolling out his final scheme. Engineers operated in a different universe of knowledge from those that could be described as an abstract system. They were trained to see the specificities of the local, rather than overruling them with general principles. The fact that the Shanghai Waterworks Co.'s establishments were a mixture of foreign industrial installments can be interpreted as the diffusion of technologies. But these machineries themselves were not at the heart of the "knowledge". Machineries were imported and transplanted as black-boxed expertise to perform designated tasks – engines were used to take in water from the river, pipes to convey water, hydrants to let out water when needed. They were components of engineer's vision. The process of globalization, therefore, had two parallel lines of development. On

¹⁷⁹ Giddens, 64.

the one hand, there was the shipment of hardware, which lent the superficial imagery of invariability to the Western technologies; on the other hand, there was engineering expertise, embodied by traveling specialists whose primary mission was to mold their knowledge in accordance with local landscape.

Water supply and drainage of better quality created their own problems. One of them was the increasing amount of domestic waste water. The two rivers that surrounded the Settlement were supposed to absorb all of the impurity, just as all engineers in Shanghai had envisioned. But Mother Nature had her limit. The creeks themselves were poised to become the miasmatic nuisance, the source of all diseases. The Yangkingpang Creek, the vital river that separated the British and French concession, was going to be the site where answers to this next set of engineering and medical questions would be found. It will be revealed that not only was engineering expertise grounded in local geographic reality, even scientific understandings were subject to local variation.

CHAPTER 4. CULVERT

There was a time when the British occupied only the furthest east strip of land in Shanghai and anything west of the Sichuan Road was “in the country”. During the later months of 1853, a Chinese force was stationed in Shanghai, headquartering at Sinza, the village to the northwest of the Settlement. The camps stretched from the present race course (or Recreation Ground) to the west side of the city. The troops, under the command of the Governor of Jiangsu, was in Shanghai for the purpose of retaking the city from the Triad rebels.¹⁸⁰

The Chinese soldiers committed various cases of inroads into the foreign settlement. To stop the inroads, two young British officials suggested cutting “a broad ditch” to keep the Chinese men at bay. The governor was for a while in agreement with the foreigners on paying the cost. But eventually, nothing was done. The ditch that was chosen to be made broader was known as the Defence Creek. It was a waterway that ran from the Suzhou Creek in the north and the Yangkingpang in the South, making it a natural barrier for the British to repel pushes from the west. Tension kept mounting. On April 3, a Western man and a woman were attacked while taking a stroll, leading to foreigners armed with rifle rushing to the scene. The Imperial soldiers of Qing and the foreigners exchanged many shots. On the next day, the Consuls demanded that the Imperial troops withdraw and in the afternoon the naval landing parties and the Volunteer Corps were assembled. A force of two hundred strong, consisting of most of the able-bodied men of the Settlement, along

¹⁸⁰ “Battle of Muddy Flat: Humorous But Not a Bloodless or Unimportant Encounter”, *The North-China Herald*, Dec 08, 1931: 359.

with a party of American marines and sailors from the *U.S.S. Plymouth* and a score of sailors from the merchant ships, formed a formidable force. But the Chinese troops did not back down. At the junction of the Defence Creek and the Yangkingpang, the Imperial troops came under attack of a joint force as the Triad Rebels and the foreigners found their common enemy. Drums of the rebels grew louder, and the American cannon bombarded the trenches on the other side of the Defence Creek. The Qing troops retreated westward when they lost their last ditch of defense. The casualty on the foreign side was slight. Two Volunteers and three from the American and British naval parties were killed.¹⁸¹

The foreigners came to realize that treaties alone could not safeguard their interest in the Chinese ports. Military establishments were needed. In 1861, the British finished deepening the Defence Creek and used the mud to fortify the west border of the Settlement. The work was for protecting the foreign community from the growing threat of Taiping Rebellion. In August 1860, when a rebel force approached the Settlement, a fire emblazed a village in the west. The fight continued for two days. The British was able to fend off the attack with their 13 in. shells, which caught the primitively equipped rebels by surprise. Another attack was planned some eighteen months later, but it was never carried out due to heavy snowfall for over two days. The foreigners took the possibility of invasion quite seriously. Fourteen redoubts were built across the Settlement at various locations. The junction of the Yangkingpang and the Defence Creek was one of the most armed spots.¹⁸²

¹⁸¹ Ibid.

¹⁸² “The Story of the Defence Creek”, *The North-China Herald*, Jan 23, 1915: 226.



Figure 7 – Defence Creek and the Yangkingpang. Defence Creek was the river that ran north-south next to the Recreation Ground, and the Yangkingpang was north to the walled Chinese city in the south. Source: “Settlements Shanghai 1912”, maps.mychinastart.com.

The Taiping Rebellion petered out, but the two creeks remained critical to the Settlement. They were God-given fortification against invasion. They were good for business. Via them a large amount of commodities were transported to the inner Settlement – coal, rice, wood, brick, hay, oil, tiles, etc. They were also the arterial passage for the transport of nightsoil. That is why even though the International Settlement had outgrown its natural limits, even though the two creeks had become offensively dirty, the authorities still hesitated to fill them in. Culverting the two creeks, particularly of the Yangkingpang, was more than just about ridding of the stench.

4.1 Shanties of the Yangkingpang

For foreigners in Shanghai, the Yangkingpang had always been a nuisance. For one thing, it was a place where you found dead bodies floating.¹⁸³ But the real eyesore was the Chinese shanties erected on the northern shore of the Yangkingpang. Before the Triad takeover, this piece of land was designated exclusively to the British. The riot in 1853, however, rendered this rule pointless as thousands of Chinese refugees sought for asylum in the foreign quarter. Many of them never left. While some living in that region were of better-off gentry class, most, as how the British saw it, took up residence there for no good purpose. The young Settlement saw a rapid increase in the number of opium shops and gambling houses. The land upon which these establishments and houses stood were

¹⁸³ The Yangkingpang was a busy waterway, where all boats and ships making their ways into the Settlement needed to go by. Incidents happened. For example, a man named Thomas Rawlinson was drown in the Yangkingpang on an early summer evening. Rawlinson was the master of the *Barque Excellent*. While returning to his vessel, the intoxicated man tried to step into a sampan from the jetty, but he fell on his knees and caused a lurch. Rawlinson plunged into the creek. He rose a few yards off, but immediately afterwards disappeared. The body was found next morning in the mud in the Yangkingpang. An indication for the cases of intoxication and the consequent drowning as the cause of death was that the dead often displayed no marks of violence on the bodies, or any appearance of their having been robbed. See “Proclamation”, *The North-China Herald*, June 07, 1856: 178; “Drowned”, *The North-China Herald*, June 25, 1859: 187.

supposed to be for foreign use only, but the proprietors, eyeing on the large number of Chinese tenants, refused to sell the houses to foreigners. One upset foreigner argued: “The protection of our flag is now enjoyed by a set of the lowest characters, for the furtherance of their own vile purposes, and setting aside all other considerations, the proximity of such a class of men is highly objectionable and may lead to something unpleasant.”¹⁸⁴

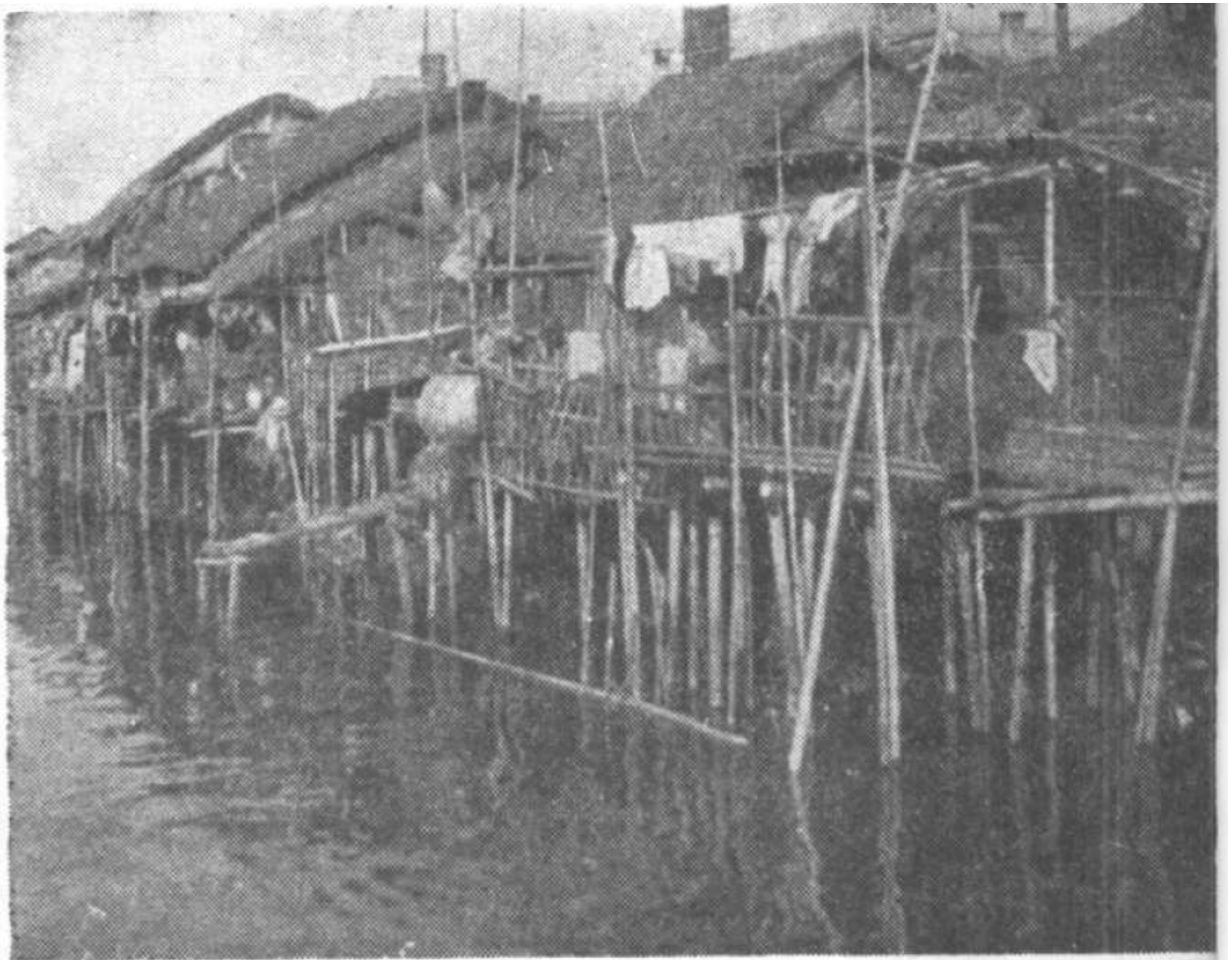


Figure 8 – Shanties on the bund of a river. Source: Shanghais shehui kexue yuan, 4.

¹⁸⁴ Resident, “Article 1 - No Title”, *The North-China Herald*, May 27, 1854: 170.

Nevertheless, the British authority formally gave up all exclusive claim to the locality for its own subjects in 1854. With the new order came freer commerce and seismic shift of urban landscape. Chinese godowns emerged in all directions. Chinese residents always managed to find shelter in the tiniest unoccupied strip of land. The high walls around the Chinese godowns and the perforated screens around the dwellings were believed to be intended to diminish the salubrity of the air foreigners breathe. Along the Yangkingpang, small Chinese dwellings were increasing to an extraordinary degree. Built within them were shops and market, which brought in traffic on the bund of the Creek. The situation in Shanghai reminded some foreigners of major European cities, but not in a good way, where “the palaces of the great and the hovels of the beggar jostled each other.”¹⁸⁵

Oddly, the Municipal Council did not do much to contain the problematic Chinese dwellings until the Chinese government requested help from them in clearing out the bund of the Yangkingpang. Chinese officials could not care less about the complaints from Westerners. Rather, they were concerned about the markets along the creek, which provided the Triad rebels who unlawfully occupied the city with goods and money. To eradicate the rebels, they needed to remove these shanties first. An unlikely political alliance was formed. The British authorities started tearing down the shantytown and the Chinese government supported it. In his proclamation to his fellow compatriot, the district magistrate Sun affirmed that the ground on the north side of the Creek was for the British to rent. Chinese were not allowed to build any more houses thereon. The English Consul apprehended the idea of hasted removal of people. A ten-day grace period was announced,

¹⁸⁵ “Article 2 - No Title”, *The North-China Herald*, June 03, 1854: 174.

with January 18, 1855 being the final day before foreign officers sending people to do the job.¹⁸⁶

The proclamation from the Magistrate did not sit well with the Yangkingpang residents. Distress spread widely among the property owners. On January 13, five days before the proclaimed deadline, a man who was bound to lose \$72 bargain money hanged himself. Two days later, another man hanged himself in his own house near the Yangkingpang Bridge. Resentment against foreigners started brewing. Condemnation was seen in posters:

The uncivilized western barbarians, who in form resemble birds and beasts, and in disposition are like serpents and scorpions, were originally the monkeys and apes of foreign countries. They have now become the wolves of the central land, and clutch and devour everything that lies in their way... They dig up the graves and destroy people's houses, so that the manes of the departed can with difficulty rest in peace, while women and children are cruelly exposed in the open roads, wailing in the most distressing manner. The white bones of the dead are broken in pieces and scattered about, the very sight of which pains the mind, and the mere mention of it makes the teeth gnash with rage. Now we able-bodied men are numerous as the trees of the forest... unite in the attempt to subdue these barbarians, plant in concert a righteous standard, and acting speedily accomplish a meritorious work, by reducing [their] houses to ashes, exterminating their whole race, and utterly destroying these hundreds and thousands of monkeys, at which time only the anger of all hearts will be appeased.¹⁸⁷

In spite of the inflammatory outcry, the work of removal met little resistance. By early February 1855, nearly all houses were removed.¹⁸⁸ The British figured out a way to compensate the hurt and infuriated Chinese property owners. As soon as the order was restored after the flight of rebels, the whole land was sold for the benefit of those who had

¹⁸⁶ "Proclamation from the District Magistrate", *The North-China Herald*, Jan 20, 1855: 101.

¹⁸⁷ Ibid.

¹⁸⁸ "Article 1 - No Title", *The North-China Herald*, Feb 03, 1855: 108.

been or were to be ejected. A sum of \$40,000, obtained after the public auction at the British Consulate for the selling of these riverbank land, would be given to the owners of the land before the coerced removal. The Municipal Council asked the Chinese authorities to have the fund properly distributed.¹⁸⁹

4.2 First Attempt for Culverting, 1866

The situation along the Yangkingpang remained problematic. Chinese tenants kept coming back. With them they brought their habits of water consumption. They drank from the Yangkingpang, did their washing there too. The Yangkingpang was being gradually filled up with rubbish that interfered with its navigation.¹⁹⁰ Foreigners contributed to pollution by building drains and dumping unwanted water in the Yangkingpang.¹⁹¹ Chinese peasants rode their nightsoil boats on the Yangkingpang. Leakage and unlawful dumping took place inevitably. The latrines and urinals that Municipal Council built on the bund of to reduce filth within the Chinese neighborhood certainly did not help with the cleanliness of water.

In view of such rapid deterioration, the Municipal Council of the English Settlement reached out to the French Council on the other side of the Yangkingpang. Both authorities understood that a scheme was needed to reduce pollutants from all sides. The British proposed to bund the side of the Creek with granite, cleansing and deepening it, replacing flimsy bridges with iron ones.¹⁹² They suggested levying dues on traffic through the

¹⁸⁹ "Article 3 - No Title", *The North-China Herald*, June 30, 1855: 192.

¹⁹⁰ "General Meeting of Land Renters", *The North-China Herald*, Dec 05, 1863: 195.

¹⁹¹ Shanghai Municipal Archive, *Minutes of SMC* Vol.1, 470-471.

¹⁹² "Article 2 - No Title", *The North-China Herald*, Nov 14, 1863: 185; "Editorial Article 1 - No Title", *The North-China Herald*, Nov 14, 1863: 182.

Yangkingpang to meet the expenses attendant on cleansing the channel. Less rubbish meant better traffic. Better traffic led to more revenue. That way, the cleansing of Yangkingpang could pay for itself. With some adjustment about exempting those who had already been charged for being next to and using public jetties, the resolution was passed, and was sent to the secretary of the French Council for their consent.¹⁹³

The French Council, however, could not afford the suggested improvement. The French Council was only able to open a credit for Tls. 2,500-3,000 for this project, whereas the proposed iron bridge at the mouth to the Yangkingpang alone would cost Tls. 11,000. The French also believed that dredging the Yangkingpang might not sound like a difficult task, but various kinds of cost could round up to a large sum. For example, in order to keep the water out of the channel during dredging, sluices would need to be installed at each end of the channel. They needed to import dredging machines from Europe at high cost. In addition, constant agitation of the mud and deposits of all kinds that formed the bed of the channel must give rise to noxious vapors which would doubtless produce severe maladies that would spread over the settlements. The French Council, instead, proposed to close up the Yangkingpang through its whole length, making a broad collecting drain through the center as far as practicable. The traffic of boats would come to an end, ending the nuisance created by nightsoil boats. Tramways with carts drawn by horses would substitute for the current transport of goods. Unlike the boats on the Yangkingpang that could only go with the tidal flow, the ground transportation could be carried out at every hour of the day, thus at less expense than by boat.¹⁹⁴

¹⁹³ “General Meeting of Land Renters”, *The North-China Herald*, Dec 05, 1863: 195.

¹⁹⁴ E. Schmidt, “Letter to the Editor 1 - No Title”, Dec 05, 1863: 197.

The British community did not find the French vision acceptable. Some feared that a busy waterway like the Yangkingpang was irreplaceable; others suggested the cost of the proposed scheme would be somewhat about half a million of Taels, too hefty for ratepayers. One suggested that such drastic change to the landscape might be “most unjust towards the Chinese, on whose soil it must not be forgotten that we are living”. Others were more concerned that the loss of the water frontage would result in lowered property value. Not to mention that it remained uncertain whether a project of such scale, with the employment of perhaps hundreds of Chinese laborers, would be permitted by the Chinese authorities.¹⁹⁵ Given that the French authority saw culverting as the only worthy investment and rejected any other expedient measures to reduce the impurities, the proposal was shelved.¹⁹⁶

Three years later, in the early summer of 1866, the two authorities came together to dredge the troubled creek. Even the Chinese government joined in. The weather was getting warm, fear of poisonous vapor was growing, but the work proceeded in spite of protests from the medical community.¹⁹⁷ About Tls. 10,000 was expected to be spent on cleansing and repairing bridges. The two councils agreed to split the cost of Tls. 5,000, and the Daotai agreed to contribute the remainder. In the end, the work was wrapped up in two months at a cost of Tls. 9,000, of which sum the Daotai contributed Tls. 4,000.¹⁹⁸ It is worth mentioning that since March 1866 the British Council was already imposing wharfage dues upon cargos transported via the Yangkingpang. By August, the Council was

¹⁹⁵ “Editorial Article 2 - No Title”, *The North-China Herald*, Dec 05, 1863: 194; “Editorial Article 3 - No Title”, *The North-China Herald*, Dec 12, 1863: 198.

¹⁹⁶ “End of Yangkingpang: A memorable meeting”, *The North-China Herald*, June 06, 1914: 762.

¹⁹⁷ “Summary of the Week”, *The North-China Herald*, May 19, 1866: 78.

¹⁹⁸ “Summary of the Week”, *The North-China Herald*, Nov 17, 1866: 182; “Summary of the Week”, *The North-China Herald*, Jan 26, 1867: 14.

able to collect Tls. 1180.33 from a number of shipping companies.¹⁹⁹ This sum certainly made the decision of dredging easier on the British side. In addition, local coolies were employed rather than European dredging machines. They had plenty of time to do the excavation when the tide was low.

4.3 More Water, Less Nightsoil

The nuisance of Yangkingpang was not only caused by the people, but also by tide and the sun. The reason why it gave off strong odor all the time was because for hours the riverbed was exposed. Filth rose up with the steam when heated by the sun. Therefore, physician R. Alex Jamieson proposed a permanent solution to the Yangkingpang problem. He suggested there to be locks at the upper and lower outlets of the creek to keep it full of water at all times. If it were kept full of water and emptied only at intervals, drainage matter would be unable to accumulate on the bed and be subjected to the action of the sun or the heated atmosphere.²⁰⁰ But Jamieson's plan jeopardized the Yangkingpang's role as the arterial waterway for trade. Blocking the Yangkingpang with any permanent establishments would almost certainly tank the business of a great number of Chinese boatmen. The backlash would have Chinese authorities involved, which was the last thing either Settlement ever wanted. The scheme, therefore, was never attempted.

But the idea of securing more tidal water for the Yangkingpang was generally accepted. In the spring of 1878, the French Council suggested to the British Council that the dam now dividing the Yangkingpang and the Defence Creek be removed. It was

¹⁹⁹ These companies included Clausen, Donge & Co., Cutschow & Co., Oppert & Co., Behoff Vale & Co., and Telge Nolting & Co. See "Municipal Council", *The North-China Herald*, Oct 27, 1866: 171.

²⁰⁰ R Alex Jamieson, "Memo. on the sanitary condition of the yangkingpang and hongque settlements at Shanghai", *The North-China Herald*, Mar 22, 1870: 208.

instructed by French physician Dr. Galle, who believed that the increased current of the Yangkingpang would prevent the accumulation of refuse matter coming from the slaughterhouses. Considering that the Defence Creek was entirely under the jurisdiction of the British Council, it was extraordinary that they agreed to remove the dam for the sake of common good.²⁰¹ However, in November 1875 and in January 1877, the British made another two attempts to dredge the Yangkingpang with the French cooperation, all declined by the French Council based on financial concerns.²⁰²

Another obvious hazard was the nightsoil boats staying on the Yangkingpang, which became increasingly bothersome in the 1880s. Nightsoil boats traveled with the tide. During the flow, they stranded in the Yangkingpang. Furthermore, peasants tended to collect till the tanks were full before sailing back. These factors resulted in countless nightsoil boats dwelling inside the Settlement for an upsettingly long period. One of the most affected business was real estate. T.W. Kingsmill, member of the Council and prominent naturalist and sinologist, argued that his land lots at the junction of Zhejiang and Songjiang Roads (aka. the northern bund of the Yangkingpang) was losing value because the Council allowed nightsoil boats to anchor right in front of his properties. Kingsmill complained that it was getting harder to obtain fair rentals on a land of which the price was diminishing.²⁰³ In March 1886, the Council decided to instruct the Police that all coolies carrying nightsoil along the streets of the Settlement in buckets which were not provided

²⁰¹ "Municipal Council", *The North-China Herald*, Apr 04, 1878: 343.

²⁰² "Municipal Council Meeting", *The North-China Herald*, Nov 25, 1875: 523; "Summary of News", *The North-China Herald*, June 24, 1876: 610; "Public Meeting: Municipal Council", *The North-China Herald*, Jan 04, 1877: 9; "Municipal Council", *The North-China Herald*, Jan 18, 1877: 61; "Municipal Council", *The North-China Herald*, Feb 01, 1877: 107.

²⁰³ "Public Meeting: Municipal Council", *The North-China Herald*, Nov 15, 1882: 534.

with proper covers, were to be arrested and taken to the Mixed Court.²⁰⁴ But the nuisance did not end with this. In July 1886, the Council received letter from the Imperial Chinese Telegraph Administration, complaining of the offensive smell from the native boats which collected in the Yangkingpang between the Zhejiang and Fujian Road bridges, requesting the Council to order the boats to remove to some other part of the Creek. The chairman of the Council suggested that this was a problem that every Council struggled with in the last ten years. The Council informed the Chinese Telegraph Administration that the Inspector would be instructed to do all in his power to abate the nuisance. But nightsoil must be removed from the Settlement, it was impossible to prohibit loading in the Creek.²⁰⁵



Figure 9 – The busy entrance of the Yangkingpang. Source: French, 51.

²⁰⁴ “Meeting: Municipal Council”, *The North-China Herald*, Mar 31, 1886: 343.

²⁰⁵ “Meeting: Municipal Council”, *The North-China Herald*, July 02, 1886: 14.

In the spring of 1887, the dredging of the Yangkingpang was successfully executed under the supervision of the French Council, although there had been complaints about the length of time the mud taken out was allowed to remain upon the banks before it was carted away. The dredging was completed at the cost of Tls. 3231.50. The British Council happily sent out a check to cover half of the expense.²⁰⁶ Dredging in 1887 helped clean the riverbed of the Yangkingpang and deepened the creek by four feet, but the problem of nightsoil boats continued. It was not that the Municipal Council did not try. In 1889, it was suggested that arrangements needed to be made for having the nightsoil removed from the Settlement in hermetically closed buckets placed in drays, instead of having it put into boats on the Yangkingpang and Suzhou Creeks.²⁰⁷ But for the Municipal Council, the matter of nightsoil boats was largely out of their range of control. The Council could only enforce the rules and regulations on the coolies employed by the Municipal contractors, providing them with proper covers, but many employed their own contractors to remove the nightsoil. The Council had no jurisdiction over these laborers. Moreover, the Yangkingpang, the creek not the bunds, was after all a Chinese waterway, where technically the two concessions could only enforce rules with the Daotai's consent.²⁰⁸

4.4 Another Attempt for Culverting

Shanghai towards the end of the nineteenth century was experiencing a rapid growth. The urban scheme of the early settlers could no longer sustain the booming population. One of the thorniest issues was the shortage of space for decent roads. It was

²⁰⁶ "Meetings: Municipal Council", *The North-China Herald*, Feb 16, 1887: 172; "Municipal Council", *The North-China Herald*, Apr 29, 1887: 470; "Meetings: Municipal Council", *The North-China Herald*, May 27, 1887: 577.

²⁰⁷ "Meetings: Municipal Council", *The North-China Herald*, Apr 20, 1889: 472.

²⁰⁸ "Meetings: Municipal Council", *The North-China Herald*, Aug 19, 1892: 263.

then suggested that the Municipal Council should covert some of the rivers - once important, but now of little use – into long, culverted boulevard. The Defence Creek, for example, was once strategically crucial to the very existence of the Settlement, especially during the 1850s, but at present the creek silted up continuously, forming black, unpleasantly smelling mud that required constant sanitary attention. It seemed that the community could make better use of them if the creeks were turned into roads.²⁰⁹

It was under such circumstance that the question of filling in the Yangkingpang returned to the center stage after three decades. In 1897, solutions were being discussed by the British and the French Councils. The French revived the idea of filling in the Creek. The British Municipal Council, unlike their predecessor thirty years ago, showed certain interest in the proposal. By the end of 1898, the Council in principle adopted the idea of culverting the Yangkingpang. In May 1899, the Municipal Engineers of the two settlements were in the course of ironing out a feasible plan. The British Council proceeded with great cautiousness. The Council requested a report about the condition of Yangkingpang from its medical advisor. By the end of 1900, people were saying that the Council was preparing its 1901 budget, in which the conversion of the Yangkingpang into a closed sewer was expected to be included, with an estimated cost of Tls. 100,000. Accordingly, the French Council would bear half the weight. The planned culvert would be so large that the tidal flow would still be able to reach the creeks at the backs of the settlements, and the

²⁰⁹ “The Defence Creek”, *The North-China Herald*, Aug 02, 1895: 181.

unpleasantness of stranded nightsoil boats under people's windows would be gone for good.²¹⁰

This proposed scheme, however, was not passed by the Municipal Council because of the divided opinions on this matter. Some believed that culverting the Yangkingpang would not make it healthier. There were sixty-eight, and on the south side fifty-three surface drains that poured into the creek. Tidal water was necessary in dealing with this amount of waste water. Once the Yangkingpang was culverted, the volume of tidal water that was able to flush the creek would diminish, leading to worse accumulation of pestiferous substance. Others argued that the Yangkingpang furnished an extensive wharfage line, a convenient and secluded line for the landing of garbage and nightsoil. Culverting the creek would cause disturbance to the current arrangement of waste matters and bring the nuisance to the Bund, the finest architectural façade of Shanghai.²¹¹ It was thus suggested that the best improvement was to transform the riverbed of the Yangkingpang from mud to concrete. This way, not only would the settlements retain one of the most crucial waterways, but it would take fewer dredging to maintain its cleanliness.²¹²

Those who supported culverting had their own reasoning. First, they did not believe culverting would impair the value of the Yangkingpang as a sewer. They argued that the volume of water that flowed up and down the Yangkingpang was not determined by the width of the creek. A moderate reduction of the section of the Yangkingpang would cause

²¹⁰ "Meeting: The Municipal Council", *The North-China Herald*, Dec 19, 1898: 1150; "Article 1 - No Title", *The North-China Herald*, Nov 13, 1899: 952; "The Yangkingpang", *The North-China Herald*, Dec 12, 1900: 1237.

²¹¹ "Meetings: The Municipal Council", *The North-China Herald*, Jan 16, 1901: 108.

²¹² "Meetings: The Municipal Council", *The North-China Herald*, Aug 21, 1903: 385.

a swifter current through it and therefore a better scour. Second, the traffic on the Yangkingpang was often congested and delayed because boats could only enter and leave the Yangkingpang when the tidal flow was proper. On a wide new boulevard, goods could be carried uninterruptedly. Third, repeated dredging had always been a threat to the health of the community. Medical community had complained in the past about the unseasonable excavations. In 1900, the French Council pointed out in their letter to the Municipal Council that the mud lying around unattended for weeks could inflict serious damage to the neighborhood near the bund before they were carted away. Frequent dredging also affected the current bunding on the British side of the creek. Therefore, it was concluded that the Yangkingpang was an insanitary open sewer. It consumed too much money and did not yield enough health benefits. With a slightly more spending the Settlement would be able to have a healthy, new, fine, wide boulevard.²¹³ The cost was going to be hefty, yet affordable, and could hardly be better spent.²¹⁴

²¹³ “The Municipal Council’s Report I”, *The North-China Herald*, Mar 05, 1902: 419.

²¹⁴ With respect to the cost of culverting the Yangkingpang, the cost of making a culvert 8 feet by 6 feet would be Tls. 187 per chang (1 chang = roughly 10 ft.), but some residents believe that the proposed culvert should be twelve feet wide, and the cost of this would probably be Tls. 350 per chang. The cost of making the 500 chang required would thus be some Tls. 175,000, or Tls. 87,500 for each Council. See “The Yangkingpang”, *The North-China Herald*, Oct 29, 1901: 823.

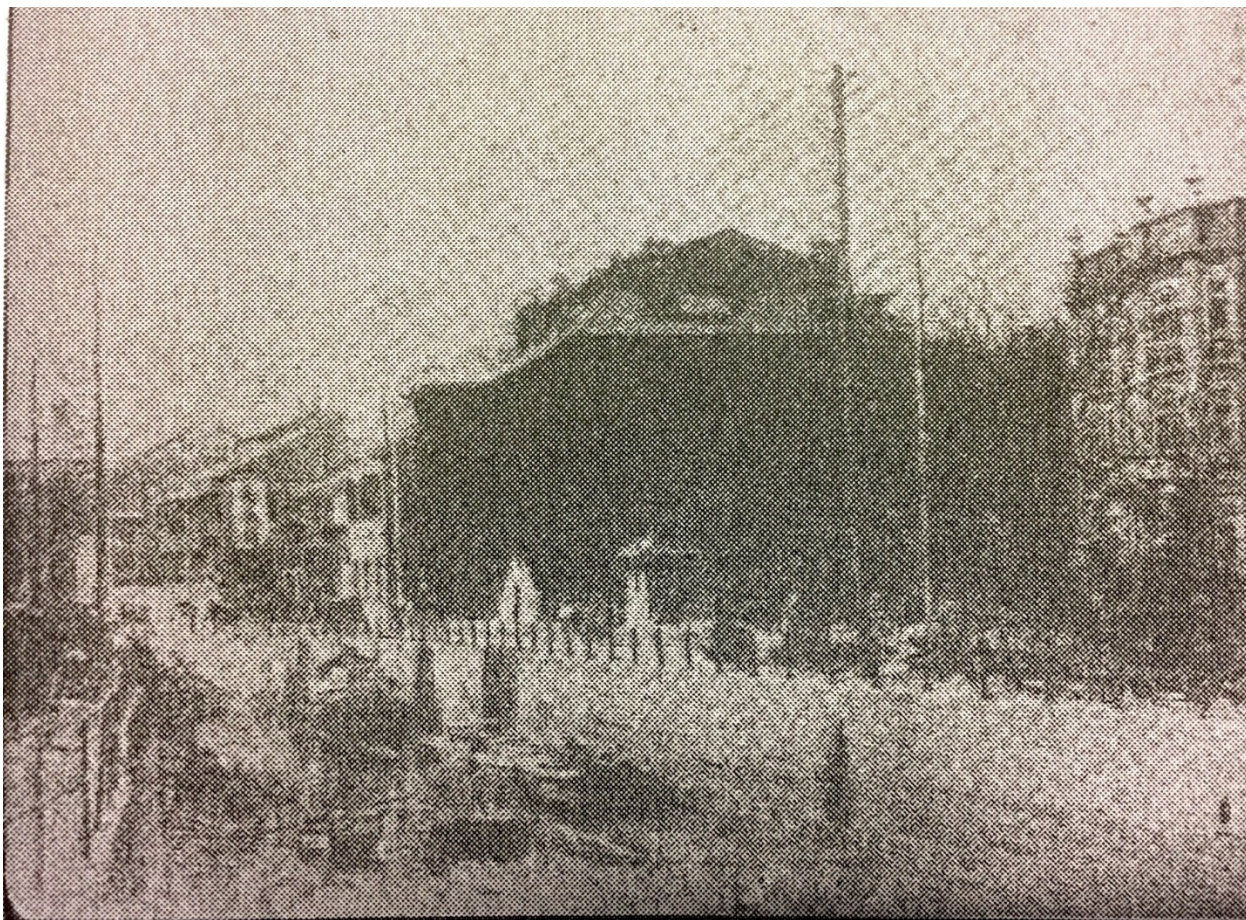


Figure 10 – Yangkingpang. On the north bund, shown on the right, the British authorities had built embankment. The French did not. This is another reason why the British opposed to culverting. Source: “Shanghai zhi jinxi”, 1942.

4.5 Fear of Sewer Gas

The full-fledged debate over the matter of culverting the Yangkingpang took place at the Ratepayers’ Meeting in March 1902, where various concerns – economic, practical, medical – crossed paths. R. W. Little proposed the resolution to turn the polluted creek into a road and to have the expenses shared with the French Council. Little suggested that this would not only relieve foreigners of the sewer, but give them what they really wanted, a wide and excellent road that led into the Western district where the International Settlement had expanded into. Little estimated that the cost would add up to something like Tls.

200,000, of which the French was prepared to pay half. But it was certain that if the Yangkingpang was culverted, the land on either side will be very much increased in value. Therefore, it was fair that the owners of that land should be called upon to contribute to the expense. Little pointed out that this resolution was not instructing the Council to do the work, but merely drawing their attention to it, as an undertaking that was considered desirable by the ratepayers.²¹⁵

The opposition came from many sides. First was sanitation and the fear of disease-inducing gas in the drains. W. V. Drummond suggested that one of the most dangerous things they could do in a place like Shanghai was to have covered drains. The fewer the better. “Almost every drain,” said Drummond, “great or small, in a place like this, where there is practically no fall, is more or less a trap for typhoid fever and other diseases; and therefore I cannot but think that the utmost caution should be observed before we take any step towards covering this great, big, open sewer, the Yangkingpang Creek.”²¹⁶ Others pointed out that in a former report written by the Municipal Health Officer, it was said that it was better to have an open sewer than a closed one.²¹⁷

The fear of sewer gas seemed to be a deep-seated belief. Physicians of the 19th century divided into two groups, contagionists and anticontagionists. Contagionists argued that epidemic was transmitted by contact with a diseased person, while anticontagionists believed that the contact was not necessary. Foul air alone would cause infection. Putrefying substances, from feces to sewer muck, were believed to accelerate the spread of

²¹⁵ “Meetings: The Ratepayers’ Meeting”, *The North-China Herald*, Mar 19, 1902: 529.

²¹⁶ Ibid.

²¹⁷ Ibid.

disease.²¹⁸ In his book *Sewer-Gas and Its Dangers*, Chicago-based scientist George Preston Brown argued that chemists in London had studied the composition of sewer gas. They confirmed the existence of hydrogen sulfide and methane , etc., but the organism arising from decomposition of animal and vegetable matters remained to be identified. These substances were almost certainly harmful to human health. In this work, Brown argued that most toxins could be removed by bowel movement, but toxins of cholera and typhoid could survive the digestion. They would then enter the sewer with refuse and spread toxins to other places:

“Many leading scientists discredit the germ theory of the spread of disease. They believe that chemical gases generated by disease in one organism may produce a ferment in another, and the result is the reproduction of the same disease... In many diseases the poison of the malady seems to be eliminated largely by the bowels, and the fecal discharges evolve gases, which are capable of propagating disease. This is particularly true of typhoid fever, and does not fail in the case of cholera...”²¹⁹

Brown’s book was written in 1881, a time when germ theory was just on the rise and a hybrid was created amidst the displacement of miasma theory. Nevertheless, the fear of sewer gas was not without its “scientific” explanations. The reasoning of Brown was obviously mirrored in many of the concerns the British in Shanghai had in the 1900s.

Back to the problem of Yangkingpang, there was also the question of cost. The last dredging took in 1886-1887 cost the two Councils Tls. 3,331. An item like this spreading over fourteen years was small, comparing to the Tls. 200,000 estimated for culverting the Yangkingpang. Moreover, although a profit may come to owners of land on the creek in ten or twelve years, the lost would be immediate. This impact would particularly affect the

²¹⁸ Tarr, 1984.

²¹⁹ Brown, *Sewer-Gas and Its Dangers*, 134, 138-9, 31-52.

Chinese houses upstream because the value of them depended mainly on the presence of the Yangkingpang itself. It was a place used on either side as a wharf, and cargo of all sorts and kinds was taken there by boats from other parts of the Settlement and from up-country and discharged.²²⁰

Before the final voting, Little pointed out that the British Health Officer might favor open sewers, but the Health Officers of the French Municipality were decidedly of opinion that the Creek was a great menace to the health of the French Settlement. Their opinions were worthy of respect too. Little emphasized that this resolution had no binding power. It was a gesture intended to encourage Council to take actions. He concluded: "What we really intended by the Resolution was to get an expression of opinion from the ratepayers that this work should be done and so strengthen the hands of the Council by saying they should do it.... I really do not think it is necessary for me to say anything more." The resolution was then put to the vote. As the "ayes" appeared to have it, the motion was carried.²²¹

R. W. Little won the vote, but the Municipal Council did not have to take the resolution seriously. The sum for the purpose of culverting the Yangkingpang was not even appropriated in the 1902 budget. The Councils explained in the report that they regard this as an improvement only postponed; its advantages were so obvious that it was certain to be made before long.²²² At the Municipal Council's meeting, which took place weeks after the Ratepayers' Meeting, the issue of Yangkingpang was hardly mentioned. It was stated

²²⁰ Meetings: The Ratepayers' Meeting, *The North-China Herald*, 19 Mar 1902: 529.

²²¹ Meetings: The Ratepayers' Meeting, *The North-China Herald*, 19 Mar 1902: 529.

²²² Miscellaneous Articles: The Municipal Council's Report, *The North-China Herald*, 12 Mar 1902: 464.

that the creek was being “cleansed”. For months since the meetings earlier in 1902, the Yangkingpang was being dredged, deepened, with hundreds of tons of mud carted away by the Chinese coolies, and the bunding of the Yangkingpang continued as well.²²³ In addressing the French, the Municipal Council said that “while a certain proportion of those interested regard the matter favorably there is no probability of any considerable financial contribution being made by them towards the cost of the undertaking”.²²⁴

The matter was shelved for more than a year until it was brought back in the early summer of 1903. On June 18, 1903, a letter was sent to the Municipal Council, reiterating the importance and value of having the Yangkingpang culverted. The letter came from George McBain, a wealthy merchant who happened to live in a residence facing the creek in question. The Municipal Council had earlier called the culverting an “expensive luxury” that the municipality could not afford to indulge in. McBain then wrote to the Council, suggesting that the narrow streets and crowded dwellings and shops on the side of the Yangkingpang were undoubtedly capable of “communicating diphtheria, septic sore-throat, typhoid fever, diarrhea, dysentery, and cholera, either through the air or by the agency of flies, mosquitoes, and similar means of convection to the residents and others in the vicinity.” McBain suggested that the culverting would cost the municipality some Tls. 150,000 spread over two years, but it would give the Settlement some fifteen mow of ground for a road, which was as cheap as Tls. 10,000 per mow (1 mow = roughly 7,168 square ft.).²²⁵

²²³ “Meetings: The Municipal Council”, *The North-China Herald*, Apr 30, 1902: 844; “Meetings: The Municipal Council”, *The North-China Herald*, June 04, 1902: 1108; “The Municipal Council”, *The North-China Herald*, Apr 16, 1903: 758.

²²⁴ “End of Yangkingpang: A memorable meeting”, *The North-China Herald*, June 06, 1914: 762.

²²⁵ C. E., “The Yangkingpang”, *The North-China Herald*, Aug 21, 1903: 377.

With the letter McBain enclosed a report written by Dr. Paulun, Decan J. Reid, M.B., and Ewart L. Marsh, M.B., D.P.H. three Shanghai-based medical men. In the report, they provided a more in-depth analysis of the composition of the sewage that poured into the Yangkingpang by the drains. Aside from the pollution coming from the contributive streams, it was apparent that a large portion of impurities in the Yangkingpang was made of liquid excrement. They wrote:

In fact, if anyone will walk through the Chinese quarters of both Settlements in the early part of the day, he will [see] hundreds of nightsoil buckets being washed over the surface drains, a practice which must in the aggregate produce a large quantity of ordinary sewage. And as matter of observation, crude fecal matter can be seen any day in the Creek, especially at low tide. The state of the Creek, indeed, shows that the great source of the pollution is the [insoluble] organic matter which continues decomposing for many weeks. A portion of this matter also precipitated to the bed of the Creek, especially in the lower stretch near the foreshore, forming, with sedimentary matters brought down from the upper reaches, a black mud, which at all times, and especially in hot weather, gives off abundance of noxious gases. It cannot be claimed therefore that the air or the tides of the river are capable of playing any significant part in the oxidation of the mass of organic filth in the Creek. It is equally certain that the rise and fall of the tide can, in no way, under present conditions, effectively flush the Creek. Self-purification, therefore, if it exists at all, is so slight as to be practically inoperative.²²⁶

The doctors proposed to put a sewer 13 feet by 2.5 feet into the culverted Yangkingpang to receive the drainage from all outlets currently along the creek. They concluded that an open sewer was injurious to the health and an interference to the improvement and development of the Settlement.²²⁷

The Council replied to McBain, stating that the proposed culverting was not calculated to be of benefit either to the public health or the general interests of this

²²⁶ "Meetings: The Municipal Council", *The North-China Herald*, Aug 21, 1903: 385.

²²⁷ Ibid.

community. The Council argued that among the death of natives, cases of diseases were few despite that they use the Yangkingpang water for potable or other domestic purposes. It proved that the condition of the creek was not detrimental to public health.²²⁸ The Council invoked the Municipal Engineer's report to counter certain medical beliefs they disagreed with. Charles Mayne, Municipal Engineer at the time, argued that the noxious gases bottled up in a trunk sewer 12 feet by 6.5 feet, into which all the large branch drains from the two Settlements would empty, would not improve matters because these gases might find their way back into the street. Mayne also argued that the British drainage system included sewer running north and south that had a free outlet into the open air. These outlets allowed a free tidal circulation right through the system. Blocking up all the openings at one end of this system with a trunk sewer must deteriorate the condition of the cross sewers generally. Plus, the proposed culvert would be the means of directly connecting the drainage system of the two foreign settlements, which would render the air in both systems of the sewers much worse.²²⁹

Municipal Engineer's report came under attack once the correspondence between McBain and the Council was published in *The North-China Herald*. Someone called out Charles Mayne flip-flopping on the issue of the Yangkingpang. In his earlier report, fashioned on December 14, 1898, Mayne extolled the proposed culverting as "the finest public improvement ever carried out in Shanghai."²³⁰ In his most recent report on July 6, 1903, where Mayne argued against combining the drainage systems of the two settlements

²²⁸ C. E., "The Yangkingpang", *The North-China Herald*, Aug 21, 1903: 377.

²²⁹ "Meetings: The Municipal Council", *The North-China Herald*, Aug 21, 1903: 385.

²³⁰ To this Mayne explained that when he said that filling in the Yangkingpang would be "the finest improvement", he meant that it would have cost infinitely more than any other improvement of public work carried out in Shanghai. See "The Ratepayers Meeting", *The North-China Herald*, Mar 20 1909: 725.

by culverting Yangkingpang, he astoundingly pointed out that “from the point of view of the French Council it would be a great public improvement”. But why was it only a bad thing for the north of the Yangkingpang? ²³¹

4.6 Political Obstructions

Some suggested that it was the pride of being British that was at play in deciding the matter of public health. A contributor to *The Herald* wrote a piece of satire:

We are British; bred in our bones is the knowledge that our greatness is due to the silver streak between us and France... What if it were culverted? Dual control and daily disturbances with French Police, ordure roading at the Bund jetties, residential development in French hinterland, already a sore point; premier position of picturesque Maloo jeopardized. What one point in its favor? None. Let us cleanse, dredge, pave, bund, maintain, and never abolish our time-honored Settlement boundary, and let all interested landowners and Frenchmen with axes to grind go hang. ²³²

This administrative concern was corroborated by Charles Mayne’s earlier report. Mayne once said that if the Settlements north and south of the Yangkingpang were under the control of one authority, then the case for a boulevard would have been very much stronger. A similar rhetoric could be heard in 1863, when the American Concession merged with the British one, forming the International Settlement. At the time, protests were mainly about the Americans benefiting much more largely than the British. ²³³

Two months after the rebuttal against McBain’s request, the Municipal Council informed the French Concession that they concurred in the opinion that culverting the Yangkingpang would improve healthiness for foreign communities, but this was not this

²³¹ Francis Ellis, “Letter to the Editor 2 - No Title”, *The North-China Herald*, Aug 21, 1903: 397.

²³² Ibid.

²³³ “The Yangkingpang”, *The North-China Herald*, Sep 04, 1903: 487.

debate was about. “The proposed improvement,” said the secretary of the Municipal Council, “while undoubtedly calculated to benefit in the marked degree the interests of owners of property situated in the rear of the French Settlement, would not serve as a means of egress or as a feeder to the outlying roads of this Settlement.”²³⁴ The British authorities expected that a public thoroughfare as it was planned would attract traffic all across the city, from the already busy Bund and the Central District of the Settlement, to the newly developed French extension area in the west. The worsened traffic would harm the landowners and others in the Settlement. The Municipal Council then urged again that the joined work of dredging be resumed and carried out with the least possible delay. It is suffice to say that the overwhelming element in upholding the plan of dredging was that the merge of the two foreign settlements was set to bring about administrative challenges that the Municipal Council did not think it was ready for, or that the Council believed would diminish the current advantages they currently enjoyed over the French authorities.

The French, on the other hand, was “unanimously of opinion” that the only solution calculated to satisfy the residents of these Settlements was the culverting of the Yangkingpang. Facing the reactionary British authorities, the French began to take the lead. In January 1904, the French Council put out a four-point scheme of culverting the Yangkingpang, which included a plan approved by Municipal Engineers of both municipalities, the French working on the west section of the Yangkingpang and the British working on the east, and each municipality would refund half of the cost incurred in work carried out by the other municipality.²³⁵ This proposal fell on deaf ears. Partly it was due

²³⁴ “The Yangkingpang”, *The North-China Herald*, Oct 23, 1903: 838.

²³⁵ “Meetings: The Municipal Council”, *The North-China Herald*, Jan 08, 1904: 21.

to that the Municipal Council of 1904 was on its way of leaving the office in summer. Partly it was due to the sudden death of George McBain, the most prominent proponent of culverting, on February 13, 1904.²³⁶

The French, on the other hand, was not as adamant about governing the future boulevard as they were about culverting the Yangkingpang. They were reportedly unwilling to re-institute the police and sanitary work which had hitherto been jointly performed for the Yangkingpang. The bunding of the Yangkingpang continued till late fall of 1904, with zero signs of improvements made on the French side.²³⁷ For a brief while in November 1904, the two Councils seemed to agree on an alternative – to erect a system of sluice gates at suitable points on the Defence Creek and the Yangkingpang. It was cheap to maintain, it would keep the creek always half full of water, and it would flush them at each tide. Noticing that this was in fact an antique plan proposed by Jamieson in 1870, which never gained any interest. It was therefore not surprising when it was rejected by the harbor-master based on the serious impairment in navigation the sluices were to incur.²³⁸

By the end of 1904, the French Council finally caved in. They sent in their engineer to work on a practical and economical solution to the Yangkingpang problem. They agreed to authorize the necessary credit. The expense was to be borne in equal parts by the two municipalities. The dredging and cleansing hence continued, marking another successful

²³⁶ York Lo, “From No 1 on the Bund in Shanghai to a Kaolin Mine in Cha Kwo Ling, Hong Kong – the Century Old China Coast Saga of the McBains”, *The Industrial History of Hong Kong Group*, December 12, 2016. Accessed in Feb 12, 2019, URL: <https://industrialhistoryhk.org/from-no-1-on-the-bund-in-shanghai-to-kaolin-mine-in-cha-kwo-ling-the-century-old-china-coast-saga-of-the-mcbains/>

²³⁷ “The Ratepayers Meeting”, *The North-China Herald*, Mar 18, 1904: 543; Charles Mayne, “The Municipal Council: Engineer’s Report for September”, *The North-China Herald*, Oct 28, 1904: 965.

²³⁸ Fred J. Burge, “The Yangkingpang”, *The North-China Herald*, Jan 15, 1904: 73; “The Yangkingpang Again”, *The North-China Herald*, Nov 25, 1904: 1175.

cooperation since 1887. By the summer of 1906, tens of hundreds of tons of mud was removed from the Yangkingpang by the Chinese contractor at the cost of Tls. 0.16 per ton (same was done to the Defence Creek, which was paid for entirely by the Municipal Council).²³⁹ Dredging indeed cost the Councils a lot less. Yet for many, whether the Yangkingpang should be culverted or not was simply a matter of dollars and cents. Stench might not be the cause of any disease, but it was still annoying and needed elimination. Such viewpoint was gaining ground when conditions of the Yangkingpang quickly deteriorated in merely three years.

4.7 Need for a Boulevard

From the second dredging of the Yangkingpang in 1887 to the last time in 1906, Shanghai had undergone tremendous growth. The Chinese population in the International Settlement increased from 125,665 in 1885 to 550,000 in 1905. In the French Concession, it rose from 41,166 in 1890 to 96,132 in 1905. As for the foreigners in Shanghai, there were a few more than four thousand living in Shanghai in the late twentieth century, including 3,673 in the north of the Yangkingpang and 444 in the south. By 1905, the total number of foreigners jumped to nearly 16,000.²⁴⁰ Shanghai was without a question the most successful treaty ports in China. With more people came more impurities. The second dredging of the Yangkingpang was able to keep the conditions of the creek above bearable for nearly two decades, but the effect of second dredging expired in merely three years.

²³⁹ “Meetings: The Municipal Council”, *The North-China Herald*, Dec 09, 1904: 1292; “The Municipal Council”, *The North-China Herald*, Mar 09, 1906: 522; “The Municipal Council”, *The North-China Herald*, June 10, 1906: 495.

²⁴⁰ “The Yangkingpang Creek”, *The North-China Herald*, Mar 13, 1909: 643.

A new change of policy might have caused the short-lived cleanliness of the Yangkingpang. In November 1906, the Municipal Council issued a new policy regarding the increasingly busy and unpleasant street scene along the Bund: the load of house refuse into boats stationed at the jetties on the Bund was, with one temporary exception, discontinued. House refuse from the Bund would now be collected by barrow and be loaded in the Yangkingpang.²⁴¹ This decision was one of the measures to limit the littering of the Bund foreshore and to keep the decency of the first sight of the city. But it was done apparently at the expense of the environment near the Yangkingpang. Its shoreline remained the chief assembly point of nightsoil boats.

By March 1909, proposal of culverting the Yangkingpang made its second return. At the annual Ratepayers' Meeting on March 17, 1909 held in the Town Hall of the International Settlement, the resolution regarding the Yangkingpang was announced: considering the congested condition of traffic on the Nanjing road, and the present insanitary state of the Yangkingpang, the Council was empowered to enter into negotiations with the French Municipal Council to culvert the Yangkingpang. Morgan Phillips, the sponsor of the resolution, pointed out that now there were more practical reasons to culvert the creek. He said that the Nanjing Road was the only thoroughfare the Settlement had into the western districts. Now that the tramways were running and under construction, the Settlement needed more than one major east-west passage. Other roads in Shanghai rarely presented a carriage-way wider than forty feet. It was high time that the Council gave the community a magnificent roadway, which would be about one mile in length and over 100 feet in width, doubling the width of the Nanjing Road at the time.

²⁴¹ "Health Officer's Report for October", *The North-China Herald*, Nov 09, 1906: 309.

Phillips read to the gathering the special report of the Captain Superintendent of Police, which suggested that broad thoroughfare in the place of the Yangkingpang would practically solve one of the chief traffic problems of this settlement, namely that connected with vehicular communication between the Bund and the Western District. Once the creek was gone, more north-south passages would show up so that the congestion on the Bund would be entirely disposed of.²⁴²

Phillips also addressed the issue of stench, suggesting that although it might not have caused disease yet, the current condition of the Yangkingpang was an embarrassment to Shanghai, the “Model Settlement”. “There are hundreds of persons,” Phillips said, “men, women and children... hoping to get some fresh air after an exhausting day, but there is waited from the [Huangpu] a most unutterable, indescribable [odor]. It paralyzes everything. It beats the Band. How can you expect music out of a trumpet which is filled with air like that [?] That is how it is done now in the Yangkingpang...” The speech drew loud laughter from the crowd, who were expressively in support of Phillips’ comment.²⁴³

The issue of the Yangkingpang was so contended that the Meeting reconvened two days later. This round was made for opponents of culverting. Brodie Clark, a veteran trader, alluded to the impact the culverting would have on the boat traffic. Clark said he had been living near the creek for nearly twenty years. In no way did he suffer from it being a waterway. In fact, it had been a boom to the business. Clark said no less than 1,800 tons of traffic were conveyed by the route of Yangkingpang in one tide every morning. Some two hundred boats would be crossing the bridge at the mouth of the creek. He admitted that

²⁴² “The Ratepayers Meeting”, *The North-China Herald*, Mar 20, 1909: 725.

²⁴³ Ibid.

there were times during the very hot weather, when the tide was at low water, the creek stank, but it only lasted for an hour or two. It was in no way a “plague spot”. Such a thing was so common that anyone who lived in China long enough would have to put up with it.²⁴⁴

F. Anderson pointed to the unfair accusations flying around between the two sides. In private, proponents of culverting said those who opposed the scheme were narrow-minded, jealous of the ample expansion that has taken place in the French Extension. The French might be able to build their avenues to the west in a straight line, but the British road twisted and turned for a good reason – Ratepayers’ Meeting, where property rights were honored, opinions valued. Jealousy surely was unnecessary. The foundation of opposition remained the four principles: defense, traffic, finance, and sanitation. He suggested that the Yangkingpang and the Defence Creek would come in necessary when the heart of the Settlement was under threat. As for traffic, he argued that a Yangkingpang Boulevard would not relieve the traffic; to the contrary once culverted, the boat traffic would be brought up to the ground, and people living in the poorest, dirtiest portion of the two Settlements would flock to the fine boulevard, like from Pahsienjao (八仙桥), an area at the intersection of the Yangkingpang and the Defence Creek mostly occupied by Chinese paupers.²⁴⁵

4.8 The French System in Question

²⁴⁴ Ibid.

²⁴⁵ Ibid.

In the neighboring French Concession, drains and sewers were arranged in a different way. The first key difference was to what extent the benefits of ventilating sewers should be believed. The French had a long history of building covered sewers. The first of these was built in 1370. In medieval France, building sewers was not a municipal duty. Many sewers were private, thus built and covered at the owners' wish. In the middle of the seventeenth century, the Old Regime began enclosing sewers in Paris. By 1663, one-quarter were enclosed. In the nineteenth century, the French began to worry about the waste matter rotting in the sewers and gave off miasma and airborne diseases before they could be flushed away. Their solution was an army of sewer men, who were contracted by the city to clean out garbage, sand, and rotting animal and vegetable matter with a two-meter pole with paddle attached at a right angle called *rabot*. Later, sluice carts were put to use, which could scrape away the accumulation along the sewer. During the reign of Napoleon III, civil engineer Eugene Belgrand designed a system that had discharge of all sewers going into three collectors and then into the Seine. The new sewer system was celebrated for its mechanical elegance. After 1854 water-borne diseases like cholera fell off in frequency and intensity in Paris.²⁴⁶

The second difference between the French and the British system was whether sewers for refuse and domestic waste should be of its own system separated from drains for surface water. The descriptions about the French system in Shanghai was not abundant in municipal archive. The 1951 survey done by the Communist government revealed that the French sewer system had only one set of pipeline, which accepted both sewage and surface water. The French sewer very much relied on septic tanks. Human-generated waste

²⁴⁶ Reid, *Paris Sewers and Sewermen*, 9-36; Goldman, 114.

would go into the tanks. After a period of deposition, the waste water went into the combined sewer. The solid matter would be emptied with manual labor.²⁴⁷

For the British, the French practices were highly questionable. Anderson pointed out that the French authorities had been for long instituting a new extensive sewage works without discussing with the Municipal Health Officer of the International Settlement. They had been transforming creeks into covered sewers over a very extensive area. They had also permitted sanitary appliances in houses, like plumbing fixtures, which had been strictly forbidden in the International Settlement. It was only after they had carried on this work and brought it to the borders of the International Settlement that they approached the Municipal Council and asked the system to be continued on the north side of the Yangkingpang. Anderson, quoting Col. E. C. S. Moore and his *Sanitary Engineering*, argued that a gravitation system of sewage for a perfectly flat and tide-locked city must not, under any circumstances, be recommended on sanitary grounds. The gravitation system was tried in Rangoon, Burma. In the end, they had to institute an exceedingly costly system of pumping sewage known as the “Shone System”.²⁴⁸

Shone System invoked here was a late-19th-century British invention. It was invented by and named after engineer Isaac Shone. Shone was born in Wrexham, Wales, where the ground was flat and was prone to flooding. After resuming his grandfather’s duty at the Mining Engineering Agency in 1854, Shone came up a way of improvement without displacing too many existing drains. On September 5, 1878, Shone patented the pneumatic system he designed. With the installation of ejectors, waste water would be driven by

²⁴⁷ Shanghai Municipal Archive, B0-12-214.

²⁴⁸ “The Ratepayers Meeting”, *The North-China Herald*, Mar 20, 1909: 725.

mechanical power instead of gravitation.²⁴⁹ By 1890, this system was in operation in many cities in England and America, with the capacity of pumping 9,000 gallons of waste water per minute. At Rangoon, Burma that Anderson mentioned, the British installed twenty-five Shone ejectors.²⁵⁰ It was estimated that one ejector was needed for every five thousand people, each costing £7,960 (Tls. 31,840).²⁵¹ Population of the International Settlement in Shanghai had reached 550,000 by 1905.²⁵² That means 110 ejectors across the Settlement at an expense of more than Tls. 3.5 million, a cost too astronomical to bear.

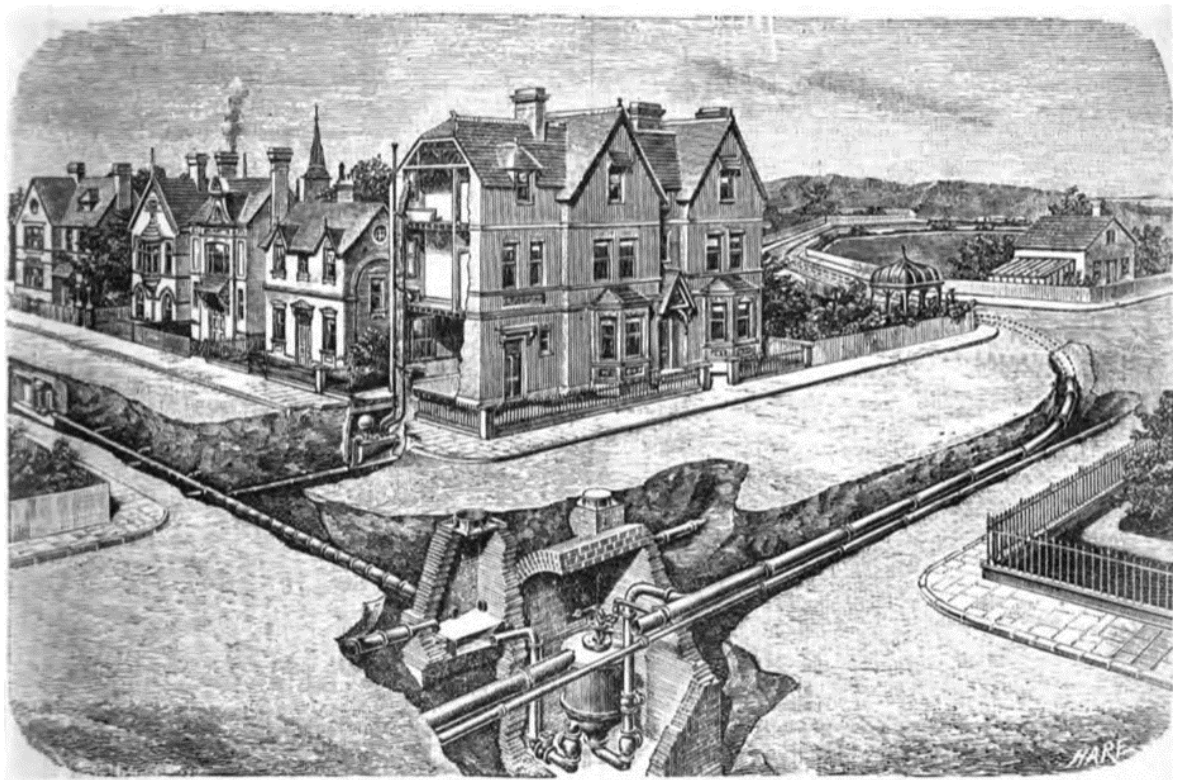


Figure 11 – Shone System. Source: “New Inventions: The Shone Hydro-Pneumatic System of Sewerage”, *The Sanitary Record*, September 15, 1890: 151.

²⁴⁹ Shone, *The Evolution*, 14-15, 8-9, 16.

²⁵⁰ “New Inventions: The Shone Hydro-Pneumatic System of Sewerage”, *The Sanitary Record*, September 15, 1890, 151-152.

²⁵¹ J. F. Brunton, “Notes on the Working of the Shone System of Sewerage at Karachi (including appendix)”, *Minutes of the Proceedings of the Institution of Civil Engineers*, Vol. 160 (1905), 211-238.

²⁵² “The Yangkingpang Creek”, *The North-China Herald*, March 13, 1909: 643.

Anderson suggested that the British Council should wait to see the result before joining in. The current result of this new system seemed doubtful on the French side. If one went to the culverted French Bund at a low tide, he would not be able to linger long in the immediate neighborhood. It was due to the bottled-up noxious gases, which could not be properly ventilated like they were in the International Settlement where both ends of the drains were open. Replacing a 40-foot wide creek with 13-foot wide sewers would not permit the same amount of flow of water. “The fact that their system has been greatly extended” said Anderson, “is no reason why it should still be further extended... if we follow the French example here and convert our system of open creek drainage into sewer drainage, we shall find that putting sewage out of sight is merely the beginning and not the end of our troubles.”²⁵³

4.9 Plural Vote

The chairman then put this resolution to vote. He found it difficult to count the hands as the hands for and against the resolution were about the same number. The chairman then appointed Morgan Phillips and Brodie Clark as tellers. At that point, someone suggested since there difference between the two sides were not as discernable, a poll should be demanded. Wilkinson objected a poll, arguing that a show of hands would be able to show the feeling of the ratepayers. Others pointed out that a poll would take much time, even more so than the meeting itself had already done. Therefore, there should be a second show of hands to vote on the resolution. Chants arose in the town hall, crying “Divide! Divide!”. The ratepayers were then asked to divide – those “against” going to the

²⁵³ “The Ratepayers Meeting”, *The North-China Herald*, Mar 20, 1909: 725.

right of the hall; those “for” to the left. The Chairman asked Wilkinson and Anderson to act as tellers. Those who voted in favor of the resolution numbered 211 and those against it 185. The resolution was therefore carried.²⁵⁴

However, this was not how the meeting ended. The announcement was received with loud and continued applause from the supporters of the resolution. Anderson rose to speak but his voiced was drowned with the applause which did not subside for several minutes. The opponents of the resolution insisted to call for a poll. Cries of “No, No” arose from the supporters of the resolution, “Let us leave the hall!” While many were beginning to leave, Wilkinson asked them to keep their seats and remained for the poll. By this time the doors of the hall had been closed and no one was allowed to leave.²⁵⁵

Wilkinson argued that after the declaration of the resolution carried, he had saw, and was told, that about forty voters had left the hall. He therefore called for the adjournment for the meeting. The chairman said Rule of Procedure of Ratepayers’ Meeting No. 8 said: After the doors have been closed no person shall be allowed to enter until the poll has been completed. “Looking at the rules of the procedure and the Land Regulations, on which our powers are based, that they provide for a poll following a show of hands. If we were to adjourn, we should have to begin again. A poll must be taken now or never... I am required to apply this rule and there must be a poll. It must go on.”²⁵⁶ The poll was then taken. After several attempts of nullifying the poll was defeated by the chairman, the result was announced: For, 311; Against, 411. In the shocking turn of event, loud applause

²⁵⁴ Ibid.

²⁵⁵ Ibid.

²⁵⁶ Ibid.

rose from the side of the house against the proposition, whereas those who were in favor replied with hoots and hissing. The meeting was then adjourned.²⁵⁷

The dramatic turn of event was subject to one special rule for the polling process – plural voting, a rule imitated that the number of vote a person had equaled to the number of lots of land he owned. In other words, polling was in favor of big landowners. Among the ratepayers who attended the meeting on March 19, there were some of the biggest landowners in Shanghai, including C. Iburg who owned 33 lots, Duncan McNeill, 31 lots, D. Landale, 27 lots, etc., all of whom opposed the plan of culverting. The closest thing the proponents of culverting got was C. W. Ure, who had 18 votes. That is why the opponents of culverting was able to win the poll by a margin of 100 votes after losing the show-of-hand popular vote.²⁵⁸

The 1909 Ratepayers' Meeting gave rise to another wave of robust debate. This time, the debate focused on the internal political process of the International Settlement. Faith in the procedure of decision-making was weakened. Opinions began to emerge in *The North-China Herald*, questioning whether the Ratepayers' Meeting was the proper place for making critical decisions. It was suggested that in almost any other town of the same size and importance as Shanghai, an issue like culverting the Yangkingpang would have been subjected to weeks of preliminary canvassing. Thus, the electors would vote in a comparatively cool frame of mind regardless of the heated debate. Shanghai should have a preliminary committee of investigation created, a body that would spend weeks on door-

²⁵⁷ Ibid.

²⁵⁸ Ibid.

to-door canvassing and would provide the ratepayers with a better overview on the issue.²⁵⁹

Other complaints focused on the questionable procedure of voting, particularly the rule of plural voting. Some suggested the ratepayers make a clean sweep of the whole unsavory system by abolishing plural voting, reducing voting qualification, introducing elective auditors, and voting for councilors by ballot. “It will not be the first time” the author wrote, “where clinging to old privileges in an unsuitable environment has resulted privileged classes being swept away.”²⁶⁰

4.10 Last Voice against Culverting

Although the endeavor of culverting failed in 1909, the consensus was coming into being among the general public: the Yangkingpang had to go. One last vocal opponent was Thomas W. Kingsmill, the prominent sinologist, engineer, and former director of the Municipal Council. Kingsmill had been a staunch opponent of the culverting plan for years while arguing for re-engineering the creek. It was also known as “the Kingsmill scheme” – to keep the Yangkingpang open, but to cement the bottom of the channel. The fact that he possessed only one lot of land distinguished Kingsmill from others who voted in lined with the vested interest. After the controversial 1909 Ratepayers’ Meeting, the public were in distrust of the authorities. Kingsmill stepped in, trying to clarify a common misunderstanding about the stench of the Yangkingpang:

“There is somewhat widespread idea that smells are in themselves a source of danger, and that all you have to do with them is to bottle them up... Practically, the smell is like a railway whistle; it is not dangerous itself, but

²⁵⁹ “The Debate on the Yangkingpang”, *The North-China Herald*, Mar 20, 1909: 681.

²⁶⁰ Arthur Edwyn Charlton, “The Yangkingpang”, *The North-China Herald*, Mar 27, 1909: 771.

it gives warning of coming danger, which can by no means be averted by throttling the whistle, as our would-be wise heads desire us to believe.”²⁶¹

Kingsmill argued that bottling up the smells was to leave the real danger, the disease-laden germs, which had no particular smell, to find their way through the anastomosing sewer circulation to all parts of the Settlement. As the town sewers were for the most part under high water level, the rising tide acted as the piston of a pump to drive the disease germs to the higher level, which gave rise to outbreaks of typhoid fever. Culverting the Yangkingpang and the lengthening of the courses of the sewers would aggravate the danger. Kingsmill said that comparing to other cities of similar latitude, like Calcutta, Alexandria, and New Orleans, Shanghai had been enjoying favorable health for decades, which only proved that the stench alone was not the cause of disease.²⁶² Kingsmill also pointed out that the French’s fondness of “Parisian boulevard” was to allow of large bodies of troops and artillery acting in case of popular disturbance. The International Settlement did not possess an arm force comparable in size to what the French had at home. It was also unwise to carry out such a financially unsound scheme in the present time of extreme financial depression.²⁶³

Kingsmill was at the age of seventy-two when he made these remarks. He had spent decades in China and Shanghai where his influence could be felt in many places. He helped resuscitate and arm the Shanghai Volunteer Corps, the militia that defended the sovereignty of the Settlement. As a seasoned surveyor and architect, he participated in the building of the first Woosung railway line. He wrote prolifically for newspapers and scientific journals.

²⁶¹ Thos. W. Kingsmill, “Correspondence: The Yangkingpang”, *The North-China Herald*, Mar 20, 1909: 697.

²⁶² Ibid.

²⁶³ Ibid.

He was the vice president of the Royal Asiatic Society and donated 120 volumes of his collection to the library. That is why when weighing in on public issues, Kingsmill always commanded great respect. Kingsmill unfortunately fell ill in 1910. The ailment lasted for months. At one point he was hospitalized at the General Hospital for an infection of the heart, and then was removed to his home. He passed away shortly after six o'clock in the evening on July 26, 1910.²⁶⁴ The whole foreign community sorrowed for the great loss, but for the cause of culverting the Yangkingpang, the last standing obstruction disappeared.

The state of the Yangkingpang kept turning for the worse. Silting made the creek shallower than ever. The creek was reportedly without water for twelve hours out of the twenty-four. Nightsoil boats which served both Settlements were aground on the pestilent mud for hours, and the combined effluvia were unbearable.²⁶⁵ Those who urged aggressive actions found a new rhetorical weapon – modernity. In 1913, the word “modern” was first seen used in *The North-China Herald* in condemnation of the status quo of Shanghai’s rivers: “Visit either of these odoriferous creeks at ebb-tide; their foulness staggers one, and leaves one to wonder greatly how, in a city which has every appearance of being modern and up-to-date, such terribly unhealthy and useless waterways are permitted to remain in existence.”²⁶⁶ The idea of being “modern” was so vague that it imposed a sweeping negation of the existence of the Yangkingpang, detaching the creek from its economic and practical contexts. The problem needed to be solved, plain and simple.

4.11 Culverting the Creeks

²⁶⁴ “Obituary: Mr. T. W. Kingsmill”, *The North-China Herald*, July 29, 1910: 249.

²⁶⁵ “Sanitary”, “Insanitary conditions”, *The North-China Herald*, 01 July 1910: 38.

²⁶⁶ Alert, “Objectionable Creeks”, *The North-China Herald*, May 17, 1913: 486.

In 1914, the crusade against the Yangkingpang was renewed. To the west of the Yangkingpang, where the International Settlement met French Concession, a thoroughfare had been built. The two concessions had been jointly managing the police, traffic, and garbage disposal. This put faith in many about the future joint operation on a culverted Yangkingpang. Furthermore, placing two projected lines of tramways on the boulevard, seeing buildings grow on the ground adjoining the limit of the boundary, the Yangkingpang boulevard would sure set an example for the Chinese. “I feel convinced”, the editor of *The North-China Herald* wrote, “that [the Chinese] will be only anxious to help the municipalities by all means in their power in order successfully to complete an enterprise which would contribute to make our settlements finer, more agreeable and really worthy of their reputation as model settlements, not only in the eyes of the residents here, but of our transient guests.”²⁶⁷

By May, a stage had been reached in the negotiations when both Councils agreed on the urgent need of the proposed improvement for the Yangkingpang. All that remained for discussion was the settlement of the details.²⁶⁸ One of the reasons the agreement could be reached quickly was that the French authorities were able to obtain cheap mud for the work of filling in while they were dredging from the Pootung Point (today’s 陆家嘴 Lujiazui). This greatly reduced the cost of culverting. Moreover, the French had reduced the drainage emptying in the Yangkingpang by laying new drains through the Chinese city in the south. They helped the Chinese culvert the moot and transform it into sewer, which

²⁶⁷ “The Yangkingpang: Renewed Crusade for Culverting Suggestive Article”, *The North-China Herald*, Apr 11, 1914: 100.

²⁶⁸ “The Yang King-pang”, *The Shanghai Times*, May 09, 1914: 4.

was able to drain a large Chinese area. This change further eased the sanitary concerns about using the Yangkingpang channel as trunk sewer.²⁶⁹

As for the British authorities, C. H. Godfrey, the new Municipal Engineer, suggested that the Yangkingpang could not be treated independently of other systems. Once the Yangkingpang was filled in, the Defence Creek would be deprived of the tidal scour it received from the South. It would be cheaper to fill in the Defence Creek along with the Yangkingpang, instead of spending endlessly on dredging the Creek. This scheme was generally welcomed by the ratepayers in Shanghai, thanks to the improved finance conditions.²⁷⁰ Some expressed their concerns about whether the new boulevard should be free of tramway, or some arrangement was necessary between the two Council to properly regulate the new routes the nightsoil boats took, but no organized resistance was expected among foreigners heading to the special meeting of ratepayers, which was set to be held in the beginning of June.²⁷¹

On the evening of June 4, 1914, a special meeting of ratepayers was held at the Town Hall. The meeting was supposed to begin at six o'clock, yet by five seats were already plentifully occupied. The chairman announced that the requisite number of votes was present, and hence began the meeting. The resolution on culverting the Yangkingpang

²⁶⁹ "The Yangkingpang", *The North-China Herald*, May 16, 1914: 505.

²⁷⁰ The Municipal Health Officer, Arthur Stanley, pointed out that the disappearance of these two creeks would cost the community Tls. 12,000 because the nightsoil now needed to be transported to the Suzhou Creek with additional labor and infrastructures. Municipal Engineer and Health Officer estimated that the total cost would be Tls. 211,463, including filling in the Yangkingpang and the Defence Creek, building drainage along the channels, half cost of road construction, ten percent for contingencies, and new scheme of transporting nightsoil. See "The Yangkingpang Scheme", *The North-China Herald*, May 23, 1914: 577; "The Yangkingpang Scheme", *The North-China Herald*, May 30, 1914: 577.

²⁷¹ "Letter to the Editor 8 - No Title", *The North-China Herald*, May 30, 1914: 696; Darwent, C. E., "Letter to the Editor 3", *The North-China Herald*, May 30, 1914: 694.

enjoyed almost unanimous support from the ratepayers. In 1909, the estimation stood at half a million Taels, and the Defence Creek was not even included. In 1914, the project for two creeks amounted to Tls. 200,000. The cost could also be covered by a fraction of the enhanced revenue – for example, charging the new shops long the thoroughfare for electricity, which was not as widely available in 1909. The ratepayers did not fight over this matter again. The resolution was carried with few dissentients.²⁷²

The work of filling the Defence Creek was launched by the Municipal Council in late November 1914, starting from its northern end. The mud used for filling in was obtained from dredging the Suzhou Creek and from the foundations of the new municipal buildings. Unlike how things were done half a century ago, the pipes for drainage and sewerage could now be obtained locally as they were manufactured at the Council's depot on the Fearon Road (九龙路 Jiulong Road). They were 4 ft. 6 in. in diameter and was made of reinforced concrete. To lay the pipes, the water of the Defence Creek was drained off by a 6-inch centrifugal pump and went into the Yangkingpang. A small dam was built on the southern end and it kept out the water on the Yangkingpang side. The trench into which the drain pipes went was about five feet wide and three feet deep. Large wooden piles were set up to prevent the sides of trench from falling in. Bricks were laid at the bottom of the trench. The pipes were about ten feet below the surface of the road and five feet below the bed of the original creek. The work gave employment to over two hundred Chinese coolies.

²⁷² "Exit the Yangkingpang", *The North-China Herald*, June 06, 1914: 729; "End of Yangkingpang: A memorable meeting", *The North-China Herald*, June 06, 1914: 762; T. Toledano, "Letter to the Editor", *The North-China Herald*, June 06, 1914: 770.

They used cheap appliances wherever possible. On average about seventy feet of pipes were being laid per day.²⁷³

At Yangkingpang, substantial progress was made by the French Council. The work began at the east end of the creek near the Bund. The channel was free of water at low tide. Chinese coolies were then able to work for six hours every day, during which the seventy-five coolies employed by the French Council were able to lay an average twelve pipes. The pipes laid were slightly bigger than those in the Defence Creek, each being 5 ft. long and 4 ft. 6 in. in diameter, made of ferroconcrete. Manholes were constructed at crossroads, where men could easily descend by iron ladders to inspect the pipes. To squeeze the cost, the French Public Works Department had the pipes made by prisoners. About eighty men out of the four hundred or so prisoners were constantly engaged, and everything was done by hand without any assistance from plant or machinery. One pipe could be made at the cost of merely Tls. 12 and the prisoners carried them to the site for free. Cement poles for fencing purposes were also manufactured in prison at the small cost of Tls. 0.74 each. *The North-China Herald* sent in a reporter to see the pipes in the making. The prisoners appeared contented, almost happy. They entered into work with a zeal. They were also allowed to speak to each other freely. Cases of insubordination were said to be rare.²⁷⁴

The work continued to 1916. In January, the two foreign councils had agreed on the name of the wide thoroughfare – Avenue Edward VII – to “perpetuate the local memory

²⁷³ “The Filling in of Defence Creek: An Avenue from City to Suzhou Creek”, *The North-China Herald*, Jan 16, 1915: 165.

²⁷⁴ “The Yangkingpang Avenue: What the French Council are Doing”, *The North-China Herald*, Jan 23, 1915: 235; “A Visit to the French Gaol: Making Pipes for the Yangkingpang”, *The North-China Herald*, Jan 30, 1915: 307.

of the illustrious sovereign”.²⁷⁵ By February, the thoroughfare began to take shape. With the exception of the Bund Bridge at the east entry to the creek, which would be scrapped, all the other bridged had been removed intact waiting to be used in the future. By July, the roadway was near completion. From the Bund to Tibet Road, the road was 110 ft. wide. On either side there was an 18 ft. footpath, while the carriage way was 74 ft., making the avenue the spacious roadway Shanghai had ever seen.²⁷⁶

4.12 Conclusion: Reflexivity

In its early days the Yangkingpang served defense purpose, but it later became the origin of insanitation. Chinese shanties occupied its shore. Discharge from the drains added to the pollution. The creek was filled with domestic waste. It was advised to use sluices to keep more water in the creek, or to drive out overstaying nightsoil boats to reduce the stench. Neither idea was carried out.

Dredging had been the standard procedure to clean up the Yangkingpang because it was cheaper and easier to do. The British and the French authorities dredged the creek it in 1866, 1887 and finally in 1904. The alternative was culverting, favored by the French, yet unacceptable to the British. Stench was upsetting, but the British were more concerned about sewer gas finding its way to the streets and homes once it could not reach the open air above the Yangkingpang. At least stench did not give people cholera.

²⁷⁵ “The Yangkingpang”, *The Shanghai Times*, Jan 06, 1916: 7.

²⁷⁶ “The Last of the Yangkingpang: The Crux of Removing the Bund Bridge”, *The North-China Herald*, Feb 26, 1916: 507, Wayfarer, “The Yang King Pang”, *The North-China Herald*, July 22, 1916: 144.

The opposition to culverting collapsed when several factors came together. The stench had become unbearable. A wide new road was badly needed now that the Settlement extended to the west. Cheap labor and material for culverting had become accessible locally. Obstructionist rules like plural voting, were widely condemned. By 1916, after more than half a century since the first proposal, the Yangkingpang was finally gone. The open sewer into which nearly two hundred drains poured into was now the new Avenue Edward VII with a trunk sewer beneath it.

In his elaboration of science in the time of modernity, Anthony Giddens says that modernity is constituted in and through reflexively applied knowledge. Any given element of that knowledge can be revised. “No knowledge under conditions of modernity is knowledge in the ‘old’ sense,” says Giddens, “where ‘to know’ is to be certain.” Giddens argues that social practices are far less attached to tradition in modern social life. They are constantly examined and reformed in the light of incoming information about those very practices. Their character is thus constitutively altering.²⁷⁷ The episode of culverting the Yangkingpang witnessed the shifting ground of medicine at the turn of the twentieth century. In French’s protest against dredging the Yangkingpang in the 1860s, they invoked the health concern about the mud sitting in the banks of the creek, which they believed could induce disease. In the early 1880s, when the British Health Officer halted the pipe laying of the Shanghai Waterworks Company during summer, telluric theory came into force again as he suspected spread of disease was associated to disturbance of soil. Since the mid-nineteenth century, sewer gas had been a consistent concern of public health. Part of the reason why waterworks was a necessity was for scouring the drains to prevent the

²⁷⁷ Giddens, 38-40.

formation of sewer gas. In the late nineteenth century, advancement of germ theory in the Europe and the entrenchment of miasma theory gave birth to a set of medical belief that was neither the former, nor the latter, and sometimes a mix of both. Situated in a mesh of variety of perceptions, the potential harm of sewer gas became the focal point in addressing the Yangkingpang nuisance. The fear of the cholera-inducing gas was inexplicable to us today, yet the discussion on this matter lingered on to the 1910s, decades after the discovery of *Vibrio cholerae* as the pathogen. This dated theory did not lose its influence until one of its most prominent advocates died.

The evolvement of medical theories in Shanghai proved that despite increasing institutionalization of the discipline in Europe, medicine at the turn of the century was still by large a product of locality in periphery – environmental conditions and the beliefs created to make sense of them. The popularity of telluric theories obviously arose from the constant excavation that occurred in large civil engineering projects in Shanghai at the time. As the city grew, Shanghai was troubled by polluted rivers. The constant presence of bad odor made it nearly impossible for local inhabitants to evade the discussion of miasma. The situation was further burdened by the flatness of Shanghai, an engineering challenge that could easily render drainage defective and allow sewer gas to be generated. This had been haunting foreign inhabitants of Shanghai ever since their arrival. In the end, what killed off miasma theory and its variations was not an intellectual or paradigmatic shift in medicine. It was the practical need of wider roads in Shanghai and a growing confidence in cooperation between the two foreign administrations. The uneasy process of medical community in Shanghai catching up to the up-to-date scientific framework in Europe showed that the diffusion and the internalization of knowledge was not driven solely by

the appearance of medical treatises, translated or not. Learning from containing the side effects of new engineering seemed to have played a bigger role in shaping the beliefs of the foreigners overseas. To reduce the perceived risks, an accurate scientific understanding was not a prerequisite. Rather, it was the reality of engineering techniques that generated the topics and set the agenda for the science and medicine community.

Culverting of the Yangkingpang ushered a new era of urban development when bolder moves were taken to change natural landscape of the city in human's favor. In the meantime, another novelty was quickly gaining ground in Shanghai – the technology of water closet. In the past, merely bringing up the issue of defecation was considered unrefined and backward. Yet never had any other hydraulic technologies caused as much debate and disagreement among foreigners in Shanghai. Lay person believed they could simply flush away the nuisance. Only an engineer would know that the environmental impact of water closet was remained to be seen.

CHAPTER 5. SEWAGE

In nineteenth-century China, handling fecal matter was a good business. In public space, pit latrines were set up at the obscure corners of the road, accommodating the need of those who walked by. The filth accumulated inside belonged to the owner of the latrine, who sold the nightsoil to peasants and coolies and had them empty the pit regularly. In private space, people used nightstools – wooden lidded drum-shaped bucket about sixteen inches high and a foot in diameter. Nightstools were painted purplish red or golden yellow as they were often a part of women’s dowry.²⁷⁸ These buckets were emptied every early morning by nightsoil coolies who then carried the buckets with a bamboo pole on their shoulder and sold the fecal matter to peasants. The peasants would ship tanks of manure back to their used-up farmlands by water and apply the matter as fertilizer. The principle was clear: no waste goes to waste, be it human-generated or otherwise.

Nightsoil business did not enjoy much reputation but was nonetheless profitable. The coolies did not earn as much as latrine owners and foremen, but still they had the right to boss around residents and requested a tip from time to time. They roamed the city day and night, hardly ever embarrassed by their job. John MacGowan, an Amoy-based affiliate of the London Missionary Society wrote:

“The nightsoil men with their open buckets would act as if the streets were their own for in loud voices that can be heard away down the narrow arteries, they threatened to bump up against anyone that will not get out of their way. This threat is so powerful that the densest crowd will scatter in a moment, and stand without a sound by the sides of the road.”²⁷⁹

²⁷⁸ Lu, *Beyond the Neon Lights*, 190-191.

²⁷⁹ John MacGowan, “Lights and Shadows of Chinese Life: Farmers and Farming”, *The North-China Herald*, Dec 06, 1907: 599.

The practice of nightsoil collection varied. In some area it was a women's job. In Fujian province, a long line of female nightsoil scavengers was a common scene:

“They were a light-hearted merry party indeed. They all seemed to enjoy rude health and to have overflowing spirits, for they were full of laughter and jokes, and they made the road ring with the sound of their merry voices. It was a most pleasant sight to see so many women, with such happy faces, upon which care never seemed to rest. They were just like a pack of school-girls let loose for their holidays.”²⁸⁰

In Shanghai, the nightsoil jobs were not gender specific, but almost all coolies were men. By the early twentieth century, nightsoil coolies were known as “Emptying Masters”.²⁸¹ The nickname speaks a ton about the extent to which the municipal authorities relied on the labor of nightsoil coolies. In the International Settlement, the Municipal Council did not seem to be interested in displacing the manual handling of waste matter for a long while. What contributed to the slow adoption of sewer and water closet in British Shanghai? Some suggest that it was because the British authorities joined in the Chinese customs for money as they received handsome deposit and monthly payment from the “Municipal Contractor”.²⁸² But to imply that the manual refuse removal system was unique to China was misleading. This chapter reveals that the British authorities executed great cautiousness not because they were unwilling to give up the revenue generated by the old business, but because the old practices not only contributed to the final capacity of nightsoil

²⁸⁰ Ibid.

²⁸¹ Lu, *Beyond the Neon Lights*, 193.

²⁸² The Council held an open tender nearly every year since 1864. The bidder who was most willing to pay the Municipal Council, in forms of deposit or monthly fee, would most likely win the contract. The “municipal contractor” was then granted monopoly to nightsoil from all properties under the jurisdiction of the Municipal Council. Therefore, the Council received a handsome paycheck and the contractor was guaranteed access. This payment was then used to fund departments related to the nightsoil business, like the Department of Public Health that maintained the cleanliness of the foreign community. Some argues that the authorities thus became an interested party of the status quo. See Cun-chao Jiao and Ye-xin Chen, “Reasons for Rejecting the New System of Nightsoil Disposal by Shanghai Municipal Council”, *Journal of Shanghai Jiao Tong University (Philosophy and Social Sciences)*, Vol. 24, No. 6 (Nov., 2016), 84-93.

disposal, but they provided immediate benefits to local environment, which allowed the technological innovation to run its course.

5.1 Regulating Nightsoil

The British was not without their own tradition of collecting and using nightsoil. In medieval England, a coolie of such duty, known as gongfermor, earned a decent payment. They were recruited by city councils when pits became filled with dung. They would then carry the content of cesspool to suburbs and sold it to farmers.²⁸³ With the pressure of rapid industrialization in the nineteenth century, some areas in the British cities had become too populated to use cesspool properly. People began to dump their refuse into the sewers designed for surface water. The early sanitation campaigns in Britain, centering on the miasmatic idea that foul air made people sick, vigorously condemned practices of cesspools and gongfermors. Water closet popular among the affluent forced more refuse down the drains, further killing the business. By the mid-nineteenth century, the practice started to die out.²⁸⁴

In China, the tradition went back much further. During the mid-Ming dynasty of the late 16th century, the Yangtze Delta had experienced what could be called the “fertilizer revolution”. *The Book of Promoting Agriculture at Baodi* (宝坻劝农书), written by an official working in north China but of south origin, kept a good record of where fertilizer could be found in the natural environment and how fertilizer could be made out of domestic waste and animal refuse. Incineration of grass roots, sludge at the bottom of the lake,

²⁸³ Horan, *The Porcelain God*, 33.

²⁸⁴ Allen, *Cleansing the City*, 29.

limestone could all be used to replenish the used-up soil. Feces of human, pigs, sheep, and cattle, even the bones of animals, should be put together in a special vault, waiting for it to “ripe”. Heating also helped with faster ripening.²⁸⁵ The Jesuit missionaries were amazed by the Chinese practices in conformity of nature that were able to avoid the exhaustion of soil and keep the cities from the infection of latrines.²⁸⁶ The north China later developed a tradition of making beancake, which consisted of the residue of soybean after the oil was extracted. Beancake was easier to transport and apply. It began to gain popularity in the Yangtze Delta during Qing dynasty. But nightsoil remained an indispensable source of fertilizer.²⁸⁷

The long-established Chinese customs shaped the reality of the nightsoil business. Foreigners were the late comers. For a while, compromise needed to be made. First, there were the latrines. Foreigners found it impossible to use these primitive facilities. The Road Inspector and Nuisance Inspector therefore urged the Municipal Council to build large, better public restrooms. The Chinese quickly responded to the proposal by contacting the inspectors, offering their financial assistance. They demanded in return exclusive ownership of the nightsoil that came with these restrooms.²⁸⁸ When the British was building its first public restroom on Shakloo Road in May 1862 on the land purchased by tax money, it immediately raised concerns that Chinese inhabitants nearby might take advantage of the restroom instead of using their own nightstools, or perhaps dumping their domestic waste there. The new facility, not yet equipped with water-carriage system, would

²⁸⁵ Du and Zeng, “The Book of Promoting Agriculture at Baodi”, 2014.

²⁸⁶ Elvin, 468-469.

²⁸⁷ Cui, “The Appearance of Beancake”, 2014.

²⁸⁸ “Minutes of the Annual Meeting of Land Renters within the Limits of the British Settlement at Shanghai, held at H.b.m. Consulate on Monday, the 31st day of March, 1862”, *The North-China Herald*, Apr 05, 1862: 54.

then be put under serious stress.²⁸⁹ By the end of 1863, the British built another three restrooms after experimenting with the first one.²⁹⁰ For each of these facilities, the Council needed to deal with individuals for the required land. For example, in 1863 a Chinese landowner agreed to offer half of his lot for building a public latrine. He fixed the price at Tls. 600. After negotiation, the Council was able to obtain the land at Tls. 400.²⁹¹

Then, there was the rambling nightsoil coolies. In February 1864, the Municipal Council issued a series of rules in view of reforming the old practices. They planned to recruit a municipal contractor who paid the Council monthly in exchange for access to nightsoil within the Settlement. The municipal contractor would also be responsible for enforcing certain rules among his coolies. Pouring waste into river or into open ditches was strictly prohibited. Nightsoil collection could only go on before 7 o'clock in the morning and after 8 at night. The monthly fee for one nightstool was fixed at 180 to 200 cash (1 cash = 1/1000 tael of silver). The municipal contractor was responsible for providing his coolies with ships and buckets. Occasions would arise when some households rejected municipal coolies due to their own arrangement. Under such circumstances, police would be sent in by the Municipal Council to enforce the new arrangement.²⁹²

Cooperation between foreign power and local hierarchy formally began. By 1865, altogether 405 nightsoil coolies were working across the International Settlement. They were also employed in emptying public latrines and cleansing the street, which cost the

²⁸⁹ "Meeting of Shanghai Land-Renters", *The North-China Herald*, May 24, 1862: 83; "Municipal Council", *The North-China Herald*, July 19, 1862: 115.

²⁹⁰ "Article 2 - No Title", *The North-China Herald*, Nov 14, 1863: 185.

²⁹¹ Shanghai Municipal Archive, *Minutes of SMC*, Vol.1, 493-503.

²⁹² Shanghai Municipal Archive, *Minutes of SMC*, Vol. 2, 467.

Council no additional charge.²⁹³ These rules might seem harsh for the contractor, but considering the profitability, people still fought for the job. In 1865, the Council received \$435 per month from the municipal contractor; in 1866, with a new tender Kiu Ting Chow coming in, the Council was able to be paid \$505 per month. Meanwhile, the Council was seeking to expand the system. They reduced the charge to the Chinese residents from 180 cash per commode per month to 120 cash, encouraging the low-income to use the municipal coolies so that all nightsoil could be disposed properly.²⁹⁴ They were also willing to arrest independent peasants who came to Shanghai, pretending to work for the municipal contractor, but were collecting nightsoil for their own benefit.²⁹⁵ It was not uncommon that the Council and the contractor would fight over every penny.²⁹⁶ Nevertheless, contractor's monopoly over nightsoil was generally backed up by the foreign authorities. The system thus kept growing.

²⁹³ "Engineer's Department: Report of Municipal Engineer", *The North-China Herald*, Apr 08, 1865: 55.

²⁹⁴ A.J. How, "Municipal council: report of the finance rate and appeal committee municipal savings bank". *The North-China Herald*, Oct 27, 1866: 171.

²⁹⁵ On November 26, 1866, at 5 p.m., two men were arrested and brought to the Central Police Station by constables affiliated with the Chinese Police Station. The two men claimed that they were contractors under the Municipal Council and were performing their duty. They were in the end dismissed instead of being sent into the city for trial. See "Municipal Council", *The North-China Herald*, Dec 15, 1866: 200.

²⁹⁶ From a technical perspective, nightsoil at public latrines built by the Council or with the municipal fund belonged to the municipal contractor. But the business of nightsoil was so profitable even foreigners in Shanghai could not fight the temptation. For example, E. J. Hogg once lowered the price of his land, Lot 759 on Hankou Road, to such an extent that the Council was able to build a public latrine upon it at a reasonable price. Hogg then applied for the privilege of removing and selling nightsoil from that latrine. This unusual move provoked the municipal contractor. He asked compensation of 10,000 cash a month for the loss he suffered in consequence of latrine on Lot 759 having been handed over to Hogg's contractor. This demand was not granted by the Council. They argued that several new houses were being built in the Settlement. Sale of nightsoil from these premises would amply compensate for any diminution in profit by the loss of the latrine on Lot 759. See "Council Meeting", *The North-China Herald*, Oct 14, 1875: 381; "Municipal Council Meeting", *The North-China Herald*, Nov 25, 1875: 523.

In 1878, the Municipal Council made rules into laws. An article regarding waste management was formally included in the mini constitution of the Settlement, Building Rule. Article VII of the Regulations reads as follow:

“No privy, urinal or latrine for general use shall be erected in any part of the Settlements without the sanction of the Council first obtained, and said privy, urinal or latrine shall be erected in all respects in accordance with the directions of the Surveyor of the Municipal Council as concerns construction, drainage, ventilation and facilities for removal of soil, and shall at all times be kept in such state of repair as he may consider necessary of advisable; and the Council may at its discretion order any existing privy, urinal, or latrine to be closed or removed, on giving seven days’ notice to the owner or managing agent of same, and if necessary, in such a case may make compensation to the owner or lessee thereof, as the circumstances of the case may require.”²⁹⁷

The Article VII empowered the municipality in handling the problematic Chinese latrines. An inexpensive latrine consisted of merely walls and a roof with some buckets in it. The bucket ideally were removed twice a day.²⁹⁸ In some cases, the latrine was made of bamboo and matting.²⁹⁹ It was also discovered that some Chinese preferred relieved themselves outside instead of inside the latrine. This made latrines nuisance to the immediate neighborhood. The landholders, therefore, became averse to selling portion of their land to the Council for the purpose of building public latrine.³⁰⁰ In a case in 1883, the Health Officer spotted a latrine at a Chinese shop Laou-kee-chong that was in such poor condition it had become a nuisance. The Officer stated that it must be regularly and thoroughly emptied and disinfected, otherwise the Council would obtain an injunction from the Court to compel the proprietor to carry out his instructions. The proprietor followed

²⁹⁷ “Miscellaneous: Proposed Building Regulations”, *The North-China Herald*, Feb 21, 1878: 188.

²⁹⁸ “Meetings: Municipal Council”, *The North-China Herald*, June 22, 1894: 975.

²⁹⁹ “The Municipal Council”, *The North-China Herald*, Jun 19, 1896: 972.

³⁰⁰ “Public Meetings: Municipal Council”, *The North-China Herald*, May 20, 1881: 482.

through. He was warned that this establishment would be handed over to the municipal nightsoil contractor if it was not cleaned out every morning.³⁰¹

To address the shortage of clean restrooms, the Superintendence of Police of the Settlement suggested latrines of teahouses be opened to all passers-by for free.³⁰² Because teahouses scattered thickly over the Settlement, the Municipal Council apparently stopped building more public restrooms. This led to a curious distribution of public restrooms in the Settlement. In the old English Settlement (Hongkou not included) were some fourteen latrines. They all situated to the west of Henan Road. On the east side of Henan Road, the most populous and business-centered area, no public restroom was to be found because the foreign banks employed enough coolies to keep the premises clean and free of odor.³⁰³ This might be able to explain why modernizing the nightsoil business had not always been a primary concern of the Council. The wealthy and powerful were obviously spared from the insanitation that others had to endure on a daily basis.

5.2 A Flawed Municipal System

The system headed by a municipal contractor, created in 1864, seemed to have given the Municipal Council considerable power in regulating the nightsoil business. But the Council soon began to realize that many owners of Chinese tenements did not switch to the system of municipal contractor. They still kept their own nightsoil workers to empty the nightstools in their buildings. By 1868 the municipal system was only able to cover slightly more than half of the households in the Settlement.³⁰⁴ To make up the loss of

³⁰¹ "Meeting: Municipal Council", *The North-China Herald*, Aug 31, 1883: 261.

³⁰² "Public Meetings: Municipal Council", *The North-China Herald*, May 20, 1881: 482.

³⁰³ "Meetings: Municipal Council", *The North-China Herald*, Oct 08, 1884: 388.

³⁰⁴ Shanghai Municipal Archive, *Minutes of SMC*, Vol. 3, 159-160.

revenue, the Council proposed to charge 120 cash, in the name of nuisance rate, for every commode in every household, regardless of who they sold their nightsoil to. It was roundly rejected. Those who found its own way of removing and selling nightsoil felt strongly against the Council's intervention. Those who were in the municipal system felt being double-taxed. The Council argued that the sum collected would be used in scavenging the Settlement, a fair environment that all residents would be able to enjoy, therefore a flat rate on every household should be considered fair.³⁰⁵

This dispute was eventually resolved under arbitration in 1869. The arbitrators decided that the Council had no right to intervene in matters on private properties. With land renters winning the case, the nuisance rate was never implemented and the Council lost up to \$4,000 in revenue.³⁰⁶ The owners of large area of Chinese houses told the Council that their goal could only be achieved by material incentives. If the Watch Committee was willing to pay them what they received at present, if not more, they would be more likely to switch to the municipal system.³⁰⁷ Meanwhile, there were mavericks like Thomas Hanbury, English banker and a prominent land renters in Shanghai, notifying the Council in April 1870 that he would sign a new private contract to have nightsoil removed at his properties on Zhili Road, Fujian Road, Wuxi Road, Henan Road, Fuzhou Road, and Shandong Road.³⁰⁸ Tension among land renters was brewing.

³⁰⁵ "Municipal Council of Shanghai", *The North-China Herald*, Sep 04, 1869: 161.

³⁰⁶ Shanghai Municipal Archive, *Minutes of SMC*, 462-465, 467. "Municipal Council of Shanghai", *The North-China Herald*, Sep 04, 1869: 161.

³⁰⁷ "Municipal Council of Shanghai: Report of the Watch Committee", *The North-China Herald*, Oct 16, 1869: 243.

³⁰⁸ Shanghai Municipal Archive, *Minutes of SMC*, Vol. 4, 65.

At the Ratepayers' Meeting in May 1870, the budget for the upcoming fiscal year became the hot button issue. The Municipal Council foresaw a fall in nightsoil revenue – from Tls. 3,433 last year to Tls. 2,500. This was estimated on the basis of shrinking subscription of those who would have their nightsoil removed by the municipal contractor. It was then proposed to raise the tax by half percent on land rental to better carry out policies regarding sanitation, such as removing garbage and watering the streets. Raising taxes never sat well with ratepayers, particularly with people like Thomas Hanbury, who thought him understood the nightsoil business better than the Council. Hanbury said nightsoil in Shanghai was always saleable, and the account for its removal should be balanced by the sale. Hanbury believed that the Council was short selling its nightsoil. He knew four land renters who received more for the sale of nightsoil from their houses than the Council did for the whole of the rest of the Settlement. He then proposed to amend the budget by striking out the half percent raise on land rental. Hanbury's allies pointed out that Nuisance Department received an income of altogether Tls. 9,000 in the previous year, Tls. 5,861 in fees and rest in nightsoil income. With this amount, the department was self-supporting, and it was absolutely unnecessary all ratepayers should be taxed towards its expense.³⁰⁹

F. C. Adams came to the Municipal Council's defense. Adams said that two buckets of nightsoil was sold at 32 cash on the Yangkingpang, and 35 cash on the Suzhou Creek. If the Council was selling nightsoil for less than it was worth, Hanbury should inform them about the right price. The large Chinese property owners had deprived the Council of great portion of its revenue. They got the advantage of cleaner street but wished to throw the

³⁰⁹ "Public Meeting: Ratepayers' Meeting", *The North-China Herald*, May 28, 1870: 377.

burden of paying for it on the small properties, which were the only ones left to the Council.³¹⁰ To this, Hanbury argued that the arbitration in 1869 had already settled the matter of nightsoil. Some proprietors might say, we will do so, under the Council's supervision, others might not care for the trouble, and prefer that the Council should remove it, and to pay a fee for the purpose. Fee and a general rate of tax should not be lumped together. Hanbury contended that although he sold his nightsoil at a different price, he paid his own scavenger to clean the streets in his neighborhood. His properties were kept in beautiful conditions.³¹¹

After a few back and forth between Hanbury and Adams on whether the street could be kept clean with Hanbury's one scavenger, the chairman decided to proceed to put the amendment proposed by Hanbury to vote. It was lost by one vote – 88 vs. 89.³¹² The increased land rental immediately came into effect. In the following year, the Settlement indeed witnessed a declining income from nightsoil sales by Tls. 1,000. But the imposition of a half percent nuisance rate on the rental was able to make up for the loss.³¹³

5.3 Towards a Real Municipal System

Municipal and self-employed nightsoil coolies working side by side caused another problem. Whenever the Municipal Council tried to reduce the offensiveness of current practices, it faced tough challenges in imposing municipal regulations on non-municipal nightsoil men. In March 1886, the Council instructed the police that all coolies carrying nightsoil along the streets inside the Settlement must be provided with proper covers.

³¹⁰ Ibid.

³¹¹ Ibid.

³¹² Ibid.

³¹³ "The Municipal Budget, 1871-72", *The North-China Herald*, May 05, 1871: 317.

Otherwise they were to be arrested and taken to the Mixed Court, regardless of whether they worked for the Council or not.³¹⁴ In 1894, the air-tight galvanized iron buckets began to be used among some municipal nightsoil workers. The result was satisfactory.³¹⁵ By the end of the year, the Council proposed to make a regulation that banned the wooden buckets currently in use. The new bucket would be made of iron and cost \$2.20 each. A specimen one was on display at the office of the sanitary inspector so that the contractors would know the right model to buy for coolies.³¹⁶ In April 1895, the Council discussed the most ideal type of bucket for Shanghai. It would not be too heavy, and the opening at the lid should not be too small. Three months later, the new scheme was implemented under the instruction of the Municipal Engineer.³¹⁷

On July 1, 1895, the new regulation came into effect. It required all coolies in the International Settlement to carry nightsoil in the new buckets. And that was when the strike began. The resistance was led by an old Chinese woman who was well known for her defensiveness against any interference with her pecuniary interests. Her nightsoil workers complained that the new bucket was too heavy. The old one weighed 12 pound, whereas the new one was around 30 pound. The non-municipal workers went on a strike the same day the new regulation came in effect. The situation was most acute in Hongkou, where nightsoil workers deposited a sting of about hundred full and empty buckets in front of the Hongkou Railway Station. Others sneaked into the police compound and left their foul-

³¹⁴ "Meeting: Municipal Council", *The North-China Herald*, Mar 31, 1886: 343.

³¹⁵ "Meetings: The Municipal Council", *The North-China Herald*, Nov 30, 1894: 897.

³¹⁶ "Meetings: The Municipal Council", *The North-China Herald*, Dec 21, 1894: 1018.

³¹⁷ "Meetings: The Municipal Council", *The North-China Herald*, Apr 05, 1895: 518; "Meetings: The Municipal Council", *The North-China Herald*, July 26, 1895: 147.

smelling loads inside. An altogether 115 nightsoil buckets containing nightsoil was placed in the compound. The nuisance did not cease until a constable was stationed at the gate.³¹⁸

In the central district of the Settlement, about nine hundred nightsoil workers, armed with bamboos, made a grand charge towards the police at the Laozha Police Station (Tianjin Rd. & Guizhou Rd.). The crowd was loud but little damage was done as they stopped shortly after entering the compound. The coolies then turned their attention to finding the previous municipal contractor who agreed to the Council's decision before leaving the position. They tried to take him to a teashop where they believed they could force him to renounce the agreement. But the ex-contractor managed to escape and found shelter in the Laozha Police Station.³¹⁹

The next day, July 2, the municipal contractor's coolies resumed their duties, but private contractors' coolies compelled them to continue with the strike. The Sanitary Inspector of the Municipal Council prosecuted a woman at the Mixed Court who was represented as being the principal intimidator. The woman allegedly refused to supply the coolies with the new pattern buckets, but she contended that her workers were prevented from working by other coolies. The new Magistrate, who spoke English, was not willing to deal with the case unless he could consult the British Assessor because the case involved the Municipal Council. But the Sanitary Inspector insisted that the strike had been on for two days and the weather was hot, a delay on the solution to this matter would cost the community its health. So the hearing continued. In the end, the woman was given another week to acquire the new buckets, and she was promised protection from the police to keep

³¹⁸ "The Night-soil coolies' strike", *The North-China Herald*, Jul 05, 1895: 32.

³¹⁹ Ibid.

harassment by other coolies. Still, she was angry, cursing the previous municipal contractor, slapping her knees while vowing vengeance. Another nightsoil contractor, Sah Doh-mau, who was behind the nuisance at the Hongkou Police Compound, was sentenced to two weeks' imprisonment and had all his buckets confiscated. As they saw no hope in laying their hands on the previous municipal contractor, the angry mob of nightsoil workers gradually dispersed.³²⁰

After the 1895 revolt was appeased, the municipal system began to take shape. Nuisance fee kept the government oversight going, and labor forces became more disciplined. Although no forceful action was taken in reaching the goal, the increase of contract fee over the years indicated a growing number of subscribers to the municipal system. For example, the new tender in 1873 was Tsang Ah Nook (曾阿牛) who paid the Council \$345 per month in addition to a deposit of \$1,000.³²¹ In contrast, Sung Yuen Kee, the contractor of 1898, was willing to pay \$3,200 per month.³²² By March 1899, the Council could comfortably claimed that it had “the undivided control of the nightsoil collection by the nuisance branch”, and it had worked well with remarkably few complaints in regard to the service.³²³

5.4 Banning Water Closets

When the Shanghai Waterworks Company completed its infrastructure in 1883, it immediately came to the Council's notice that people might take advantage of the water

³²⁰ Ibid.

³²¹ “Municipal Council Meeting: Report of Watch Committee Secretary”, *The North-China Herald*, Nov 25, 1875: 523.

³²² “Meeting: The Municipal Council”, *The North-China Herald*, Dec 19, 1898: 1150.

³²³ “The Ratepayers' Meeting”, *The North-China Herald*, Mar 13, 1899: 434.

supply by installing plumbing fixtures at home. Someone dubbed as “Sanitarian” in *The North-China Herald* warned the Council about the damage it could do once water closets were connected with the drains. Typhoid and cholera and other filth diseases would become the rule instead of the exception. He suggested that earth closets should be adopted. They could clean out refuse without having water-carriage system placing extra burden onto the existing drainage. He said in many of the provincial towns of England, the supply of dry earth, and removal of the soil, was undertaken by the sanitary authorities. Each closet had duplicate, air-tight, covered buckets, marked with the number of the house. One was cleansed, and filled with clean dry earth, to place in the hopper of the closet, and was delivered by cart early in the morning; the other was taken away at the same time to be emptied, cleansed, and recharged with dry earth, for delivery next morning. In Shanghai fine sifted earth was obtainable from foreshores in any dry days. “Sanitarian” claimed that he had an earth closet for the last ten years: five whilst in the English Settlement, and five in the suburbs. He found it far superior over the ill-smelling and unhealthy manual collection of nightsoil. Earth toilet would banish typhoid fever and probably cholera, if ratepayers, both foreign and native, were “compelled for the common good to use them.”³²⁴

During the late nineteenth century, earth closet was for a while seen as the legit alternative to water closet. It was invented by Henry Moule, an English “divine inventor”. Moule was a Cambridge graduate. He worked as the vicar of Fordington, Dorset much of his career. He patented the dry-earth system in 1860 in pursuit of a better national health. Moule promoted his vision unwearingly and argued that earth closet was better because water merely removed the waste, but earth absorbed and deodorized it. Moule’s invention

³²⁴ Sanitarian, “Correspondence: Sanitary Matters”, *The North-China Herald*, Sep 085, 1883: 289.

found an audience in North America where the United States and Canada, less urbanized than Europe, were in the process of replacing old-fashioned privy houses.³²⁵ In Shanghai, the earliest mention of earth closet was in October 1869. The Municipal Council at the time was having a trouble similar to the one in North America. They purchased and put in place some public urinals, but they did not work well. The Council was in the middle of selling and replacing them and that was the moment when Henry Moule and his alternative invention entered the dialogue.³²⁶ However, there was no evidence of general adoption of earth closet in Shanghai after 1869. Nor was it ever mentioned again in the press after 1883. Earth closet seemed to have been quickly forgotten.

Water closet did not become immediately commonplace in Shanghai either. It was not until 1904 that nuisance caused by the increased usage of water closet caught the attention of the Health Officer. On April 27, 1904, the Watch Committee presented to the Council the Health Officer's report. Edward Henderson urged the Council to stop further installation of water closet because overflowing cesspool was threatening the health of the community. The Council was ambivalent. While the directors unanimously agreed that the current drainage system was not built for water-closet discharge, it was not within the Council's authority to prohibit people from using water closet on their own properties. The Health Officer suggested that Building Rule needed to be adjusted to execute the ban. But some worried that water closet without connection to drainage would only cause more hazard.³²⁷ On a different note, water closet undermined the existing nightsoil regime. The discharge contained too much water, making the waste less valuable than the nightstool

³²⁵ Benidickson, *The Culture of Flushing*, 121.

³²⁶ Shanghai Municipal Archive, *Minutes of SMC*, Vol. 3, 449, 489.

³²⁷ Shanghai Municipal Archive, *Minutes of SMC*, Vol. 15, 406.

nightsoil of same weight. Cesspool was also difficult to deal with for nightsoil coolies compared to the old task of emptying a nightstool of waste into a bucket or a cart. Therefore, in July 1904 the Council was seriously considering charging water closet users to make up for the dwindling contract money.³²⁸

Meanwhile, water closets were gaining traction. Entering the twentieth century, the Bund became the testing ground of various new types of architecture. As the buildings grew taller and finer, so grew the necessity of installing water-closet systems. In January 1905, architectural agent Scott & Carter (玛礼逊洋行) applied to the Municipal for installation of a water-closet system at the new Palace Hotel (汇中饭店). They were going to build a six-story tall building on the Bund for Central Store, Ltd. (汇中洋行). Health Officer Henderson pointed out the Public Health Department objection to this form of disposal and requested Scott & Cater's reconsideration of the matter. The Council decided that in the wake of their introducing this installation, they would make a charge of Tls. 150 per month for removal of the ordure.³²⁹ Amidst its emerging popularity, water closet was officially banned. On July 4, 1906, the Land Commission approved the Council's amendment to Building Rule 76: "No connexion shall be made with any drain public or private whereby ordure will be discharged into the same. No water closet, cesspool, cistern or permanent receptacle for sewage or ordure shall be constructed or used"³³⁰ The

³²⁸ Shanghai Municipal Archive, *Minutes of SMC*, Vol. 15, 447.

³²⁹ Shanghai Municipal Archive, *Minutes of SMC*, Vol. 16, 9.

³³⁰ Shanghai Municipal Archive, *Minutes of SMC*, Vol. 16, 288; "The Court of Consuls", *The North-China Herald*, July 03, 1915: 63.

Shanghai Waterworks Company even agreed that it would refuse to supply water to all houses outside Settlement limits where water closets were installed.³³¹

However, the application for water closet installation kept coming. In January 1908, the Council received another application for installing water-closet system at the Mrs. McBain's residence in the Bubbling Well Road in the west extension of the Settlement. The prominent architectural and civil engineering company Atkinson & Dallas (通和洋行) enclosed plans of an elaborate sewage device. The Works Committee was unanimously of opinion that no exception to the Building Rule on this point should be permitted, however perfect the proposed arrangement was. Otherwise, the case would be cited as precedent for like concessions hereafter. The application was therefore rejected.³³² The only exception was the Shanghai Club. In November 1908, when erecting their new building, the Shanghai Club applied for the installation of a system of water closets. The old building of the Club has been so equipped for many years. Opinions were therefore divided among directors. They then decided that water closet be only applied on first and ground floor, but not in the bedrooms. The Council permitted the connection of the drainage of the new club building directly with the Huangpu River as heretofore.³³³ This decision was probably made due to the unique nature of the Shanghai Club. The Club was the place where foreigners gathered for drinking and party. Manual nightsoil disposal simply could not deal with the amount of discharge being produced every day.

³³¹ Shanghai Municipal Archive, *Minutes of SMC*, Vol. 16, 288.

³³² Shanghai Municipal Archive, *Minutes of SMC*, Vol. 17, 24.

³³³ Shanghai Municipal Archive, *Minutes of SMC*, Vol. 17, 161, 164.

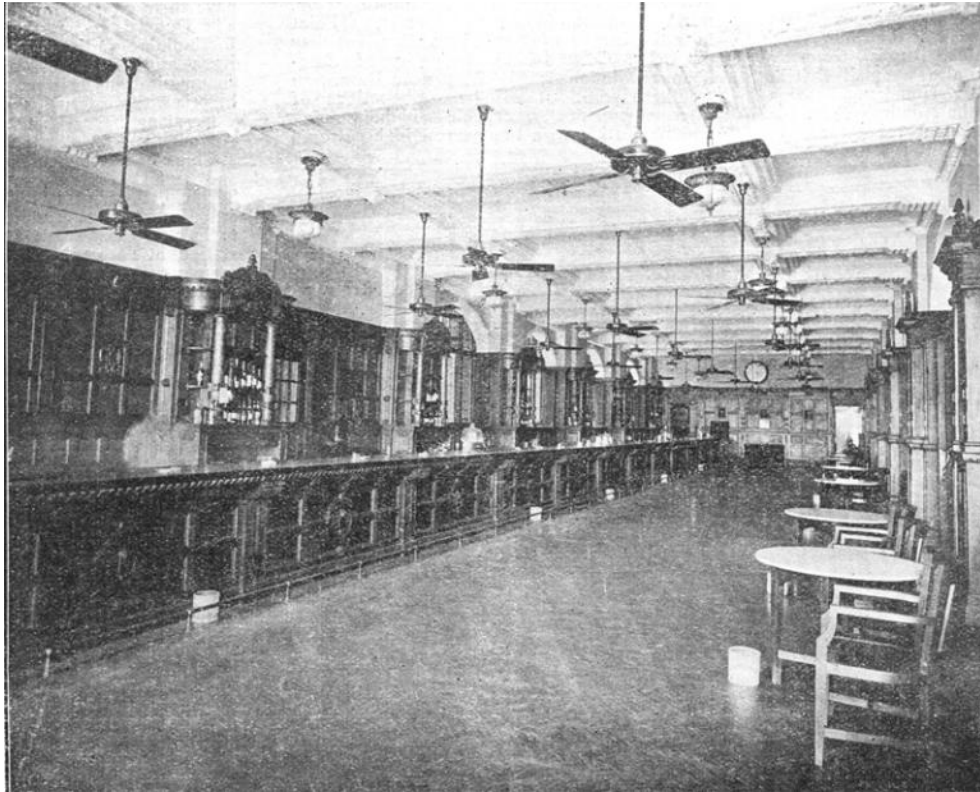


Figure 12 – Long bar at the Shanghai Club. Source: “Shanghai Zonghui Dalou”, Wikipedia, <https://zh.wikipedia.org/wiki/上海总会大楼>

There were three reasons why the Municipal Council was cautiously against water closet. First, it disturbed the municipal contractor system the Council painstakingly created. The contractor did not like diluted waste and cesspool. Record of contractors of the late 1910s showed that they would charge the owner \$1 per water closet for emptying cesspools. It was obviously troublesome for their coolies.³³⁴ Second, the existing drainage system was not ready for water-closet discharge. Drains made in the 1870s were for the sole purpose of draining storm water. Many were small and narrow – varying from 15 in. to 3 ft. 3 in. Large quantity of solid waste would leave the drains chocked up. Finally, the

³³⁴ Shanghai Municipal Archive, U-3-204.

concerns about river pollution. We have established in Chapter 2 that main drains ran across the Settlement and had their outlets north in the Suzhou Creek and south in the Yangkingpang. If water closets were connected to drainage, organic waste matter would flood the creeks. Considering how the British at home survived “the Great Stink” in the summer of 1858, to which the reckless use of water closet and cesspool contributed greatly, it was not surprising that those in Shanghai wanted as few water closets as possible in their neighborhood.³³⁵

5.5 Lifting the Ban on Water Closet

The interest in water closet in Shanghai was reignited after a critical technology in waste treatment was introduced – septic tank. Septic tank was a sedimentation tank, which permitted the decomposition of solids or sludge in the absence of oxygen, leading to a type of fermentation. A septic tank was made in cement. It would have several outlets where processed water, with nearly all organic pollutants removed, was released back to the soil. The sludge could be removed and sold as fertilizer. In comparison, a cesspool drained waste matter by its porous brick wall, poisoning the surrounding soil, and needed to be emptied more regularly. Septic tank was thus a safer and more convenient alternative. In Britain, septic tanks gained wider popularity after 1895. It was then patented and improved in continental Europe. By World War I, approximately seventy-five cities and several institutions employed the latest Imhoff septic tank. It soon became the most popular method for preparing sewage for further treatment on both sides of the Atlantic.³³⁶

³³⁵ Halliday, *The Great Stink of London*, 35-57.

³³⁶ Melosi, 110.

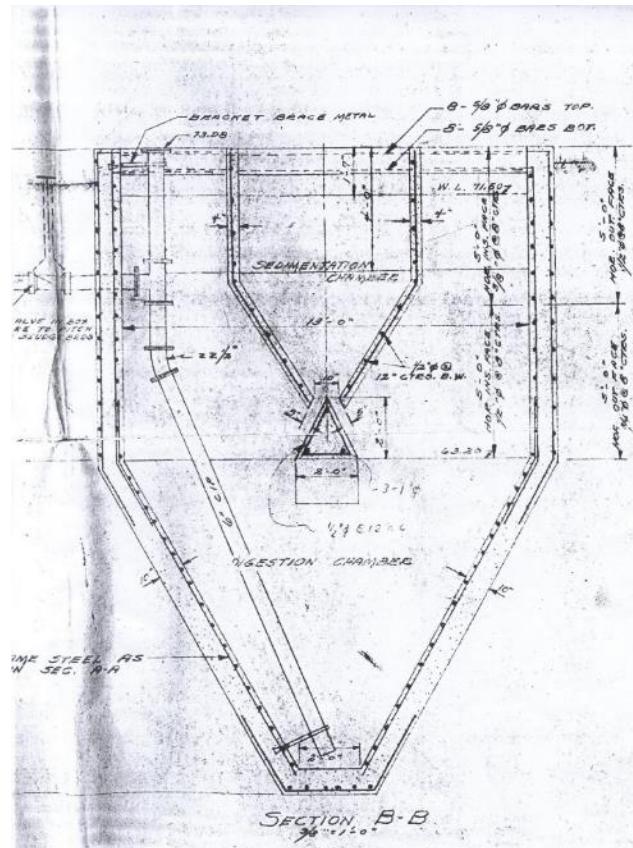


Figure 13 – Structure of the Imhoff Tank. Source: Asmus, 2019.
<https://www.wwoa.org/history/treatment/>

Septic tank made its brief first appearance in the record of Shanghai in 1913. The Banque de l'Indo Chine applied for the installation of water closet and septic tank in the new building, which would be four-story tall and located at the Bund. The Health Officer's report on septic tank was read, but certain members of the Council did not think the prohibition on septic tank was reasonable. It was stated that such tanks were in use in the French Settlement and at other treaty ports like Hankou and Tianjin. They requested the Health Officer to produce another report on this matter. The new report was written in two weeks. It was then circulated at the meeting and had convinced the Council that it would

be undesirable to make any exception in the application of Article 76. The Council then declined the application of the Banque de l'Indo Chine.³³⁷

The real challenge to the water closet ban occurred in 1915. The McBain Company, after purchasing three land lots (50, 99 and 153) at the junction of the Bund and the Yangkingpang, commenced in 1913 the construction of what was later known as the McBain Building, a four-storied tall building situated at the most prominent location in the Settlement. On April 25, 1914, desiring to install in the buildings a water-closet system, the McBains submitted to the Municipal Engineer a diagram and particulars of the proposed system. Any suggestions were welcome, but the Council had not made any. The McBains sent in another application, particularly seeking for a permit. The Council on February 18, 1915, refused to grant a permit on the ground of Land Regulation Article 30 and the Building Rule No 76, which was amended and announced to the public by Municipal Notification No. 1789.³³⁸ Compared to the earlier applications, the case of McBain Building divided the Council further apart. Some urged changes to be made to the current rules because water closet was prerequisite to the modern hygiene. Another presented to the Council a letter signed by foreign physicians in Shanghai, in which they argued for the wide adoption of septic tanks.³³⁹ The Council consulted their legal advisor and was only told that Foreign Building Rule No. 76 was not legally binding.³⁴⁰

In July 1915, the McBain Company brought the petition to the Court of Consul, calling for the annulment of the Rule No. 76. They argued that if water closets and septic

³³⁷ Shanghai Municipal Archive, *Minutes of SMC*, Vol. 18, 427.

³³⁸ "The Court of Consuls", *The North-China Herald*, July 03, 1915: 63.

³³⁹ Shanghai Municipal Archive, *Minutes of SMC*, Vol. 19, 195.

³⁴⁰ Shanghai Municipal Archive, *Minutes of SMC*, Vol. 19, 199.

tanks, which were in universal use in every civilized country, were a danger in Shanghai, they would not have proceeded with the petition. The current rules did not elaborate on how the system should be installed or where it should be installed. The prohibition was general, which was unreasonable. The McBain Company was entitled to the new system in a building, which could be described as one of the largest buildings, if not the largest, in Shanghai. The McBain Building was said to have over forty different establishments, with over forty coolies properly to carry out their duties. The building was an exceedingly high one. If nightsoil were to be removed manually, there needed to be a staircase provided for that purpose only, which was apparently impossible. Nightstools would meet food and other articles being carried in the staircase. The danger of flies was also inevitable. The McBain Company was able to obtain the opinions of four doctors, Dr. N. Macleod, Dr. Ziervogel, Dr. Goode and Dr. Marshall, all of whom had been asked to submit a report on the water-closet system by Moorhead and Halse, architects to the petitioner. They all spoke in favor of the system.³⁴¹

In response, the attorney for the Council stated that it was striking that so far as the proceedings have gone, no reference at all had been made to the question of the water supply of Shanghai. The question was simple: whether, as a matter of fact, the introduction of a system of water closets in Shanghai would, or would not, be likely to constitute a serious danger to the public health by reason of possible contamination of the water supply. It was the sole reason why the Council were in Court. Based on the operation of several existing water-closet systems in Shanghai, they were extremely unsatisfactory and a danger to public health by contamination. The discharge was either poured down the surface

³⁴¹ "The Court of Consuls", *The North-China Herald*, July 03, 1915: 63.

drains, from which it found its way into the river, or was placed in boats where it was dumped into the river halfway to the farmlands. Shanghai had an unusual arrangement regarding water supply. The intake at Yangtszepoo was situated within the very big town, not farther away. The quality of water supply thus depended on the effective collection of nightsoil and other waste matters. Changes in the present arrangements regarding sanitary matters was thus not advisable.³⁴²

In defending the Municipal Council's stance, Health Office Arthur Stanley argued that 1. Unless the waste was suitable for agricultural purposes it was practically impossible to prevent it going into the river. Water closet drainage had no local agricultural value and was rejected by the boatmen. 2. There had been water closets, cesspools or tanks installed before the prohibition came into effect. None of these installations, due to their defective working, could be recommended from a sanitary point of view. 3. There was no method of purification for water closet drainage applicable to the McBain Building yet known to sanitary science. Septic tanks did not do all the work. 4. The suggested "concrete container in the yard at the rear of the buildings into which ordure from commodes could be dumped" could not be recommended from a sanitary point of view and was, moreover, prohibited by the rule. 5. The alternative was the ordinary system in vogue in Shanghai applicable to a large building as to a small one. For example, at the newly built large The Victoria Nursing Home (on Henan Road), no nuisance was caused by adopting the ordinary method of disposal of ordure. Five ordinary ordure buckets held the day's accumulation and were kept in a small fly-proof place in the yard below, ready for removal by the coolie each morning. But Dr. Stanley did admit water-closet system was more convenient, apart from the

³⁴² Ibid.

question of disposal.³⁴³ The attorney representing the McBain Company had the following exchange with Stanley:

“Do you really contend there is no advantage in a water-closet system over the commode system as regard public health?”

“Yes. The present system is extraordinarily well carried out by Chinese, and there is very little spilling.”

“When these vessels are washed out, the dregs must go into the surface drains?”

“No, they go into the coolie’s bucket.”

“How do you know that?”

“I have seen it. I have watched it many times.”

“Are you prepared seriously to tell us that the coolies never spill the dregs into the surface drain?”

“No, I would not say that. It certainly occurs sometimes, but I don’t think it happens very very often.”

... “...[Has] it never occurred to you that there might be some method started in Shanghai of dealing with water closet drainage?”

“Yes.”

“A method such as has been suggested by my witnesses - a destructor or evaporator?”

“Yes, but to me they are impracticable. I don’t think anything that has been suggested is a practicable scheme. I think if there had been a practicable scheme, we should have got it.”

Dr. Stanley then referred to the London system, and said that the discharges there finally went into the river. They were treated in London, so far as he knew, by precipitation works.

“And is that impossible in Shanghai?”

“It is not impossible but impracticable.”

“Why is it impracticable?”

“... Shanghai is vastly different from other places in the world. The chief difference was in the supply of labor, and the most important thing to consider was the water, which was obtained from the river, though this was not an overwhelming obstacle. The scheme suggested by the petitioners was impossible with the present sewage system. My experience of the disposal of nightsoil was not limited to what a contractor said he would or would not do. The contractor and the boatmen might object to the proposed scheme on the ground that it touched their pockets.”

“Is it not a fact that the only reason you know why this cannot be done is that the boatmen won’t take the stuff?”

“No.”³⁴⁴

³⁴³ Ibid.

³⁴⁴ Ibid.

A. P. Wood, Secretary and Engineer-in-chief of the Shanghai Waterworks, also spoke against the McBain scheme on the ground of danger to the water supply. C. H. Godfrey, Municipal Engineer, speaking on the method of removal, said numerous complaints had been received from the Harbor Authorities and the River Police about dumping. Such unsatisfactory practices could not be eliminated. A proper sewage scheme, however, would cost millions of Taels.³⁴⁵

In July, the Court of Consuls decided that Building Rule 76, the ban on water-closet system, was ultra vires. The Court held that such a prohibition was not within the authority given by the Land Regulation, and that the application of the by-laws would suffice to obviate any serious danger to the public health.³⁴⁶ However, the Court also contended that while the McBains were at liberty to proceed with the installation, the Municipal Council were fully entitled to refuse to receive into the boats used by their contractor the contents of the tank or cesspool connected with the proposed water-closet system. The McBains were bound themselves to the satisfaction of the municipal sanitary authority to provide for the periodical removal beyond the limits of the Settlement of all nightsoil collected on their new premises.³⁴⁷ The dispute between the McBain Company and the Municipal Council might have shaken the legal framework that had long been containing the development of water-closet system in the Settlement, but technological changes were still faced with basic practical questions – like, where should the waste water go?

5.6 Dealing with Toilet Discharge

³⁴⁵ Ibid.

³⁴⁶ Ibid.

³⁴⁷ “Local Affairs”, *The North-China Herald*, July 17, 1915: 133.

After the unfavorable ruling, the Municipal Council struggled with the inevitability of water-closet system. Applications and inquires had been received by the Council, requesting the Building Rules Commission to draw up new rules with respect to water closets and to incorporate them in the revised code. However, C. H. Godfrey, the Municipal Engineer, argued that the innovation of water closet was too gigantic an experiment for the city, and a too expensive one. Godfrey said: "In my opinion the adoption of a general sewage disposal scheme for Shanghai is unnecessary and impracticable. I do not say that from an engineering point of view it is impossible - there is no such thing as an engineering impossibility provided the necessary funds are forthcoming."³⁴⁸

Godfrey mentioned the recent practices in England – the borough of Cheltenham, in the valley formed by the semicircular sweep of the Cotswold hills, had a sewage farm. The farm was situated some distance from the town, on which cabbage, roots, etc., were grown with great success and sold for fodder, making the farm a source of income to the ratepayers. Godfrey suggested that the Municipal Council should obtain a large tract of land and farm it by strictly controlling the disposal of sewage. This system, which would cost ratepayers far less than a general water carriage system, would be able to rid of many very real dangers to health. Godfrey admitted that the feasibility, both engineering and financial, of a project of such scale could not be understood with his expertise on this matter. He suggested the Council to reach out to experts who enjoyed global acclaim to address the issue.³⁴⁹

³⁴⁸ "Sanitation in Shanghai", *The North-China Herald*, July 31, 1915: 269.

³⁴⁹ Ibid.

A series of measures were taken in 1916 to curb the rapid development of water-closet system. In February, the Municipal Council began to impose special fees on water closet users – Tls. 2 per water closet, and Tls. 20 per septic tank.³⁵⁰ A special committee was created under the Building Rule Commission to assess the effectiveness of septic tank. After two months of investigation, the committee had its verdict: septic tanks were not safe to public health because the so-called bacterial process was ineffective in removing all impurities.³⁵¹ At the end of 1916, the scheme of waste disposal had emerged. After consulting directors, engineer and surveyors, legal advisers, chief officers of the Fire Brigade, architects, and property owners, the Council put forth the revised code of the Building Bye-laws. It stated that water closet effluent must be conveyed into airtight and watertight cesspools. No form of treatment by sedimentation or filtration or treatment by bacteriological method of excremental matter from water closets shall be permitted in the Settlement.³⁵² In other words, the ban on water closet was lifted, but septic tanks were still forbidden.

The public had their own take on the unfriendliness the Council held against septic tanks. Some said that the Municipal Council reportedly received a comfortable sum at the rate of Tls. 90,000 per year. This money was virtually collected from the ratepayers’

³⁵⁰ Shanghai Municipal Archive, *Minutes of SMC*, Vol. 19, 385.

³⁵¹ In October, Dr. Stanley underwent some changes regarding his attitude towards the water-closet system. Reckoning with the fact that the trend was unstoppable, Stanley suggested that septic tanks could be put to test, but the extent of their effectiveness would have to be closely observed in the laboratory. But after two months of investigation, the committee claimed that the so-called bacterial disinfection proved ineffective. In the report, the committee also attacked Stanley’s wobbling position on the issue of water closet, alluding to that Stanley was under such influence of popular views that he basically retracted the verdict on the sanitary effectiveness of water closet and septic tank he made three or four years ago. The Council did not wish to embarrass Dr. Stanley in front of the public. The committee’s report was thus kept unpublished. See Shanghai Municipal Archive, *Minutes of SMC*, Vol. 19, 487, 516-517.

³⁵² “The New Building By-Laws: Report of the Special Commission”, *The North-China Herald*, Dec 23, 1916: 636.

pockets, since monthly fees had to be paid by each household to the coolies. Therefore, the sum ought to be employed for the comfort and safety of the population of Shanghai. The municipal revenue accumulated over the years should be enough to go a very long way towards the cost of construction of a sewage works. "The question which now presents itself is:" the author in *The Herald* wrote, "whether a sewage works is justified, because it eliminates any profits accruing from the disposal of the residuum. The dollar again enters into the discussion, and that seems to us to be the greatest obstacle to an adequate and rightful solution of the whole affair."³⁵³ In the eyes of the general public, the Municipal Council's prolonged resistance against house drainage system was not a matter of sanitation or cost; it was solely determined by the wish and will of the Council and the influence of the vested interest. "If not enough, other municipal expenses ought to be cut down," someone wrote in *The North-China Herald*, "A safe system of house draining is of more importance than an expensive Municipal Band."³⁵⁴

The public also expressed their loss of faith in the old manual system of nightsoil disposal. Stanley's defense of the old practices was shredded in the press. The health regime of the Municipal Council was under attack. Some argued that while waiting for the right tide, nightsoil farmers formed a floating population who lived and defecated over these creeks. This was equally injurious to the quality of water supply.³⁵⁵ Others said a large proportion of nightsoil coolies emptied about fifty percent of all fluid matter into the drains and took almost only the solid matter.³⁵⁶ Not to mention that in spite of the Council's

³⁵³ "Shanghai's Sanitary Arrangements", *The Shanghai Times*, July 17, 1915: 7.

³⁵⁴ A Resident, "Letter to the Editor", *The North-China Herald*, July 17, 1915: 170.

³⁵⁵ "Shanghai's Sanitary Arrangements", *The Shanghai Times*, July 17, 1915: 7.

³⁵⁶ Observer, "Shanghai's Sanitary System", *The North-China Herald*, Aug 07, 1915: 365.

attempt in regulating the working hours of nightsoil coolies, most of the city still needed to endure the parade of countless evil-smelling nightsoil carts every morning. “It seems preposterous,” someone wrote in *The Herald*, “that the Health Department should allow these crazy, ramshackle hand-carts to be used and that the unsavory work should not all be complete in the early hours of the day when few people are about, instead of being continued up to close on ten o’clock in the forenoon.”³⁵⁷

5.7 Help from Outside: The Fowler’s Report

The Municipal Engineer, C. H. Godfrey, had for some time suggested that the issue of waste disposal could only be solved under the help of experts outside Shanghai. Now that the reputation of the Health Officer Arthur Stanley was damaged, the Municipal Council had to look outside. Godfrey recommended Gilbert Fowler, a bacterial chemistry professor at Manchester University, as the candidate for the job. In April 1917, the Council had agreed to pay Fowler £525 for traveling and composing a report.³⁵⁸ Fowler at the time resided and worked in India. Due to conflict of time, Fowler did not arrive at Shanghai until June 1918. At the first Municipal Council’s meeting he attended on June 19, Fowler made some preliminary instructions for the system in Shanghai, including separation of “trade effluent”, i.e. industrial waste, from domestic waste and replacing iron buckets with enamel ones.³⁵⁹

The most important instruction from Fowler was the employment of “Activated Sludge Process” in the treatment of waste water. Fowler was a specialist and the self-

³⁵⁷ Curator, “A Public Nuisance”, *The North-China Herald*, Nov 02, 1918: 295.

³⁵⁸ The sum is worthy of £43,398.52 in 2017. See Shanghai Municipal Archive, *Minutes of SMC*, Vol. 20, 62.

³⁵⁹ Shanghai Municipal Archive, *Minutes of SMC*, Vol. 20, 288-289.

claimed inventor of this process. In his early works, Fowler already demonstrated sophisticated understanding of aeration and its application in sewage treatment. He also had envisioned a treatment plant that consisted of sedimentary, anaerobic, aerobic, chemical clarification processes.³⁶⁰ When he was visiting the United States in 1912, Fowler ventured to the pioneering experiment station in Lawrence, Massachusetts, where he had his eureka moment. After returning to Britain, Fowler initiated a series of experiments at Manchester's Davyhulme sewage works. After sedimentation, sewage was aerated in the presence of a bacterial sediment or sludge. The effluent became extraordinarily clean. Fowler had his new equipment designed and manufactured. The city of Manchester purchased them and had them operating between September 20 and 26, 1913. Another scientist Walter Jones patented the Activated Sludge Process in October 1913, which consisted an aeration tank, a final settling tank and a pump for return of sludge. In November 1913, Fowler and his associates presented publicly the first of his Manchester studies, suggesting that effluent could be free from bacteria after six hours of aeration. These inventions and discoveries were followed by a string of scientific literature and new patents applications. Activated sludge plants were installed in England. From 1914 to 1921, at least seven of this kind was built across the country.³⁶¹ Shanghai might be slow in its adoption of water closet, but as for the sewage treatment technology, it did not come in late at all.

In Shanghai, Fowler spent more than a month investigating local conditions. During this time, the Health Officer and engineers of the Shanghai Waterworks Company provided

³⁶⁰ Fowler (1902), 1-20; Fowler (1911), 280-311.

³⁶¹ Benedickson, 219-220; Melosi, 111.

very complete statistics regarding the bacteriological and chemical information of the Huangpu River and the current arrangement of water supply at Yangtszepoo. In his final report, Fowler addressed a dozen of important questions that had been left unanswered for years. First, water-closet system. Fowler concluded that the extension of water carriage of sewage in Shanghai was inevitable, to which septic tanks should give way to. Vacuum tank wagon would be employed in emptying the existing septic tanks. The Municipal Engineer should be instructed to prepare plans and estimates for a system of separate sewers, discharging into ejectors from which the sewage would be forced by compressed air to a suitable area of land for treatment. At least 300 acres of land for this purpose needed to be acquired. For every hundred thousand people a million-and-a-half-gallon tank is required. The sewage would be treated by the "Activated Sludge Process". It would produce an effluent which could be absorbed by the land and be turned into the river without nuisance or danger, and a sludge which could take the place of the nightsoil for peasants. Second, the source of water supply. Fowler had examined the water of the Yangtze, taken several miles above its junction to the Huangpu. It was better than the current source of water but was still subject to pollution. There was no practical source of water in Shanghai like the one in Lake Katrine or Lake Thirlmere, the purity of which was incomparable. Therefore, if Shanghai were to keep its present source of water supply, no discharge of unpurified or imperfectly purified sewage into the river should be permitted on any extended scale. This objection to discharge into the river needed to be reinforced by the necessity of safeguarding supplies of fertilizer to the surrounding country. More observations and analysis should be done in laboratories. Third, the persisting drainage problem. Fowler recommends that the present sewers be only used for rain water and that garbage be

excluded therefrom by screens and catchpits. The smaller creeks in the inhabited districts of Shanghai were at present a frequent cause of nuisance. They should be either inverted in cement concrete or completely culverted and transformed into sewer, whichever the local conditions may render most economic or desirable. Finally, Fowler called for a Joint Board for water supply and sewage disposal, which should comprise representatives from all bodies concerned, including the French Concession and the Chinese City.³⁶²

After Fowler's departure, the Municipal Council had some further discussion on the matter. The Municipal Engineer C. H. Godfrey expressed his agreement regarding the character of effluent after the "Activated Sludge Process". He suggested that the effluent remained a danger of disease producing organism that could reach waterworks. Therefore, the location of treatment plants needed to be carefully thought out. Godfrey also suggested that 300-acre land for the plant was necessary. Fifty acres would be sufficient.³⁶³ Starting from the summer of 1919, the Municipal Council had been trying out the new system of sewage disposal. In August, the Municipal Engineer, C. H. Godfrey published in the Municipal Gazette the report on the proposed sewage disposal system. Godfrey had recently visited America, and the information he had gained there gave the matter its practical aspect. A small experimental plant was built by the Public Works Department and the result had been satisfactory. Fowler's idea was to include not only the International Settlement, but the French Concession and Chinese City as well. But local economy and politics had ruled out such possibilities. Godfrey said that with a population smaller than Shanghai, Cairo had just completed a sewerage scheme costing £2,000,000. Shanghai

³⁶² Shanghai Municipal Archive, Q5-3-1973-1; "Shanghai's Sanitary System", *Millard's Review of the Far East*, July 12, 1918: 269; "Dr. Fowler's Report", *The North-China Herald*, July 20, 1918: 123.

³⁶³ Shanghai Municipal Archive, Q5-3-1973-1.

needed to be prepared for bigger figures when contemplating future sanitary arrangements.³⁶⁴

5.8 The Creation of Water-Carriage System

Shanghai was partly following through on Gilbert Fowler's instructions. In the fall of 1919, Godfrey reported that experiments of the Activated Sludge Process had been carried out on a small scale for nearly four months. A primitive plant was able to deal with 4,000 gallons of water closet sewage a day. A clear effluent with a pale yellow tinge was of little or no noticeable smell. The Council was recommended to replace the current experimental plant with another one, still experimental, but on a commercial scale, and to employ a chemist who had experience in matters such as sewage disposal and water supply.³⁶⁵ In November 1919, Godfrey polled the Central District and estimated a total of 1,382 water closets and 575 baths to be installed.³⁶⁶ By March 1920, the handcarts of the Health Department and the vacuum tank wagons of the Public Works Department were employed in emptying cesspools, particularly in the eastern portions of the Central District.³⁶⁷ In September 1920, when Godfrey returned from his trip to India and Burma after examining the water supply and sewer system there, the total number of basins (toilet, bathtubs , etc.) in the whole of the Settlement had increased by at least 1,000, still all connected to cesspools, which had to be emptied at no longer periods than every three

³⁶⁴ "Mr. Godfrey's Report", *The North-China Herald*, Aug 30, 1919: 519.

³⁶⁵ *The Municipal Gazette* 1919, 424.

³⁶⁶ It was estimated that the total amount of sewage to be allowed for daily was 600,000 gallons. From the collecting tank, the sewage would be pumped by means of centrifugal pump installed and working in an underground chamber. The sewage would be pumped by these means into the 9 in. diam. pumping main. The estimated cost of the whole work was between Tls. 100,000 and Tls. 200,000. See *The Municipal Gazette* 1919, 425-6.

³⁶⁷ "The Public Works Department", *The North-China Herald*, Mar 13, 1920: 698.

days.³⁶⁸ In January 1921, the Council approved a scheme for a sewerage system that would deal with the sewage from the portion of the Central District east of Henan Road. The matter was of urgency.³⁶⁹

Meanwhile, engineers in Shanghai joined the discussion about the effectiveness of various sewage treatment. At the Engineering Society of China's meeting in March 1921, a paper on "The Present Aspect of Sewage Disposal with Special Reference to Shanghai" was presented. The sewer consisted for the most part of 9 in. diameter concrete pipes. The main sewer would run via the Bund, Huangpu Road, Nanjing Road, and Dixwell Road to the Disposal site. The size of this would increase from 12 in. diameter at the Bund to 1 ft. 6 in. by 1 ft., egg-shaped after it left the Central District. The pipes would be laid so as to ensure a self-cleansing velocity to the sewage. They would travel by gravity from pump to pump en route, with the exception of the lengths crossing the Suzhou Creek, the Hongkou Creek, and others. Pumping mains were provided over these crossings. Pumping stations would be provided at six localities en route. They would be constructed underground, and no public inconvenience would be resulted. It had been decided to use the Stereophagus type of centrifugal pump, the special feature of which was that it did not become choked by the passage of ordinary solids. The impeller, which was conical, had a number of spiral blades, which, working against a straight cutting blade, provided an action which had been likened to that of a mowing machine. The pumps would be automatic in their action and would be electrically driven. In that same report, sedimentation tank was demerited, including septic tanks and other two special forms of tanks invented by Dr. Travis and Dr.

³⁶⁸ "Mr. Godfrey's latest report", *The North-China Herald*, Sep 11, 1920: 655.

³⁶⁹ "Shanghai Sewage Scheme: Interesting Paper Read Before Engineering Society", *The North-China Herald*, Mar 5, 1921: 601.

Imhoff (Figure 13). Aeration was regarded as the only viable measure in sewage treatment.³⁷⁰

On July 20, 1921, the Public Works Department presented the comprehensive reports on the subject of sewage disposal to the Municipal Council. The scheme provided for the conveyance of sewage to three disposal sites. The Northern works situated on the land to the rear of the Rifle Butts, the effluent to discharge into the Sawginkiang (沙泾港), a main stream in Hongkou area. The Western works was situated on land closely adjoining Brenan Road (长宁路), the effluent to discharge into the Suzhou Creek. The Eastern works was to be situated towards the eastern end of the Eastern District, the effluent to discharge into the Huangpu. Each of these works would receive sewage from a certain section of the Settlement, with the Northern one managing mostly waste of Hongkou, the Western one of the western extension, and the East one of the Central District of the Settlement. The report explained why they planned to build three treatment plants, instead of treating the whole of sewage at one site. It was because to pump sewage in any great quantities from the north to the south of the Suzhou Creek would be costly. The current arrangement was more economical. Godfrey suggested that for the completion of the work of the Central District, it would be necessary to provide an appropriation of Tls. 50,000 in the 1922 budget. The total cost of the project, including land purchase, stood at 3,870,000 (see Figure 14).³⁷¹

³⁷⁰ Ibid.

³⁷¹ More details about the scheme was provided in the report, especially regarding the layout of sewers and pumps. In Central District, the pump would be solely dealing with the portion east of Henan Road. It situated at the junction of Bubbling Well Road and Tibet Road. The sewage would gravitate thereto by two main lines of sewers, a 12-in. diameter sewer traversing Hankou Road and Tibet Road picking up the sewers in the area

(Enclosure)						
ESTIMATED EXPENDITURE 1921						
	Central East of Honan Rd. Tls.	Central West of Honan Rd. Tls.	Western Tls.	Eastern Tls.	Northern Tls.	Total Tls.
Expenditure to July 31	80,000					*80,000
Estimated Expenditure July 31 to end of year						
Main sewers	41,000					
Branch sewers	20,000					
Pumps & motors	65,000					
Total for 1921	206,000					206,000
1922 PROGRAMME						
Main sewers		25,000	292,000	50,000	17,200	384,200
Branch sewers	60,000				32,800	92,800
Pumps & motors						
Disposal works	75,000					75,000
Total for 1922	135,000	25,000	292,000	50,000	50,000	552,000
1923 PROGRAMME						
Main sewers						
Branch sewers						
Pumps & motors		15,000	100,000	30,000	12,000	157,000
Disposal works			300,000			300,000
Total for 1923		15,000	400,000	30,000	12,000	457,000 +Tls. 60,000 for land.
PROGRAMME SUBSEQUENT TO 1923						
Main sewers				85,000		
Branch sewers		210,000	840,000	900,000	300,000	2,250,000
Pumps & motors				100,000		100,000
Disposal works				100,000		100,000
Total for years subsequent to 1923		210,000	840,000	1,185,000	300,000	2,450,000 +Tls. 60,000 for land.
Grand Total	341,000	250,000	1,532,000	1,265,000	362,000	3,750,000 +Tls. 120,000 for land.
Note.—Total cost of Scheme exclusive of Land						Tls. 3,750,000
Total cost of Scheme including Land						Tls. 3,870,000
*Includes £2,500 part payment on pumps						

Figure 14 – The estimated total expenditure of the sewer system. Source: “Sewage Disposal”, *The North-China Herald*, Sep 17, 1921: 894.

south of Nanjing Road, and a 12 in. diameter sewer via Ningbo Road, Lloyd Road, and so to the pump chamber, dealing with the sewers north of Nanjing Road. The subsidiary sewers flowing into these main sewers would all be 9-in. diameter. In the Western District, sewage travel westward via Bubbling Well Road, Hart Road, Yuyuen Road and Brenan Road to the site of the Disposal Works, subsidiary main sewers entering at the junctions of Mohawk Road, Burkill Road and Gordon Road, with Bubbling Well Road. Two 4-inc. pumps would be installed at the junction of Weihaiwei Road and Mohawk Road, the sewage being conveyed through a 12-in. diameter pipe to join the main sewer in Bubbling Well Road. In the Eastern District, west of MacGregor Road (Lintong Road), a 12-in. diameter main sewer would be laid in Broadway (大名路), passing along Chaoufoong Road, East Yuhang Road, Tungchow Road, East Yalu Road and Urga Road through the join the main sewer in Dixwell Road, this latter conveying the sewage through to the site by the Rifle Butts. Two pump stations would be necessary, one with two 6-in. pumps at the junction of Tongshan Road and Chaoufoong Road, and the other with three 6-inch. Pumps in Urga Road close to where this road crosses the Sawginkiang. The subsidiary sewers would all be 9-in. diameter. East of MacGregor Road development was chiefly confined to the vicinity of Yangtszepoo Road, and though there are some very large industrial works in this area, it may be impracticable to provide a water carriage system of sewers for some years. In the meantime, it may suffice to convey cesspool sewage to the nearest completed main sewer by tank wagons. See “Sewage Disposal”, *The North-China Herald*, Sep 17, 1921: 894.

By mid-1926, the construction was near its completion. At the Eastern District Works, four more longitudinal walls had been poured to the aeration tanks, making a total of sixteen. At the power house, the concrete walling and columns had been poured up to the low roof level. At the Western Treatment Works, the preparation of the Power House was in hand and the steel was being prepared.³⁷² By the end of 1926, the Engineering Society proudly claimed that a modern system of sewerage, commenced five years ago, was put into operation this year. The system was capable of dealing with the whole of the International Settlement and the total cost had been somewhat more than three million Taels. The sewage was pumped in stages by means of automatically controlled electrically driven pumps and was treated by means of the activated sludge system at two large treatment works situated in the Rubicon Road and near the Point. The effluent obtained is very satisfactory. The engineer even suggested that these works were on par with the latest practice in Europe and America.³⁷³

By 1930, Public Works Department and Health Department were jointly handling a disposal of nearly 1,000 tons of refuse every day.³⁷⁴ There were 19 of pumping stations in existence, each of which was fitted with electrically driven centrifugal pumps, dealing with the flatness of Shanghai. The total length of sewers laid to date was 50 miles.³⁷⁵ A traveler's note in 1930 recorded the art of the sewage farm in Shanghai. "The task of standing over its tanks and admiring the system whereby air compression separates the actuated sludge from moderately clean water, thus saving the Municipal Council enormous

³⁷² "Municipal Gazette News", *The North-China Herald*, May 1, 1926: 216.

³⁷³ "Engineering Progress in Shanghai Reviewed", *The North-China Herald*, Dec 18, 1926: 540.

³⁷⁴ "President of Engineering Society of China Issues Annual Report to Members", *The China Press*, Oct 21, 1930: 3.

³⁷⁵ "Flatness of Shanghai Necessitates Adoption of 'Separate; Sewerage System'", *The China Weekly Review*, Jul 25, 1931: 321.

expenditure on sewage transport and long distance dumping, demands some display of heroism.”³⁷⁶ What was also recorded was an ongoing Chinese festivity at one of the sewage works. It was a feast day of local importance. A fat smiling Taoist priest was in charge of an amazingly kaleidoscopic marionette show. The works was decorated with gaily colored paper streamers. The works was open to all Chinese visitors. They could even take a curious glance at the engines in the engine room.³⁷⁷

5.9 Conclusion: Expert Systems

Nightsoil was an established business in China. Property owners tended to find their own coolies to have the nightsoil removed at a lower price. Intervention required stronger execution and tactical arrangement with the native forces. During the last decade of the century, the Municipal Council not only expanded its involvement in nightsoil dealings by raising taxes, but also stood firm against the 1895 nightsoil coolie riot and brought the agitator to justice. By 1899 the nightsoil business of the whole Settlement was under control of the municipal contractor, whose monopoly was granted by the British authority.

The Council’s rejection of water closet, however, was not because of its reliance on contractors. Water closets were not suitable for Shanghai’s hydraulic system, in which intake of water supply was too close to the core of the city. Contamination of water supply would be unavoidable if toilets were widely in use. From 1906 to 1915 water closet was prohibited by law. But the ban was lifted in 1915 when the court decided that the Council’s prohibition was ultra vires. Water closets began to gain ground.

³⁷⁶ “Impressions of Shanghai: Special to the N. C. D. N.”, *The North-China Herald*, Sep 16, 1930: 434.

³⁷⁷ Ibid.

For a while, septic tank was believed to be the ideal device to treat toilet discharge. A fierce debate on its effectiveness arose led to the employment of Gilbert Fowler in 1918, a hydraulic engineer known for his promotion of “Activated Sludge Process”. Fowler’s report instructed the Council to phase out septic tanks and adopt a water-carriage system. The construction of the three treatment plants lasted from 1921 to 1926. Shanghai was finally endowed with the full set of city water technologies.

When the Health Officer and the sub-committee of nightsoil could not reach an agreement on the effectiveness of septic tank, the Municipal Council decided to consult experts from outside Shanghai and China to have this debate settled. This was not the first time that the foreign concession sought for external advices. They had done so for building drainage and waterworks. But contracting Gilbert Fowler was a move of different nature. During the early stage of engineering development in Shanghai, individual proprietors were capable of building their own drains. As the city grew, municipal coordination in building a drainage system became necessary. Yet a thirty-year-old engineer (E. H. Oliver) and a part-time health officer were able to do the job. In comparison, building and operating waterworks needed more experience and that is why Engineer-in-chief had played a critical role throughout the history of Shanghai Waterworks Company. Sewage system in Shanghai was by far the most complicated of them all. Unlike drainage and water supply, a sewage system needed a higher level of interconnectedness and compatibility with the preexisting ones. It required more careful measurement of capacity because the waste it carried would have an immediate impact on the environment. It also pertained to expertise beyond that of an engineer because understanding chemistry, such as the effect of anaerobic and aerobic

reactions, became increasingly important in making the right decision. It was the turning point when the Shanghai-based specialists struggled to keep up with the global trend.

Anthony Giddens uses expert system in describing such sophistication: systems of technical accomplishment or professional expertise that organize large areas of the material and social environments. He suggests that expert systems is a disembedding mechanism as it removes social relations from the immediacies of context and provides guarantees of expectations across distanced time-space.³⁷⁸ This summary, when applied to engineering realities, is only partially correct. Each component of the system had already been scientifically approved and could be put in place regardless of local conditions. The principles of septic tanks and activated sludge process would not be affected by change of location. The social context in which they were created was no longer significant in its diffusion. However, building expert system relied on intensive reconfiguration of social relations. Gilbert Fowler recommended that a body of representatives be formed in instructing the building of sewers so that inhabitants in the British, French, and Chinese settlements could enjoy a homogenized underground system. Although the construction of sewage system fell short of this vision, it showcased the influence infrastructure could have had over the political structures.

Technological progressions in Shanghai had hitherto been little involved with the actual members of Chinese society. That was no longer the case. When all infrastructures were put in place, their nature was bound to change – they became the artwork open to interpretation, the Holy Grail people fight for, the threads woven into the tapestry. In the

³⁷⁸ Giddens, 27, 28.

following chapters, we will explore how these technologies made up the strategies taken by the native nationalist forces and how the Westerners strived to keep their advantages.

CHAPTER 6. MUNICIPALITY

On June 28, 1888, Robert E. Wainewright, legal advisor of the Shanghai Waterworks Company, was standing at the Mixed Court, representing an employee in trouble, David Main. Main allegedly assaulted a Chinese man named Chao Yung-chang who ran a hot water shop at the back of the Mixed Court. Hot water shops used to have their supply of water from rivers, but more were now piped and buy their water from the Shanghai Waterworks Company. Chao's premise was one of those. The incident happened on the 21st of June when David Main came to his place and notified him about the 50-cent rate surcharge. Chao, unhappy with the change, agreed to pay only 20 cents more per month. He said he would only agree to pay the full amount if all the other hot water shops consented to the increase. At that point, Main stopped reasoning with Chao. He went to the valve near the shop, in his hand an iron rod with which he was turning off the water. Chao said he attempted to stop Main, and Main struck him with the iron rod over the eye and on the head and kicked him two or three times. Chao was covered with blood and was sent to the hospital. Chao said he was unable to attend to his work on account of the injury in the past days. He could not afford the increase because his business was very dull recently. Chao said he had paid 5 Taels for putting up the water pipe and fittings. He begged Main not to close the tap as would have no water supply for the shop.³⁷⁹

Wainewright, however, accused that the whole story was a fabrication. He was stunned by the theatrical performance of Chao's. What happened was that Chao insisted on paying only 20 cents instead of 50. Main suggested it was not sufficient, then went to

³⁷⁹ "Law Reports", *The North-China Herald*, June 29, 1888: 842.

turn off the water with the key. Chao rushed at him, seized hold of it, and they had a struggle and the key was wrenched away from Main and flew up. The end of it struck Chao in the face, hence he was covered with blood. The wound was inflicted by Chao upon himself. Two other Chinese were called as witnesses. Ma Wang-kung, who kept a cake shop next door to Chao's hot water shop, said that he saw that they had a disturbance. They did not actually fight – Chao did not strike the Main, but Main struck Chao first on the hand and then the head with the iron rod. Shun Ah-loh, the shoemaker living next door to Chao's shop, said that he was taking his little boy out for a walk when he saw the European strike the Chinese man twice, with the key. He then rushed into his own house. His little boy was frightened. He did not see anybody touch Main.³⁸⁰

The Acting Assistant Judge, J. C. Hall, was presiding over the case. Hall concluded that the complainant's action was only natural in resisting a high-handed attempt to take away his means of livelihood. Hall said this was a matter of public interest and the Shanghai Waterworks Company should treat their customers with a proper consideration. He held that Main's attempt to cut off the water was a trespass under the circumstances. He fined Main the maximum sum allowed under the statute, i. e. £5, or in default six weeks' imprisonment with hard labor.³⁸¹

The verdict was sit well with foreigners in Shanghai. They lamented that the Acting Assistant Judge knew too little about "the dark ways and vain tricks of the Chinese." People said that Chao was virtually heard saying, "All right, cut it off." Hence, Main went to carry out the threat. Chao did receive a blow on the forehead, but it was trifling. Main,

³⁸⁰ Ibid.

³⁸¹ Ibid.

on the other hand, had his clothes all torn. The charge of trespassing was also ridiculed because the valve the Main was turning was out in the street, in front of the hot water shop, not within the realm of it. “When Mr. Hall knows Chinese witness a little better,” the author in *The Herald* wrote, “he will know that the fact that three witnesses give the same evidence against a foreigner, should excite strong suspicion that the evidence is trumped up, instead of being taken as an indication of its truth.”³⁸²



Figure 15 – Diorama of a hot water shop. Courtesy of Author at Shanghai Technology Museum of Water Supply.

³⁸² “Article 1 - No Title”, *The North-China Herald*, 07 July 1888: 3.

David Main, a native of Aberdeen, was one of the earliest employees of the Shanghai Waterworks Company. He left Scotland in 1872 and came to Shanghai to join his brother, James Main, to assist in the erection of the first waterworks in China. The enterprise of the Main brothers eventually gave way to the creation of the Shanghai Waterworks Company, and David Main ended up joining the new company on its formation in 1881.³⁸³ Main had the background of a typical Shanghailander. He was young, of British heritage, energetic and entrepreneurial, spending years living in Shanghai, yet still inexperienced in handling his Chinese neighbors. The International Settlement was a place where nine out of ten inhabitants were Chinese, yet only foreigners could call the shots. The cultural barrier, worsened by imbalance of power, was not brought down by the advent of new technologies. In this chapter, we would delve into the process in which water supply and the associated administrative measures slowly became an integral part of Chinese life. Technology prowess and administrative power were equally important in the rise of the public health regime. To govern a city as diverse as Shanghai, the Municipal Council and the Shanghai Waterworks needed each other.

6.1 Selling Water to the Chinese

On April 26, 1883 in London, a special meeting of the shareholders of the Shanghai Waterworks Company was held. The completion of the water supply system in Shanghai was within sight, and the construction took less time than expected. But one major issue remained unsolved. The Company must break into the native market to survive, but how should they sell water to the Chinese who were accustomed to drinking from rivers and

³⁸³ “Obituary: Mr. David Main”, *The North-China Herald*, Aug 26, 1916: 411.

wells? Some suggested that the Municipal Council should include at least one Chinese director so that less obstruction could be expected from the Daotai, for he would tend to believe that the Chinese must have indubitable proof of the water being innocuous before he would vote for its general use. Some foreigners saw it as a way to take away the representative power from the conservative mandarins dictated by Beijing and to hand it over to liberal-viewed Shanghai-based merchants.³⁸⁴

In fact, the Daotai was not entirely hostile to the novelty. The native water supply had many problems. Sediments were so common in the water that the natives had become skillful in applying alum to induce flocculation to clear it up. The river water was also subject to salty tide actions. It was said that when the salty tide reached the rivers, every house had to drink salty tea and eat salty conge.³⁸⁵ The Daotai would surely prefer a native waterworks to be built. He might even have expressed his interest in attending the inauguration if such ceremony was held in the Chinese city. Some foreigners saw this as an opportunity. If the Company could make the Daotai a client, it would surely change the Chinese mind that a foreign company could be trusted in carrying out a mission of such scale and of public nature.³⁸⁶ The invitation extended to the Grand Secretary Li Hongzhang for the opening of the Waterworks at Yangtszepoo in July 1883 was probably for the same purpose – to convince the Chinese, from reformist officials to ordinary users, that water fashioned by foreigners was not disruption to the nature, but gospels for better health and greater convenience.

³⁸⁴ Sadly, this arrangement was not carried out until the 1928 when three Chinese merchants made it into the Municipal Council. See “Correspondence: The Chinese Authorities in Shanghai”, *The North-China Herald*, Nov 22, 1882: 565.

³⁸⁵ Zhang Yaojun, 2012.

³⁸⁶ “Summary of News: Latest Intelligence”, *The North-China Herald*, Apr 04, 1883: 362.

The problem, however, was that a life style as such was not affordable to many. When the waterworks advertisement appeared in the vernacular Chinese papers, people flocked to the office to enquire into the terms and arrangements the Company proposed. But inquiries soon died down. The reason was that the Company intended to charge the sum of fifteen cash for two buckets of water and three cash for the coolie, making the sum total for every two buckets of water eighteen cash; if the water was from the Huangpu River or Yangkingpang, it only cost three to five or six cash for two buckets for those who lived near, and fourteen cash for those who lived afar. The Chinese believed that when water of Huangpu was consumed along with tea, boiled and distilled, it was as pure as water from the waterworks. "My countrymen's ideas of economy far outweigh their care for health and cleanliness." the author 'A Chinese' wrote in *The North-China Herald*.³⁸⁷

Unable to lower the price just for the Chinese customers, the Shanghai Waterworks Company again resorted to appealing to officials and expected a trickle-down effect that might loosen up the grip of old habit. The members of the Company sent around a present of a few sample buckets of clear water to the Daotai, the Zhixian (magistrate of a prefect), the Marine Subprefect, the French Mixed Court, and the English Mixed Court. The gifts were received with polite gratitude, and the coolies who brought the water were presented with handsome tips. Judge Chen of the English Mixed Court, however, refused to receive such present. Chen explained to the Company that he had been drinking the muddy water of the Huangpu all his life. He did not intend to take up something this new at his old age. Chen said the crystal water might be good for his goldfish, but he himself enjoyed water

³⁸⁷ A Chinese, "The Waterworks", *The North-China Herald*, Aug 10, 1883: 185.

with a little substance in it.³⁸⁸ By the end of the year 1883, the Company still had a hard time finding Chinese customers. Even among those buckets collected from the water of hydrants, nine out of ten went to foreigners who had not yet piped their houses.³⁸⁹

It was later discovered that the aversion among Chinese, apart from higher price, was due to rumors that was meant to scare them away. For example, some rumor had it that the foreign water was drugged with opium and if one drank the water, it would cause the addiction similar to the one to opium. Others said the foreign water was poisoned. If raw alum was put into the water, it would turn black the next morning. Some people believed that there were two dragons fighting each other inside the water pipe, or that the water pipe was so close to the gas pipeline that the water coming from underground was poisoned by the gas. More outlandish ones suggested that some person had been drowned in the water tower, or the water at the height of the water tower must have been spoiled by lightening. The Company was able to spot one source of rumors. It was a Ningbo man, Ying Changfu (应昌福). Upon the completion of the water supply in the International Settlement, Ying thought of registering a company to obtain the monopoly of supply of SWW water to the native city. But some enterprising Chinese had formed a company of this kind already. Ying then used his utmost endeavors to sabotage their business. Being a Ningbo man, Ying found many fellow townsmen among water coolies in the Settlement. They were concerned about losing their business when the monopoly of such Chinese company was realized. They then helped spread the rumor to tarnish the name of the

³⁸⁸ "Summary of News", *The North-China Herald*, Aug 31, 1883: 246.

³⁸⁹ Viator, "Correspondence: Conspiracy against the Waterworks", *The North-China Herald*, Nov 28, 1883: 621

foreigner-made water.³⁹⁰ The Shanghai Waterworks Company, in reaction, asked the Chinese magistrate of the Mixed Court to issue a proclamation to quiet the fears and rumors.³⁹¹



Figure 16 – Illustration of the working of water supply. The Chinese explanation was to educate the Chinese on the matter. Source: “Zilaishui zhi li (futu)”, 1881.

6.2 Promoting Water Supply by the Municipal Council

³⁹⁰ Ibid.; “Proclamation: Proclamation of the Mixed Court Magistrate”, *The North-China Herald*, Feb 20, 1884: 202.

³⁹¹ “Proclamation: Proclamation of the Mixed Court Magistrate”, *The North-China Herald*, Feb 20, 1884: 202; Shanghai Archive Information Website, 2008.

The persistence of Chinese habit was not only a problem for the Shanghai Waterworks Company, it also drew attention of the Municipal Council because the insanitary practices posed an immediate danger to the foreign community. At the Council's meeting in 1884, T. W. Kingsmill pointed out that the sources of native water supply were often only steps away from the terminations of the various roads. The drainage went into the Suzhou Creek and the Yangkingpang at the same sections. The water coolies were dipping their buckets into the contaminated water at the drain mouths. At the northern end of Shanxi road, drainage went through a decayed timber trunk into the Suzhou Creek under the jetty. The stench under this jetty in warm weather was unbearable, yet down the unpaved slope at the side large numbers of water coolies were constantly to be seen dipping their buckets into the slack water. Kingsmill said it would be advisable to restrict the times of drawing to the period of flood tide. Water carts of the native coolies needed to be kept clean, and at intervals disinfected with Condy's fluid or other effective preparations.³⁹²

Health Officer Edward Henderson said it was true that water carriers were utterly indifferent at where they filled their buckets. He had seen supplies taken from the center of floating garbage. Water coolies preferred the mouth of a drain because it was much closer for them. Henderson did not believe that it was practically possible to restrict the water coolies in filling their buckets to certain states of the tide. He argued that the only efficient remedy was for the Municipal Council to buy from the Waterworks Company the right to supply the whole native population with pure water from fixed hydrants erected at suitable points in the public streets. Henderson suggested that this purchase might lead to higher taxes briefly, but the health of foreigners in Shanghai was intimately bound up with the

³⁹² "Meeting: Municipal Council", *The North-China Herald*, Sep 12, 1884: 303.

health of the natives. Zymotic diseases - fevers, cholera, and the like invariably developed first among the Chinese. Any measure that restricted the development of disease in the native population diminishes the risk of extension to foreigners.³⁹³

In late 1884, the Health Officer grew increasingly concerned about the use of the water taken from the Suzhou Creek and the Yangkingpang for native consumption. The Company did not rule out the possibility of selling Municipal Council at a lower rate, but the rate must be mutually agreed.³⁹⁴ In February 1885, the Council voted to enter into negotiations with the Company with a view of securing a supply of pure water to the native population. The motion was carried under the condition that ratepayers of the Settlement would not have to bear any pecuniary responsibility.³⁹⁵ But the Council quickly abandoned the idea due to its embarrassing financial position. Alex McLeod, president of the Shanghai Waterworks Company, suggested that the real problem lied at the gatekeepers of the Chinese property. Water, which was supplied at 8 or 10 cash for two buckets, cost the natives at the end of an alleyway sometimes twice or three times that sum. McLeod suggested that the Council ought to publish the rate of water supply in certain districts in the Settlement so that the public could become aware of the origin of high price.³⁹⁶

To regulate the price of water for native population, the Municipal Council proposed two experimental measures. First, the Council could allow a servant of the Company to accompany the Municipal Tax Collector to make enquiry from house to house as to whether water supply was needed, at what prices were they charged, and if there was

³⁹³ Ibid.

³⁹⁴ "Meetings: Municipal Council", *The North-China Herald*, Nov 26, 1884: 603.

³⁹⁵ "Meetings: Annual Meeting of Ratepayers", *The North-China Herald*, Feb 18, 1885: 189.

³⁹⁶ "Meetings: Annual Meeting of Ratepayers", *The North-China Herald*, Feb 25, 1885: 220.

any grievance about the present supply. Second, the Company would be permitted to distribute notices under the Municipal Council seal, stating that intending customers could contract directly with the Company or with the Council through their tax collector, and that their contract would be subject to no additional squeeze. The rate would be collected like ordinary taxes and the tax collector would be the only person authorized to collect the money.³⁹⁷

Meanwhile, the Shanghai Water Company was becoming more ready to take on missions other than earning profit. At the fifth annual general meeting in 1885, months after the Council's proposed cooperation, Chairman of Board E. F. Duncanson contended that by far the promotion of fresh water to the native population failed largely due to Chinese's inertia of mental constitution, which was the same mentality that made him "eat his favorite shark fins putrid, and scorn every egg laid in the present century".³⁹⁸ Duncanson suggested that a growing native market would generate higher dividend for shareholders, but the Company also had innate moral obligations in defending sanitation in the East:

"Think for a moment what improved sanitation means. It means the reduction of the death-rate from a larger to a smaller figure - the preservation of so much life in which the happiness of any one of us may be bound up by the closest ties which unite social or family life. Bear with me for a moment while, in all seriousness, I point the moral of this last remark. Are we not at this very moment deploring the loss of one whose name has been a household word in the East during the lifetime of the present generation, whose keen insight, dauntless courage, and inexhaustible energy and industry, displayed in so many fields both in China and Japan, have stamped themselves indelibly upon the histories of these Empire? Death, which Sir Harry Parkes had faced in many forms, some of them inexpressibly terrible, came to him in the subtle guise of typhoid

³⁹⁷ "Meetings: Municipal Council", *The North-China Herald*, Apr 18, 1885: 441.

³⁹⁸ "The Shanghai Waterworks Company (Limited)", *The North-China Herald*, July 03, 1885: 16.

poison. I shall not suspect of any unworthy motive in thus referring to its latest and most distinguished victim in China. If in his varied career, he was witness to and even an active participator in the stirring scenes which come in the train of war, his large intelligence and active kindliness of disposition were ever enlisted in the arts of peace, and in the promotion of those works which conduce to the welfare, the comfort, and the happiness of mankind.”³⁹⁹

After the meeting, the establishment in Shanghai immediately took on a more active role in promoting service to the Chinese. They managed to obtain the service of, not a municipal tax collector, but a police officer to go around with their men soliciting customers. Tickets began to show up over the doors of the houses, denoting whether water was supplied by contract, by ticket, or from pipes. The Company even supplied the pipes at their own cost.⁴⁰⁰ In November 1885, the Company was granted the permission by the Daotai to lay the water pipes in the Chinese city.⁴⁰¹ In the summer of 1886, the Chinese living at the upper end of Tibet Road was able to enjoy free supply of fresh water from the hydrant. The Company used the scene as an expressive suggestion to the ratepayers that free supply of water would be beneficial to the entire Settlement.⁴⁰² After an intense summer of campaigning, it seemed that general trust in the water produced by the Company

³⁹⁹ Ibid.

⁴⁰⁰ “Summary of News”, *The North-China Herald*, July 24, 1885: 86.

⁴⁰¹ “News of Summary”, *The North-China Herald*, Nov 04, 1885: 514.

⁴⁰² “Summary of News”, *The North-China Herald*, July 16, 1886: 54. The Company business ran into trouble in 1886. That was why at the time the management was in hope of a stable source of municipal funding. By the middle of 1886, the Company was able to earn a sizeable net profit of £2,374.4. But the receipts, derived almost entirely from the sale of water, were regarded as greatly disappointing. The dividend fell from 4 percent to 1.5 percent. The chairman, E. F. Duncanson, was unhappy what the foreigners in Shanghai was paying the Company, calling them “giving too little, and asking too much.” Once a Shanghailanders himself, Duncanson said that the foreigners in Shanghai now luxuriated in a bountiful supply of pure, bright water, undreamt of when he was a resident there, but their contributions towards the dividend were hardly worthy of their well-established reputation for liberality. At this point, the Company was hoping that the Municipal Council would followed the precedent of the authorities of the French Concession – to buy water from the Company and to give the native residents water for free. “The backbone of our enterprise,” said Duncanson, “is the supply to the Chinese inhabitants in the foreign settlements, and the sooner this is thoroughly realized by the shareholders in Shanghai the better for all of us.” See in “Report: Shanghai Waterworks’ Company, Limited, Directors’ Report”, *The North-China Herald*, June 18, 1886: 649; “The Shanghai Waterworks’ Company (Limited)”, *The North-China Herald*, June 25, 1886: 669.

was formed. It was dubbed as “the self-coming water”. Waterworks water became commonplace among hot water shops. For a while the Company provided the supply for free; in return, these shops announced to their customers that they sold nothing but waterworks water.⁴⁰³



Figure 17 – Illustration of water fountain for Chinese. Source: “Zilaishui guan (futu)”, 1883.

6.3 Relocating the Company to Shanghai

⁴⁰³ “Front Page 1 - No Title”, *The North-China Herald*, Sep 24, 1886: 329.

As all Shanghai-based branches were engaged in all ways possible to sell fresh water to the Chinese, the necessity of having a company headquartered in London was called into question. An anonymous shareholder lamented in *The North-China Herald* that while the Directors in Shanghai deserved to reap some benefit for their energy and zeal, a Board in London did not deserve to have the income they enjoyed.⁴⁰⁴ The feud between the operatives in Shanghai and the directory in London was not new. In October 1884, the Board in London was to add another member. The decision faced strong criticism from Shanghai. They felt that if there were to be an additional director, it should be added in Shanghai where the increasing business needed to be attended.⁴⁰⁵

When the growth of native market fell short of expectation, call for the abandonment of the directory in London grew louder. On August 30, 1886, a meeting of shareholders was held in Shanghai. Thirty members attended the meeting, including Alex McLeod and the only Chinese shareholder, Show Foong. It was formally proposed to transfer the head office and the directorate from London to Shanghai. It was suggested that to have the head office in Shanghai had been the plan since the Company was launched. The mission of the London office was completed. A registered office and a secretary would remain in London to attend to the transfer of shares, but the main body of the directory should be relocated in Shanghai. The proposition was carried unanimously.⁴⁰⁶

The letter of proposition was signed by fifty-six shareholders, representing some 2,700 shares. Upon receiving the letter in October, the Directors in London accentuated

⁴⁰⁴ Shareholder, "Correspondence: The Shanghai Waterworks Company", *The North-China Herald*, May 07, 1886: 486.

⁴⁰⁵ A. Shareholder, "The Shanghai Waterworks Company", *The North-China Herald*, Oct 22, 1884: 460.

⁴⁰⁶ "Shanghai Waterworks' Company, Limited", *The North-China Herald*, Sep 04, 1886: 259.

that there had long been misapprehension as to how the expense of the London establishment affected the dividends. The proportion borne by this expense to the total annual expenditure was indeed 6.25% in 1884 and 6% in 1885. But in general, the London directory agreed with the idea that the disappearance of prejudice among the native population was subject to the Company's ability in producing a larger and more remunerative demand for its supplies of water. Thus, a focus in Shanghai was desirable for business. The proposition was approved.⁴⁰⁷ Overall, the Shanghai Waterworks Company's nature was undergoing significant changes. In 1885 the directory at London did not hold back to declare that their sole object is a handsome dividend.⁴⁰⁸ Now that the business of water supply had made inroads into local society, a change of tone was necessary. Foreigners in Shanghai had noticed that though in its constitution a private association of shareholders, the Company had become so much mixed up with public interest.⁴⁰⁹

The campaign to attract native consumers resumed. On October 13, 1886, the Daotai of Shanghai, accompanied by a few officials, visited the waterworks in Yangtszepoo. They were warmly received by the directors and the management of the Company. The Daotai inspected the filters and machinery and expressed satisfaction with all he saw.⁴¹⁰ In May 1887, the Company obtained the consent of the Daotai to lay mains across the walled native city, up to the gates in the south.⁴¹¹ The Municipal Council, around the same time, erected a public drinking fountain at the end of the Peking Road in the north. The fountain was placed upon one of the pillars near a public garden. It was meant to lure

⁴⁰⁷ W. G. Howell, "Correspondence: Shanghai Waterworks' Co.", *The North-China Herald*, Oct 06, 1886: 373.

⁴⁰⁸ "The Shanghai Waterworks Company (Limited)", *The North-China Herald*, July 03, 1885: 16.

⁴⁰⁹ "Front Page 1 - No Title", *The North-China Herald*, Sep 24, 1886: 329.

⁴¹⁰ "Summary of News", *The North-China Herald*, Oct 13, 1886: 386.

⁴¹¹ "The Shanghai Waterworks' Company (Limited)", *The North-China Herald*, May 27, 1887: 578.

in more native in the northern part of the Settlement. The Company provided the related devices and services at the cost of only Tls. 9.⁴¹²

The service of in Shanghai spread steadily across the Chinese section of the city. During the first year of operation, the Company lost Tls. 5,000 due to the unsuccessful campaign of supplying the Chinese with water. By 1887, positive signs began to show. In March 1886, only 806 native houses were supplied with water. In the same month 1887, the number grew to 1,020. The monthly receipt from the Chinese houses rose from \$607 in 1886 to \$1,044 in 1887. The number of houses supplied from street hydrants also increased – from 1,288 in 1886 to 1,507 in 1887. The total net income from all native sources was \$27,000, which included \$13,000 from houses supplied with hydrants and \$12,900 from direct supply to the native houses.⁴¹³ By May 1887, the transfer of the Company's headquarter was completed. The Shanghai Waterworks Company finally lived up to its name in the literal sense.⁴¹⁴

6.4 Endeavors to Acquire the Waterworks, 1888 and 1891

Water system in French Concession was considerably different from that of their English neighbor. For a while, the French Council did not charge residents for using water. Water was provided by the authority at fountains and hydrants that were made by the Shanghai Waterworks Company. On February 4, 1885, the French Municipal Council authorized the fund for the land required for their own waterworks.⁴¹⁵ Yet by the 1890s, the project was going nowhere. Reliance on the British water continued. In the end of 1897,

⁴¹² "Meeting: Municipal Council", *The North-China Herald*, Aug 05, 1887: 152.

⁴¹³ "Shanghai Waterworks Co., Limited", *The North-China Herald*, Apr 13, 1888: 418.

⁴¹⁴ "Summary of News: Latest Intelligence", *The North-China Herald*, May 06, 1887: 486.

⁴¹⁵ "The French Waterworks: The Opening Ceremony", *The North-China Herald*, Jan 15, 1902: 86.

the French waterworks was finally commenced.⁴¹⁶ An agreement was reached between the French Council and the Shanghai Waterworks Company in 1899. The Company would keep supplying the Concession until the French waterworks were in operation. In the meantime, the French authorities would buy out all the pipes laid by the Company in the Concession for the lump sum of Tls. 35,000.⁴¹⁷

The construction went on for five years, which was unnecessarily long considering the size of the plant. On January 4, 1902, the inauguration of the new waterworks took place at the pumping station at Dongjiadu (董家渡). Consul-General for France, Chairman of the French Municipal Council, and the Daotai of Shanghai attended the ceremony. It was declared that there would be no competition between the French waterworks and the Shanghai Waterworks Company. The General-Consul praised the Daotai as enlightened man. Rhetorically, the water supply brought the two settlements together as one community, but in reality the French did intend to supply the neighboring Chinese town.⁴¹⁸

The Shanghai Waterworks Company, however much public interests they were involved in, was still a private, profit-driven enterprise. While pursuing a moral goal of modernizing the Chinese habits, the Company never shied away from the best financial

⁴¹⁶ "Article 1 - No Title", *The North-China Herald*, Dec 24, 1897: 1115.

⁴¹⁷ "Readings for the Week", *The North-China Herald*, Mar 13, 1899: 415.

⁴¹⁸ "The French Waterworks: The Opening Ceremony", *The North-China Herald*, Jan 15, 1902: 86. The star of the ceremony was J. J. Chollot, the chief engineer of the new waterworks, who was recommended by the Consul-General to Paris for the cross of the Legion of Honor. Chollot was born at Metz in 1861 and after graduation from the "Ecole des Ponts et Chaussées," the renowned French school of technology, he came to China employed on a tenure provided by the Russian government. He directed the construction of the wharves at Port Arthur and Qingdao. After the work in Qingdao was completed, Chollot came to Shanghai and was made the municipal engineer. Chollot was responsible for laying the finest streets in the French Concession, including Avenue Joffre (淮海路) and Route Pere Robert (瑞金二路), and for erecting utility works like the ones of water and electricity. Chollot was awarded by Paris with the cross of the Legion of Honor for his contribution in Shanghai. See in "Noted French Resident of Shanghai Dies", *The China Press*, Nov 09, 1938: 1; "Obituaries: Mr. J. J. Chollot", *The North-China Herald*, Nov 16, 1938: 278.

gain. This pursuit often pitted the Company against the Municipal Council. For example, when the two sides signed the contract in 1880, the Municipal Council asked for the supply of 150,000 gallons of water per day. By 1886, the Company reported that the Council was using more than what was agreed upon and should pay Tls. 8,000 for the additional supply. The Council insisted that according to their calculation the amount of water used was less than was provided for by agreement. Both sides released data in *The North-China Herald* in hope to gain more support from ratepayers.⁴¹⁹

At the Ratepayers' Meeting, the opinions were divided. There were those who thought the Company was entitled to the additional remuneration for the quality municipal improvements they made happen – few cases of fire, lowered rates of insurance, and cleaner roads. But the opponent suggested that these improvements were irrelevant. What was at the heart of the argument was the discrepancy between the figure of the Council and that of the Company. J. W. Hart, chief engineer of the Shanghai Waterworks Company, suggested that the way the Council calculated those numbers were unfathomable, but it was most likely that only the quantity of water received into the watercarts each day was included. But large amount of water was wasted when the carts were being filled, like in case the hydrants were left open. The quantities wasted was unknown. There were forty cases of fire during the past year, in all of which great amount of water was used but was not counted towards municipal usage. Hart estimated that the water used for this purpose alone was about half a million gallons. Hart then argued from 1880 to 1886, the population in the Settlement increased 22.5% and the houses 32%. The Company met this increased

⁴¹⁹ “Meetings: Municipal Council”, *The North-China Herald*, Feb 17, 1886: 173; “Summary of News”, *The North-China Herald*, Feb 24, 1886: 190.

requirement but received no increase of revenue. The amendment of paying the Company additional Tls. 8,000 was then put to the vote and was lost by a narrow majority.⁴²⁰

This dispute was eventually up to arbitration. On September 6, 1886, it was announced that the Company should be paid by the Council the extra amount of Tls. 8,000. The umpires argued that the limit of the amount of 150,000 gallon of water per day, stipulated in the 1880 agreement, did not mean that as long as the Council used less than 55 million gallons within a year, they did not need to pay for the extra. The original contract was clear on that. Therefore, the arbitration went in favor of the Company.⁴²¹

The 1886 dispute was a legal landmark that solidified the Company's position against the Council when their interests conflicted. In 1887, upon the expiration of the previous contract, the Company suggested that they were ready to furnish a daily supply of 200,000 gallons instead of 150,000 gallons per day for municipal purposes. In order to acquire the service, however, the Council had to pay an extra Tls. 2,000 per annum, or an altogether Tls. 10,000 every year.⁴²² The demand spurred some harsh words from ratepayers. The directors of the Company were called out for "issuing edicts as absolute as the ukases of the most autocratic Czar".⁴²³ The Company was also criticized for its overreach in private life. For example, the Company forbid consumers to sell water to the water coolies, but the coolies came for water anyway. The customer was liable to have his

⁴²⁰ "Meeting: Annual Meeting of Ratepayers", *The North-China Herald*, Feb 24, 1886: 202.

⁴²¹ Deed of Covenant, Clause No. 4: "The charges to be made by the Company for the supply of water for municipal purposes shall provided such supply do not exceed one hundred and fifty thousand gallons per diem be for the first five years eight thousand Taels per annum payable quarterly and if a larger supply than one hundred and fifty thousand gallons is required the charge for the overplus shall be at the same rate per gallon." See "Meetings: Municipal Council", *The North-China Herald*, Sep 18, 1886: 313.

⁴²² "Meetings: Municipal Council", *The North-China Herald*, Jan 05, 1887: 11.

⁴²³ "Summary of News", *The North-China Herald*, Aug 12, 1887: 170.

supply cut off if any exchange took place. Any change to the tap needed the permission from the Company's engineer. Meanwhile, the Company did not bear the responsibility of piped water causing damage to the customer's house. Ratepayers began urging the municipality to look into the possibility of acquiring the works and conduct them on sound liberal principles.⁴²⁴

Following the popular demand, the Municipal Council began looking into the terms and conditions on which they could acquire the whole water supply of the Settlement. The agreement between the Council and the Company never closed down on the possibility of a buy-off. It only required one-year's notice in writing of the intention before the expiration of the contract.⁴²⁵ At the meeting of Council in February 1888, it was formally suggested that now that the incoming Council should consider the advisability of taking advantage of the option of acquiring the undertaking for the ratepayers.⁴²⁶ In April, the Council wrote to the Company and inquired into the possibility of total acquirement. But apparently the Council narrowly missed the one-year window. The directorate outright cut off any further discussion by invoking the Article VIII of the contract and said that they were "not at present prepared to make any other proposals on the subject".⁴²⁷

The hybridity of private business and public interest continued. Compromises were made by both sides. The Company often had the upper hand in fixing the price of municipal supply;⁴²⁸ but the Council would have the right to direct the Company to expand their

⁴²⁴ "Correspondence: The Shanghai Waterworks Co.", *The North-China Herald*, Aug 19, 1887: 212.

⁴²⁵ A. McLeod, H. R. Hearn, Robt Mackenzie, J. M. Ringer, "Agreement Between the Municipal Council and the Waterworks Company", *The North-China Herald*, Feb 22, 1881: 180.

⁴²⁶ "The Ratepayer Meeting", *The North-China Herald*, Mar 02, 1888: 232.

⁴²⁷ "Meeting: Municipal Council", *The North-China Herald*, May 12, 1888: 531.

⁴²⁸ For 1889, The Council proposed Tls. 6,700 for 125,000 gallons of water per day and for any quantity used in excess of 125,000 gallons per day, the Council would pay at the rate of one dollar for 5,000 gallon. The

services into places where material incentives were inadequate.⁴²⁹ The cooperation brought about immediate, visible benefits to the entire community. At the end of the 1889, the Council was pleased to learn from the Health Officer that the death rate in 1889 was the lowest recorded in the last twenty years, two per ten thousand lower than in 1875. Henderson suggested the Council should exclude all other sources of water supply than the Shanghai Waterworks'.⁴³⁰

The Municipal Council launched another acquisition in late 1891. In October, the Council formally informed the Company about the intent of acquiring the land, buildings, machinery on March 31, 1893, ten years from the date fixed for the completion of the works.⁴³¹ On November 24, the Company made their demands after serious consideration about the matter. They fixed the price of their property and business at no less than two million Taels.⁴³² The exorbitant price triggered backlash from ratepayers. They had very different estimation about the assets of the Company. Some suggested that according to the published accounts of the Company, the assets were valued at Tls. 731,444; even with the land included, the value was far below two million Taels. Others suggested the value

Company, however, rejected the proposal and offer their four-tier plan of municipal water supply: Tls. 9,125 for 125,000 gallons of water per day, Tls. 10,950 for 150,000 gallons, Tls. 14,600 for 200,000 gallons, and Tls. 18,230 for 250,000 gallons. The Company was not to be held responsible for a larger supply than that contracted for, but for the requirements of the Fire Brigade service, the Company agreed to give such a supply without extra charge. See "Meetings: Municipal Council", *The North-China Herald*, Sep 07, 1888: 272.

⁴²⁹ The Company was obligated to erect hydrants wherever the Council deemed desirable or necessary within the limit of the International Settlement. The hydrants would be provided by the Company with almost free of charge, with the Company being entitled to a rental of 10% of the cost of supplying them. But for those regions where mains were not yet laid down, it would be the Council that bore the cost of laying pipes. Otherwise, the Company would have no incentive to reach to the areas where few consumers existed. See "Meetings: Municipal Council", *The North-China Herald*, Feb 15, 1889: 177; "Meeting: Municipal Council", *The North-China Herald*, Aug 31, 1889: 273; "Meetings: Municipal Council", *The North-China Herald*, Sep 14, 1889: 329.

⁴³⁰ "The Municipal Report – I", *The North-China Herald*, Feb 14, 1890: 166.

⁴³¹ "Meetings: Municipal Council", *The North-China Herald*, Oct 09, 1891: 494.

⁴³² "Meetings: Municipal Council", *The North-China Herald*, Dec 04, 1891: 775.

should be fixed by arbitration, which according to some estimation was around 1.5 million Taels, giving the shareholders a net return of over Tls. 200 a share, Tls. 40 more a share than its current value.⁴³³ At the Ratepayers' Meeting on February 29, 1892, it was agreed that as the price proposed by the Company was far beyond what the ratepayers were willing to give, they had no resolution regarding it to submit.⁴³⁴ This marked the second failed attempt of acquisition by the Municipal Council. The first time in 1888 was thwarted by legal technicalities, whereas the 1892 endeavor was tanked by the disinterest among majority of ratepayers. A municipal water supply became an increasingly intangible idea.

6.5 Publicness of Water Issue

The monopoly enjoyed by a private company did not change the reality that water supply was a matter of great public interest. While the Shanghai Waterworks Company was profiting for supplying clean water, it also bore the burden of a public venture. People living in Shanghai believed that some authority needed to be appointed to test the water supplied by the Company. The analysis should be done monthly, with the samples taken indiscriminately across the city.⁴³⁵ In April 1892, the Company offered to have their testing results published in *The North-China Herald* to earn the trust.⁴³⁶ In January 1893, however, people noticed cloudiness of water in Shanghai and demanded explanations. The Company reported to the Council multiple possible reasons that might have contributed to the

⁴³³ "The Council and the Water Works' Company", *The North-China Herald*, Dec 04, 1891: 768.

⁴³⁴ "Meetings: Annual Meeting of Ratepayers", *The North-China Herald*, Mar 04, 1892: 273.

⁴³⁵ "Correspondence: the Water Supply", *The North-China Herald*, Apr 01, 1892: 422.

⁴³⁶ The result showed that the SWW water contains 10.4 grains of solid matter per gallon, about 3 of which consist of lime and magnesia and nearly 3 of common salt. The water was considered by A. P. Wood a good water for drinking purposes, whilst its comparative softness rendered it excellently well fitted for ordinary domestic purposes. See C. Meymott Tidy, "North-China Daily News: Shanghai Water", *The North-China Herald*, Apr 01, 1892: 422.

impurity – a recent leakage that caused the closing of two of the filter beds, a constant deposit of sand in the Yangtze water, and sediment accumulated within the mains flushed down to taps. The Company argued that despite the unpleasant outlook, the water supply was actually innocuous and was well fitted for ordinary domestic purposes.⁴³⁷ In order to ease the public anxiety over the quality of water supply, the Municipal Council decided to assume the duty of oversight and regularly published the results of laboratory work, with the first report published in *The North-China Herald* in January 1893.⁴³⁸ Water sanitation had become a mission of municipality.



Figure 18 – Laboratory of the Shanghai Waterworks Company. The laboratory remains in operation today. Courtesy of author.

Another issue that pertained to people's everyday life was the operation of washing houses. As the British water supply was gaining ground, Chinese businesses took little time

⁴³⁷ "Meetings: Municipal Council", *The North-China Herald*, Jan 27, 1893: 119.

⁴³⁸ "Meetings: Municipal Council", *The North-China Herald*, Jan 20, 1893: 86.

to capitalize on the trendy foreign novelty. Many of washing houses, for example, disseminated cards, proclaiming that the water they used was provided by the Shanghai Waterworks Company. However, the investigation in 1898 launched by the Council's Board of Sanitation discovered that among those who advertised about having Shanghai Waterwork's water, few actually had it. Of the eleven wash houses in the neighborhood in the western district, only one had the Shanghai Waterworks' pipe laid on. The best water supply of some twenty washing houses in Hongkou came from a creek covered by some fifty beggar boats where vegetable scum and other waste matters floating around. Many shop owners could not read their own cards because they were illiterate, and the cards were in many cases made up by middlemen for advertising purposes. The Board of Sanitation vividly reported the inner working of these washing houses:

“Soiled articles of clothing, linen, etc., are tied up in bundles and carried thus or in baskets to the wash houses which are the washermen's dwelling houses. Until the baskets are next required, they are used in some instances as cradles for the infant of the household wrapped in its inches thick of dirty clothing... Wrung out of pond or creek water the clothes are dried in the open air in fine weather; in wet weather they are dried in the houses chiefly in the room where ironing and starching are carried on, a room almost invariably occupied as a bedroom... The workers, having spread out the shirt, on an ironing board which is used in its hours of leisure as a bed, dips his mouth and often the tip of his nose into a dish of water, sucks up and squirts the mouthful over the shirt front, and having ironed it, deposits the finished article in a cupboard, if there be one, in most instances on a neighboring bed... The cleaned articles are sent home in the baskets previously referred to at the door of one of the places first inspected were seen a number of towels drying on the ground at the edge of a stinking open drain with garbage scattered around. These towels are no doubt destined to wipe clean hands and faces.”⁴³⁹

⁴³⁹ “Washing as It is Done”, *The North-China Herald*, Feb 21, 1898: 265; “The Municipal Council”, *The North-China Herald*, Feb 21, 1898: 276.

Twelve essential requisites for the proper washing of clothes were then proposed, which included concrete or stone floors, well ventilated wash rooms, water supplied by the Shanghai Waterworks, separation of soiled and cleaned clothes and so forth. Squirting from the mouth was prohibited and liable to penalty. The Council also banned eating, sleeping, and dwelling in the workplace.⁴⁴⁰ The Municipal Council was aware that regulations as such would not be able to change the dirty habits of washer. A small, modern, municipal laundry was then erected in Hongkou (on the Rifle Range Road), leased to a Chinese businessman named Seou Kok on stringent conditions. The hope was that the public would decide for themselves where they wanted their clothes washed. In this municipal laundry, only waterworks' water was used. Floor was made of cement and was well-drained with troughs. The ironing room it was in neat condition. Nonetheless, one year into the experiment, the Council found out that foreigners still patronized the old-fashioned washing houses weekly where suspicious water was used.⁴⁴¹

In February 1899, the Council was suggested to have all washing houses licensed.⁴⁴² Of course, one of the prerequisites for a municipal license was that only waterworks' water was used. Or even have water meter installed to make sure that the

⁴⁴⁰ "The Municipal Council", *The North-China Herald*, Feb 21, 1898: 276.

⁴⁴¹ "A Sanitary Laundry in Shanghai: Why not support it", *The North-China Herald*, Feb 06, 1899: 225.

⁴⁴² The same procedure of licensing was done in the case of native dairies and the native livery stables. The improvements had been remarkable. The following resolution regarding water supply in dairies, as recommended by the Sanitary Board, was adopted: that a notice be issued at once to all the dairy keepers to the effect that no license should be held by those dairies which after the 1st of January 1899 were without an approved Waterworks water supply or using filtered water as approved by the Health Officer. The notice was later known as the Municipal Notification No. 1285, calling upon them to provide an approved Waterworks' supply of water within their premises. The native dairies had all been inspected during the following week, and found in good condition. The animals were found in good health. A license had been issued to Ah Bing, Markham Dairy, Sinza Road, who had erected a milk storage room and a bottle washing room and made other alterations to his premises. He had also laid on a supply of Waterworks water. Ah Mai, North Henan Road, having removed his stock to Pootung, his license had been withdrawn. See "The Municipal Council", *The North-China Herald*, Aug 08, 1898: 253; "The Municipal Council", *The North-China Herald*, Aug 22, 1898: 348.

water was not used over and over again.⁴⁴³ In June, the Council, with the approval of the Ratepayers' Meeting, issued a set of rules to the washmen in the Settlement, which stipulated that the immediate surroundings of the laundry be healthy, that the laundry be built of stone or brick and be well ventilated and drained, that a copious supply of Waterworks water be in use and other rules and so on. The wealthy Chinese merchants took advantage of the sanitary reform and built new washing houses of approved pattern during the ensuing months. The Municipal Council published the licensed few washing houses in *The North-China Herald* in October 1900 and called for all unlicensed ones be closed down as soon as possible.⁴⁴⁴

The municipal intervention in this business was not welcomed by all. Some felt that the rules were unnecessarily specific. If the customer was happy with what he got, it should not matter if the floor of the washing house was made of cement or not. Besides, few could afford to comply with these rules. In the end only corporate bodies prevailed.⁴⁴⁵ In fact, the course of "natural selection" did seem like something the Municipal Council was after. There was no evidence that the Council forcefully pushed anyone out of business. All they did was publishing the list of licensed washing houses every month for the public to see. By November 1901, the Council had licensed thirty-four establishments, and a few unlicensed ones were still in business. The Shanghai Waterworks Company generously reduced the price of water from 50 to 30 dollar-cents per thousand gallons to licensed

⁴⁴³ "Clean clothes", *The North-China Herald*, Feb 20, 1899: 282.

⁴⁴⁴ "Laundries", *The North-China Herald*, Oct 17, 1900: 831.

⁴⁴⁵ Sea Lawyer, "Letter to the Editor 2 - No Title", *The North-China Herald*, Oct 24, 1900: 881.

laundries. This not only eased the burden of those businesses that were undergoing sanitary reconstruction, but also helped stabilize the cost of washing for patrons.⁴⁴⁶

6.6 Specialization of Health Officer

At the turn of the century, when the Municipal Council was busy bringing order to the Chinese laundry businesses, a change in the institution was also underway – the specialization of the position of Health Officer. When Municipal Surgeon Edward Henderson first filled the position in 1868, he virtually volunteered. The title won him respect and influence, but the duties as Health Officer ate up a great deal of his time. Therefore, in early 1870 when the annual budget was under discussion, Henderson proposed to the Municipal Council a grant of Tls. 500 for his work as Health Officer. The Council immediately agreed and appropriated the sum from the Sanitary Department.⁴⁴⁷ But the position remained to be two jobs at one. By the time Henderson retired in 1896, the salary for Municipal Surgeon/Health Officer had risen to Tls. 4,000 per annum.⁴⁴⁸

Henderson's dual responsibilities basically defined this job. At the Ratepayers' Meeting in 1896, the duties of a "Municipal Surgeon" was defined explicitly for the first time, which included the collection and arrangement of statistics bearing on the health of the population, inspection of nuisance, advising to prevent and limit epidemics, advising regarding disinfection, drainage, and ventilation in public buildings, native dwellings, etc. In addition, Surgeon/Health Officer had special duties such as care and direction of a laboratory, where the chemical and bacteriological examination of air, soil, water, milk,

⁴⁴⁶ "The Municipal Council", *The North-China Herald*, Nov 27, 1901: 1024.

⁴⁴⁷ "Public Meeting: Rate-Payers' Meeting", *The North-China Herald*, May 28, 1870: 377.

⁴⁴⁸ Fredr. J. Burge, "Letter to the Editor 1 - No Title", *The North-China Herald*, Sep 03, 1897: 456.

etc. was carried out, and researches made for the detection of the causes of disease, to assist in its early diagnosis or to ascertain definitely its character (diphtheria, and cholera, anthrax, rinderpest, etc.). Manufacturing of the various anti-oxides and vaccination would be part of the work done at this laboratory. He had also medical and surgical charge of the Municipal Staff and Police force, but not of their families, and visit and gave advice regarding police cases when required. For a job as a surgeon, the duties regarding public health were overwhelming.⁴⁴⁹

After Henderson retired in March 1896, the vacancy was quickly filled by Dr. Taylor Grant in June. The Municipal Council was expecting Grant to fill in Henderson's shoes, and for a while he seemed to be the perfect successor. Grant was diligent and professional. He assumed the duties as soon as he arrived. He submitted a report to the Council in less than a year, in which he elaborated on the necessity of Vaccine Institute, the threat of diphtheria, and the general work of his laboratory.⁴⁵⁰ However, by the summer of 1897, the trust between the new Surgeon/Health Officer and the municipality deteriorated. Grant faced serious accusation of receiving money from a company Butterfield & Swire in form of "Bill of Health", which led to an investigation into the matter by a sub-committee of the Municipal Council.⁴⁵¹

Municipal Surgeon/Health Officer was supposed to serve in the interest of the Council and public health. What Grant was accused of was downright bribery. Grant was called into Council for a meeting, with the presence of his lawyer. The Council decided to

⁴⁴⁹ "Meeting of Ratepayers", *The North-China Herald*, Mar 13, 1896: 401.

⁴⁵⁰ "Meetings: Meeting of Ratepayers", *The North-China Herald*, Mar 12, 1897: 440.

⁴⁵¹ "The Municipal Council", *The North-China Herald*, Aug 20, 1897: 361.

terminate the contract immediately and passed a resolution, asking the resignation of Grant within seven days. Grant refused to comply. He said that this case was about his character. He would not resign until all suspicion regarding his professional integrity was cleared.⁴⁵²

When Henderson's retirement was approved on March 10, 1896 at the Ratepayers' Meeting, his company, Henderson, Macleod & Miles (HMM), was requested by the Council to find in England and brought to Shanghai a medical man to perform the duties of Health Officer.⁴⁵³ HMM was the major, if not the only, pharmaceutical and surgical company in Shanghai, and Taylor Grant was its long-time employee. When Grant was hired by the Council in June 1896, he was relieved from the duty at HMM. In the eyes of Henderson, Grant was a young doctor over whom he could still assert certain level of control. But Grant staunchly rejected Henderson's influence and claimed that he now he only had the Council to answer to.⁴⁵⁴

Grant argued that the Bill of Health did not start from him. Henderson had been charging Tls. 5 for each of his inspection for years. It was merely an expression of gratitude for his service from the companies. It did not in any way impair his judgement. Grant's argument was most likely true. Considering Henderson for some years had been working as Health Officer without being paid properly, it was only natural that Henderson claimed some benefits as the head of HMM. The whole Grant scandal was caused by the unclear definition of the job of Health Officer. The Council, however, was determined to remove Grant from the position. Henderson was asked to carry on the duty of Health Officer until

⁴⁵² Ibid.

⁴⁵³ "Letter to the Editor 11 - No Title", *The North-China Herald*, Aug 27, 1897: 410.

⁴⁵⁴ "Letter to the Editor 7 - No Title", *The North-China Herald*, Aug 27, 1897: 410.

the arrival of a new and duly qualified man.⁴⁵⁵ After losing the municipal appointment, Grant returned to his job at HMM. Henderson ordered Grant to resume his duty as the Health Officer. But he would no longer carry the title. Every move of his must be approved by Henderson.⁴⁵⁶

The scandal became a magnet of attention. Many people felt for Grant because his work as Municipal Surgeon so far was generally considered satisfactory. Some believed that such trivial matter should not make up the reason to dismiss someone of such important job. Some believed the money was not worth the job. Unless the Council was to provide necessary allowance, no able person would apply for the job. Others believed that the design of the authorities of Health Officer was flawed to begin with, especially considering that for the time being it was Grant who did the work and Henderson who signed all the reports. The candidate would better be selected by a London Committee of old Shanghailanders as how the excellent Municipal Surveyor was found.⁴⁵⁷

In September 1897, the Finance Committee of the Municipal Council had decided to terminate the agreement which the Council and HMM entered into in March 1896. The new Health Officer would be engaged in England. Unlike Grant who worked for both the Council and a private company, the new Health Officer would be engaged through the Council's agents as a municipal employee. He should receive his authority, salary, and instructions directly from the Council, as a public servant. In a separate agreement, the Council asked HMM to continue to perform the duties of Municipal Surgeons, attending

⁴⁵⁵ "Letter to the Editor 8 - No Title", *The North-China Herald*, Aug 27, 1897: 410.

⁴⁵⁶ "Letter to the Editor 9 - No Title", *The North-China Herald*, Aug 27, 1897: 410.

⁴⁵⁷ "Letter to the Editor 11 - No Title", *The North-China Herald*, Aug 27, 1897: 410; "Letter to the Editor 12 - No Title", *The North-China Herald*, Aug 27, 1897: 411; Fredr. J. Burge, "Letter to the Editor 1 - No Title", *The North-China Herald*, Sep 03, 1897: 456.

the health of the employee of the Council, including their families, hence the separation of the duties of Municipal Surgeon and Health Officer. The total expenditure for the Surgeon and the Health Officer would not exceed the amount authorized by the Ratepayers, i.e. Tls. 7,000 per annum.⁴⁵⁸

6.7 Arthur Stanley and Modernization of Public Health

By March 1898, the Council had secured the service of Arthur Stanley, a British doctor who received his M.D. in London.⁴⁵⁹ Stanley was known to be a rigid, scientific man, who was more interested in laboratory work than in networking with peers in sports clubs. He formally assumed the duty of Henderson on March 21, 1898. Stanley visited, accompanied by the Municipal Engineer, the garbage shoots in Hongkou and ascended the Suzhou Creek to view the spots where garbage was deposited. He visited the slaughterhouses and cattle sheds, the factory for concrete ware, the cholera isolation hospital and the proposed vaccine station. He inspected the most unsanitary neighborhoods between the Peking Road and the Suzhou Creek and in the West Hongkou. He made his first Health Officer's Report on April 11. This report was the first of its kind to include registered deaths, cause of death, infectious diseases notification, in and out of patients at Lock Hospital, native dairies, lab work with specimens taken from the throats and blood of patients, and quality of milk. Monthly report from the Health Officer henceforth became a tradition.⁴⁶⁰

⁴⁵⁸ "The Municipal Council", *The North-China Herald*, Sep 10, 1897: 496.

⁴⁵⁹ "The Ratepayers' Meetings", *The North-China Herald*, Mar 14, 1898: 405.

⁴⁶⁰ "The Municipal Council", *The North-China Herald*, Apr 25, 1898: 707.

Stanley was a pioneer in modernizing public health in Shanghai. He was about thirty years old when he started his tenure as Health Officer. He was energetic, strong-willed, and became the first Commissioner of Public Health. During his first summer in Shanghai, he launched some unprecedented initiatives in Shanghai. For example, in July, he drew up a notice of measures for the prevention of epidemic and contagious diseases, in English and Chinese, and ordered them to be distributed to householders throughout the Settlement. Unlike his predecessor who tended to blame the outbreak on poorer districts where sanitation was problematic, Stanley put much emphasis on precautions measures that could be easily done by any individual, such as boiling and filtering drinking water through a Berkefeld or Pasteur filter, keeping vegetables on a table that was solely for food, and plunging fresh vegetables and fruits into boiling water for a short time before eating them. Stanley also called for the use of crude Jeyes' Fluid, a good and cheap disinfectant added in the proportion of a teacupful to a gallon of water, in the cleansing of yards, drains, nightsoil buckets and other places where refuse might accumulate.⁴⁶¹ In May 1899, Stanley oversaw the creation of Pasteur Institute at Shanghai where inoculation against rabies were tried on rabbits to select the best preparation for the vaccine.⁴⁶² In March 1901, he initiated the employment of steam disinfector at the General Hospital in cleaning bedding and clothing.⁴⁶³ Riding the tide of germ theory, Stanley displayed a progressive understanding of disease and nuisance. He once wrote in his 1903 report: "The inspector of nuisances of

⁴⁶¹ "The Municipal Council", *The North-China Herald*, Aug 01, 1898: 210.

⁴⁶² "The Municipal Council", *The North-China Herald*, May 29, 1899: 967; Stanley, 1901.

⁴⁶³ "The Ratepayers' Meeting", *The North-China Herald*, Mar 27, 1901: 588.

a few years ago, when nuisances were confused with stinks, was a mere smeller, an inspector of stinks.”⁴⁶⁴

Stanley was extremely vigilant against epidemics in Shanghai. Using statistics carefully collected over the years, Stanley was able to make the case that although Shanghai was exposed to threats of more kinds of diseases, foreign death rate remained only a little higher than that for England and Wales – 18.1 per thousand vs. 16.9 per thousand in 1901. But considering the less than average proportion of elderly in Shanghai, this number was still high. He thus recommended to the Council the adoption of the proposed Infectious Disease bye-laws, which would make it mandatory for Chinese servants working in foreign households to get vaccinated. His department generously provided the Chinese with free vaccines.⁴⁶⁵ The turn of the twentieth-century saw the rise some new disease, among which were malaria and yellow fever, both mosquitos-borne. Stanley keenly followed the steps taken in other mosquito-infested areas like Panama and southern ports of the United States and formed a mosquito brigade in the summer of 1909 in aim of exterminating mosquito population in Shanghai. He also made filling in ponds a portion of the routine work of his department.⁴⁶⁶ In 1911, Stanley participated the creation of the first Chinese Isolation Hospital. The hospital was established on the North Henan Road Extension at a former residence of Chang Chi-pao, a Chinese merchant who generously offered his house for the purpose when approached by the Hospital Committee. The medical staff of the hospital consisted of four Chinese doctors (one of them was a woman) and three foreign doctors. It was designed to remove native prejudice against foreign medical methods. In his speech,

⁴⁶⁴ “Miscellaneous Articles: The Government of Shanghai”, *The North-China Herald*, Mar 12, 1903: 473.

⁴⁶⁵ Ibid.

⁴⁶⁶ “The Extermination of Mosquitoes”, *The North-China Herald*, Apr 03, 1909: 10.

Stanley said that the establishment of the hospital indicated to him a new China from the medical point of view. The difficulties which foreigners had in matters of plague prevention would be largely minimized.⁴⁶⁷

Stanley struck a fine balance between introducing general principles of disease control and approaching the Chinese community with cultural sensitivity. In his observation of the Chinese philosophy of medicine, he realized that the Chinese valued hygiene in their own ways. Their “drug-shops” contained an immense number of drugs and preparations, and were the most elaborately ornamented of all shop; they also spent a large part of his income on medicine.⁴⁶⁸ He saw the confusion of tongues and mutual misunderstanding in a city as heterogeneous as Shanghai a major impediment to better public health. He said the ignorance of modern methods among the Chinese must be met by education and soft-handed compulsion.⁴⁶⁹ He engaged in person in educating the Chinese on the prevention and cure for tuberculosis. In the spring of 1911, Stanley delivered a fortnightly series of lectures on “Health and Sanitation” and plague prevention at the large hall of the Chinese Y.M.C.A. The audience was almost entirely Chinese. At the time, Manchuria was being affected by pneumonic plague, which made Stanley’s lecture more relevant than ever. He introduced the three types of plagues – bubonic, septicemic, and pneumonic – to the audience. He talked about tuberculosis and the measures for prevention, such as quarantine, timely reporting to the authorities, and exterminating rats in the house. The speech was frequently met with loud applause. In the winter of 1912, Stanley delivered another series of lectures on tuberculosis. He pointed out

⁴⁶⁷ “Chinese Isolation Hospital: Opening Ceremony”, *The North-China Herald*, June 03, 1911: 596.

⁴⁶⁸ Stanley, 1903

⁴⁶⁹ “Miscellaneous Articles: The Government of Shanghai”, *The North-China Herald*, Mar 12, 1903: 473.

that there was no effective cure for TB other than by rest, good food, open air and sunlight. But as to public measures, Stanley said it was essential to establish a TB office with an aim of early diagnosis and treatment of the disease.⁴⁷⁰ Stanley even published an article in *China Medical Journal* in 1915 on the topic of how to initiate public health work in Chinese cities.⁴⁷¹

Arthur Stanley was appointed at a time when epidemiology was on the rise. He became the key figure in modernizing the public health regime in Shanghai. The effect of his contribution was hard to measure. It was even harder to assess Stanley's influence among young Christian Chinese. But many desirable changes happened under Stanley's watch, including new quarantine establishments and scientific recording of disease. With the help of Stanley's lectures, China was making progress in medical education and was on track of producing its own health officers.⁴⁷² Stanley, in his own word, was "a man gentle in manner and firm in action".⁴⁷³ It was his attentiveness and execution that greatly expanded the municipality's involvement in public health matters.

6.8 Final Attempt on the Municipal Water Supply, 1922-1928

As public health was becoming a municipal matter in Shanghai, people's interest in the municipal water supply was rekindled in the late 1910s. Over the summer of 1917, the Municipal Council had been increasing its already large financial interest in the Waterworks Company. The intent of this move was clear: given that the Shanghai

⁴⁷⁰ "Plague Prevention: Lecture by Dr. A. Stanley", *The North-China Herald*, Mar 10, 1911: 579; "Consumption, Its Prevention and Cure", *The North-China Herald*, Nov 09, 1912: 361.

⁴⁷¹ "Instituting Public Health Work", *The Chinese Recorder*, Aug 01, 1915: 461.

⁴⁷² "Chinese Isolation Hospital: Opening Ceremony", *The North-China Herald*, June 03, 1911: 596.

⁴⁷³ "Miscellaneous Articles: The Government of Shanghai", *The North-China Herald*, Mar 12, 1903: 473.

Waterworks was a joint stock company, the Municipal Council was aiming to take over the company by owning the majority share. Shanghailanders was strongly in favor of municipal ownership because many believed the Company was overcharging their water and the rate would be reduced by half if water supply became a public undertaking.⁴⁷⁴ The tension between the two sides was running high.⁴⁷⁵ The Council later appointed two directors to “assist” in the guidance of its affairs.⁴⁷⁶

The Company was aware of that the Council was buying its way into a full municipal ownership. Hence in March 1918, it announced an increase in the capital from £400,000 to £1,000,000 by the creation of an additional 30,000 shares of 20 pound each. The directors ordered 3,000 shares to be issued immediately. By diminishing the proportion of the Council’s shareholding, the Company would be able to remain its status as a private enterprise. In order to keep up the proceeding of acquisition, the Council would have to spend more money on buying the created shares, a move that most ratepayers would not be pleased with.⁴⁷⁷

⁴⁷⁴ “Editorial Article 15 - No Title”, *Milliard’s Review of the Far East*, Sep 08, 1917: 34.

⁴⁷⁵ Another dispute was developing on the side between the Council and the Company. In September 1917, the French Tramway Company was laying water mains along Siccawei Road. The nature of Siccawei Road was complicated. It sat within the boundaries of the French Concession, but was administered by the Municipal Council of the International Settlement. The Shanghai Waterworks Company protested to the Municipal Council, to which the Council replied that the agreement the Council and the Company entered into granted the Company a virtual monopoly, but it did not prevent the Council from giving similar rights to other undertakings. The Company tried to induce the Council to declare that no permit would be granted on any Municipal Roads without the Council’s consent. The council refused to give such an undertaking. In October, the Company reiterated its claim for the exclusive right to lay mains on roads within the Municipal jurisdiction. The Council, however, maintains its former position and denies any monopoly of any kind whatever to the Waterworks Co. See “Men and Events”, *Milliard’s Review of the Far East*, Sep 01, 1917: 16; “Men and Events”, *Milliard’s Review of the Far East*, Oct 20, 1917: 211.

⁴⁷⁶ “The Waterworks Controversy”, *The North-China Herald*, June 03, 1922: 655.

⁴⁷⁷ “The Shanghai Waterworks”, *The North-China Herald*, Mar 02, 1918: 482.

The Council appointed a special committee to study the desirability of the purchase of the Company by the municipality, only to find that the Council was not financially sound enough to entertain the idea of taking over all utilities. The special committee was thus disbanded. Years later, the Council managed to gain control over electricity, which led to a substantial drop in the rate in 1915. The Council grew confident in doing the same for water supply. Therefore, the Special Waterworks Committee was resuscitated in 1922.⁴⁷⁸ The negotiation went on for months. By February 1921, the Company seemed to be very open about the idea of municipal acquisition, but the Company had already grown so big that its fittings department and shipping department had already become and registered as their own companies. In order to obtain full control over water supply, the Municipal Council needed to summon a huge sum to purchase all three undertakings.⁴⁷⁹ The very big scheme of municipal purchase began to sow doubts among ratepayers. “Public officials are not deterred by expense in quite the same manner as a Company,” someone wrote in *The Herald*, “...Within five years from now, either the ratepayers will have to find a huge deficit, or the water rates will be enormously increased.”⁴⁸⁰

At the ratepayers meeting of 1923, it was announced that the figure at which the directors of Shanghai Waterworks Company were prepared to sell the total undertaking would be approximately Tls. 14,950,000. The Council believed in principle that this essential public utility should be taken over by the Council, but the figure seemed “like a fairy tale”.⁴⁸¹ Nonetheless, three resolutions were passed regarding the municipal

⁴⁷⁸ “The Waterworks Controversy”, *The North-China Herald*, June 03, 1922: 655.

⁴⁷⁹ “News from the Municipal Gazette: Shanghai, February 8, 1923 Water Supply”, *The North-China Herald*, Feb 10, 1923: 407.

⁴⁸⁰ Common Sense, “The Waterworks”, *The North-China Herald*, Apr 21, 1923: 173.

⁴⁸¹ “Clubs and Societies: The Ratepayers’ Meeting”, *The North-China Herald*, Apr 21, 1923: 181.

acquisition of water supply, which authorized the required fund and enabled the Council to run the business in line with the 1915 agreement between the Council and the electricity company.⁴⁸²

During the year of 1923, the Company's revenue saw a steady fall. It was due to the inability of the Company to collect revenue commensurate with the increased cost of water supply at the rates fixed by the 1905 agreement. The Company was therefore anxious too and became more open to a municipal take-over. The Council adjusted its offer – the price of the Company would be arrived at on the basis of 15.3846 years' purchase of the profits earned during the year 1922.⁴⁸³ At the Ratepayers' Meeting held in April 1924, the new price of the Company's assets was accepted, and the Council was enabled to purchase the entire establishments. The two sides finally entered a real negotiation.⁴⁸⁴

In March 1928, the eleven-year-old controversy came to an end. The final agreement consisted of 32 folios. This agreement did not make the Company a municipal undertaking but made the Council a major shareholder of the Company. The finance of the two became intertwined. This change of ownership lent the Council's power of control over the Company in the interests of ratepayers, limitation of dividends, and what was to become of the Company's subordinate undertaking - the supply of baths, basins, taps, towel rails, drying cupboards, dish drainers and the like.⁴⁸⁵ The Council was now entitled to have

⁴⁸² "Waterworks Co. and the Council: The Annual Report", *The North-China Herald*, Mar 29, 1924: 486.

⁴⁸³ "Waterworks Co. and the Council: The Annual Report", *The North-China Herald*, Mar 29, 1924: 486.

⁴⁸⁴ "Municipal Gazette News: Ratepayers' Votes", *The North-China Herald*, Apr 04, 1925: 24.

⁴⁸⁵ "Waterworks Co. and Council: Controversy Ended by Signing of the Agreement", *The North-China Herald*, Mar 24, 1928: 480; "Leading Articles: S. W. W. Agreement At Last", *The North-China Herald*, Mar 24, 1928: 468.

appointees on the Board of Directors to guarantee that public interest was properly met.⁴⁸⁶ Meanwhile, the Council became more active in investing in the Company to pump up its stock value. After all, the Council was among the biggest beneficiaries if the Company grew. In 1928, the Council was considering purchasing 17,600 shares of the Company's B issue, the cost of which amounted to Tls. 141,980.⁴⁸⁷ Over the years, the Council kept funding the Company. When the World War II ended, an investigation found that the Council had bought in shares in total worth of £129,820, or more than half a million Taels.⁴⁸⁸

In contrast, from 1902 to 1908, the French waterworks underwent rapid growth during which principal mains were laid inside and outside the Concession.⁴⁸⁹ But the business ran into stagnation after 1908. The Council handed the establishment to a company created in Paris in January 1909, which would take charge of electric light, tramway and water altogether in the French Shanghai. Numerous complaints about the deteriorating quality of water was received during the transition.⁴⁹⁰ The filtering system kept falling behind the development in pumping. Since 1914, the waterworks was producing more than its proper capacity. In the fall of 1920, two fire occurred in the Concession. Poor water supply of the French failed to deter the flame.⁴⁹¹ Publicness of water service and greater good for the community had been the focus of municipality. But

⁴⁸⁶ "Municipal Council deal with protests against proposed water surcharge: statement in Chinese is to be drawn up setting out facts of existing situation", *The China Press*, Sep 20, 1930: 1.

⁴⁸⁷ "Municipal Gazette News: Report of the Annual Meeting of Ratepayers", *The North-China Herald*, Apr 21, 1928: 115.

⁴⁸⁸ Shanghai Municipal Archive, Q109-1-491-2.

⁴⁸⁹ "Water In French Concession: Company's Failure to Meet Growing Demands", *The North-China Herald*, Nov 20, 1920: 553.

⁴⁹⁰ "French Municipal Elections", *The North-China Herald*, Jan 16, 1909: 176.

⁴⁹¹ "Water In French Concession: Company's Failure to Meet Growing Demands", *The North-China Herald*, Nov 20, 1920: 553.

despite “always having the interests of the public at heart”, the French waterworks remained unsatisfactory.⁴⁹²

6.9 Conclusion: Trust

Water supply in Shanghai used to be a luxury for foreigners only. But an expansion into the native market was inevitable due to both business and public health concerns. The Shanghai Waterworks Company had to deal with rumors among commoners and indifferent mandarins. It eventually secured the Municipal Council’s support in promoting their business. By 1887 the Company, headquartered now in Shanghai, had gain popularity among the natives.

With more hydraulic projects at its disposal, the Council became increasingly involved in public health matters and its administrative measures had become centralized. The Council took charge of water analysis. Chinese washing houses were being licensed to be kept in order. With an emphasis on data collecting, the new, specialized Health Officer Arthur Stanley modernized public health practices in Shanghai. He educated young Chinese on epidemiology and about preventive measures, many of which centered on water supply and waste disposal.

To stimulate a sense of trust among Chinese was not easy. In the case of potable water, the presence of waterworks and water tower might not be the best promoter during earlier days because they were symbols of alienness that put people off. The fact that these establishments were run by foreigners added to the strangeness of water coming out of

⁴⁹² “The French Waterworks: The Opening Ceremony”, *The North-China Herald*, Jan 15, 1902: 86.

pipes. The Shanghai Waterworks Company fought the battle on two fronts: on the one hand, it needed to win over consumers who were under the influence of misinformation campaigns by the water carriers; on the other hand, it relied on the Municipal Council and the inherent top-down institutional authority to gain subscribers. Over time, it was the taste, cleanliness, and convenience of tap water that won most of its customers. The trust was built through bodily experience for which a higher level of intellectuality was not a prerequisite. As for the medical knowledge preached by Arthur Stanley, the dynamic of that diffusion among young Chinese, many of whom were perhaps Christian, relied almost entirely on the institutionalization of Western medicine where consistent exposure to the information could be maintained by various institutes in their various forms (medical school, church, book store, lectures, clinics, apprenticeship, etc.). In this case, a uniform framework of knowledge and epistemology was a must. The faith in these institutions were not a bodily experience, it laid in the explanatory power of principles and knowledge.

We tend to think that in conditions of modernity, trust exists in the context of the general awareness that human activity is socially created.⁴⁹³ In the case of the Chinese becoming used to running water, this observation did not apply. The trust in the engineering system was based largely on the quality of final product. Being able to realize the better quality of tap water had little to do with intervention of modern social institutions. The acceptance of it eventually took place on the level of individuals. It was consumers who were making informed decisions regarding their daily necessities and well-being. The growing acceptance of Western medicine in the early twentieth century was, on the other hand, more of a social construction. People of any nationalities could be taught and trained

⁴⁹³ Giddens, 34.

to believe that the up-to-date science was most reliable before they could have access to a laboratory to prove any of what they were told. This discrepancy in the dynamics behind the prevalence of products of modernity points to the loophole in the conventional modernity theory. Many things of modern creation can be lumped together under the banner of modernity, but they were not of the same nature. During the late nineteenth century, before tap water became a staple of modern life style, the trust in the water and the system behind it must come from physical, tactile, and gustatory experience. Although tap water and germ theory were both considered creation of modern era, the process of accepting the former was much less “modern” than that of accepting the latter.

The Municipal Council attempted several times to acquire the waterworks, but the Company maintained its status with both legal and financial measures. Although a municipal supply never came to realization, the adhesion between the Council and the Company grew stronger. The robust system of water supply laid the ground for an increasingly powerful municipality. But it was also this codependence and co-construction of technology and governance that made the water establishments an easy political target.

CHAPTER 7. POLITICS

Foreigners in Shanghai had a long history of building roads outside the limits of Settlement. For example, in 1860 the Qing army built two roads to reach the base of Taiping Rebellion. One of these roads started from the Jing'an Temple and ended in Siccawei and the other connected the Jing'an Temple with Fanwangtu Road (梵皇渡, and later 万航渡路). All places mentioned were at least three miles west to the limit of Settlement. However, after the Rebellion was put down, the British who allied with the Qing government felt entitled to some of the wartime infrastructures as they contributed to their creation. In 1866 and 1869, the two roads were taken by the Municipal Council without permission from the Chinese authorities. This marked the beginning of what was later known as “the building of extra-Settlement roads” (越界筑路).⁴⁹⁴

The illegal expansion of the Settlement was met with protest from time to time, but short-lived anger did not undermine the British presence in these extra-Settlement areas. The Council considered their control legitimate. For one thing, Chinese roads were too poor for foreigners to commute. It was said that there were two kinds of Chinese roads,

⁴⁹⁴ In 1870, a similar action was taken in the northern part of the city. The British extended Wusong Road further north across the Suzhou Creek, which was supposed to be the Settlement's north limit. After water supply was made available in 1883, the Municipal Council felt necessary to incorporate those who lived along the extended road and consumed waterworks water into the administration and levy tax on them. In 1892, the Council began assigning numbers to the houses on the extended Wusong Road. This move was met with vehement protest from the Daotai. On September 2, 1892, a number of Chinese inhabitants revolted against the British rule. Altogether ninety tablets were forcefully removed. See Changning qu zhi bianzuan weiyuanhui (Editorial Committee of Gazetteer of Changning District). *Changning qu zhi* (Gazetteer of Changning District). Shanghai: Shanghai Academy of Social Science Press, 1999. <http://www.shtong.gov.cn/newsite/node2/node4/node2249/changning/node15181/index.html>

one of which readily became a stinking abomination, the other was made to look at and when used speedily became useless. It was up for the Council to pave, sanitize, and police the new roads. The other thing was public health. Foreigners grew increasingly concerned about the risk of epidemics originating from the crowded, filthy Chinese villages in the city. Edward Henderson said in 1898 that for a long while, the Settlement was busy setting sanitary matters straight within the boundaries, but now it was imperative to look outside in view of disease control. The Municipal Council even sent the formal request to Beijing, asking the Foreign Ministry to press on this issue so that an imperial permission would be acquired.⁴⁹⁵ Entering the twentieth century, the Municipal Council endeavored to make use of the vast undeveloped area in the west by connecting them with tramways. From 1901 to 1905, the Municipal Council built Brenan Road, Hongqiao Road, Rubicon Road and Edinburgh Road, which were eight to ten miles west of the Settlement.⁴⁹⁶

Water infrastructures the British built earlier became a convenient tool in extra-Settlement disputes. For example, a skirmish in 1907 happened between a Sikh constable and a Chinese man outside the Settlement. The Sikh officer claimed that his actions were legitimate because wherever water pipes were laid outside the Settlement, and in case of residents using Waterworks water, the police would give protection, as circumstances therefore arose. The Daotai insisted that although his predecessor was warmer to foreign undertakings and permitted the temporary laying of water pipes outside the Settlement for the convenience of native residents, to claim any sort of authority over the land was an

⁴⁹⁵ “The Shanghai General Chamber of Commerce: The Extension of the Foreign Settlements”, *The North-China Herald*, Jun 20, 1898: 1077.

⁴⁹⁶ Changning qu zhi bianzuan weiyuanhui (Editorial Committee of Gazetteer of Changning District). *Changning qu zhi* (Gazetteer of Changning District). Shanghai: Shanghai Academy of Social Science Press, 1999. <http://www.shtong.gov.cn/newsite/node2/node4/node2249/changning/node15181/index.html>

aggression on Chinese sovereignty. The Council dismissed the complaint, insisting that the grounds upon which such actions were taken were unassailable.⁴⁹⁷

During the final years of the dynasty, the Qing officials came to realize that if the service of water supply provided by the Shanghai Waterworks Company could be used as the ground for extra-Settlement expansion, so could a Chinese enterprise that fashioned water of the same quality be used against their illegitimate claims. That was the moment when water technologies were transformed into political ammunitions.

7.1 The Inland Waterworks Company

Without pressurized water supply, the Chinese city was continually dogged by fire incidents. In the winter of 1884, a fire was caused by the upsetting of a lamp in a charcoal shop near the bank of the Huangpu River. Sixty to seventy houses were destroyed after enduring flames for nearly three hours.⁴⁹⁸ On the night of February 1, 1886, fire broke out near the East Gate of the native walled city. The natives hurried to the scene. People were knocked down and trampled on; coolies carrying water were knocking their buckets against the shins of the sightseers; guild men with their myriad lamps were rushing along followed by soldiers and city watchmen. The late arrival of the native fire engine was heralded by the clashing of gongs and a good deal of shouting. This fire, caused by the upsetting of a kerosene lamp, consumed one hundred houses.⁴⁹⁹ However, with a few exceptions when

⁴⁹⁷ "Policing beyond limits", *The North-China Herald*, July 26, 1907: 195.

⁴⁹⁸ "Correspondence: The Extension of the Waterworks to the City", *The North-China Herald*, Dec 10, 1884: 662.

⁴⁹⁹ "Article 1 - No Title", *The North-China Herald*, Feb 03, 1886: 111.

foreign fire brigades were allowed to help, the Chinese city kept saying no to the proven convenient foreign technologies.

In 1890, a new Daotai was appointed. His name was Nie Jigui (聂缉槩, 1855-1911). Daotai Nie was distinctly more favorable to the European improvements than his predecessors. In their negotiation with the Shanghai Waterworks Company, the representative of Chinese authorities expressed their support for a scheme of water supply. But for the moment, they did not wish for a general supply of water. They planned to have the two yamens, the Daotai's and the city magistrate's court and office buildings, supplied with waterworks water.⁵⁰⁰ The record was unclear on whether the two yamens were piped with small mains as it had been agreed, but a general water supply was yet in existence in the Chinese city. Tragic fire incidents were not uncommon in Shanghai, yet no further actions were taken in pursuit of native water supply.⁵⁰¹ Some foreigners felt so frustrated that they doubted whether Chinese would ever accept these new technologies:

“It was once pithily remarked that the Municipal Council of Shanghai are the best missionaries in China. But in the [proselytizing] sense the mission of our Council is not more successful than the religious missions are. Native officials who pass through Shanghai, even if they condescend when here to use a brougham instead of a chair when making calls, are just as conservative as ever when they get back to their posts in the interior. Electric lights, waterworks, and carriages may be very well in a foreign settlement, they persuade themselves, but are not wanted in a Chinese city. How many foreign ideas have been put in practice in the native here?”⁵⁰²

⁵⁰⁰ “Shanghai Waterworks Co. Ltd.: Directors’ Report”, *The North-China Herald*, Mar 21, 1890: 341.

⁵⁰¹ On January 11, 1893, an incident of fire destroyed more than thirty houses inside the walled city. The old-fashioned water was too slow in extinguishing the blaze. An old woman was killed. The Chinese newspaper called on the government to permit the Company to lay pipes in the city. In the wake of the tragedy, Daotai Nie thought about having the waterworks water supplied in the city. But nothing was done to this end. In April 1894, another fire broke out, but the government did not seem bothered at all. See “The Fire In the City”, *The North-China Herald*, Jan 13, 1893: 57; “Summary of News: Latest Intelligence”, *The North-China Herald*, Mar 10, 1893: 326; “An Opportunity for the Daotai”, *The North-China Herald*, Apr 06, 1894: 511.

⁵⁰² “Notices of Books, etc.”, *The North-China Herald*, May 17, 1895: 734.

The Chinese efforts in building their own waterworks finally began in 1892. A local merchant recommended Tang Jiechen (Tong Kid-son 唐杰臣, 1862-1904), comprador of British company Jardine Matheson Co. (怡和洋行), in his petition to the viceroy about opening a Chinese waterworks in the Chinese city. The capital of the proposed company was Tls. 300,000. Tong and another merchant would be paying for two-thirds of the sum, and the rest would be raised locally. The proposed waterworks would be the only one at the time not located outside the Chinese settlement, hence the name of the company the Inland Waterworks Co.⁵⁰³ On September 16, 1899, a Saturday morning, the Inland Waterworks opened its door. Many constructions were still underway, but the town office, which was on the Chinese Bund, and the engines and boiler houses were ready for the press to see. The Inland claimed they would erect a water tower, which would be made of steel, 80 ft. high, supporting a tank 20 ft. in diameter. The tower would be capable of holding 50,000 gallons of water. Two settling tanks, three filter beds, and a clear water reservoir were under planning.⁵⁰⁴ Champagnes were popped at the ceremony, but it was not until 1902 that the company was finally put in shape. In April, the shares of the company, with a capital of Tls. 1,000,000 divided into 20,000 shares of Tls. 50 each, were allotted.⁵⁰⁵

Saying that the Inland Waterworks Co. was a Chinese enterprise might be problematic. The company was a result of Chinese money and American technologies. Tang Jiechen and the local government, represented by the Daotai, were two principal

⁵⁰³ Shanghai gongyong shiye zhi bianzuan weiyuanhui (Editorial Committee of Gazetteer of Public Works of Shanghai). Shanghai gongyong shiye zhi (Gazetteer of Public Works of Shanghai). Shanghai: Shanghai Academy of Social Science Press, 1999.
http://www.shtong.gov.cn/dfz_web/DFZ/Info?idnode=55089&tableName=userobject1a&id=42315

⁵⁰⁴ "The Shanghai Native City Waterworks", *The North-China Herald*, Sep 18, 1899: 583.

⁵⁰⁵ "Reading for the Week", *The North-China Herald*, Apr 23, 1902: 780.

directors. Foreign press attributed the successful launching of the Inland Co. to Tang, whose ability and energy navigated the new enterprise in the official and commercial world of China. But the core technologies of the company were all imports from the United States. The engines were supplied by the Cincinnati-based Laidlaw, Dunn, Gordon Co., the cast-iron pipes by R. D. Wood & Co., Philadelphia, and the hydrants and valves were purchased from the Kennedy Valve Co. in the state of New York, which is still in business to this day. The technical body of the company was also administered by foreign specialists. The company hired two foreign engineers, Atkinson and Dallas. The general manager Lehmann came from a German company, Arnhold, Karberg & Co. (瑞记洋行). Fowler of the Laidlaw, Dunn, Gordon Co. would be the engineer in charge of the Waterworks upon its completion. Blechynden and Ord of the Shanghai Engineering, Shipbuilding & Dock Co. were contracted for erecting the machinery and water tower and laying the pipes.⁵⁰⁶

⁵⁰⁶ “The Shanghai Native City Waterworks”, *The North-China Herald*, Sep 18, 1899: 583.

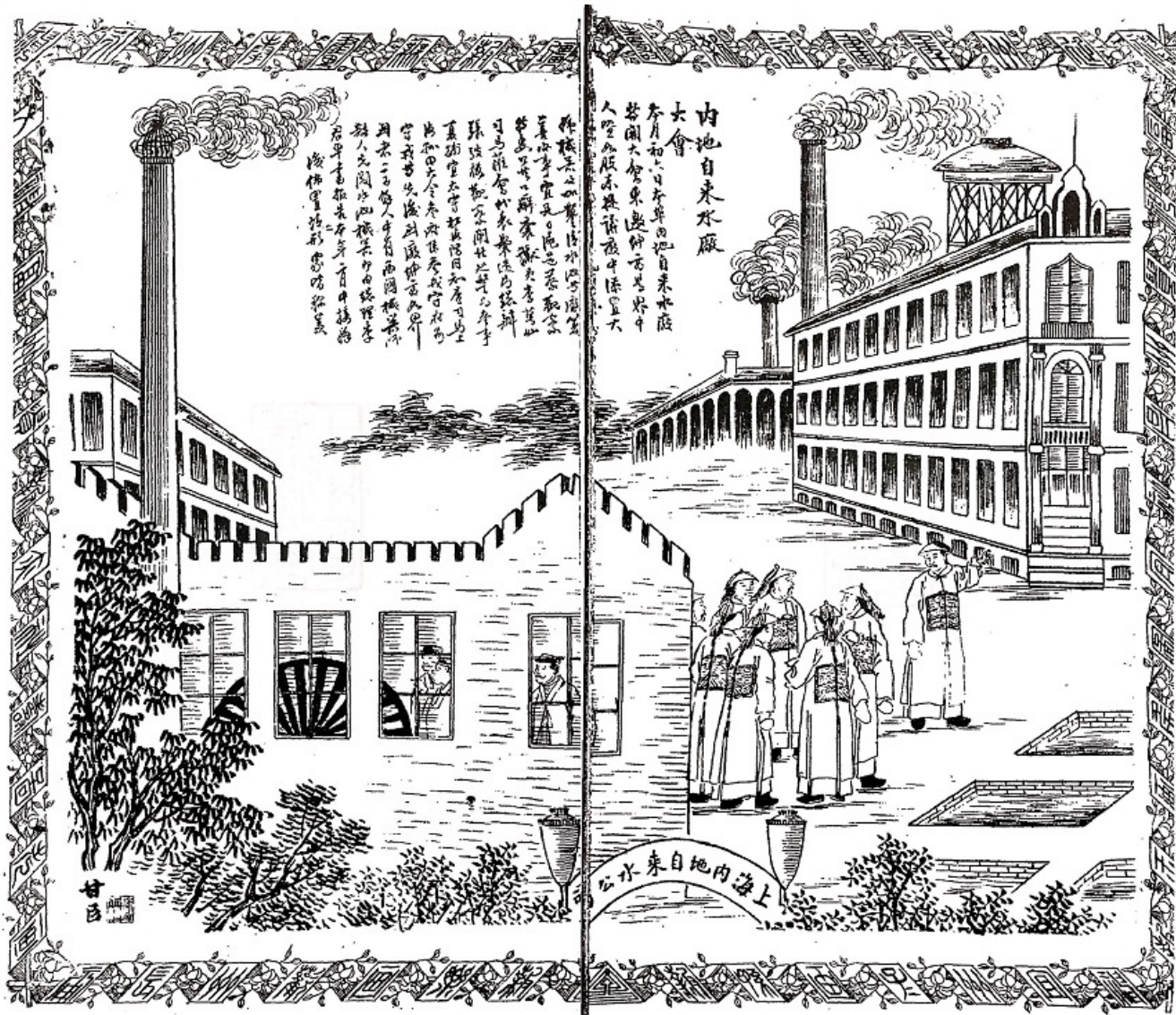


Figure 19 – Illustration of the Inland Waterworks Company. Source: Gan Chen, 1909.

The Inland Waterworks Company was created to compete with the Shanghai Waterworks Co. The late Qing elites counted on their fellow countrymen to cancel their subscription to the British business switch to a Chinese one. But the company struggled with winning enough subscribers. The business remained stagnant for more than a decade. The embattled enterprise caught a break after being purchased by the Republic government

in March 1915.⁵⁰⁷ Within a year, it was resold to a wealthy native merchant Yao Mulian (姚慕莲, 1876-1950). The company was not fully straightened up until the 1930s.⁵⁰⁸ During the early twentieth century, the Shanghai Waterworks Company faced much more formidable challenge from another Chinese enterprise in the north of Shanghai – the Chapei Waterworks and Electricity Company.

7.2 Creation of the Chapei Waterworks

In the fall of 1909, Daotai Cai Naihuang (蔡乃煌, 1861-1916) asked permission of Viceroy Zhang Renjun (张人俊) to construct waterworks in Chapei, the booming industrial and commercial hub on the north side of the Suzhou Creek, in opposition to the International Settlement. The Viceroy approved for waterworks in Chapei as it was both

⁵⁰⁷ The transition from a joint enterprise to government property was uneasy. Of the original capital of the company, the government's was \$1,000,000 and that of the shareholder was \$150,000. On March 12, 1915, a conference was held by the shareholders at the Nantao Chamber of Commerce to hear a report of the arrangement from Lu Bohong (陆伯鸿), the representative of shareholders who conducted the negotiations with the government deputy. Lu said that at first the Ministry of Finance consented only to refund the capital to shareholders in instalments spread to ten years and without interest for the second and third year of the Republic (i.e. 1913-1914). Lu objected on the ground that the time of ten years was too long. Lu said the final deal was made that the whole of capital of the shareholders was to be refunded in five years, together with interest at the rate of six percent per annum up to the end of 1915. The Inland Waterworks Company under the government would deposit Tls. 2,000 per month with the Bank of China to ensure the shareholders be paid on time. The shareholders accepted the arrangement after some discussion. They would have to surrender the shares in exchange for a receipt for their value, signed by the Ministry. See "From the Chinese Press: The Chinese Waterworks Company", *The North-China Herald*, Mar 20, 1915: 840.

⁵⁰⁸ It was not until when Yao purchased the entire establishments from the Ministry of Finance of the new Republic government that the revenue began to pick up. In October 1915, Yao paid \$500,000 to buy out the establishments, \$300,000 in cash to the Ministry of Finance, \$105,000 be repaid by the new proprietors to clear off debt, and the rest be paid at the end of the year. The waterworks under Yao Mulian underwent significant improvement. After years of extensive improvement, with \$2,400,000 spent, the total capacity of waterworks was elevated to 34,000,000 gallons daily by 1932. Water was sold for 50 cents per 1,000 gallons with a decreasing rate for an increasing quantity used. Yao replaced coal-fueled engine with electric motors, which saved about \$150,000 every year. The waterworks also established a chemical laboratory for \$20,000 to insure the quality of their services. See "Waterworks Firm Shows Improvements: Installations of Nantao Company Provide for 20 Years' Expansion", *The China Press*, Nov 07, 1932: 9.

practically valuable and politically important. He ordered Daotai Cai to fashion a report on the matter with the help of the Chapei Constabulary.⁵⁰⁹ The report found that among the 7,025 families residing in the district, some 2,000 were using the Shanghai Waterworks' water. The director of the Chapei Constabulary estimated that once a Chinese enterprise was around to replace the service provided by foreigners, the residence, almost all of them being Chinese, would revert to use of Chinese water. But after consulting the local gentry, the officials discovered that the current arrangements with the Shanghai Waterworks Company for water supply in that district was enabled by local authorities in view of improvements in the police and sanitation. The local authorities said that the agreement did not violate local sovereignty.⁵¹⁰

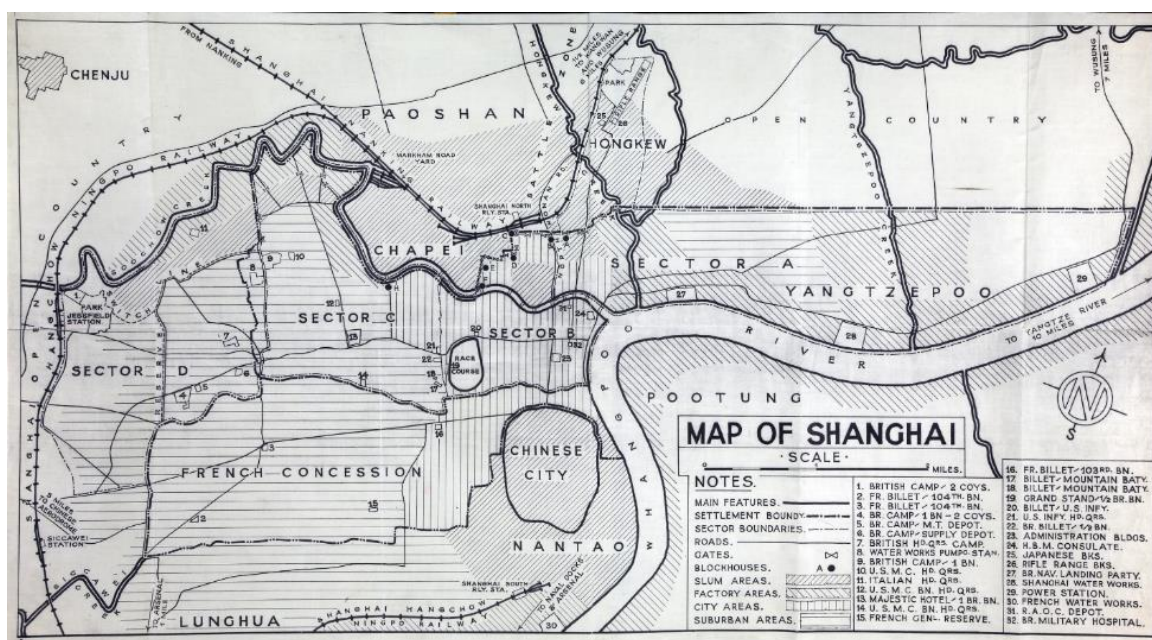


Figure 20 – Chapei district and its position in relation to the International Settlement. Source: “National Archives (United Kingdom)”.

⁵⁰⁹ “Notes on Native Affairs”, *The North-China Herald*, Sep 11, 1909: 615.

⁵¹⁰ Ibid.; “Notes on Native Affairs”, *The North-China Herald*, Nov 06, 1909: 308.

The Chapei scheme continued nonetheless. Unlike the Inland Waterworks Company, which was funded by the locals, the Chapei waterworks was a project of national significance. Viceroy Zhang obtained the permission from the Qing court for native waterworks to be built to address the “insufficient supply of water”. He suggested to the throne that the Shanghai Daotai and the local gentry had come to the conclusion that it would be advisable to construct Chinese waterworks in Chapei than to make arrangements for a water supply with a foreign company. The enterprise was commenced in 1910. To ensure that the Chapei waterworks was to be a symbol of national pride, the government would order machinery from the Kiangnan Arsenal, a home-grown military and industrial compound in Shanghai created during the 1860s.⁵¹¹

However, the Engineer-in-Chief of the Chapei waterworks, Max Engel, a former employee of the Shanghai Waterworks Company, was a foreigner. By April 1910, after surveying the place, Engel chose a site near the Guangdong Cemetery on the bank of the Suzhou Creek. Although the Suzhou Creek was immediate to the busy towns, the water was believed to be of enough depth that it would be clear. The proposed scheme was simple: the establishment would comprise of a water tower, two filter ponds and one purifying pond, for which 20 mow of land would be acquired. Two sets of pumping engine were to pump 600,000 gallons of water in 24 hours and an electric dynamo would be purchased that brightened up the district with 2,000 lights. It was estimated that machinery, land and buildings would cost about Tls. 200,000 and another Tls. 200,000 for service pipes. It was suggested by the Viceroy that capital required should be loaned, half by the Ministry of Commerce and half through the Daotai from private sources, bearing interest

⁵¹¹ “Local News”, *The North-China Herald*, Feb 04, 1910: 273.

at 7 per cent. Shares would be issued to raise stock to refund the loans after one year.⁵¹² The Qing government permitted the loan from the Ministry of Commerce.⁵¹³

As for the general manager of the Chapei waterworks, the Qing officials felt that the position had to be held by a competent Chinese. Enter Li Pingshu (李平书, 1854-1927), a Ningbo native who enjoyed a reputation of capability in the Chapei district. Li's interest in water supply started in 1883 when he set up a shop to have hydrant water supplied by the Shanghai Waterworks sold to the French Concession and the native city in buckets. Seeing water supply as a boon to the Chinese, Li petitioned to the Daotai to have the pipes coming into the Chinese city. The scheme failed the last minute, but Li's passion for utilities did not stop there.⁵¹⁴ In 1910, when Li was visiting Nanjing attending an exhibition, he had the chance to meet Viceroy Chang and was asked by the latter to establish the works. Upon his return to Shanghai, Li consulted Daotai Cai and decided to take on the matter.⁵¹⁵ By May 1911, the reservoir and the electric power station was near completion.⁵¹⁶ The construction was behind the schedule since the original scheme set the date of completion at the beginning of 1911. But given the prospect of an unprecedented home-grown enterprise, Li came out unscathed as the project slowly dragged on. The waterworks were completed around the late summer of 1911. It had the capacity of supply two million gallons of water a day. The opening ceremony took place in October and was

⁵¹² "Notes on Native Affairs", *The North-China Herald*, Apr 08, 1910: 87.

⁵¹³ "Chinese News", *The North-China Herald*, June 24, 1910: 720.

⁵¹⁴ Xiong, "On Li Pingshu".

⁵¹⁵ "The Shanghai Chapei Works Mortgage", *Peking Daily News*, Apr 16, 1914: 5.

⁵¹⁶ "Notes on Native Affairs", *The North-China Herald*, May 20, 1911: 498.

honored by the presence of a large gathering of guests. The total expenditure, as reported by Engel, was Tls. 470,000, 17.5% higher than the original estimate.⁵¹⁷

Within a month, the Xinhai Revolution broke out. The Qing regime was overthrown. The birth of Republic of China ended the monarchical tradition of China. The country went into a period of anarchy. The climate was harmful for business, especially those who were guaranteed funding from the old government. When the disorder ended, the newly-born Chapei Water and Electricity Company, overspending its budget before completion, found itself in debt of over Tls. 200,000. At the time, nobody had a definite idea about how dire the crisis was, except for Li Pingshu. Li was the one who put the company together, reputable and capable, but also was the one at fault for the financial predicament, which would not reveal itself until years later.

7.3 When Pipes Met

Since its creation, the Chapei waterworks was on a collision course with the Shanghai Waterworks Company (SWW). The Municipal Council was determined to protect interest of Shanghai Waterworks in the north. In March 1911, the Council protested to the Consular Body on the subject of SWW under threat. The Consular Body accordingly agreed not to allow any interference with the mains already laid by the SWW.⁵¹⁸ When the Chapei waterworks began laying pipes in the district, many consumers of the SWW transferred to the Chinese supplier. The SWW urged the Council to enforce the early

⁵¹⁷ The Shanghai Chapei Works Mortgage, *Peking Daily News*, Apr 16, 1914: 5.

⁵¹⁸ “The Municipal Report”, *The North-China Herald*, Mar 17, 1911: 616.

agreement about their exclusive right in supplying houses on extra-Settlement roads. The dispute was subject to arbitration, and the result was in the SWW's favor.⁵¹⁹

The existing rules put the operation of the Chapei Company under constraints. In March 1912, the Chapei Company was in the middle of laying water mains in the bed of the old Wusong Road on the north bund of the Suzhou Creek. Wusong Road crossed paths with the North Sichuan Road Extension, and the Sichuan Road was a critical roadway running north and south in the International Settlement. The "Extension" in the name indicated that this section of the Sichuan Road was not within the boundary of the Settlement. Nonetheless, the Shanghai Waterworks Company had for years provided the residents with tap water, effectively putting the North Sichuan Road Extension under the jurisdiction of the Municipal Council. The Chapei Company needed to open a trench in the Wusong Road at the juncture with Sichuan Road in order to reach further east. They considered it was duly authorized to do so because the work was operated outside the Settlement. The Shanghai Waterworks Company, however, claimed the move was disputable. Fearing having to pay for the alleged damage, the Chapei Company took the matter to the Mixed Court. The conflict quickly escalated. The tension over sovereignty issues became palatable in the room.⁵²⁰

The Chapei Company argued that Wusong Road was a public Chinese road on Chinese soil under Chinese jurisdiction. It was a main native road from time immemorial, connecting Shanghai to the exit of the Huangpu River to the Yangtze. The Council, however, argued that in the past forty years, the Wusong Road had not at any time been a

⁵¹⁹ "Shanghai Waterworks Co., Ltd.", *The North-China Herald*, Mar 30, 1912: 851.

⁵²⁰ "Court of Consuls", *The North-China Herald*, Mar 23, 1912: 810.

public Chinese road in that it was not constructed or maintained by the Chinese government. Prior to 1867, foreigners had the old Wusong Road widened by acquiring land from native owners. Rent was paid in 1867 by the Council to the Chinese authorities. Since then, considerable sums were spent from time to time by the Council in repairing the road. As for the North Sichuan Road Extension, the Council claimed that it was constructed by them in the year of 1903 and had ever since been repaired, controlled and policed without any involvement from the Chinese authorities. Therefore, the right to permit the opening of the North Sichuan Road Extension was solely vested in the Council and the Chapei Company had no authority to open such road without their consent.⁵²¹

The attorney representing the Chapei Company argued that although the old road was widened by foreigners, the actual purchase of land never happened. The lands were taken by foreigners but were never paid for. The Road was allowed to go into complete disrepair since 1870 and was never used by foreigners, making it de facto a Chinese road again. Two aged persons were brought out as witnesses. They recalled the history of the road quite differently from what the Council was claiming. Max Engel, engineer-in-chief of the Chapei Company, was called in as witness. He said that the refusal of the Council to allow the Company to lay their pipes prevented them from supplying the eastern district with water. That district was very densely populated and the houses were flimsy structures. Thus, there was a special need of water in case of fire. The refusal of the Council caused the Company considerable loss and added to the anxiety over fire incidents. At current status, the fire appliances which had been laid down east of the Sichuan Road were of no practical use. The attorney pointed out that the only section that would be affected was a

⁵²¹ Ibid.

junction as wide as the North Sichuan Road Extension itself. He said that the Chinese authorities were showing every disposition to endeavor to administer the district to the best of their lights at all events, and so they should receive encouragement from their foreign neighbors.⁵²²

The Council argued that they opposed the application of laying pipes for two reasons. First, under by-law ten attached to the Land Regulations, the Council had made an arrangement with the Shanghai Waterworks Company in July 1905. They should allow no person to open the roads under their control except the Shanghai Waterworks Company. Second, the Council denied the application because what the Chapei Company aimed to achieve was pointless. Before the commencement of the Chapei Company, the Shanghai Waterworks Company was supplying water on the east side of the North Sichuan Road Extension, which the Chapei now sought to come into. They were asking the permission to duplicate the supply of water when people were already quite able to obtain a sufficient supply. The Council also pointed out that whether the old Wusong Road was Chinese soil was questionable. In 1867, the Daotai asked the Council to pay rent for the said road. If it was not for rent, the Daotai could have said “I will take it back.”⁵²³

The Chapei Company argued that even though Shanghai Waterworks Company was authorized to lay pipes, it did not prevent others to lay pipes on the same road so as to supply thoroughly a district. The Chapei had a superior right to the Shanghai Waterworks Company in that it was their district. They had the right from the Chinese government to supply that district. The Shanghai Waterworks Company might have acquired some right

⁵²² Ibid.

⁵²³ Ibid.

to lay mains along a certain road, but not a general right to supply the whole district. The Chapei Company had unquestioned and unquestionable rights to supply the whole of that district of Baoshan (east to Chapei and north to the International Settlement) and to lay their pipes there.⁵²⁴

The Court did not announce the verdict immediately. Pressure was mounting for both sides. Some of the SWW's customers in the district had transferred to the Chinese company in protest. On the Chapei's side, their attorney suddenly died of angina pectoris at his residence on the night of April 5.⁵²⁵ Now that a legal victory seemed unattainable, the Chapei authorities ramped up its force to claim what they believed they rightfully owned. At the annual meeting of the China Association, it was reported that the Chapei Constabulary had stationed armed policemen with rifles and ball ammunition a foot from the North Sichuan Road Extension. The aggressiveness was believed to be an attempt to influence the case.⁵²⁶

In June, the Court found that neither party had any absolute prescriptive right to the land in question. On the Chinese side, the authorities never repaired the road, leaving it in the hands of the foreign neighbors. When the Northern Sichuan Road Extension was built, the Chinese authorities never brought up any claim of ownership of the land affected. However, the supposed right the Municipal Council claimed was not sound either. No proof could be provided for legit purchase, let alone the ownership that extended to the subsoil. Therefore, it was decided that neither party should interfere with the other except in the

⁵²⁴ Ibid.

⁵²⁵ "Obituary: Mr. T. Morgan Phillips", *The North-China Herald*, Apr 13, 1912: 83.

⁵²⁶ "Meetings: China Association the Annual Meeting", *The North-China Herald*, Apr 20, 1912: 168.

way of legitimate competition. The judgement pointed out that the absence of fire hydrants of the Shanghai Waterworks Company in the area (Baoshan district) the Chapei intended to reach was due to the opposition of the local authority, of which the head of Chapei Company was also head. Since there was a large area to be served close to the waterworks, the Company insistence on going into the east district looked motivated by politics instead of business and public demand.⁵²⁷

The Court ruled that the Chapei Company enter into an undertaking with the Municipal Council not to prevent, hinder, nor interfere with in any way except by legitimate competition the operation of the Shanghai Waterworks Company to the east of the North Sichuan Road Extension; the Council shall issue the permit applied for to the Chapei Company. The operation at the crossing shall be confined without the assent of the Council; the Chapei Company shall deposit with the Court the sum of Tls. 2,000 as security to make good any loss or damage suffered by the Council owing to delay in operations or failure to make good the roadway after operations are ended.⁵²⁸

Foreigners were concerned about the possibility of the Chapei Company advancing their business by receiving political favors from the Chinese authorities. Some pointed out that the cooperation between the Chapei Constabulary Office and of the Local Government Office of Chapei was a clear indication that the “legitimate competition” was to completely protect the Chapei Company from competition.⁵²⁹ These concerns were legitimate. A few days after the judgement was out, Max Engel, the engineer-in-chief of the Chapei

⁵²⁷ “The Chapei Judgement”, *The North-China Herald*, June 08, 1912: 653.

⁵²⁸ “In the Court of Consuls: Judgement”, *The North-China Herald*, June 8, 1912: 720.

⁵²⁹ “Municipal Affairs”, *The North-China Herald*, June 22, 1912: 809.

Company, wrote to request the Municipal Council to issue the permit in accordance with the judgement. The permit was granted. However, when the Shanghai Waterworks Company appealed to supply water to two British Lots in Chapei, they were refused by the Chapei Board. In his letter to the Shanghai Waterworks Company, the Chinese engineer of the Chapei Board stated that a monopoly had been granted to the Chapei Company. The Municipal Council was infuriated. The Council said that until the Chapei authorities issue the permits the SWW applied for and guaranteed that no such obstacle be placed in the application for permits in future, until they showed that they were honestly prepared to abide by the decision of the Court of Consuls, no permit would be issued to the Chapei waterworks for extension of their pipes across the North Sichuan Road.⁵³⁰

In September 1912, the Municipal Council formally rescinded the permit. The negotiation ran into a standstill.⁵³¹ It was not until March 1913 that the Chapei Company figured out a way to circumvent the obstruction. Laying pipes across North Sichuan Road Extension could not be attempted, but the waterways remained legally Chinese territory, free of foreign intervention. The Chapei Company utilized the creek which was crossed by the bridge in Northern Sichuan Road Extension and laid a main along the riverbed. Li Pingshu was the one who came up with the clever scheme and the construction was quickly wrapped in merely days.⁵³² However, after finally reaching the eastern Baoshan district, the advancement of the Chapei Company faltered. This was most likely due to the debt that had plagued the company for long. The crisis underneath started manifesting itself.

⁵³⁰ "The Deadlock in Chapei", *The North-China Herald*, July 06, 1912: 16.

⁵³¹ "Local and General News", *The North-China Herald*, Sep 07, 1912: 708.

⁵³² Ibid.

7.4 Ownership of the Chapei Company: From Private to Public

The Chapei Company was caught in between its own aggressive expansion and the Municipal Council's obstructionism. It was rumored in the summer of 1913 that Li Pingshu had gone to Osaka, negotiating a big loan from Japan to save the Company. The security was said to be the waterworks.⁵³³ Li had always been a complicated figure, whose ties reached far beyond the business world. Li's political career started in the 1870s when he rose to officialdom in prefects of Canton Province. He was dismissed by the Qing court for abrasiveness in dealing with the French imperial expansion in Canton. Moving back to Shanghai, Li was inspired by the presence of the British-run modern utilities. He paid a visit to the waterworks with his fellow village man Yao Angu, whose brother Yao Langu was an employee of the Shanghai Waterworks Company. That was the beginning of Li's interest in water business and Western technologies. Before leading the project of Chapei waterworks, Li was already in contact with several managerial and engineering talents. Under Li's recommendation, one of them were sent to save the Inland Waterworks Company, which was on the verge of bankruptcy in 1902.⁵³⁴

Li remained active in politics. He participated in the Xinhai Revolution in Shanghai. After the military occupation he was appointed by the military governor Chen Qimei (陈其美, 1878-1916) as the head of the Civil Bureau of Shanghai and Chief of the Chapei Police.⁵³⁵ However, with the rise of conservative Yuan Shikai as president of the

⁵³³ "Correspondence: Japanese and the Revolt", *The North-China Herald*, July 26, 1913: 263.

⁵³⁴ Shanghai gongyong shiye zhi bianzuan weiyuanhui (Editorial Committee of Gazetteer of Public Works of Shanghai). Shanghai gongyong shiye zhi (Gazetteer of Public Works of Shanghai). Shanghai: Shanghai Academy of Social Science Press, 1999.
http://www.shtong.gov.cn/dfz_web/DFZ/Info?idnode=60617&tableName=userobject1a&id=49083

⁵³⁵ "Correspondence: Japanese and the Revolt", *The North-China Herald*, July 26, 1913: 263.

Republic of China, close allies of revolutionary Sun Yat-sen's fell out of favor. Yuan made a deal with the foreign authorities in Shanghai to the effect that Chen Qimei and Li Pingshu were deprived of rights to reside in the International Settlement. Fearing for his safety, Li fled to Japan, abandoning his duty at the Chapei Company.⁵³⁶

The Chapei Company's difficulties caught government's attention. In March 1914, Han Guojun (韩国钧, 1857-1942), civil governor of Jiangsu province, ordered the Company to forward a report about its operation since its inception. It was found in the accounts that a sum of Tls. 400,000 was borrowed from a Japanese firm, of which the directors of the Company were not aware. Even the foreign chief engineer, Max Engel, could not shed any light upon the loan. The Company addressed to Li Pingshu, who was in Japan, a letter seeking further information about the loan. Li said that the Company after the revolution was indebted to the Chinese government to a large extent. Since the Chapei Municipal Council had no funds to spare, it became his responsibility for the continuance of the Company. That was why he turned to foreign money for help. Directors of the Chapei Company was deceived and upset. They urged the civil governor to summon Li to Shanghai.⁵³⁷

Japanese authorities were swift to prey on the vulnerable Chapei Company. Later in March, Japanese Consul-General in Shanghai said that Li Pingshu had mortgaged the works to a Japanese firm, Okura & Co., and unless the loan was repaid, Okura & Co. would

⁵³⁶ Shanghai gongyong shiye zhi bianzuan weiyuanhui (Editorial Committee of Gazetteer of Public Works of Shanghai). Shanghai gongyong shiye zhi (Gazetteer of Public Works of Shanghai). Shanghai: Shanghai Academy of Social Science Press, 1999. http://www.shtong.gov.cn/dfz_web/DFZ/Info?idnode=60617&tableName=userobject1a&id=49083

⁵³⁷ "The Chapei Waterworks: Alleged Illegal Loan? Japanese Interested", *The Shanghai Times*, Mar 21, 1914: 5.

exercise their right to take over the works.⁵³⁸ The Jiangsu government had been thinking of selling the company to the Japanese, but after investigating the condition of the Chapei Company, the local merchants said that the property, even in its entirety, was insufficient to pay off the loan debts.⁵³⁹ The Chapei Company was not alone in this unfortunate trend. In Beijing, the Peking Waterworks too was in the course of being transferred to Arnhold, Karberg & Co. (德商瑞记洋行), a trading company registered in Germany. This project, initiated by Yuan Shikai, approved by Empress Dowager Cixi in 1908, was in the Chinese hands for less than four years. The future of the Chapei Company looked gloomy.⁵⁴⁰

As the investigation went on, more disgraceful details about Chapei's finance were exposed. The Peking Daily News revealed that when the idea of Chapei waterworks was first conceived, it was proposed to enter into an arrangement with the Shanghai Waterworks Company for the supply of water. But the negotiation fell apart. Li Pingshu estimated that the project would cost Tls. 500,000 now that the company was completely on its own. Daotai Cai suggested that Li should apply for a smaller amount because he was afraid that the Viceroy might not approve the scheme if the cost was too great. They fixed the price of the project at Tls. 200,000, with the Tls. 200,000 for service pipes removed. By the time when the project was completed, the total expenditure, according to engineer Max Engel, was Tls. 470,000.⁵⁴¹

⁵³⁸ "The Chapei Waterworks in Shanghai", *Peking Daily News*, Apr 01, 1914: 5.

⁵³⁹ "News from Chinese Press", *The Shanghai Times*, Mar 25, 1914: 5.

⁵⁴⁰ "Local and General News", *The North-China Herald*, Apr 04, 1914: 66.

⁵⁴¹ "The Shanghai Chapei Works Mortgage", *Peking Daily News*, Apr 16, 1914: 5.

The Chapei Company was heavily in debt before the turmoil of 1911 Xinhai Revolution. After General Chen Qimei forcefully occupied Shanghai, the Company turned to the military governor for help. Chen suggested that the Chapei Company could mortgage its property to Okura & Co. The agreed loan was Tls. 200,000 at first, but Chen wanted to take advantage of the moment. He asked the company to request a larger loan from the Japanese and planned to divert some of the money to his arsenal. The proposed amount thus rose to Tls. 330,000. Okura & Co. only agreed to loan Tls. 300,000. This sum was not spent on any improvements of the service. Tls. 210,000 were used to square up the debts, Tls. 60,000 to pay back the payment of advances made by the Daotai's treasury. In 1913, the mortgage increased to Tls. 400,000. Since then, no interests had been paid to Okura & Co.⁵⁴²

The Chapei Company was meant to be China's monument of national pride. After it fell from grace, the government decided to intervene. In April 1914, Department of Industry of Jiangsu Province (江苏省实业厅) bought out the Chapei Company. The provincial government paid instantly Tls. 60,000 to the Okura & Co. and promised to pay up the rest of the debt in the coming years. Li Pingshu escaped the punishment. He returned to China safely in 1916. His company, in the meantime, changed its name into Jiangsu Province Chapei Water and Electric Company.⁵⁴³

7.5 Ownership of the Chapei Company: From Public to Private

⁵⁴² Ibid.

⁵⁴³ Shanghai gongyong shiye zhi bianzuan weiyuanhui (Editorial Committee of Gazetteer of Public Works of Shanghai). Shanghai gongyong shiye zhi (Gazetteer of Public Works of Shanghai). Shanghai: Shanghai Academy of Social Science Press, 1999.
http://www.shtong.gov.cn/dfz_web/DFZ/Info?idnode=55089&tableName=userobject1a&id=42315

The governmental control over the waterworks did not lead to improvements in services. Fourteen months into the new ownership, the quality of water supplied by the Chapei Company deteriorated. The population in the district was increasing, but the capacity of waterworks was not. The Chapei Company petitioned in June 1915 that the Company's waterworks should enter an agreement with the Shanghai Waterworks Company to obtain a supply of water from the International Settlement. Governor of Jiangsu, Qi Yaolin (齐耀琳, 1862-1949), refused to grant the petition as it would embarrass the sovereignty of the new republic.⁵⁴⁴

By 1918, the Jiangsu government was on its way of abandoning the Chapei Company. They thought about granting a charter to a private company working in the same capacity of the Chapei Company. Jiangsu Provincial Assembly sanctioned the proposal of replacement. Upon hearing the news, the gentry of Chapei sent a delegate to Nanjing to oppose the proposed new company. They believed that this creation would be redundant. They argued that once they took over the Chapei waterworks, they would be able to put it back in business.⁵⁴⁵

However, there was a reason why the government would rather have another waterworks built than giving up on the Chapei Company. An investigation by the Chinese press discovered a reserve fund amounting to several tens of thousands of dollars in the Chapei Company. But the sum had not been spent on any needed improvements or extensions. Public bodies of Chapei submitted a joint petition to the Governor of Jiangsu,

⁵⁴⁴ "Chapei Waterworks: Petition Refused", *The Shanghai Times*, June 21, 1915: 4.

⁵⁴⁵ "Chinese Press: The District Prize Court", *The North-China Herald*, Jan 05, 1918: 9.

requesting permit to use this reserve. The inquiry was never answered. The manager of the works, who was appointed by the Jiangsu government, grew so frustrated that he submitted his resignation. The Chapei gentry was worried that once the manager was gone, they would not be able to carry out any real improvements: “If nothing is done, these provincial-owned industries, we are afraid, cannot last long, however well preserved.”⁵⁴⁶

Government’s involvement in the Chapei Company proved to be more trouble than help. Obstructionism associated with bureaucracy was best exemplified by the following story. On January 15, 1922, manager of the Chapei Company Feng informed Governor Wang about the pressing need of a larger trunk pipe to connect the waterworks with the commercially developed yet far away Baoshan district in the north. Feng stated that due to the long-distance water supply in Baoshan was not pressurized enough to fight fire. The supply to Baoshan was at the center of controversy in 1913 when the Chapei Company bypassed the obstruction of Municipal Council to pipe the district. Almost ten years had passed, supplied remained inadequate. Feng reported that Chapei Company would call for a bidding for the proposed 150,000 feet-long trunk pipes. Since the Chapei was technically a government franchise, Feng was seeking permission from the Governor. On March 2, 1922, after a month of search for the qualified tender, the Chapei Company had selected the candidates. Feng suggested that considering the scale of the proposed project, it would be better if the provincial government could send in their agent to oversee the process. On March 8, the bidding began under the oversight of Commissioner Yu, representing

⁵⁴⁶ “Views of the Chinese Press: Chapei Water & Electric Works”, *The North-China Herald*, Jan 01, 1921: 10.

Department of Industry of Jiangsu Province. The contract went to a foreign bank who offered to build a steel pipe at low cost.⁵⁴⁷

However, the Governor's Office became furious. They said the special agent they sent was still on his way to Shanghai when the bidding ended without his presence. The Company was scolded for the contempt against the government. The Company was even ordered to retract the result and hold another bidding with the presence of the special agent sent from the Governor's Office. Feng tried to make the case that a second bidding would be a bad idea in that the lowest possible cost of the project was already exposed to all candidates and if the current tender lost its bid, struggles and skirmishes were bound to occur. Not to mention how much credit the government would lose in reversing a process of such gravity. Hubris of the governor prevailed. At his insistence, the process was reversed and redone in June.⁵⁴⁸

The Chapei Company remained in the hands of the government for another year. Due to the arrested development of their waterworks, the company had to purchase water from the Shanghai Waterworks Company. This arrangement was done behind closed doors, otherwise it would deal a huge blow to the Republic government whose entire legitimacy was founded on the idea of sovereignty. The consumers, who were drinking water fashioned by the British company, had to pay ten cents more for each gallon than they paid the Shanghai Waterworks Company. This "temporary" arrangement lasted well into the summer of 1923.⁵⁴⁹ The terrible quality of water pushed the people to their limit. The water

⁵⁴⁷ Shanghai Municipal Archive, Q577-1-1656.

⁵⁴⁸ Ibid.

⁵⁴⁹ Shanghai Municipal Archive, Q577-1-1659, 1922-1923.

provided was said to be green in color. Little fish, shrimp and insects were reportedly found in his tap water.⁵⁵⁰ Not only was the water hard to swallow, the supply for fire extinguishing was also in question. On the evening of March 10, 1924, a silk filature in the district was burned to the ground. Most of the workers lived in the workers' quarter inside the building. The police had to break the lock for those who were lucky enough to escape. Fifty-two people died, thirty-nine wounded. Fire brigade reportedly could not find a source of water that was adequately pressurized. A general strike swept the Chapei district in protest of the inept Chapei waterworks.⁵⁵¹ Although it was found out that the problematic design of the workers' quarter was the primary reason for the high death toll, merchants of Chapei accused the provincial government's arrogance of leading the Chapei waterworks to the "most corrupt and darkest place". The governor should be held responsible for the "utmost tragedy in Shanghai's recent history."⁵⁵²

Underneath the dissidence was a power shift between Chapei district and the Jiangsu province. Chapei merchants had long been yearning autonomy for their district. After government's acquisition of the Chapei Company, commerce in Chapei had grown steadily. The provincial government of Jiangsu at one point almost authorized the establishment of Chapei's own Municipal Council. But the governor went back on his word at the last moment. This was the real momentum behind the general strike. Those who expected to move up in the would-be Council closed their shops in protest. The strike went

⁵⁵⁰ Vera Kelsey, "China's Industrial Workers: II - Living Conditions", *The North-China Herald*, Mar 24, 1923: 822.

⁵⁵¹ Wang Shu-huai, "Dispute on the Ownership of Chapei Company of Electricity and Waterworks", *Bulletin of the Institute of Modern History, Academia Sinica*, Vol. 25 (Jun., 1996): 169-209.

⁵⁵² Chi Zihua, "How the Amenity Killed the Workers: the 1924 Fire Incident at Women's Quarter at Xiangjing Filature and Public Reaction". *Shehui kexue zhanxian (Social Science Front)*, No. 3 (2017): 80-87.

on for days. A mass meeting was held on the afternoon of March 22. Various resolutions were passed including taking possession of the Chapei Company along with its water and electricity plants if the provincial authorities refused to hand them over. A group of one hundred “special constables” was formed, who wore badges inscribed “Chapei Public Bodies’ Peace Maintenance Officers.” Under the pressure of public agitation, the Jiangsu governor announced that the demands of the merchants would be acceded to. April 30 was fixed as the date for handing over the two services of Chapei Company to local control. The news spread across Chapei. People celebrated the victory with fireworks and parades.⁵⁵³

The transition of Chapei Company was not finalized until the end of August 1924. During the five months, the government’s stance remained highly unclear. They kept picking on the draft agreement and was concerned that the Chapei merchants would be slow in paying the full amount. These actions deepened the division between Chapei district and the province.⁵⁵⁴ In fact, the Chapei merchants had raised \$2,000,000 capital

⁵⁵³ The Chapei Strike: Merchants demand Conceded by the Authorities, *The North-China Herald*, 22 Mar 1924: 449.

⁵⁵⁴ A committee of Chapei public bodies was formed to facilitate the take-over. A representative was sent to the Company’s office and demanded to assume charge. The clerk of the Chapei Company assured the deputation that the Governor had pledged his word to convert the works into a commercial undertaking. But in case the Governor went back on his words, the Company still had the Provincial administration to answer to before any handling-over could take place. The discussion went on for hours. In the end, it was agreed that 24 hours would be given during which time the Company needed to obtain the Governor’s decision regarding the ownership of the Company. However, one of the committee member, He Fenglin (何丰林, 1873-1935), received an urgent telegram from a friend at Nanjing on Tuesday morning, suggesting that the draft agreement would be cancelled by the Administrative Court. In addition to being a committee member at Chapei, He was also the Military Commissioner of Shanghai. He mediated between the Chapei and Jiangsu throughout the entire transition. He was in verbal support of the privatization of the Chapei Company: “I will guarantee from first to last that the Works will be transferred to a private company; you may hold the inaugural meeting on August 4; and if any change of official attitude should develop by that time, I shall take emergency action, as I have said before.” Despite the mounting pressure, the Jiangsu government employed legal actions to stall the transition. The governor insisted that negotiations must be held up until the Administrative Court gave its decision; for now the draft agreement shall not be executed. These moves all contributed to the delayed transition of the Chapei Company. See “Gen. Ho Feng-Ling and Chapei Waterworks: Promise to Support Promoters of Private Co. Despite Nanjing’s Interference”, *The North-China Herald*, July 26, 1924: 138;

shortly after the victory of general strike and expected to double this sum for improving the efficiency of Chapei's service. Their plan included addressing the water pressure issue by erecting a new water tower 180 ft. high, with a capacity of 450,000 gallons.⁵⁵⁵ Unfortunately, the Chapei Company barely catch a break. Merely one month after the company was privatized, war broke out in Shanghai. From September 3 to October 13 1924, numerous battles occurred across the Yangtze delta between warlords of Jiangsu and those of Zhejiang. The key purpose of this war was for the Jiangsu warlords to seize the military control over the Shanghai area and to drive out the Zhejiang influence. Due to the disturbance, the Chapei Company was not able to make any substantial improvements. The water supply remained a major trouble for the local inhabitants. The negligence of the Company even led to cholera outbreak in Chapei in the summer of 1926, which would be explored in the next chapter.

7.6 Rise of Nationalism

While the two Chinese waterworks struggled, the Shanghai Waterworks kept expanding its service. Pipes were laid not only across the Suzhou Creek into the north, but also beyond the west border of the Settlement along the major roads like Bubbling Well Road. The ample water supply brought about better sanitation and increasing revenue, and helped the Municipal Council projected political influence to the surrounding areas. Foreigners who lived outside the Settlement paid their taxes, but had no representative in the Council in deciding the tax rate because the rules forbid those who lived outside the

Wang Shu-huai, "Dispute on the Ownership of Chapei Company of Electricity and Waterworks", *Bulletin of the Institute of Modern History, Academia Sinica*, Vol. 25 (Jun., 1996): 169-209.

⁵⁵⁵ "The Chapei Strike: Merchants demand Conceded by the Authorities", *The North-China Herald*, Mar 22, 1924: 449.

Settlement to be elected to such positions.⁵⁵⁶ This issue caused some minor complaints, but did not prevent more foreigners from settling down in extra-Settlement areas. The Municipal Council managed to occupy large area in the western area amidst the chaos in 1924. By claiming administrative rights over the roads and villages some five miles west to the limits of Settlement, the British authorities transformed the vast rural area into its western district.⁵⁵⁷ The political landscape underwent major changes when the Nationalist troops, led by the young general Chiang Kai-shek, the revolutionary disciple of late Sun Yat-sen, captured Shanghai in 1927. The old, weak, greedy, and deeply unpopular local government was unseated. Chiang Kai-shek's army had yet swept away the warlords in northern China, but the nationalist sentiment was already on the rise.

After occupying the Chinese sections of Shanghai, the Nationalist regime solidified their control by launching a purge of the union leaders and communists, who helped organize strikes in support of the new regime merely months ago. Special Municipality of Shanghai was then created to oversee all Chinese districts. The new government sent in senior Health Officer, Dr. Liu Hsin-tz, to meet the board of trustees of the Chapei Company. Liu inspected the waterworks and offered some suggestions. Liu said that

⁵⁵⁶ "Outside Roder, Rates Beyond Limits", *The North-China Herald*, Dec 18, 1920: 813.

⁵⁵⁷ When the war broke out in September 1924, the British sent troops of five hundred men into the Fahua Village, about 5.6 mile from the Bund. Union Jack could be seen all over the place. In 1925, the Municipal Council managed to build another eleven roads in the west, including Amherst Avenue (安和寺路/新华路), Jordan Road (乔敦路/淮海西路), Lincoln Avenue (林肯路/天山路), Pearce Road (庇亚士路/北翟路), Tunsin Road (惇信路/武夷路), Jernigan Road (佑尼干路/仙霞路), Columbia Road (哥伦比亚路/番禺路), Fraser Road (法磊斯路/伊犁路), Keswick Road (开士威克路/凯旋路), Macleod Road (麦克利奥路/淮阴路), Monument Road (碑坊路/绥宁路). Changning qu zhi bianzuan weiyuanhui (Editorial Committee of Gazetteer of Changning District). Changning qu zhi (Gazetteer of Changning District). Shanghai: Shanghai Academy of Social Science Press, 1999. http://www.shtong.gov.cn/dfz_web/DFZ/Info?idnode=15181&tableName=userobject1a&id=27570

considering currently only one filter was in proper working order, the Company should immediately repair the other two it had for the sake of sufficient filtering of water. He also advised against mixing of unfiltered water with pure water. To kill all poisonous matter in the water, Liu suggested applying gas in the filtered water in addition to existing measures. Liu said that if the Company was not able to fashion enough water during the summer, then water should be obtained from other waterworks companies to meet the additional demands. The newly forged Department of Public Utilities then was put in charge of the routine report on quality of water of both the Inland Waterworks Co. and the Chapei Company, signaling a more centralized control over the Chinese water supply.⁵⁵⁸ Dr. Liu revisited the Chapei waterworks within a week to ensure that all his previous advices were implemented. The Chapei Company was scolded for its slow action, but reforms took time.⁵⁵⁹ By the end of 1927 the Chinese water supply in Shanghai had seen a steady decline in the number of bacteria.⁵⁶⁰

The Nationalist government proceeded to challenge the legality of foreign water supply in the disputed areas. In July 1928, the Kuo Min News Agency reported that the headquarters of the Shanghai and Wusong Gendarmerie and the Special Municipality had requested Commissioner of Foreign Affairs of Jiangsu to send a dispatch to E. S. Cunningham, Senior Consul, to ascertain the truth of various reports to the effect that the waterworks of the Municipal Council had been laying pipes beyond the Settlement limits in the western part of the city. The Nationalist government requested the foreigners to

⁵⁵⁸ "The Chapei Waterworks Again: The Chinese senior health officer on Reforms which are Necessary", *The North-China Herald*, June 11, 1927: 474.

⁵⁵⁹ "The Chapei Water Supply: Vigorous Steps to be taken by, District Health Officer if No Improvement", *The North-China Herald*, June 18, 1927: 508.

⁵⁶⁰ "Chinese Municipality Improves Public Utilities", *The China Weekly Review*, Dec 03, 1927: 23.

refrain from carrying their activities beyond Settlement limits without first obtaining permission from the Chinese authorities.⁵⁶¹

The North-China Herald, however, had very different findings. They reported that the Shanghai Waterworks Company had heard nothing about the alleged complaint and had received no protest from the Commissioner of Foreign Affairs. *The Herald* suggested that the Kuo Min News Agency might be sending out “a little intelligent anticipation”. *The Herald* also suggested that the Shanghai Waterworks Company had no mains outside the Settlement limits. The said roads where pipes were laid were either under the control of the Municipal Council, or Chinese roads where pipe-laying was authorized by Chinese authorities. For example, there was indeed a considerable mileage of mains in Chinese-controlled roads – north of Zhaofeng Road (兆丰路/高阳路) and beyond the limits of Settlement. However, these mains were laid under Chinese permits and was requested by the Chinese consumers. The service of the Shanghai Waterworks Co. was deeply appreciated. Nationalist’s propaganda might not be able to convert many of them to a Chinese water supply.⁵⁶²

In the summer of 1928, the Shanghai Waterworks Company’s extra-Settlement activities caught the attention of the Nationalist government. As new foreign houses were erected on the Fahua Road, the Company was laying distributing main along the adjacent Columbia Road to supply water to those new premises. Upon learning the news, the Bureau

⁵⁶¹ “Chinese Official Questions Rights of the Settlement to Lay Water Pipes in Western District”, *The China Press*, July 19, 1928: 1.

⁵⁶² “Waterworks Co. and Chinese: Alleged Complaints of Laying Mains on Outside Roads”, *The North-China Herald*, July 21, 1928: 103.

of Foreign Affairs of the Nationalist government filed in a formal protest to the Senior Consul. This move caught the Municipal Council by surprise because up until 1928 the procedure had not been seriously questioned.⁵⁶³ Picking the fight in the western area must be a premediated move. In the northern area, it would be unrealistic to cut off the British water supply without expecting backlash from the large number of paying customers. Unlike the entrenched network in the north, the ongoing construction in the west was vulnerable to political interception. The Council maintained that it was their right to permit the Shanghai Waterworks Company to lay mains under the current regulations, but the Nationalist government did not wish to authorize the construction as their predecessors had done.

In the morning of October 18, 1928, at 8 a.m., a number of uniformed Chinese came over the railway from the west and arrived at the site of construction on Keswick Road, one of the extra-Settlement roads in the west. They ordered the coolies to stop. The appearance of these men wearing uniform came as a complete surprise to those who were working on the site. For a while the construction stopped. Noticing the incident, the representatives of the Shanghai Waterworks Company went to the police. The foreign police force responded by placing patrols on Keswick Road near the excavations to ensure the safety of the pipes lying there. The next day, on October 19, a police officer affiliated with the Second substation of the Sixth District proceeded to the scene and intended to stop the work again. He was blocked by several foreign officers of the western district. He said that he had received orders to prevent work being continued in Keswick Road. The

⁵⁶³ "Roads outside the Settlement: Question to Be Discussed in Early Autumn", *The North-China Herald*, Aug 18, 1928: 287.

inspector-in-charge of the Bubbling Well Station told him that the work would continue unless they received a letter from a responsible person, and formal negotiations must be done with the Municipal Council. The foreign police then communicated with the headquarters of the native police. It was unclear whether there had been coordination among police forces in those districts, but no further interference was seen after that day.⁵⁶⁴

The young Kuomintang (Nationalist) party members in Shanghai could not stomach the blatant violation of China's administration rights. In their petition to the central government in Nanjing, these young men said: "The Kuomintang is advocating every day the abrogation of unequal treaties and if a strong protest be not lodged against the British imperialists for roads in Chinese territory and endeavors are not made to secure the rendition of these roads how can we enforce the policy of the Kuomintang and comply with the wishes of the people?" They demanded that the roads be taken over and constructed by the Chinese authorities, that the foreign police withdraw from these roads, and that protection of the lives and property of foreign residents on the sides of these roads be undertaken by Chinese authorities; that an annual land tax on these roads be paid to the Chinese authorities, instead of to the Municipal Council; and that all the wicked members of the gentry and local chiefs who worked in conjunction with the foreigners for the sale of land be arrested and ordered to reimburse the price of the land or to have their estates confiscated.⁵⁶⁵

⁵⁶⁴ "Agitation against Outside Roads: Local Kuomintang Ask Unconditional Rendition", *The North-China Herald*, Oct 27, 1928: 140.

⁵⁶⁵ Ibid.

The Nanjing government was not called into action by the young, vengeful party members, but to battle the unjust foreign interests the Kuomintang did have a plan for Shanghai. In July 1929, Nanjing elevated Shanghai from “Special City” to “Greater Municipality of Shanghai”. Large land in Hongkou was saved for the new administrative core, soon to be decorated with magnificent office buildings and museums. The architecture would be in full-fledged Chinese style, positioning the Greater Shanghai as national monument in opposition to the neo-classical, colonial-style Bund. The plan relocated the political center to the north so that the expansion of the International Settlement could be countered. Starting from the summer of 1930, the Greater Shanghai municipality became increasingly combative in disputed sovereignty claims in the northern part of the city. The feud over the Northern Sichuan Road Extension was revived.

In July 1930, the Greater Shanghai government installed police station in alleyways where foreign patrols existed, demanding the Shanghai Municipal Council to withdraw and surrender their rights in that area. They issued a notice to the residents living in one of the alleyways off North Sichuan Road Extension (Yu Chin Fang), saying that their alleyway, part of the Chapei District, was entirely in Chinese territory and that the Chinese authorities alone should have the right to police the place and supply them with water. All residents must in future obtain their water supply from the Chapei Company instead of the Shanghai Waterworks Co.⁵⁶⁶ The Shanghai Waterworks Company did not take the gesture seriously. Around this time, the Shanghai Company was in the process of installing water meter for Chinese customers to cut back the waste. A representative of the Greater Shanghai

⁵⁶⁶ “Extra Settlement Police Rights: Denial of Decision of Municipal Police to Withdraw”, *The North-China Herald*, July 08, 1930: 54.

Government said that he had been instructed to cut the pipe inside the premises as soon as the meter was put in place. The Shanghai Waterworks Co. decided to proceed in spite of the warning. The meter was then installed in the disputed alleyway in the presence of representatives of the Shanghai Municipal Police (foreign) and the Chapei Police. It was reported that the Greater Shanghai government warned the tenants to store a sufficient supply and then without noticing the Shanghai Waterworks Company, they sent in people to cut off the water supply on July 8.⁵⁶⁷

Foreign press and Chinese officials told very different stories about the Yu Chin Fang Alley controversy. Some said that after the supply was cut off, tenants in the alley had to draw water from public supply like from hydrants in the street. The Chinese authorities were rude, invasive and unreasonable. But according to the Bureau of Public Utilities of the City Government of Greater Shanghai, the water in the area was shut off in the early morning, not by Chinese authorities, but by Shanghai Waterworks Company, for the purpose of installing the water meter. Since the Shanghai Company did not give the tenants previous notice of their intentions, the Bureau of Public Utilities had to connect these houses with the Chapei mains immediately. Due to a breach of the Bureau's regulation in the practices of the Shanghai Company, it was prohibited from reconnecting those houses. The Bureau insisted that they had warned against installing the meter, and the tenants were not without water supply except for the short period when reconnection to the Chapei water was arranged.⁵⁶⁸

⁵⁶⁷ "North Sichuan Road Alleyway: Water Cut Off by Chinese Authorities", *The North-China Herald*, July 08, 1930: 55.

⁵⁶⁸ "Utility Bureau Issues Statement on Water Dispute: Chinese Authorities Tells Story of Water Supply at Yu Chin Fong", *The China Press*, July 13, 1930: 1.

The alleged breach of regulation was never specified by the Chinese authorities. The dispute was about water supply on its face, but the real target was the Cathay Land Company. The Cathay Land Company was registered in the British Consulate. It owned more than a hundred Chinese houses beyond the Settlement's limits. Since the Company was registered in a foreign consulate, its property lay beyond the jurisdiction of Chinese authorities. The Company had been paying taxes to the Municipal Council in order to secure water from the Shanghai Waterworks Company. The Greater Shanghai government, however, considered the area owned by the Cathay Land Company under the sphere of action for the Chapei waterworks. They insisted that it was their right to cut and reconnect the water supply because the property, occupied by Chinese tenants and outside the Settlement, was under Chinese jurisdiction.⁵⁶⁹ The strategy was clear: given that extra-Settlement rights could not be materialized without the involvement of private land companies, if the Cathay Land Company caved under pressure, the Chinese authorities would win this case and all cases alike without the trouble of strenuous legal battles.

7.7 Battle against the Surcharge, 1930-1931

When the struggle over the extra-Settlement roads was in full swing, the ripple of the global depression reached Shanghai, compounding the politically-charged relationship between the Shanghai Waterworks Company and its Chinese customers. In August 1930, the Shanghai Waterworks Company announced that there would be a surcharge of 25 percent on account of the rising prices of the pipes due to the 35 percent depreciation of

⁵⁶⁹ "Dispute Over Water Supply Beyond Shanghai Settlement Limits", *The China Weekly Review*, July 12, 1930: 233.

value of silver on the global market.⁵⁷⁰ The Nationalist administration came quickly to condemn the surcharge, claiming that the waterworks is a public utility, which should never be regarded as a trade to make good profits. Since the company had an immense income, it would be more advisable to cut down its expenses than to impose an increase.⁵⁷¹ Then there was the bottom-up Chinese Ratepayers Association of the International Settlement, which began their negotiation in early September. They strongly protested to the Company while seeking a reconsideration from the Council. They also decided to issue a circular letter to all the Chinese organizations and residents in the Settlement for a united front.⁵⁷²

For the Chinese customers, they felt the surcharge was illegitimate by many measures. First, an increase of rate violated the agreement the Company and the Municipal Council entered in 1929. That agreement provided that no increase be made within two years. It also set up an extremely complicated procedure to discourage any surcharges. That procedure had not been invoked, thus the current proposed surcharge could not be implemented.⁵⁷³ Second, the Company failed to enforce any rules regarding the dividends of shareholders, such as for example, setting up Equalization of Dividends Account and Tariff Revision Suspense Account in preparation for a bad year. It was therefore in this unfair obligation to guarantee the interest of shareholders no matter how unfavorable the

⁵⁷⁰ Jack, "Letter to the Editor 4 - No Title", *The North-China Herald*, Aug 19, 1930: 281; "Waterworks Concern Stage Comeback to Criticisms on Proposed Increased Rate: Say there is no basis for suggestion that surcharge is violation of agreement with Municipal Council", *The China Press*, Sep 18, 1930: 1.

⁵⁷¹ "Kuomintang Opposes Water Rate Surcharge", *The China Press*, Aug 25, 1930: 1.

⁵⁷² "Chinese and the Water Rate", *The North-China Herald*, Sep 09, 1930: 389.

⁵⁷³ According to the 1929 agreement, if the Company must submit an estimate to the Council five months before they asked for the Council's approval for an increase. If the Council did not agree to the increase, the dispute would be settled by arbitration. If arbitration could not solved it, the British consul general would be requested to decide the matter. Chinese Ratepayers are Protesting Proposal to Increase Water Charges: Speaker at Meeting Cities agreement concluded between council and company, alleges there has been violation, *The China Press*, 07 Sep 1930: 1.

business was that year.⁵⁷⁴ Third, the Municipal Council was accused of being too involved in the Company's business. Chinese Realty Association suggested that since 1927, the Municipal Council had been guaranteed the interest of 9 percent on the Company's share. On the London market, the most common annual return was about 7.2%. The return of the Shanghai Waterworks Company, however, amounts to more than 10% for 1928 and 1929.⁵⁷⁵ Finally, The Chinese felt that if the Company truly wanted to cut the expenditure, they could have installed more water meters. But when Chinese customers requested, they were often rejected. The rent in the Settlement was high. Water rate in proportion to rental was thus more profitable than metered rate. This made many Chinese believe that the Company cared only about profit, rather than their mission of public service.⁵⁷⁶ It was

⁵⁷⁴ Five questions were asked in that letter: 1. How much is the deficiency in this year's net profit of the Company in paying the fixed dividends on the Company's shares? 2. Are the reserves under the Equalization of Dividends Account sufficient, or have they been used and applied to make up such deficiency? If not sufficient, how much more is needed to meet the deficiency? 3. Has the steady appreciation of Sterling-Tael exchange from 1s 6d when the deficiency in the company's net profit in paying dividends was first calculated to 1s 7.25d at present prevailing altogether no appreciable effect in reducing such deficiency? 4. In making allocations to the shareholders, has the agreement ever provided that maximum dividends must be guaranteed to the shareholders every year, no matter favorable or otherwise? 5. As the agreement provides for quennial revision of tariff charges, on what basis is the company's claim to revision in 1931 supported? See "Local reality owners make protest to council on proposed water rate rise: association asks that reconsideration be given to suggestion in interests of individuals and whole community", *The China Press*, Sep 14, 1930: 3.

⁵⁷⁵ "Property Owners Reject Imposition of Surcharge on Existing Water Rate: Enumerate Reasons in Letter Addressed to Chinese Ratepayers Association; Decision Reached at Meeting Held Monday", *The China Press*, Dec 3, 1930: 2.

⁵⁷⁶ "The Water Surcharge: Chinese Ratepayers' Decision to Oppose Proposed Increased Charges", *The North-China Herald*, Dec 09, 1930: 335. This speculation was not baseless. When the Company first tried out the meter system in the 1910s, there was a case in which the American-owned China & Japan Trading Company tried to arrange the water rate by meter instead of having to pay in proportion to the rental. The owner of the said company argued that the entire building of his company was occupied by offices and contained no residential flats. Therefore, consumers for other than domestic purposes, defined by Shanghai Waterworks Company's own clauses, should be able to install the metering system. The Shanghai Company, however, argued that office requirements were included in domestic requirements. It provided the former with a contract that imitated its refusal to supply water except when the service was paid in proportion to rental. The rental value of the China & Japan building was at Tls. 17,500. The whole charges, at three percent, per month, with fire hydrants and other requirements, would amount to Tls. 623.70 a year which at \$4 per 10,000 gallons would pay for 2,135,000 gallons of water. It is absurd to suppose that the building would use anything like that amount. The matter was eventually settled by arbitration, stating that Buildings which are occupied exclusively as offices are to have water supplied to them at the meter rate, namely forty cents per thousand gallons; buildings occupied both as offices and as flats are to be charged as for offices, namely at the meter rate, unless some other arrangement as to percentage is come to with the Waterworks. Dwelling houses are to be charged as previously, namely four percent on the rental. This dispute was a demonstration

pointed out by the Chinese associations that the rate of increase of production was about 22% while the increase of expenditure was about 45%. They called the British ways “incompatible with the principle of scientific management”.⁵⁷⁷

On the other hand, for the Shanghai Waterworks Company, the surcharge was necessary and unavoidable if the quality of water supply was to be maintained. First, the rising cost of production was significant. In his sit-down interview with *The China Press*, president of the Company C. D. Pearson said that the economic crisis resulted in an all-encompassing price surge that affected imports like machinery, alum, and chlorine. Even coal, which was produced in China, was expected to rise in price due to the metal involved in its production.⁵⁷⁸ Second, the Company said that the accusation about the lack of reserve was untrue. The surcharge was proposed because the reserves accumulated on Equalization of Dividends Account and Tariff Revision Suspense Account were not sufficient to meet the deficiency. Finally, the agreement between the Municipal Council and the Company in 1928 provided that the rate would be subject to revision at such periods as may be from time to time agreed upon by the parties thereto. Therefore, the surcharge did not violate the 1928 agreement.⁵⁷⁹

of how greatly varied the payment would be given a different way of payment. See “The Price of Water”, *The North-China Herald*, Jan 06, 1917: 4; “Men and Events”, *Milliard’s Review of the Far East*, July 07, 1917: 122; W. Godfrey, “Council v. Waterworks: Recent Arbitration Case”, *The Shanghai Times*, July 12, 1917: 2.

⁵⁷⁷ “Property Owners Reject Imposition of Surcharge on Existing Water Rate: Enumerate Reasons in Letter Addressed to Chinese Ratepayers Association; Decision Reached at Meeting Held Monday”, *The China Press*, Dec 3, 1930: 2.

⁵⁷⁸ “Shanghai Water Company Replies to Protest made by Consumers: No Alternative to increase, says executive”, *The China Press*, Sep 11, 1930: 1.

⁵⁷⁹ “Waterworks Concern Stage Comeback to Criticisms on Proposed Increased Rate: Say there is no basis for suggestion that surcharge is violation of agreement with Municipal Council”, *The China Press*, Sep 18, 1930: 1.

The dispute over surcharge lasted for months. In September, the Chinese Ratepayers' Association appointed a seven-person committee to study the water supply situation and the proposed increase.⁵⁸⁰ They urged the Council to inspect the books and financial records of the Company so that the Council could clarify the issues regarding the dividends.⁵⁸¹ Meanwhile, the Chinese Realty Estate Association was urged to publish an advertisement advising all Chinese building owners to refuse to make any new agreements with the Shanghai Waterworks Co. if the Company insisted on imposing the increase.⁵⁸² The Council made several major compromises to ease the tension. They adopted one of its members' suggestion and drew up a statement in Chinese to explain why the raise was necessary. The Council was also ready to make the figures of the Company open to inspection by a delegation from the Chinese Ratepayers' Association if it so desired. They even expressed willingness to embrace a Chinese member on the board of directors of the Company.⁵⁸³

On December 1, the Chinese Realty Owners Association decided unanimously to reject the demand of surcharge.⁵⁸⁴ Merely days later, the Shanghai Waterworks Company cut off the water supply of several Chinese residents who refused to pay increased rates. An emergency meeting was called with the presence of representatives of the Chinese Ratepayers Association and of the Chinese Realty Owners Association. The anxiety might

⁵⁸⁰ "Proposal to Increase Shanghai Water Rates Draws Protest", *The China Weekly Review*, Sep 13, 1930: 48.

⁵⁸¹ "Local reality owners make protest to council on proposed water rate rise: association asks that reconsideration be given to suggestion in interests of individuals and whole community", *The China Press*, Sep 14, 1930: 3.

⁵⁸² "Chinese Oppose Increase in Water Rates", *The China Weekly Review*, Sep 13, 1930: 55.

⁵⁸³ "Municipal Council deal with protests against proposed water surcharge: statement in Chinese is to be drawn up setting out facts of existing situation", *The China Press*, Sep 20, 1930: 1.

⁵⁸⁴ "Property Owners Reject Imposition of Surcharge on Existing Water Rate: Enumerate Reasons in Letter Addressed to Chinese Ratepayers Association; Decision Reached at Meeting Held Monday", *The China Press*, Dec 3, 1930: 2.

seem widely shared among Chinese, but in his interview with *The China Press*, C. D. Pearson, suggested that there were only two Chinese consumers whose supply was shut down. Pearson said “it is unfair to continue supply to consumers who will not pay their bills at the expense of those who do” as he pointed out a large number of consumers were paying the surcharge, realizing that it was justified and had been approved by their representatives. “Non-payment is due in nearly every case to outside influence.” said Pearson. The Chinese Ratepayers Association, however, dispatched urgent telegram to the Ministry of Foreign Affairs and to the Ministry of Interior. The Municipality of Greater Shanghai was also called in. The matter of water rate surcharge escalated and was now passed to Nanjing.⁵⁸⁵ In the telegram sent to Nanjing, the Association greatly inflated the size of population affected by the disrupted service saying 1,000,000 residents in the Settlement were endangered.⁵⁸⁶

The Nanjing government stepped in for intervention. On December 12, 1930, the Municipal Council held a special meeting in particular regarding the issue of disputed water rate surcharge. The meeting was attended by high-ranking officials from both Britain and China – Consul-General Brenan on the British side and Chevalier Chen (陈介, 1885-1951) and Y. F. Lieu of the Foreign Ministry of Republic of China. Thirteen councilors attended the meeting, including representatives from the Chinese Ratepayers Association, and they discussed for more than two hours. It was decided that a special committee be organized

⁵⁸⁵ “Waterworks Refuses Service to Chinese Behind in Payments”, *The China Press*, Dec 12, 1930: 1; “Trouble Brewing Between Ratepayers and Shanghai Waterworks over Prices”, *The China Press*, Dec 13, 1930: 1.

⁵⁸⁶ “Chinese Ratepayers and Water Surcharges: Astonishing letter to Municipal Council: Warning of Consequences”, *The North-China Herald*, Dec 16, 1930: 374.

to study the issue of water rate. This committee would compose of foreign and Chinese members, including special advisor to be invited from abroad. For the time being, the water supply would be resumed for those whose service was discontinued. But the surcharge, approved by the Municipal Council would stand.⁵⁸⁷ The Chinese Ratepayers Association protested and urged the Council to cancel the surcharge in order to “live up to the public trust placed in the Council”.⁵⁸⁸ Nevertheless, they agreed to pay the surcharge within days. But as soon as the committee found out that the present surcharge was unwarranted, the extra sums that had been paid needed to be refunded to the subscribers.⁵⁸⁹

The cut-off of water supply for those who failed to pay the surcharge lasted for only four days and affected only two subscribers.⁵⁹⁰ But the political implication was important. It was the first time that the Chinese organized from bottom up, in working with the government, to bargain with the British authorities and companies on the terms most familiar to the foreign businessmen. They demonstrated sophisticated understandings of the inner working of the companies and their contracts. The protest was barely a success, but the Chinese merchants was able to insert themselves into the procedures that followed. In February 1931, the Chinese Ratepayers Association petition the local Chinese

⁵⁸⁷ “Prospects of Water Rate Controversy Ending with Satisfactory Compromise”, *The China Press*, Dec 16, 1930: 1.

⁵⁸⁸ “Chinese Ratepayers and Water Surcharges: Astonishing letter to Municipal Council: Warning of Consequences”, *The North-China Herald*, Dec 16, 1930: 374.

⁵⁸⁹ “Opposition of Ratepayers to Surcharge for water Stopped”, *The China Press*, Dec 17, 1930: 1.

⁵⁹⁰ One of them was Tien Chong Electrical Apparatus Manufacturing Co. of 100 Connaught Road. This company refused to pay the surcharge in accordance with instructions from the Chinese Ratepayers Association, with the result that their water supply was severed on Dec 10. Four days later, the supply was resumed. The manager informed a representative of the Company that he had received instructions from the Ratepayer Association to pay the surcharge and accordingly he had decided to pay. He would, however, demand compensation for any losses that his company might have sustained during the period the water supply was cut off. In the event of the waterworks Company failing to meet his demand, he would institute legal proceedings for damages. See “The surcharge on water: local chinese begin to pay new rates”, *The North-China Herald*, Dec 23, 1930: 407.

authorities to call for revisions of the agreement signed between the Council and the Company. But the secretary of the Shanghai Waterworks Company suggested that the agreement with the Council had eighteen more years to go and no changes could be made according to law.⁵⁹¹ The Chinese ratepayers were left with one hope to stop the surcharge – the special committee of water rate.

7.8 The Hill Report and the Controversial Meter System

The special committee of water rate did not begin their investigation until May 1931 after the Municipal Council finally secured the service of a qualified expert – Nicholas Hill, the president of the American Waterworks Association. Hill was the chief engineer of the New York City Water Department and held the same position in Baltimore. Hill had experience with the water system in each of the forty-eight states and was identified prominently with 350 water projects in major cities of the United States, Canada, and Cuba. Hill was also member of the American Institute of Consulting Engineers, American Society of Civil Engineers, American Society of Mechanical Engineers, American Institute of Electrical Engineers, American Society for Public Improvements and the National Conference on City Planning. In order to afford Hill's six-week stay in Shanghai, the Municipal Council paid him Gold \$12,000 and covered all expenses incurred during his trip.⁵⁹²

⁵⁹¹ "Chinese and the waterworks: petition addressed to waichiaopu", *The North-China Herald*, Feb 17, 1931: 227.

⁵⁹² "Personal Notes", *The North-China Herald*, May 12, 1931: 196; "American Expert to Investigate Shanghai Waterworks", *The China Weekly Review*, May 16, 1931: 405; "American Expert to Arrive in September to Inspect Shanghai Waterworks", *The China Weekly Review*, May 23, 1931: 446; "Nicholas Hill is Noted Engineer: Has Promoted Many Big Projects In States", *The China Press*, Sep 04, 1931: 2.

Making his first visit to the East, Hill arrived in Shanghai September 2, 1931. He was treated like a star. The moment he settled down he was asked by the press about his judgement regarding the quality of water in Shanghai. "I have not had time to review the situation," he said. The eminent engineer declared that in his estimation, Shanghai water was as safe as that found in most parts of the world. He said he would not hesitate to drink that which comes from hydrants in all parts of the city. "Processes of filtration and sedimentation make the water pure beyond danger of disease." Hill said.⁵⁹³ The Chinese merchants wasted no time to make their case. Before his mission began, Hill was invited to a dinner party by T. D. Woo, managing director of Bank of Communication and C. C. Woo, manager of Kincheng Banking Corporation. Woo made a public speech at the party that night. In addition to praising the importance of Hill's mission, Woo repeatedly hit the point about how politically consequential Hill's investigation would be. He also did not shy away from hinting at favorable outcome because the Chinese comprised the majority of population in the Settlement and many of them were poor: "It is of course an important procedure in Mr. Hill's investigation to scrutinize closely the technical aspect of the problem; however, I believe the examination of the administrative aspect is of still greater importance because the fixing of water rate is largely a financial matter rather than a technical one."⁵⁹⁴

Hill began his probe shortly after, with a promise that he would be just and fair to both sides. He finished his report in about five weeks. By October 15, it was viewed by

⁵⁹³ "Nicholas Hill is Noted Engineer: Has Promoted Many Big Projects In States", *The China Press*, Sep 04, 1931: 2.

⁵⁹⁴ "Water Rates should be based on Silver, Not Gold, Woo Asserts", *The China Press*, Sep 11, 1931: 3.

members of the Municipal Council.⁵⁹⁵ Upon its release to the public, the report dominated the press for the rest of the year. Hill presented a handful of important findings and suggestions in his report. The most important one, of course, was his verdict that the water rate in Shanghai was “not excessive”. Hill discovered that apart from the rise cost of labor, 58 percent of the total increase in the cost of water delivered in recent years could be traced to the enhanced cost of gold in order to pay dividends in sterling (he also pointed out that the Company was now on their way to secure new capital in silver so as to stabilize the rates and reduce the production cost). As for the present cost of water to the consumers, Hill invoked the situation in the United States where the courts had reiterated countless times the rule that a public utility was entitled to earn a fair return on the fair value of its property, used and useful for the public service. Hill believed the same could be applied in the present instance. In the case of Shanghai, the value of the Waterworks property was Tls. 26,250,000 as determined from the books of the Company. Hill suggested that a fair rate of return on this value was 8.5 percent: “If we are to estimate fair return upon the theory that the Company should bear the hazard of exchange..., then a proper allowance must be made for surplus sufficient to maintain a proper reserve for equalization of dividends as well as to care for other reserves and for minor fluctuations in production cost depending upon variations in cost of labor and materials.” – hence 8.5 percent, which included 6 percent Debenture interest on 50 percent capitalization-average on full capitalization, 9 percent Dividends on 50 percent of capitalization-average on full capitalization, and 2 percent for surplus on 50 percent of capitalization-average on full capitalization. On the basis of 8.5 percent, the gross revenue required in 1931 to yield a

⁵⁹⁵ “Hill’s Report on Waterworks to be public tomorrow”, *The China Press*, Oct 15, 1931: 1.

fair return on the fair value of the property should be Tls. 4,309,978. The sum according to the tariff agreement between the Council and the Company was Tls. 4,316,163. Such return was approximately the same as the ascertained fair return on the fair value of the property. "There is no ground, therefore, for assuming that the existing rates and charges of the Company are excessive."⁵⁹⁶

However, Hill did suggest that the books were kept in silver and all capital expenditures were recorded in silver. The rise or fall of silver currency was intrinsically a speculative element, the risk of profit should not be borne by the consumer. Hill encouraged the installation of more meter and abandoned the old ways of paying water rate. He especially called for cheaper or free installation for the poor and the low-income households. Hill said that considering the finance of a great many Chinese inhabitants in the Settlement, the discrimination in favor of the poor and small consumers was "an economic necessity".⁵⁹⁷

The Municipal Council adopted most of Hill's advice and issued a series of new policies, which included a scheme for the meter system. However, beginning in May 1932 the Shanghai Citizens Federation, the Chinese Ratepayers Association and the Realty Owners Association reversed their previous opinions and appealed to the Shanghai

⁵⁹⁶ "Hill finds water rates are discriminatory but normal in total capital returns", *The China Press*, Oct 16, 1931: 1; "Water Experts Opposes Cheap Fire Protection: Hill releases report on Water rates study", Oct 16, 1931: 11; "Vindication", *The North-China Herald*, Oct 20, 1931: 87; "Shanghai News: The Waterworks Report Council Expert's Findings as the Result of an important lengthy investigation", *The North-China Herald*, Oct 20, 1931: 96; "'Shanghai Water Rates Not Excessive' - Mr. Hill", *The China Weekly Review*, Oct 24, 1931: 298; "From the Shanghai Municipal Gazette: Mr. N. S. Hill's Report on Shanghai Waterworks", *The North-China Herald*, Dec 01, 1931: 319.

⁵⁹⁷ "Water Experts Opposes Cheap Fire Protection: Hill releases report on Water rates study", *The China Press*, Oct 16, 1931: 11.

Waterworks Company for the halt of the meter system plan.⁵⁹⁸ For the authorities of the Settlement, the metering system was expected to save about Tls. 250,000 annually if fully adopted. By far the Council and the Company had largely rely on educating the public in the economical use of water, but the metering system would no doubt provide more effective results in reducing wastage, which had been proven successful in the neighboring French Concession.⁵⁹⁹ But for the Chinese realty owners whose properties were occupied by a large number of poor tenants who had been enjoying unlimited water usage as long as they had paid the percentage, the reform was about to be devastating financially. For example, Shanghai Hwa An Marine and Insurance Company, an agent of rent collection for fifty-two houses located in the Eastern District of the Settlement, suggested that the aggregate monthly rent previously amounted to \$981, of which water rate amounted to \$73.57. The metering system was in place since June, and the monthly water bill was \$346.75, nearly five times heavier than before.⁶⁰⁰

The meter system sparked reactions across the Chinese community. On June 22, 1932, realty owners in both the International Settlement and Chapei district held a meeting to discuss their remaining advantage against the Shanghai Waterworks Company. The Realty Owners Association notified the members to dig their own wells to get “natural water” as a protest against the Company.⁶⁰¹ Inside the Municipal Council, the Chinese members too were venting their dissatisfaction. Under the pressure of their fellow countrymen, the Chinese council members turned back on their earlier position and said

⁵⁹⁸ “Federation Requests Ratepayers to Buck New Meter System”, *The China Press*, May 14, 1932: 3.

⁵⁹⁹ “Checking Waste”, *The North-China Herald*, Aug 17, 1932: 246.

⁶⁰⁰ “Companies Protest New Meter System: Exorbitant Rates for Water Charged, Is Claimed”, *The China Press*, Sep 22, 1932: 11.

⁶⁰¹ “Realtors urge digging wells: advice given to protest against increase in water rate”, *The China Press*, June 23, 1932: 3.

the Hill report was not well-researched. They suggested that Hill's sojourn was too brief to enable him to get acquainted with local conditions. The adoption of a general metering system would discourage the poorer consumers from using tap water, diminishing the benefit of public health. Chairman of the Council, however, pointed out that it was the Chinese Ratepayers Association who proposed the introduction of a general metering system in the first place. Hill's report was a confirmation of what had been decided on. Thus, the new policies regarding water supply would not change.⁶⁰²

The Council was indeed contemplating a solution that could assured a cheaper water supply for Chinese tenants of houses of low rental.⁶⁰³ The wealthy Chinese also initiated their own special committee to look into the costly introduction of the meter system.⁶⁰⁴ But these proceedings were too slow to prevent physical confrontation. On February 8, 1933, at Shuncheng Alley in Yangtsepoo District, a violent exchange happened between the Chinese residents and Company's employers. At 10 o'clock in the morning, several workers of the Company came to the Shuncheng Alley to cut off the water supply because of the late payment. The Chinese residents there, who had little idea why their landlord did not pay the Company, tried to persuade the workers not to cut off their supply but was refused. A free-for-all fight ensued during which several Chinese were wounded. Facing an infuriated mob of Chinese residents, the workers retreated from the scene.⁶⁰⁵ The Chinese Ratepayers Associations urged that the Company adopt peaceful

⁶⁰² "SMC members avers Hill unfamiliar with Ground covered in Water Report", *The China Press*, June 30, 1932: 2.

⁶⁰³ "Problem of Water Rate Basis: Chinese Estate Owners' Letter to Municipal Council", *The North-China Herald*, Feb 08, 1933: 216.

⁶⁰⁴ "Chinese to Probe Water Rates Here: Ratepayers want Telephone Payments Cancelled", *The China Press*, Oct 05, 1932: 9.

⁶⁰⁵ "Yangtsepoo Chinese Riot in Water War: Company Workers Kept from Cutting Off Supply in Alleyway", *The China Press*, Feb 10, 1933: 9.

means in coping with the disputes because the frustration of the poor Chinese residents was understandable given that they now had to pay four or five times the original sum.⁶⁰⁶

Within ten days, more incidents of this kind were reported in the east part of the Settlement. Residents in Wei Shui Fang alleyway off Zhejiang Road, San Hsing Fang alleyway off Tangshan Road and San Sin Fang alleyway off Paoding Road all suffered from abrupt termination of their water supply. The Municipal Council not only ignored the petitions from the two Associations of the Chinese, but sent out policemen to accompany the workers of the Shanghai Waterworks Company while the latter were having the water pipes removed in those places.⁶⁰⁷ On February 18, 1933, at 11 o'clock one hundred representatives of the residents affected by the Company's doing gathered in front of the Municipal Building of the Settlement. They were told that the authorities would try to seek an early settlement of the dispute. The Realty Owner Association submitted a petition to the government of Greater Shanghai and sent in eight delegates urging for governmental.⁶⁰⁸ Two days later, the Company sent mechanics to open public hydrants on street in the Yangtszepoo district to supply Chinese residents in several blocks where water was cut off. With the water provided from hydrants, the Municipal Council was virtually buying water for the upset Chinese tenants in order to ease political tension.⁶⁰⁹

⁶⁰⁶ "Water Supply Cut off Due to Rate Protest: Association Asks that Water Be Provided by company to residents", *The China Press*, Feb 11, 1933: 3.

⁶⁰⁷ "Protest Made On Cutting Off Water Supply: Organization Demands Reply from S.M.C. On Its Stand in Dispute", *The China Press*, Feb 18, 1933: 7.

⁶⁰⁸ "100 Present Water Petition to SMC: Shang Hsing Terrace Group Oppose Stoppage of Supply", *The China Press*, Feb 19, 1933: 13.

⁶⁰⁹ "Yangtszepoo Residents Get Water Supply: Public Hydrants Opened by Company; Tenants Call on S.M.C. For Aid", *The China Press*, Feb 21, 1933: 9.

Despite the setbacks, the installation of meter system was proceeded with encouraging results. The installation started as early as January 1932. The International Settlement was divided into twenty-five sections for the purpose. Fifteen sections would be fixed up with water meters by June next year. About 90 percent of the Chinese consumers had been paying their bills based on the meter system.⁶¹⁰ The Company submitted more than one scheme in favor of the poor Chinese tenants to the Council for their consideration, but the disconnection in the east continued.⁶¹¹

On the night of February 23, 1933, a mass meeting was held at 8 o'clock. A special committee was organized by the tenants affected by the cut-off. A united front was formed by the government of Greater Shanghai, the Bureau of Social Affairs, the local Kuomintang branch, the provisional board of city councilors of Greater Shanghai, and the Chinese Ratepayers Association and the Shanghai Citizens Federation, with the sole purpose of pressuring the Shanghai Waterworks Company to restore water supply in the eastern district.⁶¹² In March, representatives of the Municipal Council, the Shanghai Waterworks Company, the Chinese Realty Owners Association, and the Chinese Ratepayers Association gathered together. The meeting was mediated by wealthy and influential Chinese and by commissioner of public utilities of the Municipality of Greater Shanghai.⁶¹³ The final scheme of payment was released in early April. During this experimental period,

⁶¹⁰ Ibid.

⁶¹¹ "Council Seeks Liquidation of Water Dispute: Position of Parties in Case Studied with View to Compromising Low Rental Tenants May Pay Less for Water", *The China Press*, Feb 22, 1933: 1; "Water Meters In Dispute: Matter Considered at Municipal Council Meeting", *The North-China Herald*, Feb 22, 1933: 298.

⁶¹² "Group Formed to Fight for Water Supply: Cutting Off of Current By Company Hit In Petitions Prepared", *The China Press*, Feb 24, 1933: 7.

⁶¹³ "Waterworks Dispute Pending After Meeting: SMC Discusses Difficulty but no agreement Reached", *The China Press*, Mar 11, 1933: 9.

the rules were set up as such: (1) Rentals between \$125 and 150: allowance per house per month 11,000 gallons, minimum charge \$8.25. (2) Rentals between \$70 and \$80: allowance per house per month 9,500 gallons, minimum charge \$5.63; Excess consumption to be charged for at \$0.95 per 1,000 gallons. (3) Rentals between \$45 and 50; allowance per house per month 7,700 gallons; minimum charge \$3.56; excess consumption to be charged for at \$0.46 per 1,000 gallons. (4) Rentals under \$10: allowance per house per month \$3.5. \$0.178 per 1,000 gallons for excess consumption.⁶¹⁴

The final scheme of payment proved acceptable to the Chinese. By October 1933, a total number of 6,300 meters were installed. The Company provided posters to the property owners, alarming the tenants that wasteful use of water must be paid for eventually by themselves. The Company also agreed to install separate meters to selected houses where water was being used for non-domestic purposes such as hot-water shops, laundries, bean curd shops and dye works. Where property owners desire it, the Company was also willing to install a meter to every house within a block of Chinese property, and to directly collect the water rate from the tenant. The charges made by the Company were higher in the case of the well to do, but the domestic supply to those living in low rental premises was only \$0.02 a day for a quantity sufficient for good sanitation or \$0.17 for a thousand gallons. This charge was reportedly the lowest known for any large city obtaining and unfailing supply of pure and wholesome water.⁶¹⁵

7.9 Shanghai Western Waterworks Company: A Joint Venture

⁶¹⁴ “Water Scheme Put into Effect From Saturday”, *The China Press*, Apr 02, 1933: 9.

⁶¹⁵ “How Water Charges are Determined in Shanghai”, *The China Weekly Review*, Jan 13, 1934: 283.

The relationship between the Shanghai Waterworks Co., the Municipal Council, and the Nationalist government of Greater Shanghai remained operable throughout this period of political wrestling. President of the Shanghai Company H. Martin Little once said: “Our relations with officials of the city government, the directors and officials of the Chapei works... have continued to be most friendly.”⁶¹⁶ Despite the Nationalist’s effort in containing the extra-Settlement roads in the west, the Municipal Council’s special revenue from these roads kept growing. From 1916 to 1941, the percentage of this sum in the total revenue rose from 0.69-0.73% to 3.73-3.89%, indicating a general economic growth in the west despite the disputes over certain roads.⁶¹⁷

The growing presence of Japan in Shanghai might be another reason why the Chinese and the British could still work together. Sino-Japanese relation never recovered after Japan invaded and staged the autonomy for Manchuria in 1931. Increasing tension between the two Asian countries prompted Chiang Kai-shek to prepare for the worst scenario. On January 6, 1932, Shanghai welcomed her most important mayor in modern history – Wu Tiecheng (吴铁城, 1888-1953). Wu was a veteran revolutionary and a trusted ally of Chiang Kai-shek. Apart from the mayoral power, Wu was also made the commissioner of Shanghai and Wusong Constabulary. The Japanese military in Shanghai was on the verge of clashing with the Chinese. The battle broke out on January 28, 1932. Nationalist army was not able to retain control over some of the strategically important spots. China and Japan made peace in March. The subsequent negotiation was mediated

⁶¹⁶ “Shanghai Waterworks Co., Ltd: Negotiations over new company for outside Roads supply”, *The North-China Herald*, Apr 11, 1934: 31.

⁶¹⁷ Mengqing Shen, *Extra-Settlement Roads*, 2009.

by Britain, France, America and Italy. Japanese was able to expand its control in the areas north and east to the International Settlement, i.e. the areas where the Chapei Company not long ago reclaimed its economic rights. The British interest in north Shanghai was under threat. As a result, the dispute over extra-Settlement roads – between Range Road and Dixwell Road along the North Sichuan Road Extension – was finally settled in July 1933. Mayor Wu declared in a press interview that the municipal tax would be collected by the Bureau of Public Safety beginning in autumn and those defying such payments would be severely prosecuted. The disputed area would be fully under police protection of the Chapei Bureau of Public Safety and enjoy supplies of public utilities from only the Chapei Waterworks and Electricity Company.⁶¹⁸ In the wake of Sino-Japanese confrontation, the Shanghai Waterworks Company willingly retreated from the contentious area. The Company turned their eyes on the developing western district.

The idea of a waterworks in the west first emerged when an advertisement was seen in local Chinese newspaper in 1930. The Nationalist government invited Chinese merchants to invest their capital in waterworks business in western area, namely in the Fahua, Pusong and Caojing Villages. Those who were interested in investing were required to apply to the Bureau of Public Utilities before September 30, 1930.⁶¹⁹ But the plan of a

⁶¹⁸ “North Sichuan Merchants will be made to pay Chapei Tax”, *The China Press*, July 20, 1933: 1.

⁶¹⁹ The government provided detailed rules for the creation of this waterworks in the west: The waterworks company would be granted a franchise for 25 years. The company should have a capital of no less than \$6,000,000 and they must lay water mains within the period of five years in villages of population over five hundred. One percent of the invested capital shall be paid in cash to the Bureau as a guarantee. Five percent of the annual revenue of the company would be paid to the City Government of Greater Shanghai. If the proposed company could not supply their own water and had to obtain it from other companies, they would be granted a franchise for 20 years. The required capital would be significantly lower – at \$4,000,000, but the percentage of annual revenue that needed to pay to the government remained the same. See “Chinese Waterworks Scheme: Merchants Invited by City Government to Subscribe”, *The North-China Herald*, July 08, 1930: 55.

Chinese enterprise was not followed through. The Nanjing government then sought the help of the Shanghai Waterworks Company. The Nanjing government had a vision: although for the time being, British technologies were still indispensable, this proposed company would eventually be a Chinese one. The former Commissioner of Public Utilities handed to the Shanghai Waterworks Company a set of seventeen principles in June 1932, laid down by the central government. The negotiation was put on hold and then resumed in 1935. The seventeen principles included: the Shanghai Western Waterworks Company needed to be registered with the Chinese government before registering at the British Consulate; the Company shall be reorganized after thirty years as a Chinese company; In the allotment of the Company's shares Chinese shares shall absorb 51% and foreign capital may only be subscribed by individuals; Besides a general manager of British nationality, the Company shall set up the office of President which shall be filled by a Chinese; Above the Board of Directors the Company shall set up a Board of Supervisors, the members of which shall be appointed by the Chinese Government; The new Company shall pay annually to the City Government of Shanghai a certain percentage of its annual income as royalty.⁶²⁰

Despite the British's urge to amend some of the principles, the agreement of the scheme of Sino-British waterworks was a political victory for the Nationalist government. In February 1935, the commissioner of the Bureau of Public Utilities told *The North-China Herald* that after years of negotiation, a Sino-British waterworks company for the western district was to be formed. The initial capital would be \$3,000,000. Once the company was founded, it would be for the City Government of Greater Shanghai to grant a franchise for

⁶²⁰ Shanghai Municipal Archive, Q5-3-1972.

the supply of water to the district.⁶²¹ Unfortunately, the “Golden Decade” of the Nationalist regime was marching towards its end. The Second Sino-Japanese War would break out in two years. The planned Sino-British waterworks was never materialized to the scale as proposed. During and after the war, some engines were erected near Fahua village, but the capacity of the waterworks was so underdeveloped that only the immediate neighborhoods could enjoy the fresh water.

7.10 Conclusion: Nation-State

The early history of the Inland Waterworks and Chapei Company showed how difficult it was for Chinese to run a large business at the turn of the century. The Inland was never a commercial success before the 1930s. As for Chapei, the government buy-out did not change the climate of the business world. The facts that Li Pingshu mortgaging the Company for a foreign loan was unknown to the directors was suggestive of the lack of transparency in the supposedly modern corporation. Politicians prioritized their own interest at the expense of the Company’s improvements made sustainable business model even less attainable. The virality of a water company was not defined only by engines, machinery, and pipes, but also by managerial skills in balancing budget and in maintaining a comfortable distance with the government.

Nonetheless, the Chapei waterworks became a good alternative for consumers. The Chinese authorities were then able to remove British influence by replacing the water supply on the extra-Settlement roads rather than displacing it altogether. The result of Yu

⁶²¹ It was also reported that the required funds for the new enterprise could have been easily obtained, but the Shanghai municipality was undergoing such a tight monetary situation that the scheme had to be put off. See “Western District Water Supply: A Sino-British Company to be Formed”, *The North-China Herald*, Feb 27, 1935: 333.

Chin Fang Alley dispute showcased what political goals could be achieved when a determined Chinese authority worked with native water industry. From the bottom-up perspective, Chinese property owners, already proficient in Western ideas of law and accounting, had learned the art of politicization. In their resistance of water rate surcharge and the introduction of meter system, the foreign authorities and company made significant political and economic compromises under the pressure when Nationalist government became frequently invoked in civil disputes.

Capitalizing on sentiment of nationalism, weaponizing the native waterworks in the fight over sovereignty, determined to back up the claims of their wealthy fellow countrymen, the Kuomintang showed foreign powers in Shanghai that this government was different from its predecessors. In the negotiation regarding the creation of Shanghai Western Waterworks, they even managed to make a deal with a British enterprise that not only uphold the sovereignty of the republic, but also mutually beneficial.

Historians tend to see nation-state as the main actors behind events, but in the story of this chapter, what type of institution played a bigger role in securing the business interest is debatable. On the Chinese side, the interest was obtained with help from both the government and companies, whereas on the British side, such interest enjoyed less governmental protection. The Shanghai Waterworks Company was on their own in most cases in their battle against economically savvy Chinese and the Municipal Council of International Settlement tended to stay neutral in general. There were certainly practical concerns behind these decisions, among which the first and foremost was the fact that the Settlement was an enclave on the Chinese land, with an armed force that seemed increasingly insignificant as opposed to the Chinese military. The Mixed Court, despite its

composition of foreign judges, was not keen on advancing the interest of one foreign company at the cost of political congeniality in general. Compromise and generosity were at times necessary because the institutional arrangements of the Company and the Settlement put financial gains before sovereignty and nationalistic pride.

This brings us to the question: if nation-state was not always the main actor, who else was able to initiate activities of similar scale? Anthony Giddens has a fairly mechanical take on the concept of nation-state, which shed light on the nature of business competition between the Chinese and the British. Giddens suggests that nation-state is a type of social community which contrasts in a radical way with pre-modern states. Nation-states concentrated administrative power far more effectively than traditional states were able to do and can mobilize social economic resources beyond those available to pre-modern systems.⁶²² At the core of the political competition over water supply was the capability of institutional power.

In the case of water supply, it was obvious that the Chapei Company lacked the same institutional capability of the Shanghai Waterworks Co. The relationship between the Chapei Company and the government was a source of its problem, not a solution. Before Chiang Kai-shek's clique took over Shanghai, the previous government drains the Company's funding for their own military projects, completely irrelevant to the Company's development. The new Nationalist government was willing to work with native property owners in their bargain with the Shanghai Waterworks Company. Nonetheless, the institutional sophistication of the Company did a great job defending itself. They opened

⁶²² Giddens, 13, 63

their books to the Chinese, hired an expert from overseas and let the native oversee the process, yet the result was still acceptable, if not favorable. That is why the nation-state on the Chinese needed to press the Shanghai Waterworks Company to win the natives some favorable terms while the foreign governments played a significantly less visible role. Not that the distance kept the British government from intervening, but the Shanghai Waterworks Company, with an institutional network channeling various talent and money beyond the reach of the Chinese, was able to stand on their own.

CHAPTER 8. CHANGE

No word in traditional Chinese medical nomenclature could accurately point to Asiatic cholera. The closest term was huoluan (霍乱). In its literal meaning, huoluan meant excessiveness and disorder, which was suitable for diseases causing vomiting and diarrhea. Symptoms of huoluan ranged from chest pain to abdominal pain to fever, many of which were not associated with Asiatic cholera – what huoluan refers specifically to today. During Qing years (1644-1912), a variety of new terms sprung from the use of huoluan, such as “wet huoluan”, “melon-pulp infection”, “huoluan with twisted tender”, etc. Asiatic cholera might be among them considering muscle cramp was one of the diagnostic characters.

Cholera had its origin in South Asia since time immemorial. Historian Li Shan suggests that although there were earlier records showing diseases similar to cholera had reached China in the sixteenth century via sea, the first documented cholera outbreak took place in Canton in 1820, as a part of the 1817-1824 global pandemic.⁶²³ China was since inflicted by nearly every cholera pandemic. Herbal pharmacists kept treating what they believed to be huoluan. It was not until the 1930s that medical men and women of the Republic of China realized that Asiatic cholera was something of its own kind.⁶²⁴

Before germ theory, the best Chinese treatise on cure for huoluan was *Essays on Huoluan* (霍乱论), written and compiled by Wang Shixiong (王士雄, 1808-1868?), a

⁶²³ Li Shan, The analysis about the Original Problem of Cholera in China, *Journal of Chinese Historical Geography*, Vol. 29 no.1 2014. 48-55.

⁶²⁴ Macpherson, 1998.

pharmacist of Zhejiang origin who visited Shanghai in the 1860s. Wang's work did not differentiate Asiatic cholera from diseases of similar symptoms, but it made two substantial progress in understanding cholera. First, Wang noticed that even though most huoluan were not contagious, occasions rose when the disease spread across an entire city. This kind of huoluan was often seen with twisted tender. He observed two outbreaks up close, one in Hangzhou in 1837, the other in Ningbo in 1862. In both cases patients suffered from muscle cramps. Second, Wang refuted the idea that some huoluan were incurable. Before *Essays on Huoluan*, some earlier Chinese medical treatises argued that if the patient suffered from diarrhea, weak pulse, bad breath, and inability to speak, he could not be cured; shrunk scrotum was also believed to be a sign of death. Wang disagreed with these claims. Wang believed that there was a cure for all cases as long as it was carefully prescribed for the conditions of the patient.⁶²⁵

Wang's prescriptions for the two dozen huoluan he sorted out consisted of the most valuable part in *Essays on Huoluan*. Even without any knowledge of the real pathogen *Vibrio cholerae*, Wang was able to provide relief for many cholera-related symptoms. From silk worm feces to dragon's bone, from licorice root to gypsum, their effects in reducing the seriousness of symptoms have now been clinically proven. They took effect in three ways: as antispasmodic that reduce cramps and bowel movement, thus less diarrhea; as disinfectant that killed *Vibrio cholerae* and other bacterial pathogens or contained the infection; as concoction that replenished sick bodies with electrolyte, thus slowing down the dehydration. Among the sixty-four key ingredients chosen and created by Wang, thirteen were antispasmodic, fifteen electrolyte, and twenty-five disinfectant. Among the

⁶²⁵ Wang Shixiong, *Essays on Huoluan*.

disinfectants in Wang's treatise, virgate wormwood herb, tatarian aster root, cassia twig, medicinal evodia fruit, and baical skullcap root had been most effective in killing the infectious *Vibrio cholerae*.⁶²⁶

The traditional Chinese herbal medicine maybe helpful, but the late imperial society was logistically unready to help to the sick population. In some cases, the best the government could provide was money and coffin.⁶²⁷ Plagues were so commonplace and natural to the Chinese they were not seen as immediate threats. For example, in spring of 1902, Asiatic cholera reached southwest of Guangxi province. When local gentry were busy funding pharmacies and feeding refugees, the emperor was communicating with local administrators about seizing the moment and eliminating the rebels when they were weakened by the epidemic.⁶²⁸ Even if the Qing government wished to contain the disease, they did not have the expertise to do away ordure and stench – like Edwin Chadwick, Joseph Bazalgette, John Snow, and Henry Whitehead achieved in London in the 1850s,

⁶²⁶ The thirteen medicines that could serve as antispasmodic are gypsum, coix seed, Chinese mosla herb, largehead *Atractylodes* rhizome, immature orange fruit, *Acorus gramineus*, Moniliform *Dendrobium*, reed rhizome, *Mangnolia officinalis*, areca Peel, Cablin Potchouli Herb, Medicinal *Evodia* fruit, and costus root. They had been clinically proven effective in reducing the spasm of intestinal smooth muscle and striated. The fifteen kinds of electrolyte are gypsum, common flowering-quince fruit, licorice root, lotus seeds, radish seed, mulberry leaf, sponge gourd, motherwort herb, loquat leaf, Japanese climbing fern spore, mung bean, common *Lophatherum*, Dragon's Bone (fossils), oyster shell, and plantain. Among them motherwort herb and Dragon's Bone were rich in potassium, which was crucial in rehydrating the patient. The twenty-five kinds of disinfectant are baical skullcap root, talc powder, common flowering-quince fruit, Chinese mosla herb, largehead *Atractylodes* rhizome, radish seed, cape jasmine fruit, phellodendron bark, dandelion, bamboo shavings, *Mangnolia officinalis*, virgate wormwood herb, plantain, coptis root, inula flower, Tatarian aster root, licorice root, cassia twig, perilla leaf, Cablin Potchouli herb, cardamom, medicinal *Evodia* fruit, combined spicebush root, Villous *Amomrum* fruit, and clove. These medicines had been proven clinically effective in killing and containing a range of bacteria and viruses, including salmonella enterica (typhoid), *Shigella* Castellani (dysentery), *staphylococcus aureus* (staph infection), and *Vibrio cholerae* (Asiatic cholera). See in Wang, *Essays on Huoluan*.

⁶²⁷ One of the examples was the 1821 cholera outbreak in Beijing. Upon learning people dying out fast amidst the unusual plague, Emperor Daoguang sent 2,500 Taels of silver in reserve to five cities to buy medicine and coffins for the poor. Emperor Daoguang also ordered the county level civil service exams to be postponed. It was quite suggestive what the priority was for the Qing court. In Jia, et al., *Daqing xuanzong cheng huangdi*.

⁶²⁸ Shan, 2011.

even though none of them fully understood how cholera transmitted. Germ theory was not the prerequisite in combating cholera, technocratic-engineering systems were. In this chapter, we focus on the early-twentieth-century Shanghai where a conjunction of political willpower and engineering capacity modernized how Chinese saw, understood, and addressed disease, insanitation, and impurity.

8.1 Cholera Outbreaks in Shanghai

Cholera first showed up in Shanghai in 1862 and it hit the city hard. The ending of Taiping Rebellion drove hundreds of refugees from ravages of war to the foreigner-administered city. Large numbers of Qing's Imperial Troops came along, creating an unusual favorable condition for the prevalence of cholera. The British Forces suffered severely. Two hundred soldiers in two regiments of the line died of cholera. On *H.M.S. Euryalus*, the death of twenty men and two officers in one day wiped out one-third of the crew. The treasurer of the Municipal Tax Department was killed, marking the most high-profile death of that episode. Among the natives, the epidemic became unmanageable. During the three weeks of outbreak, seven to twelve hundred Chinese died daily according to the record of the Native Hospital. On July 14, fifteen hundred died within twenty-four hours.⁶²⁹ The Municipal Council created Nuisance Department in response to the outbreak. The sole responsibility of the department was to scavenge the roads and to manage waste matter.⁶³⁰

⁶²⁹ "The Plague", *The North-China Herald*, May 25, 1894: 793.

⁶³⁰ Shanghai weisheng zhi bianzuan weiyuanhui (Editorial Committee of Gazetteer of Hygiene of Shanghai). *Shanghai weisheng zhi* (Gazetteer of Hygiene of Shanghai). Shanghai: Shanghai Academy of Social Science Press, 1998. Accessed on Feb. 12, 2019. URL: http://www.shtong.gov.cn/dfz_web/DFZ/Info?idnode=67647&tableName=userobject1a&id=64652

Cholera appeared in Shanghai again in 1875. During the spring, a body of native troops marched through the streets of the International Settlement without alerting the British authorities. A camp was formed in the immediate neighborhood of Shanghai. For Edward Henderson, the Health Officer appointed not long ago, this was his first test. Henderson paid a visit to the encampment, inspected the conditions, and produced a report, in which he pointed out that the land in the immediate neighborhood of Shanghai was unsuited for camping ground. Large bodies of troops stationed in the marshy and muddy rural Shanghai during spring and summer was never a blessing to the public health. Henderson suggested that the soldiers needed to be fed and clothed adequately and the land needed to be raised and drained, but such arrangements for a Chinese army on the march were unrealistic. The fact that the troops were expending their labor on constructing a permanent encampment at Fenghuang Shan meant that less sufficient labor could be spared for sanitary measures. In the native hospital on Shandong Road, a large number of sick soldiers were in terrible condition. A great many were suffering from a low form of malarious fever, which “in its most serious manifestations closely resembled Typhus”.⁶³¹

Cholera showed up amongst foreigners in Shanghai that summer. Henderson believed that cholera was an extension of the illness among the natives. He reminded the public that serious danger existed in the improper removal of nightsoil. Henderson recalled an incident in which one of the coolies, urged by the reiterated complaints of his employers, fearing of losing his wages for not fulfilling his duty, emptied several boatloads of nightsoil into the Suzhou Creek. Over the year 67 foreigners died, fixing the mortality at 22.3 per 1,000. The year of 1875 was the last time when cholera affected a large number of

⁶³¹ “Reviews”, *The North-China Herald*, Feb 24, 1876: 163.

foreigners in the Settlement, but the epidemics kept haunting the Chinese who were far worse off to take on the disease. Shanghai experienced another horrifying cholera season in 1887. Inside the International Settlement alone, 194 Chinese died in August, and another 162 died in September. In 1890, 605 out of 160,000 Chinese were killed.⁶³²

At the turn of the twentieth century the cause of cholera remained obscure to many. Robert Koch discovered (or rediscovered after the original, but forgotten, discovery in 1854 by Italian scientist Filippo Pacini) and identified *Vibrio cholerae* as the pathogen of cholera in 1883, but scientific discoveries alone would not free the public from fear of a disease of such rapidity. Many chose to believe that there were more to the cause of cholera than bacteria. A general distrust in germ theory could be seen among British living in Asia. In Hong Kong, when cholera hit the port in 1894, the British were apparently in belief that rain would be able to weaken the epidemic because it flushed away deposit in the drains that emitted virulent gas. When that failed to happen, they then argued that even with the street drains cleansed by rainwater, the private houses remained the origin of disease because hundreds of them had “the old-fashioned porous blue-brick drains, thoroughly saturated with pestilential matter.”⁶³³ When the infantry who engaged in sanitary work in Hong Kong in 1894 fell sick after they left, the *Daily Press* did not hesitate to say that it was important and essential that Europeans should exercise the greatest care, “for the theory that the plague was not contagious or infectious is quite exploded.”⁶³⁴ We see earlier in the culverting of the Yangkingpang the British were still in fear of sewer gas more so than the

⁶³² Ibid.

⁶³³ “The Plague”, *The North-China Herald*, May 25, 1894: 793.

⁶³⁴ “Precautions Against the Plague”, *The North-China Herald*, June 08, 1894: 881.

polluted water itself. Up until the mid-1910s many British were still convinced that better ventilation was the better solution to many diseases.

When cholera appeared in Shanghai again in the summer of 1926, the treaty port had undergone tremendous change. Four waterworks were in operation in all corners of the city. Drinking tap water or collecting water at hydrants had become norm rather than novelty. The Yangkingpang and the Defense Creek that reeked of ordure disappeared. Flush toilets graced the tall, fine neo-classic buildings on the Bund. While hundreds of septic tanks were still in use of holding the discharge, a water-carriage sewer system was near its completion. When cholera hit Shanghai in 1926, for the first time foreign and Chinese authorities across the city had a clearer idea about what they were engaging and what needed to be done.

8.2 Chapei Waterworks Scandal, 1926

The first case of cholera in 1926 was reported in June. It was a man from Chapei district, who was admitted to the Settlement's hospital. The number of cases increased rapidly in the following month. By July 17 the disease was considered epidemic, which was defined in the Sanitary Regulations for the Port of Shanghai as the occurrence of an average daily number of three new cases for one week. During July, the total number of cases among the Chinese was 1,399. Nearly 60 percent of the cases originated from the Chinese territory. Chapei alone contributed 520 cases. The Northern District of the International Settlement which bordered the Chapei District was also impacted. The foreigners knew very well in the 1920s that the outbreaks of cholera were usually due to contaminated water supply. Considering how Chapei was disproportionately affected,

suspicion fell upon the water fashioned by the Chapei waterworks. The Health Department of the Municipal Council sent in investigators, accompanied by agents from the Chapei Company. Samples were taken from the intake at the Suzhou Creek, from the filter beds and from a tap from the mains. The samples were then examined in the Municipal Laboratory. *Vibrio Cholerae* was found to be present in all of them.⁶³⁵



Figure 21 – Beggar boats on the Suzhou Creek. Source: “Sinza Bridge over Soochow Creek, Shanghai”.

The Chapei Company acted responsibly. They immediately invited the chief engineer of the Shanghai Waterworks Company to inspect their plant and received

⁶³⁵ “Chapei Water Found to Carry Cholera Germs”, *The China Press*, Aug 13, 1926: 1.

recommendations on the measures to right the wrongs. The inspection disclosed that the problem lay in the source of water, the Suzhou Creek. When the Chapei waterworks was conceived, it was believed that that section of the Creek where the intake would be was deep enough to provide fresh water. But by the 1920s it had been severely polluted. Both the creek and the banks were swarmed with beggars, living either on boats or in huts. The waterway was used as an open sewer by them. The Chapei Company was suggested to use chlorination to disinfect the water for now, and to consider move the intake to another location free of sewage contamination. Some engineers pointed at the mains instead of the works as the source of troubles. Although they had not been thoroughly examined, it was possible that there was a layer of filth, caked more or less hard, inside the mains that infected the water as it ran by. It would be impossible to clean all mains or to even relay them in short. Travelers were thus warned against the impurity in food and drink. The Municipal Council, in the meantime, offered cholera vaccine in the Municipal Laboratory. Once inoculated, people could be immune of cholera for months.⁶³⁶

When *The North-China Herald* was closely following the incident, the Chapei Company worried that the disclosure would bring down their business. The manager of the Company S. C. Chu wrote to *The Herald*, complaining that their report was exaggerated. Chu argued that the difficulties in the past few years needed to be considered. The Company was transferred to the current management two years ago from the provincial government. The waterworks was “poorly equipped because of lack of fund”. The war between warlords in 1924 made it more difficult to restore the waterworks to its fullest

⁶³⁶ “Shanghai News: Chapei Waterworks’ Terrible State”, *The North-China Herald*, Aug 14, 1926: 302; “Chapei Water is Found to Carry Cholera Germs”, *The China Press*, Aug 13, 1926: 1.

capacity. Chu said that in *The Herald's* earlier report the water tanks of Chapei were said to be cleaned only once in one or two months. Chu said this was untrue and the tanks were cleaned once in six days. At present as the alum dosage has been applied, they were cleaned once in a week. Chu also suggested that the saying that chlorine had been unknown to the Company was untrue as in last year two chlorinator sets were ordered and one was immediately put to use last July. Chu insisted that the recent measures taken by the Chapei Company was the “result of a keen realization of responsibility demanded by the occasion and not in deference to attacks based upon exaggerated statements”. Chu suggested that the Chapei Company had a plan for the future. They had purchased more than 150 mows of land (about 25 acre) near Wusong for building new waterworks. New machines from abroad was also purchased. A new intake in the Huangpu River was to be built. Finally, Chu pled for “constructive criticism”:

“If there is such a thing as Sino-foreign cooperation at all, it should be executed in a spirit of mutual encouragement and constructive criticism, and certainly it is unfair to deal a blow to any attempt in this direction by means of rabid and vitriolic writings.”⁶³⁷

In response, *The North-China Herald* stood by its criticism. The English newspaper argued that the problematic quality of water was not new. Hundreds of Chinese lives were lost due to a product unfit for human consumption, but one of the chief employees received an absurd salary of Tls. 1,000 a year. The Herald said that the Chapei waterworks crystalized the indifference Chinese officials held for public welfare:

“Abolish the neglect, cleanse the plant, maintain proper supervision, and the water will cease to disseminate cholera. Voila tout. What criticism could have been more constructive? ... If constructive criticism is asked for, the

⁶³⁷ “Correspondence: The Chapei Waterworks Company’s Answer to Statements in Our Columns”, *The North-China Herald*, Aug 21, 1926: 357.

first that might be offered is that Chinese in management of public affairs should admit that they may occasionally deserve to be criticized.”⁶³⁸

The public opinion on the negligence of the Chapei Company was mixed. The well-traveled foreigners said Shanghai’s native water supply was far better than those in Nanjing, Suzhou, Zhenjiang and other towns where nightsoil boats were uncomfortably close to water carts and the loading of water and sewage were taking place side by side.⁶³⁹ Some believed that the harsh tone was unnecessary in criticizing the Chapei Company. Expressions like “the notorious Chinese proclivity for allowing everything under their charge to go wrack and ruin” was hard to swallow.⁶⁴⁰ But there were also opinions expressed that given the central fact that hundreds died due to the water supply, raising of side issues or irrelevant matters served only to hide the ugly truth. In a civilized country, the man responsible would be run in for manslaughter, but not in China according to their legal system.⁶⁴¹

The medical community had a firmer opinion on the positive effect of the British engineers and English press. It was believed that the scandal of the Chapei Waterworks might never have been suspected if it were not for the disclosures made by foreigners. During the cholera outbreak in 1926, Shanghai saw an increasing number of foreign educated doctors participating and bringing about changes in disease control. It was pointed out at the biennial conference of the China Medical Association that China needed to enter the age of “modern medicine”, which entailed not the cure, nor even the prevention of disease, but the creation of health and the creation of perfect harmony with the

⁶³⁸ “The Chapei Waterworks Again”, *The North-China Herald*, Aug 21, 1926: 339.

⁶³⁹ J. L. Bostley, “China’s Public Utilities”, *The North-China Herald*, Aug 21, 1926: 358.

⁶⁴⁰ Let Us Be Fair, “Letters to the Editor 4 – No Title”, *The North-China Herald*, Aug 21, 1926: 358.

⁶⁴¹ “Squid”, “Letter to the Editor 6 – No Title”, *The North-China Herald*, Aug 21, 1926: 358.

surroundings. Foreigners, many of whom were alien to the climate of China, had a much better chance to survive in the cholera season than the Chinese. It was owing to the adoption of rules of cleanliness regarding food and drink. This understanding of healthiness underscored a clear departure from the traditional wisdom that one would be less likely to fall sick if he was indigenous to the soil and was accustomed to the atmosphere. Now that technology of water supply was well-established, healthiness at any part of the world became achievable and manageable as long as individual consistently practiced what was in line with the bacterial understanding of the disease.⁶⁴²

8.3 Government Intervention

Despite the Chapei Company's endeavor in mending its public image, the regional government began their intervention in late August. Head of the Hu-hai District (which included Shanghai) ordered Magistrate Feng of the Baoshan District to make a thorough investigation of the Chapei Company. Feng was reportedly horrified over the affair. The Chapei Company was under the pressure coming from both the Baoshan magistrate and the Director of the Port of Shanghai and Wusong V. K. Ting to conduct an immediate and thorough reform. The embattled company had to propose to appoint C. D. Pearson, Engineer-in-chief of the Shanghai Waterworks Company, as advisor.⁶⁴³

Chinese authorities even created a new department – the Department of Health of the Directorate of the Port of Shanghai and Wusong. The first director of that department was Dr. Hu Hou-ku, a Johns Hopkins alumnus. Hu specialized in public sanitation and had

⁶⁴² “Wanted a ‘Health Conscience’”, *The China Press*, Sep 03, 1926: 12.

⁶⁴³ “The Chapei Waterworks Co.: Taoyin Orders an Investigation: Result of ‘N. C. Daily News’ Agitation”, *The North-China Herald*, Aug 21, 1926: 351.

experience working for the State Board of Health of Tennessee and as Assistant Director of the Public Health Demonstration Service in Beijing. A clear sign of bringing authoritative power to the public health regime was making the commissioner of police a nominal head of the department. Inside the department there were three divisions: Street Cleaning and Sanitation, Vital Statistics and Communicable Disease Control, Medical Service and Laboratories. All existing departments of the Chinese districts in Shanghai were to merge into the organization. It was also given the responsibility of inspecting the Chapei Waterworks and other utility works. The new Department of Health would be given a budget of \$160,000 annually, of which 80 percent was to be utilized for street cleaning. To recruit qualified personnel, Hu started a training school. A Board of Health, consisting of nine prominent Chinese doctors, was created as the advisory to the department.⁶⁴⁴ In the 1920s, Shanghai had no registration for either disease or physicians. Nor was there law or regulations for the department to depend upon. The Department of Health was meant to lead in these issues, but with Shanghai coming under Chiang Kai-shek's control in 1927, the cause was interrupted.

Chinese and foreign authorities had produced several reports on the cholera incident at the Chapei waterworks.⁶⁴⁵ The most influential one was written by Wu Liande (伍连德,

⁶⁴⁴ "Public Health in Chapei: Important Department Under a Graduate of Johns Hopkins University", *The North-China Herald*, Aug 21, 1926: 357.

⁶⁴⁵ By early September of 1926, the report ordered by the Taoyin and the Department of Health was submitted and published. It was composed by Wu Huan-ming, an expert in water chemistry. Interestingly, this was not the first time Wu was asked to analyze the water of Chapei. As early as in April, Wu was requested by the then Police Health Bureau (now the Department of Health) to prepare a report about the dirtiness and unhealthiness of the state of the water supplied. However, from then to the outbreak of cholera in June and its climax in July, the authorities made no improvement regarding the Chapei water supply even with Wu's earlier report in hand. For foreign press, it was puzzling why another report from Wu was needed by the new department to roundly condemn the poor quality of Chapei water again. Also, in July, the Municipal Council's Health Department had been requested by the Chapei Company to inspect and report on the conditions of the plant. With now at least three reports at its disposal, the problem now was when action

1879-1960). Wu, whose father was a Chinese goldsmith, was born in Penang, Malaya. He was the first Chinese to graduate in medicine from Cambridge. Wu majored in epidemiology and bacteriology. During his days in Europe, Wu had the privilege of working at School of Tropical Medicine in Liverpool and the Pasteur Institute in Paris. In May 1908, Wu was invited to work for the Qing government in army services. He was entrusted in 1910 with the task of inspecting, treating and preventing bubonic plague in northeast China. The plague was wreaking havoc along the railways, wiping out one village after another. Wu and his team brought the plague under control in merely four months. The high death toll of Manchurian plague and the success of Wu's measures caught international attention. Wu was rewarded with countless positions at universities and associations across and beyond China.⁶⁴⁶ When writing his annual report on the general matter of disease control in China in 1926, Wu had the case of cholera in Shanghai included. The report was sent to the Ministry of Foreign Affairs on October 20 and was later translated and sent to the Municipal Council in early November.⁶⁴⁷

In this report, Wu mentioned that this was not the first time the Chapei waterworks caught his attention. In the previous year of 1925, Wu requested samples of water from the Company be bacteriologically examined for cholera organisms. *Vibrio cholerae* was already found in the sample from Suzhou Creek, although the tap water proved to be free of pathogen. Wu argued it was necessary to summon a Cholera Prevention Conference

would be taken by the local authorities. For observers, the case of Chapei waterworks scandal would be the touchstone of the effectiveness of the current administration. See "The Chapei Waterworks Again", *The North-China Herald*, Sep 04, 1926: 437.

⁶⁴⁶ Lee et al., "Dr. Wu Lien-teh".

⁶⁴⁷ "Wu Liande, North Manchuria Plague Prevention Service: Little Plague But a Bad Cholera Year; The Chapei Waterworks Scandal; Need of Cooperation in Chinese and Foreign Areas", *The North-China Herald*, Nov 6, 1926: 250.

across authorities in Shanghai to discuss matters like the study of epidemiology of cholera in China, early preventive measures, and examination on fecal matters. Wu suggested that intensive study of suspected sources of cholera needed to be done throughout the year, e.g. water, human carriers, flies, food, etc. As early as in spring, prophylactic measures needed to be taken, among which the most critical was mass inoculations. When cholera cases began to show, non-endemic areas needed to be notified so as to limit its spread to other localities. Mass fecal examination was necessary at ports and railway centers. Wu suggested that in treaty ports, Shanghai particularly, cooperation among Chinese and foreign authorities was essential in all health matters.⁶⁴⁸

The Republic government created the National Quarantine Service in 1930. Wu Liande was appointed director. National Quarantine Service headquartered in Shanghai. The organization was national in the sense that it had an all-Chinese staff and that it returned the power to the Chinese government in matters of quarantine control in treaty ports. On the other hand, National Quarantine Service was also international. It was linked by cable to the League of Nation's Eastern Bureau of the Health Service. Wu himself was made a member of the Advisory Board of the League's Far Eastern Epidemic Bureau.⁶⁴⁹ When cholera arose in Shanghai in 1932, the Chinese health regime under Wu Liande had become so powerful that the National Quarantine Service was leading the concerted campaign across the administratively divided metropolis.

8.4 Anti-cholera Campaign and Central Cholera Bureau, 1932

⁶⁴⁸ Ibid.

⁶⁴⁹ Lee et al., "Dr. Wu Lien-teh".

In 1932, cholera appeared in Shanghai unusually early. The first case was reported on April 26. A laborer named Hu Mingcai, age 40, residing at Chapei, was admitted into the Tibet Road Infectious Disease Hospital. Hu was treated immediately with saline infusion and returned home safely after he recovered. Another two cases occurred on April 29 and May 1. Both patients were cured. The fourth and fifth patients came from Ferry Road (西康路) and Cater Road (石门二路) of the International Settlement. They were also treated successfully. But the number of cases began to increase since May. Over the weekend of May 28, 30 cases were reported in the Settlement, 7 in the French Concession and 28 in Chinese territories. By the end of May, cases of cholera mounted to 98. Most of the patient ranged from 21 to 40 in age.⁶⁵⁰

The Municipal Council had its Health Department sending out two mobile vans to travel throughout the Settlement. They were attended by three doctors. Residents could get inoculated against cholera in the van. A direct phone line was provided to places of employment of more than 20 person in case they requested preventive services. The Municipal Council opened up 12 clinics where vaccine against cholera was provided freely.⁶⁵¹ In the Chinese settlements, upon predicting an epidemic, the Bureau of Public Health of Greater Shanghai vaccinated 76,000 persons against cholera in ten days, all injections free of charge.⁶⁵² The number of people who received preventive treatment rose significantly in three municipalities by the end of May: in Greater Shanghai 97,117 were

⁶⁵⁰ "Cases of Disease Mount from 68 to 79 over weekend: virtually all poor people; physician emphasizes need of pure water for masses", *The China Press*, May 31, 1932: 1.

⁶⁵¹ "Officials Seek to Cover Truth of Cholera Rise: Dr. Jordan Says epidemic already exists in native areas", *The China Press*, June 01, 1932: 3.

⁶⁵² "65 cases are already reported although season immature: 76,000 persons vaccinated; Unprecedented Headway of disease alarms authorities", *The China Press*, May 29, 1932: 1.

inoculated, in the International Settlement, 27,855, and in the French Concession, 4,125 in April and 9,218 in May. During this time, there were a handful of cases that appeared on the sea. For example, a Chinese sailor, Wu Dah, age 42, employed on *S.S. Sithonia* which arrived at Shanghai from Australia on May 18 was admitted on May 28 to the hospital and then transferred to the Municipal Isolation Hospital on May 29. He was diagnosed of cholera and soon died on June 2. There were also cases of Japanese seamen falling ill during their stay in Shanghai. The National Quarantine Service fumigated and disinfected the ships where cholera cases were reported to prevent the disease from spreading abroad.⁶⁵³

The investigation showed that most who contracted cholera were laborers, who drank unclean and unboiled river water. A primary source of pollution to the river was garbage disposal. The loading of garbage boats of all settlements in Shanghai amounted to 1,500-2,000 tons every day - 700 ton from the International Settlement, 500 from the French Concession, and the other 500 from the Greater Shanghai Municipality. Not only were the antiquated garbage boats prone to leaking, in some section of the Huangpu River garbage was not properly buried. At Longhua, for example, most garbage was dumped overboard during the night. The filth was silting up at low tide and flushed back to the river at high tide. It was later revealed by *The China Press* that the Greater Shanghai Municipal Government was paid \$200,000 yearly from garbage contractors for the privilege of dumping the waste of the two foreign settlements near Longhua – \$120,000 paid by contractors in British settlement, \$80,000 by the ones in the French Concession. While

⁶⁵³ “Quarantine Chief Urges Cooperation of all to curb cholera epidemic”, *The China Press*, June 07, 1932: 1.

government and contractors were filling their pockets, the poor were drinking untreated water taken near floating garbage and living under the threat of all sorts of bacterial infections.⁶⁵⁴

In view of the increasing prevalence of the disease, Wu Liande, head of the National Quarantine Service, suggested that all cholera cases came from slums where clean water was unattainable, such as Beixinjing (北新泾), Caojiadu (曹家渡), Pudong (浦东) and locations along the Suzhou Creek. Wu requested that clean water be made available to those population at the cheapest rates.⁶⁵⁵ Most poor population lived in the Chinese territories, but the government of Greater Shanghai said that situation was as such because a great many poor people were forced out of the foreign settlements recently and then into the Chinese area. Therefore, even though the Greater Shanghai produced the cheapest and equally good water supply, it was open to assistance from foreign authorities in providing cheap water supply. In early June, the Central Cholera Bureau was formed. It comprised China's National Health Bureau and the health departments from the three authorities in Shanghai.⁶⁵⁶

Under the instruction of Wu Liande, the Bureau began its discussion on the matter of providing the poor with cheap water. At 10 a.m., June 13, 1932, the Central Cholera Bureau had its first meeting in the Administration Building of the International Settlement.

⁶⁵⁴ "65 cases are already reported although season immature: 76,000 persons vaccinated; Unprecedented Headway of disease alarms authorities", *The China Press*, May 29, 1932: 1; "Cholera Epidemic Seen from Unclean Water as Filth Dumping Continues", *The China Press*, May 29, 1932: 1.

⁶⁵⁵ "Cases of Disease Mount from 68 to 79 over weekend: virtually all poor people; physician emphasizes need of pure water for masses", *The China Press*, May 31, 1932: 1.

⁶⁵⁶ "Greater Shanghai Refutes Political Barrier Charge in Garbage Disposal Issue", *The China Press*, June 08, 1932: 1.

Among the attendees were C. Harpur, commissioner of Public Works of the International Settlement, L. Louzier, engineer-in-chief and head of the French Concession Public Works Department; Hou Ki-houm and Shang Nyi of the Greater Shanghai Public Works and Police Health Department, and Captain E. B. Green, Harbormaster. The meeting was held under friendly circumstances. The issue with garbage disposal was recognized. All representatives pledged their help in correcting the problem as they would employ police force at the site of disposal to supervise the operation.⁶⁵⁷ Regulating garbage disposal, nevertheless, was too slow a change to control cholera. By late June, Shanghai saw another hike in cases of cholera with 240 new cases reported in a month.⁶⁵⁸

8.5 Free Water Supply to the Poor Chinese

The Central Cholera Bureau convened a second meeting. Wu Liande again appealed to all waterworks company in Shanghai to reduce water rates in order to make pure water affordable to poor residents.⁶⁵⁹ By the end of June, altogether 706 people in Shanghai were infected and cholera began to proceed to the outskirts. The Bureau of Public Health of the Greater Shanghai despairingly admitted the inability in coping with the situation. The battle against the Japanese in 1931 depreciated the finance of the government and the two Chinese waterworks. The Chinese government did not have the reserve to build

⁶⁵⁷ "Authorities take action against garbage dumping in source of city's water", *The China Press*, June 14, 1932: 1.

⁶⁵⁸ "Cholera Rise Shown by 240 new cases: Need of Pure water for poor again urged by Dr. Wu", *The China Press*, June 21, 1932: 1.

⁶⁵⁹ "Cholera Bureau Meets As Dread Epidemic Mounts: Waterworks Fail to Give Poor of City Free Supply", *The China Press*, June 24, 1932: 1.

long-distance water transport and the waterworks were incapable of giving much charity.⁶⁶⁰

The Chinese government had to call on various chambers of commerce, ratepayers associations, and business organizations to use their influence in adopting concerted measures in providing cheap or free water for the inhabitants of the poorer districts. The Chinese Chamber of Commerce became the first organization to respond. The Chamber announced in early July that it would assist with the installation of a number of street hydrants immediately at strategical points in the poor sections of the Greater Shanghai.⁶⁶¹ Meanwhile, the Bureau of Public Health of Greater Shanghai dispatched fifty “sanitary police squads” to disinfect all wells and creeks within the territory, each squad consisting of two sanitary policemen and a coolie. The policemen would measure the size of the wells in their assigned area, then pouring in proper amount of bleaching powder, chlorinate of lime and other disinfecting chemicals, all supplied by the Bureau.⁶⁶²

When the total number of cholera infection mounted to 1,020 in July, including four cases of foreigners, the Municipal Council of the International Settlement remained awfully quiet on the issue of cheap water supply. The Municipal Council released a communique via its public health department, which gave valuable instructions on the prevention of cholera, including preparation and consumption of food and drinks, warning people against eating uncooked food, etc. But the Municipal Council did not seem interested in providing water to the Chinese in that a popular belief was that the Chinese

⁶⁶⁰ “Seriousness of Cholera Epidemic Growing Daily, 11 people succumb to dreaded disease during week”, *The China Press*, June 28, 1932: 9.

⁶⁶¹ “Greater Shanghai to Supply Pure Water for Poor”, *The China Press*, July 05, 1932: 1.

⁶⁶² “Greater Shanghai Moves to Disinfect City Wells: 50 Sanitary Police Squads will make attempt to safeguard public from cholera”, *The China Press*, July 06, 1932: 7.

would not take advantage of the new, free water facilities. Some diehard conservatives mocked the Greater Shanghai municipal government: “Well, they have promised to erect public hydrants, we shall see if they carry out their promises.”⁶⁶³

In early July 1932, the Shanghai Waterworks Company finally announced their plan to supply the poor with free water. “We shall be pleased to supply the poor people of the International Settlement with all the water the Bureau of Public Health may see fit to advise giving them. It is really a small matter.” said C. D. Pearson, engineer-in-chief and manager. To prevent unnecessary waste of water a nominal cost was to be levied or tickets be issued to deserving classes. The hydrants in the Chinese territory was then opened to the native. The Greater Shanghai government started an educational campaign to acquaint the native population with health facts in relation to cholera and cleanliness of food and water. The Municipal Health Department reported that the poor people of Chinese areas had recognized the danger of using cholera-infected water. A large number showed up at the hydrants.⁶⁶⁴ During the warmest season, from July to September, the Shanghai Waterworks Company kept supplying the poor Chinese with free water in the Eastern and Western districts, effectively checking the rising cases of cholera.⁶⁶⁵

The campaigns against cholera was preemptively arranged in 1933. The Central Cholera Bureau had its first meeting of the year on May 8 at the Chinese Red Cross Hospital. Attendees included representatives of the three municipal health bodies, the National Quarantine Service, the Chinese Red Cross Society, the Railway Administration

⁶⁶³ “Cholera Cases Total 1,020 as epidemic grows: SMC gives excellent advice, but poor not able to apply it”, *The China Press*, July 07, 1932: 1.

⁶⁶⁴ “Poor will get free pure water from waterworks”, *The China Press*, July 08, 1932: 1.

⁶⁶⁵ “Waterworks Offers Free Water to Poor”, *The China Press*, June 23, 1933: 9.

and the National Health Administration, Nanjing. The representatives agreed that the preventive campaign in 1932 was a success. In 1933, similar arrangements were to be made with furtherance on some critical fields for cooperation. For epidemiological study, an intensive research needed to be undertaken with respect to the incidence of the various strains of Vibrios, the sources of infection (with special attention paid to water, flies, fruits and cold drinks), and the question of bacteriophage. Such work would be coordinated between the laboratories of the three municipalities so that duplication could be avoided. For the report of early cases, the hospitals in the three municipalities would work as one, with even private practitioners included. For mass inoculation, it would be more available in all three areas. The National Quarantine Service and the Railway Health Service would work together to examine and inoculate passengers, crews and employees wherever necessary.⁶⁶⁶

As for the cheap water supply to the poor, the Central Cholera Bureau requested in June a continuance of the free water supply given last year by the Shanghai Waterworks Company. One of the medical representative of the Shanghai Company informed the Municipal Council that the Company was more than willing to continue a free supply of approximately the same quantity of water as last year in districts where residents had no piped water.⁶⁶⁷ Notice that the Shanghai Waterworks Company remained the only water enterprise among four that could afford the charity. In July, Wu Liande sat down with *The China Press* and propagated the rules to be observed: Never drink any water other than that from the waterworks, and when in the country, drink only boiled water. Eat no raw

⁶⁶⁶ "Anti-Cholera Campaign is Begun Here", *The China Press*, May 09, 1933: 9.

⁶⁶⁷ "Waterworks Offers Free Water to Poor", *The China Press*, June 23, 1933: 9.

vegetables or fruits, unless they are guaranteed to be free from contamination. Eat fruits only after they have been soaked in boiling water for a short while. Eat sparingly of cold things, and in the case of ice cream and cold drinks, always be sure of the cleanliness of their sources. He also indicated appreciation for the free water services provided by the foreign companies and suggested the Chinese to use drinking fountains more, which would certainly diminish all forms of diseases like cholera, dysentery, typhoid and enteritis. Wu also encouraged people to get vaccinated before summer, a service provided in all clinics in all three settlements.⁶⁶⁸

By September not a single case of cholera infection had been reported from any part of Shanghai. The year of 1933 was regarded as cholera-free, which had not happened since 1918. According to the Report of Central Cholera Bureau, Shanghai set up 20 temporary hospitals in the summer, fully staffed and specially equipped for the treatment of cholera. The epidemiology committee of the Bureau closely studied water of various parts of Huangpu River, Suzhou Creek, Yangtszepoo, etc. as well as the many shallow wells abounding in this district from which the poorer classes still drew their supplies. No *Vibrio cholerae* was found. The propaganda committee sought out people from all walks of life to promote inoculation and healthy consumption of water and food.⁶⁶⁹

⁶⁶⁸ "Quarantine Chief Tells of Public Health Works", *The China Press*, Jun 7, 1933: 9.

⁶⁶⁹ "Seasons Passes without Sign of Epidemics", *The China Press*, Sep 10, 1933: 13.

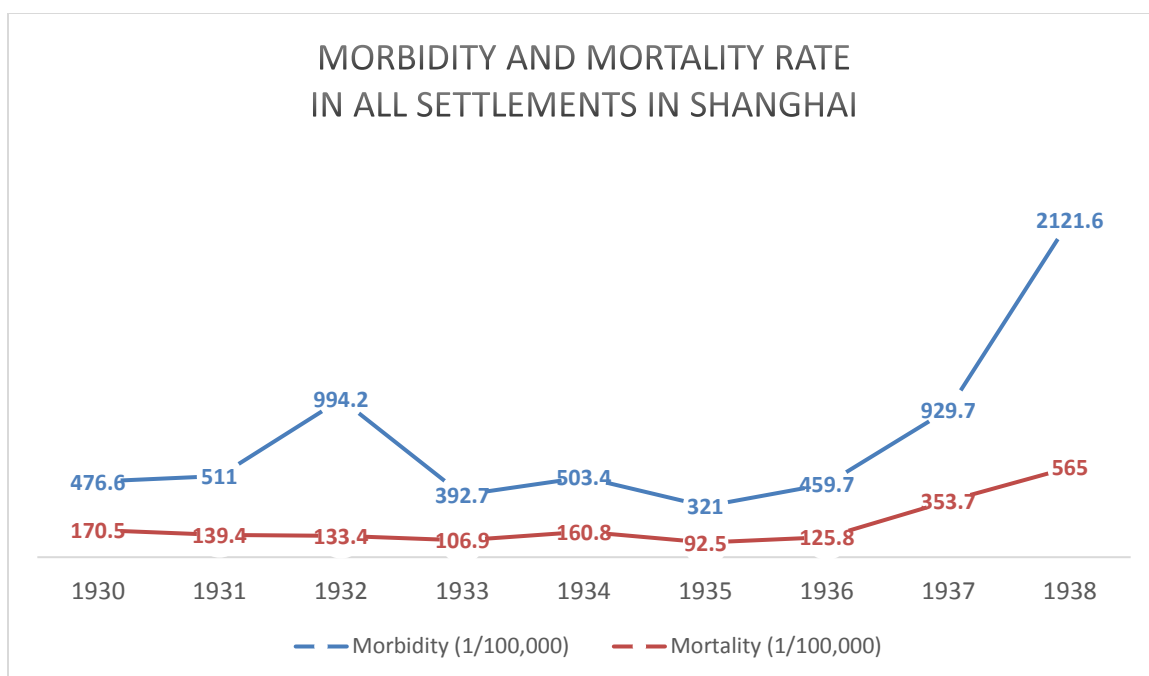


Table 1 – Morbidity and Mortality Rate in all settlements in Shanghai. Source of data: Shanghai Weisheng Zhi Bianzuan Weiyuanhui, http://www.shtong.gov.cn/dfz_web/DFZ/Info?idnode=67805&tableName=userobject1a&id=65065

After the successful anti-cholera campaign in 1933, directors of the Shanghai Company again approved of a free supply for the poor population in 1934.⁶⁷⁰ The free supply was made available from June 28, 1934. The Municipal Council noticed that not only had the Chinese population learned to take advantage of the seasonal cheap supply, but those who obtained their supply from wells started requesting chlorination for them to use and became more cooperative in assisting the officers responsible for the duty of disinfection by informing them the exact location of various wells.⁶⁷¹ Thanks to the concerted efforts across the settlements and the engineering capability of the British, Shanghai was able to maintain a reasonable morbidity and mortality from 1934 to 1936. It

⁶⁷⁰ “Waterworks to Give Poor Free Supplies”, *The China Press*, June 19, 1934: 9.

⁶⁷¹ “Heat Wave Fails to Influence Public Health”, *The China Press*, July 20, 1934: 9.

was not until 1937 when the Second Sino-Japanese War broke out that a sharp increase of infection and death was seen (see Table 1).

The government of Republic of China made substantial progress in modernizing measures of disease control. The underpinning of the cause was a conjunction of political cooperation and engineering techniques. The creation of National Quarantine Service and the Central Cholera Bureau certainly helped with synchronizing the actions of the three authorities and sharing of critical data among them. But these organization themselves did not possess any centralized executive power. The functioning of health regime during Shanghai's cholera season depended on the kindness of the two foreign authorities and the generosity of the Shanghai Waterworks Company. When the Nationalist government put forth an ambitious social engineering program without the backing of real engineering infrastructures, like the New Life Movement, it was bound to fall short of its goals.

8.6 New Life Movement

On February 17th, 1934, Generalissimo Chiang Kai-shek spoke in front of thousands of soldiers at his headquarter in Jiangxi Province, inaugurating a mass mobilization – the New Life Movement. Later, from mid-February to late March, Chiang delivered another four public speeches of similar scale, elaborating his vision for the movement and his conceptualization of the term “new life”:

The New Life Movement is the revolution of life for all Chinese. Through most straightforward and most expedient ways, it would eliminate the habits that are not suitable, and adapt our life to the time and conditions we live in. In short, the Movement is to rationalize the life of the Chinese in line

with our inherent morality --- etiquette, justice, integrity, and conscientiousness.⁶⁷²

The New Life Movement came into being in the middle of Kuomintang's ferocious military campaign that aimed to eliminate the Communists bases inside the hilly, southeast Jiangxi province. Victory of the fifth and the last encirclement was within reach. Yet the Kuomintang sought not only to take back the lost areas, but to win over the heart of peasants who had long been lived under Communism regime. An ideology of disciplines, deeply rooted in the Confucian traditions, needed to be created to counter the revolutionary tendency. The New Life Movement was to reinvigorate Chinese's "inherent morality" --- etiquette, justice, integrity and conscientiousness. The new life was in fact the old life of ancient Chinese sages. Once the inherent morality was restored, China shall be able to relive its heydays.

In practice, the New Life Movement was a pedagogical program that intended to regulate and reshape people's daily behavior with indoctrination and penalty. Chiang and his think tanks came up with a set of detailed guidelines for every aspect of life by intersecting the four Chinese virtues with eating, clothing, living, and transporting. In government agencies and schools, "good" habits were intensively promoted. For example, when the Movement first began in Jiangxi province, Chiang Kai-shek made this remark with respect to the righteous way of washing one's face:

"Everybody in Japan, from all social ranking, washed his face with cold water in the morning and in the night. It has become a common habit nationwide. If one breaks this rule, he will be regarded as barbaric and unpatriotic. Washing face with cold water is invigorating and refreshing. It also strengthens one's skin against coldness. And most importantly, it saves time. This habit, trivial as it is, brings about great benefits. That is why the

⁶⁷² Guomin zhengfu junshi weiyuanhui, 1935, 1.

entire population in Japan practice it. In China, our troops, our schools, how many of them can do the same? ... Either one skip it because there is no hot water, or wait hours for water to be heated. We can simply tell from this fact that our nation is no match to the Japanese. Not through comparing wartime performance, we are inferior to them simply because of our daily life. So, if we are to reinvigorate our nation, to redeem ourselves from humiliation, we don't have to talk about guns and cannons. Let's talk about washing face with cold water. If we cannot beat the Japanese in this tiny matter, what else could be expected?"⁶⁷³

In a country as weak and poor as China in the 1930s, the only resource that a political head could expect to command was indeed a uniformed willpower across the nation. Ideology was the cheapest tools of engineering. It cost little to create and transport. It was a convenient expression of authoritarianism, regardless of its actual effect. For Chiang Kai-shek at the time, immediate acquirement of real engineering prowess was out of reach. He thus went with social engineering. Comment on the rise of Germany after World War I, Chiang said:

“When we talk about reforming society, reinvigorating a country and nation, it cannot be achieved with only military power. How to succeed? Briefly speaking, the first is to equip ordinary ones with national morals, and the second is to equip them with national knowledge. ... As we know it, after its defeat and the Treaty of Versailles Germany could not lift a finger without the allies' interference and suppression, especially so in military. The German Army was capped at 100,000 in number. Comparing to other powers, it was nothing. Nonetheless, they managed to rise again within merely fifteen years on par with the most powerful nations on earth. How did they do that? ... In contrast, Chinese army were tens of times in number. We too have navy and air force. Germany has a population of 60 million; we have 400 million... But how come they are able to demand equal military power and to abolish indemnity as they wish?... How come Germany was able to rise to equality without military forces but China cannot even with military? It was nothing but better morals and knowledge of the German.”⁶⁷⁴

⁶⁷³ Chiang Kai-shek, 1945, 10.

⁶⁷⁴ Chiang Kai-shek, 1934.

In Shanghai, however, the New Life Movement was not spurred by ideological wrestling but was driven by desire for better public health in a rapidly developing city. The Movement was commenced in Shanghai in the most metropolitan fashion possible. From April 9 to 15, 1934, the city enjoyed a movie festival, dubbed as the “New Life Movement Propagating Week”, where slogans of the Movement were seen everywhere, even on the silver screens. The Joint Pledge of New Life was aired on the radio. The packages were stamped with special postmark. Fifty thousand leaflets were distributed, 120,000 pamphlets of Joint Pledge printed. Tens of thousands of Shanghai natives paraded with lanterns in their hands.⁶⁷⁵ Due to weakened presence of opposition to the Nationalists within the perimeter, the New Life Movement in Shanghai was not as much about the orderliness and uniformity as it was about practical guidelines for better hygiene.

The New Life Movement Commission composed a series of new rules regarding the cleanliness in public space. These rules bore great resemblance to the regulations put forth by the Municipal Council in the 1860s, which included (1) In streets, every household must ensure that the section in front of them be kept clean. (2) Pouring waste water or disposing garbage in the streets were forbidden. (3) The shops were ordered to fix their signs if broken. (4) Advertisements would be washed off the wall if not properly posted. (5) Leaving clothes to dry in main streets was not allowed. (6) Peddlers selling snacks must bring their own broom and dustpan to clean up the scene. In view of a shortage in public latrine, the Commission instructed teahouses and bars to open their latrines for public to use. They also suggested that these latrines be cleaned with limewater every day.⁶⁷⁶ In

⁶⁷⁵ *Shanghai shi xin shenghuo yundong tekan*, 211.

⁶⁷⁶ *Shanghai shi xin shenghuo yundong tekan*, 237, 247, 268-9, 270.

regulating cleanliness in private space, a myriad of rules were created to police even the most trivial things. Among them were manner issues, such as munching with mouth shut, taking off the hat when entering a room, and staying in line when boarding bus and ship. That being said, the Movement did offer health benefits by urging people to drink boiled water only and by organizing campaigns eliminating flies and mosquitoes.⁶⁷⁷

Nevertheless, the New Life Movement was non-compulsory in nature. Despite the fact that the service corps in Shanghai amounted to four hundred and seventy-two groups, with overall four thousand two hundred and seventy members, none of these groups had operable authority. They consisted of people of very different background: boy scouts, teachers, merchants, local security guards. In their realm of jurisdiction, they were asked to correct misbehaviors from sloppy outfit to spitting, from urinating in public to underage smoking, from walking on the wrong side of the road to refusing to get inoculated.⁶⁷⁸ Not only did it take time for these behavioral changes to happen, but the New Life Movement was brought to an abrupt end in 1937 when the war with Japan broke out. Historians thus had a hard time trying to assess the actual result of the New Life Movement since many of its goals simply could not be measured by numbers.

Intellectual engagement had to dwell on the nature of the movement. Arif Dirlik suggests that the New Life Movement was both conservative and revolutionary in that it was couched in traditional terminology, yet the terminology were given radically new meanings that fit best with the political needs.⁶⁷⁹ Lei Hsiang-lin argues that the Movement

⁶⁷⁷ Shanghai shi xin shenghuo yundong quandao dui xuzhi cao'an.

⁶⁷⁸ Ibid.

⁶⁷⁹ Dirlik, 1975.

was at first Chiang's idea, but was immediately developed by others who intended to add a layer of nationalism to the Confucian familial values.⁶⁸⁰ This view could be corroborated by Lloyd E. Eastman's founding that a radical youth group "The Blue Shirts Society" within the Kuomintang openly demanded a strong leader for China as powerful and forceful as Hitler, Mussolini and Stalin.⁶⁸¹ Ruth Rogaski briefly mentioned the New Life Movement in her contention of hygienic modernity. She suggested that the Movement claimed to be a mass movement, but it primarily reached individuals who were already encompassed by state-affiliated organizations such as youth groups, government offices, hospitals and schools. It had little impact on the actual urban environment.⁶⁸²

Considering Rogaski defined modernity as uniformed sense of purpose held by state and individuals, her discounting the New Life Movement as a successful state-sponsored campaign was puzzling. In the areas where sanitation was not concerned, the Movement was able to make many individuals fall in line with the vision of the state. For example, the Commission in Shanghai organized a group wedding in 1935 to challenge the traditional familial framework in which marriage was situated. The wedding took place in the city square witnessed by hundreds of fellow citizens. It was hosted by the mayor of Shanghai instead of head of family. Fifty-seven couples swore their oaths in front of mayor and the head of social bureau. The purpose of the wedding was to cut the luxurious and wasteful ceremonies and to redirect the familial ties towards the image of state. The purpose might sound politically charged, but these weddings became so popular that the

⁶⁸⁰ Lei, 2012.

⁶⁸¹ Eastman, *Fascism in Kuomintang China*, 5.

⁶⁸² Rogaski, 238-9.

government had to hold them more often, from four times a year to a monthly thing.⁶⁸³ In this sense, the New Life Movement was to some extent successful in modernizing familial traditions by infusing nationalistic values into the most traditional practices. The Movement just failed terribly at public health. The political nature did not lead to the failure. Some forms of modernization could be materialized simply with social relations engineered by the authorities, whereas modernization of public health, like we have established with the anti-cholera campaign in 1932, must be achieved on the ground of an entirety of infrastructural technologies.

8.7 Water Closet Revolution

What perhaps made a more significant impact on the behavioral change towards modernity was the prevalence of water closet. The Chinese in Shanghai had learned the better way of domestic waste disposal from their affluent foreign neighbors. Water closets was made an indicator of living a modern life. When Gilbert Fowler was contracted by the Municipal Council and traveled to Shanghai in 1918 to address the sewage problem, he suggested that the demand for modern sanitary plant in houses must be acknowledged as inevitable: “It is a question rather of amenity than vital statistics, and is one with the demand for better housing, for pleasant gardens, and for smokeless skies; it is, in fact, part of the impulse which separates cultivated or so-called civilized man from the cave dweller.”⁶⁸⁴ According to the municipal record in February 1920, there were altogether

⁶⁸³ “Xin shenghuo zhi jituan jiehun”, 1935.

⁶⁸⁴ “Mr. Godfrey’s Report”, *The North-China Herald*, Aug 30, 1919: 519.

579 water closets in the busiest and finest Central District of the Settlement. The Palace Hotel alone had 121 water closets put in place.⁶⁸⁵



Figure 22 – The Palace Hotel. Source: “The Hongkong and Shanghai Hotels – A Brief History”.

Along with the booming water closet market was a flourishing business of popular readings. Elites had been learning their news from the very serious *North-China Herald* since the previous century where municipal data and record of Council’s meeting was published regularly. Ordinary people in Shanghai had created their own sources of news – illustrated books, collection of photographs, novels, compilation of anecdotes and so forth. Every week a collage of stories was selected from across China and from the world and

⁶⁸⁵ Shanghai Municipal Archive, U-3-204.

spread in the alleyways and at the teahouses. These printed materials appealed to the basic human need of curiosity and entertainment. No topic was off the limit. At an age when censorship was sparsely imposed, water closet and restroom were commonly used for a good laugh. Humor drew upon all sorts of social realities. What made a public restrooms and water closets good joke material was the tension between reclusiveness and publicness. Four sources of comedic effect will be discussed hereafter.

8.7.1 Restroom as Social Space

First, public restroom could never be limited to its function as a place of relief and convenience. As people came in and out regularly, it was bound to become a social space where opinions were stated and dialogues were recorded. In the age before social media, writings on the wall was the best weather vane to tell the cultural and political climate at the time. Due to the nature of anonymity, public restroom became a forum most suitable for freedom of speech to prevail. The “restroom literature” thus became the finest record of subaltern reactions to many hot bottom issues at the time.

A good example would be the following piece of literature written in a restroom of a foreign bank on the Bund. In those places, foreigners and Chinese employee were treated differently. They were paid differently. They used separate restrooms. The Chinese restroom thus became the place where discontent was vented.⁶⁸⁶ At the corner of the

⁶⁸⁶ The following story was the evidence to such separation. Zhao Minheng (赵敏恒) was a special correspondent of Reuter in Nanjing. In his memoir Zhao said that at the Reuter’s Shanghai office, a sign was hung at the door of the foreign restroom, saying “No Chinese”. He said he could not stomach such blatant discrimination, so he broke the rule and went right in. See Shanghai shi wenshiguan shanghai shi renmin zhengfu canshi shi wenshi ziliao gongzuo weiyuanhui (The Committee of Historical Material of the Office of Consultancy of Shanghai Historical Library and Shanghai People’s Government). *Shanghai difangshi ziliao er* (Shanghai Local Historical Materials, Vol. 2). Shanghai: Shanghai Academy of Social Science Press, 1984, 10

restroom, someone drew a figure of modern woman, with her lips and nails painted red. On the side of the figure was where the dialogue was carried out. Gender, sexual tension, hardship and inflation, and random comments, all were published in the magazine:

“What Miss Li? Nothing but an empty vase. I work day and night, only to receive 150,000 yuan. How about her? She is taken in and out in the manager’s car. She sits at the desk, pretending to be working. If she is not reading newspaper, she is doing her knitting. When it comes to the end of the month, she earns 50% more than I do. Sigh. Where should I even begin?”

“She is such a pheasant. She does not like the manager because he is so much older, but she loves the money so she sucks up to him. In fact, she is in love with the younger business partner of the manager.”

“You two above. You are just here complaining because you don’t even get to enjoy the smell of a girl.”

“You shameless brown-nosed suck-up. You can’t have the best part of a fish, so you are just drunk in clam soup.”

“Haha. Don’t hide in the dark and hurt others with your writings. If you are a real man, let’s have a drinking contest tomorrow at second floor of Xiaoguanghan.”

“Little Ding was so busy flirting with the foreign chick last night!”

“The cost of tram tickets and stamps just keeps getting higher. I heard that there will be another spike very soon. People cannot afford to ride trams. If they walk, they might get a couple of calluses. But the price of shoes and socks are also shockingly high. Sigh. It’s so hard to get by in a day and age like this.”

“Meal plan is going to be 2000 yuan per person. How can we even live like this?”

“My neighbor is playing mahjong again. Gosh! I will lose another night of sleep.”

“The noise of radio is giving me headache. I heard radio was invented by McCartney. Weird! McCartney is supposed to be the material for spring coats. How can a piece of cloth invent radio?”

“Traditional breakfast costs at least 200 yuan. Boiled water is 100 yuan per ladle. One pack of cigarettes is 500 yuan. What is the use of earning 100,000 yuan every month? My wife can only eat cold wind to live on.”⁶⁸⁷

⁶⁸⁷ Wang Baishi, 1946.

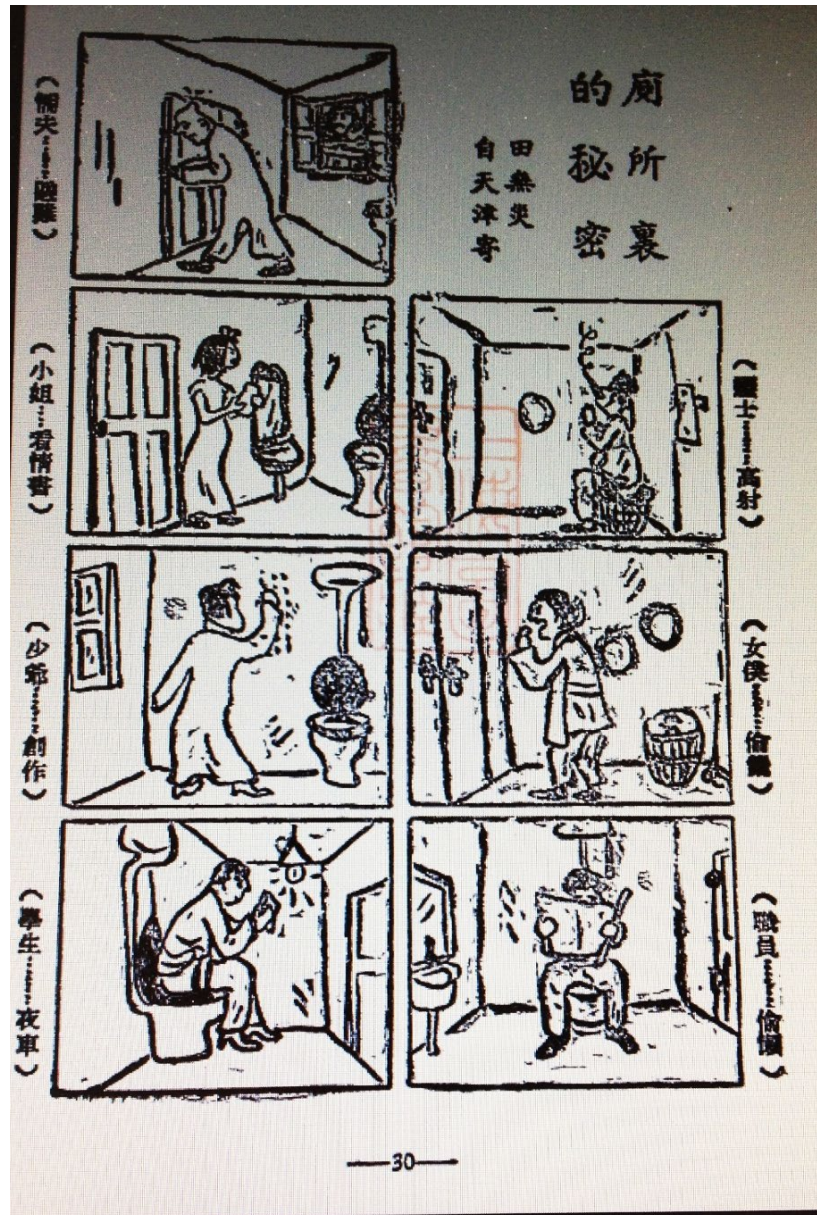


Figure 23 – Secrets in the restroom. A variety of activities were taking place, including reading love letters, stealing, creative writing, cramming for exams, hiding from work duties and so forth. Source: Tian, 1937.

Most restroom literature were coarse and vulgar. Middle school students were best at toilet jokes and they proudly describe fecal matters in all ways they found funny.⁶⁸⁸

⁶⁸⁸ “Lian: mou xiao cesuo, tuya man qiang”, 1948; Han Chun, 1926.

There was even report about illustrations of sexy women cut from magazines and pasted to an entire wall at a middle school.⁶⁸⁹ There were also poetic pieces to read from time to time. The following poem was seen on the wall of a restroom in a school, lamenting refugees' hardship and teachers' low payment:

Those descend from the sky, are they doves or are they crows
Those refugees on the ground, they don't get to eat the relief, they eat dirt instead
Monarchy and democracy fight all the time. How to mediate the differences?
Dear American dollars, I love you more than I love my country.
Teachers work more than one job otherwise they will starve to death.⁶⁹⁰

Political comments that were less subtle were not uncommon in the restrooms. After the World War II, China entered another stage of power struggle between the Nationalist Party and the Communists. The left-leaning students would write down slogans such as "Pursuit of Democracy, Down with Dictatorship" and "Find some conscience in you and deliver our fellow countrymen in northern Jiangsu out of misery."⁶⁹¹ It would be much more risky if such comments were made out in the public.

8.7.2 *Restroom, Toilet, and Gender*

The second source of humor about toilets and restrooms was the issue of gender. Public restrooms for women's convenience were still unheard of in the beginning of the twentieth century. Women were bounded by domestic sphere, thus the only places where women's restroom existed were the places that women were "allowed" to visit, such as temples. A story in 1909 suggested that behind one of the Buddhist temples in Beijing there was a women's restroom. It received a regular flow of women pilgrims. A man unfamiliar

⁶⁸⁹ Bing Ying, 1932.

⁶⁹⁰ Xia Zhen, 1946.

⁶⁹¹ Lian Gong, 1946.

with the streets was passing by the temple one day. While looking for men's room, he accidentally invaded the area for women. He was shouted at by several middle-aged women and was accused of looking their way into the restroom more than once. It was thus suggested that some distance needed to be kept between men's and women's rooms to prevent moral corruption.⁶⁹²

In Shanghai, women's restroom was seen in cinemas, theaters, and ballrooms. They were usually delicately adorned. Female attendant, usually an elderly, was hired to keep the place clean. Dancing girls mistreated by their partners or customers came in to weep. They sometimes vent their frustration at the attendant by yelling at them.⁶⁹³ In places of pleasure, hygiene in the women's rooms were not so carefully maintained. Women were suggested against using these restrooms because it was believed that if they did not cover the toilet seats with paper, or if they sat on it for too long, they might be poisoned by the foul air and contract syphilis.⁶⁹⁴

Women's pursuit of their own public restroom started in the late 1920s. The first petition was seen in 1928 when the Department of Public Works of Jiangsu province requested permission from the government to build public restrooms for women in the street as a symbol of gender equality.⁶⁹⁵ The Department of Public Works was urged by the Women's Association in Jiangsu, headed by Mao Yanwen (毛彦文, 1898-1999), a liberal-minded young political leader. Mao was born in 1898 into a gentry-class family.

⁶⁹² "Guan ce yi nuo (fu tu)", 1908.

⁶⁹³ "Yinse tiaowu: cesuo chouyu", 1940.

⁶⁹⁴ Fang Bian, 1928.

⁶⁹⁵ "Ben hui xiaoxi", 1928.

She obtained her early education in various women's schools where she received modern education. After being transferred to Jinling Women's College, Mao was elected head of branch of feminist movement.⁶⁹⁶ In 1934, another petition was made to Zhejiang government. It was written by a group of women in Nanxun, a wealthy town known for its quality silk. It was pointed out that in the town of Nanxun, it was hard for women to use the latrines without running into men. Women running business and rural women who carried heavy weight would have nature calling when walking in the city. If they relieved themselves in the street, they would feel embarrassed, met with scolding, subject to sexual harassment. Therefore, it was necessary to build some restrooms for women only. In their signatures, this group of women called themselves "female citizens", showing kindred spirit in engaging modern politics.⁶⁹⁷ The reaction among ordinary men was not so friendly. On the one hand, there was the tightening budget. On the other hand, it was mockingly suggested that in the age of Republic of China, genders were equals. Even if a woman was being watched while she went, it would not hurt her in any way. In case a man acted indecently towards the women, he shall just be forced to drink a large cup of dog's urine.⁶⁹⁸

The regional governments, however, went along with the popular requests. In 1935, Nanjing, capital of the Republic of China, saw the erection of one of the earliest public restrooms for women. It was praised by the press as a kind gesture for people's well-being.⁶⁹⁹ In Fujian province, the government ordered that all passenger ships and cargo

⁶⁹⁶ Xia Chengbo, 1930.

⁶⁹⁷ Zhang and Gao, 1934.

⁶⁹⁸ Jie Ming, 1921.

⁶⁹⁹ "Minzheng sheshi: Nanjing shi gonggong nvcesuo", 1935.

ships of the capacity of twenty people and above be equipped with a bucket exclusively used by women in the back of the ships.⁷⁰⁰ The development of women's restroom in Shanghai was hard to track. But a change in the culture was still visible. By the end of WWII, it was obvious that that women needing their own restroom was generally accepted. In a news report that discussed the Japanese use of toilets in Shanghai, they were ridiculed by the press because the Japanese men and women allegedly used the same restroom. Women walked right into the stall after the man finished before her, with no sense of shame or embarrassment. They even looked at each other through the mirror when they were relieving themselves.⁷⁰¹

8.7.3 *Government's Overreach in the Restroom*

The third source of toilet humor came from making fun of the government's overreach. Restroom was a place where no activities of personal hygiene should be bothered. People took advantage of this character. Students at school went into the restroom to light up a cigarette on the sly. At midnight students gathered at the stinky yet well-lit restroom for the exciting game of gambling.⁷⁰² It was supposed to be exempted from surveillance and interference.

Since the beginning of Republic years, the sanitation of restroom had always been the issue that the government wanted to address. In 1912, the new government of Baoshan village attempted to buy out all privately-owned public restrooms and assigned them with one government-sponsored cleaner to maintain its cleanliness.⁷⁰³ After Chiang Kai-shek's

⁷⁰⁰ Bo Qiong, 1942.

⁷⁰¹ Bu Yan, 1946.

⁷⁰² "Ce shang hu lu", 1909; Li Guoqiao, 1933.

⁷⁰³ "Zhangcheng: Gailiang cesuo jianzhang", 1912.

expedition, government offered extremely detailed guidelines for building and maintaining public restrooms. In 1928, the Nanjing government started promoting the “Java latrine” as the standard, expedient restrooms. Java latrine was cheap and easy to build, with a hole of 12 in. × 20 ft. The collected filth needed to be dug out only once a year.⁷⁰⁴ During the New Life Movement, governments of various cities actively engaged in the business of restrooms. In Guangzhou, the government urged all private owners of restroom to register at the Bureau of Sanitation, otherwise their properties would be confiscated.⁷⁰⁵ The local government in Jiangxi province issued standardized blueprint for all future public restrooms.⁷⁰⁶ In Nanjing, the government intended to take over all the sub-standard restrooms in 1934.⁷⁰⁷

When a site of privacy was met with growing intervention, humor became the way to offset the authoritarian nature of regulations. People made fun of the extreme policies and pointed at the superficiality of those campaigns. A good example would be the following article that joked about a possible “restroom charter” for middle schools. The “charter” stated that the schools received a diminishing tuition from students due to the dull economy. Many students went to the restroom before coming to school so that nightsoil could be sold by their family. If the school needed additional revenue, they should set up a scheme that demanded students to go in the restrooms at school so that the school could capitalize on the nightsoil revenue. The “charter” assign nightstools to each student and would evaluate their performance based on the quantity and quality of their

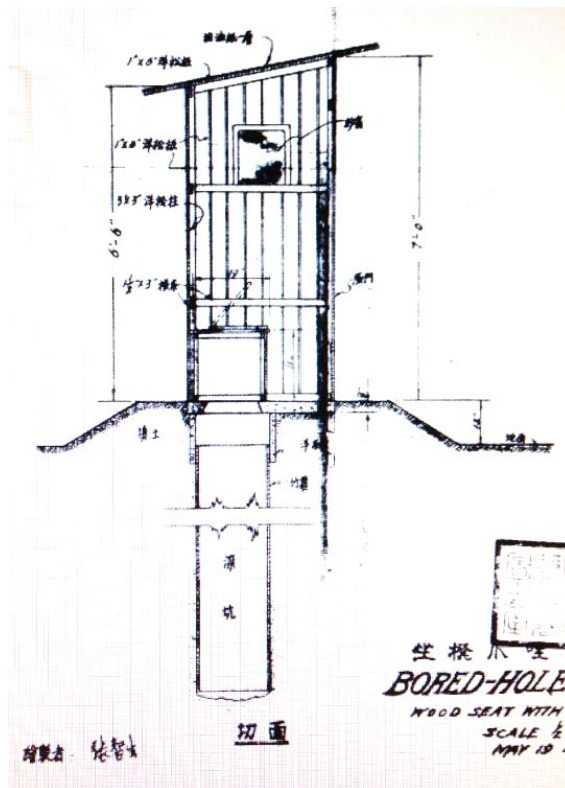
⁷⁰⁴ “Gongdu: gonghan”, 1928.

⁷⁰⁵ “Shier yuefen shi xingzheng jiyao”, 1932.

⁷⁰⁶ “Zhangze: Nanchang shi gonggong cesuo gaizao banfa”, 1934.

⁷⁰⁷ You Ji, 1935.

nightsoil.⁷⁰⁸ Another piece was seen in the magazine in 1939, stating that stocking among rice merchants was causing a spike in food price. Therefore, the best way to survive was to eat as little as possible. It was thus stipulated that one could only defecate once and urinate four times every five days. Special agent had been appointed to oversee this matter. Those who broke the rules would be liable to punishment.⁷⁰⁹ The presence of the New Life Movement and a series of attempts in regulating restrooms across the country might presented a seemingly strong authoritative power, yet the resistance from the bottom, in the form of humorous popular literature, suggested otherwise. The absurdity of the articles above was the lively demonstration of the contempt of overreach held by even the lowest rank of society.



⁷⁰⁸ Bing Ren, 1916.

⁷⁰⁹ KCH, 1939.

小便池

鑊門

便坑

隔板

腳架

附註

Figure 26 – Design for Public Restroom in Nanchang (2). Source: “Zhangze: Nanchang shi gonggong cesuo gaizao banfa”, 1934.

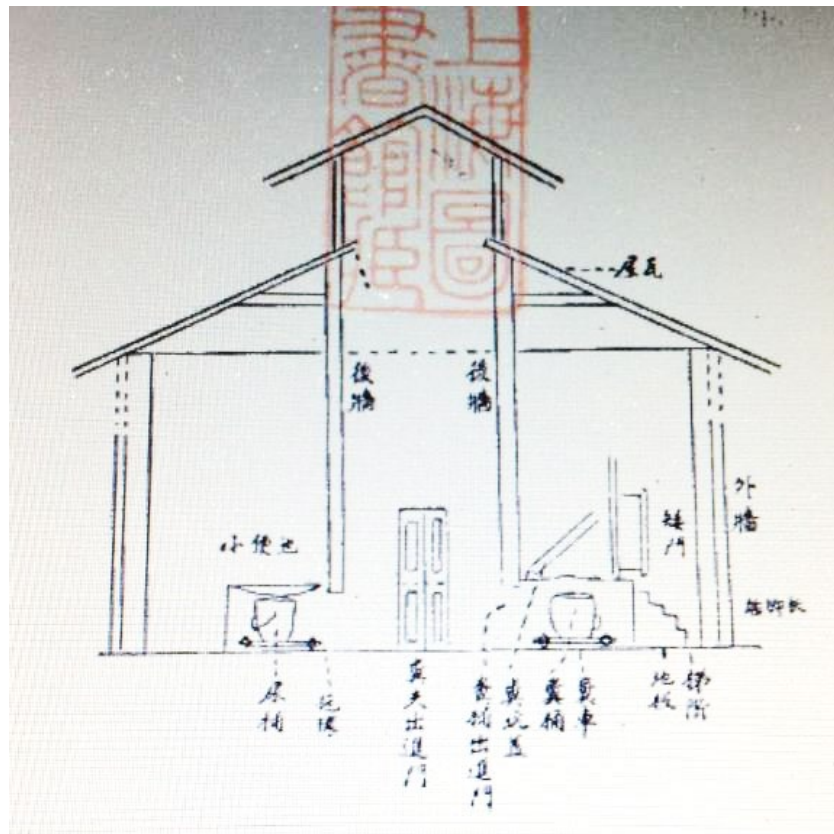


Figure 27 – Design for Public Restroom in Nanchang (3). Source: “Zhangze: Nanchang shi gonggong cesuo gaizao banfa”, 1934.

8.7.4 Toilet as the Symbol of Modernity

Finally, as water closets became prevalent, toilet became nearly an interchangeable term for modernity. On the one hand, it was the representation of a convenient yet luxurious life style. Attacks on the water closets were the attacks on urban modernity itself. This analog was used by conservatives who had doubts about the direction the country was going at. In an article published in 1934, the modern fixture and the water-carriage system were described as the “urban chemical pool”, whereas rural outdoor toilet that disposed

fecal matter into a lake for fish to eat was praised as natural and comfortable.⁷¹⁰ Even as late as in 1947, there were still voices heard about the superiority of traditional waste disposal. Flushing away the human excrement was believed to be wasteful. In contrast, in the town of Shaoxing, Zhejiang, there was pit latrines every five or ten steps of the way. “China sits on the cornerstone of agriculture,” it went, “Even at the capital, there were surrounding regions where fertilizers were preserved on site. What is bad about that? For us little people, what smell is there to complain about?”⁷¹¹

On the other hand, water closet could be new, non-traditional, and Western in style, but it remained the vessel that held excrement. It was thus the perfect metaphor for ostentatiousness. For example, Chinese students who received their education in the West and Japan were often mocked for their affection for flush toilet. They complained about China’s backwardness every time when they could not find a flush toilet nearby. An article published in 1936 called out the pretentious young people and argued that the best way to show one’s privilege was to help the less privileged. Their obsession would be much justified if they helped erect public restrooms with plumbing fixtures in shantytowns in Shanghai.⁷¹² Water closet was also used in political sarcasm that made fun of the corrupted government officials who pretended to be of integrity:

“Old-fashioned nightsoil bucket has all of its matter out in the open, and you can smell it. When people accuse it of corruption, the evidence is right there, just like the old-fashioned bureaucrats who declare themselves that ‘people everywhere enter officialdom to get rich.’ Nowadays, civil people use ‘flush toilet’. It holds waste matter but can be flushed away and hidden without a trace. It might look clean on the outside, but inside it is bottomless... I am not a fan of ‘flush toilet’. This is not in view of

⁷¹⁰ Sheng, 1934.

⁷¹¹ Cha Ke, 1947.

⁷¹² Dahua Lieshi, 1936.

preserving established culture, but because the old-fashioned buckets are plain, true, transparent and lovely... Don't pretend to be clean on the outside while being filthy on the inside. The truth will reveal itself when you take in too much and have the drain clogged.”⁷¹³

Water closet was not only used as a straw man of modernity, it was also used as an indicator of Shanghai's better quality of life compared to the rest of China. This aspect of water closet was highlighted when the wartime Nationalist government, based in the southwest hilly city Chongqing, sent their agents to work in Shanghai after the war against Japan was won. For example, when the Kuomintang branch in Shanghai was under reorganization, some party cadres were sent from inland provinces. These cadres had no experience living a comfortable city life in the past eight years of war. They had no knowledge of water closet. Some of them even used bamboo slat to wipe themselves clean after the relief. During their inspection in Shanghai, three cadres reportedly were so amazed by how clean water was inside the toilet bowl they stuck their heads into the bowl to see where the water came from. Some of them even mistaken the water closet as water fountain or reservoir. It was only after they were told about what water closet was for that they were embarrassed by their earlier reactions.⁷¹⁴

Not only did inland Chinese fail the litmus test of modernity, so were the Japanese during occupation time. After the Japanese went to war with the Western powers, they seized the buildings on the Bund that belonged to foreign banks. After 1945, these buildings were returned to their previous owners who only to find that toilets on all floors were filthy and broken. Many of the toilet seats were removed. The Chinese press ridiculed the barbaric habit of the Japanese, suggesting that the Japanese could only go when they in

⁷¹³ Le Jian, 1946.

⁷¹⁴ Jian Jizhe, 1946.

squat position. That was the reason why so many toilet bowls were destroyed. The Chinese press, drunk in pride and victory, called the Japanese style “cock on a rack”⁷¹⁵

Ironically, the prevalence of water closet and public restroom in popular literature did not mean that the majority of populace were able to enjoy the cleanliness and convenience. The shortage became even more acute when a great many of latrines were destroyed or went out of order during the war. It was said that every morning around 5 to 6 o’clock, one could almost certainly find a pile of dung on the side of the road.⁷¹⁶ People jokingly ran for city councilor on the promises of more public restrooms.⁷¹⁷ Some even presented radical ideas of urging those who have flush toilets at home to list their address in the newspaper and rent their facilities five minutes every day to the public.⁷¹⁸ With respect to the functioning restrooms, people needed to pay an exorbitant amount for entry, often in the name of toilet paper. A pack of toilet paper could cost 200 yuan, earning millions of dollars for the contractors.⁷¹⁹ For ordinary people in Shanghai, the modern life style remained symbolic.

8.8 Conclusion: Reskilling in Everyday Life

Entering the 1920s, Shanghai housed nearly three million people and a full set of urban water infrastructures – drainage, water supply, culvert, and water-carriage system in the making. The availability of these technologies tantalized authorities, Chinese and foreign, to impose sweeping public health measures, hoping that they would obtain better

⁷¹⁵ Bu Yan, 1946

⁷¹⁶ Yi Shimin, 1946.

⁷¹⁷ Yitan Xiaojiang, 1946.

⁷¹⁸ A Mao Di, 1946.

⁷¹⁹ “Xinwen Tiandi”, 1947.

results than their predecessors. Modern disease control did become more effective, whereas the results of sanitary campaigns launched for political purposes were debatable.

The Chapei waterworks scandal in 1926 was the first recorded water-borne epidemic in Shanghai. Chinese traditional pharmacists had long been dealing with cholera in their own effective ways, but dealing with *Vibrio cholerae* infested at the Chapei waterworks required a different set of skills. The creation of the Department of Health in 1926 and of the later National Quarantine Service was the embodiment of growing state intervention in public health matters. In the anti-cholera campaign in 1932, Wu Liande and the new government agencies played a critical role in coordinating disease control measures across districts. But coordination alone would not reduce the cases of cholera infection. Clean water delivered to the targeted population as the authorities requested was the key component. It was backed by the engineering prowess of the Shanghai Waterworks Company, which remained most critical to the success of the anti-cholera campaign.

The New Life Movement and the growing popularity of water closets in Shanghai were a pair of cases that demonstrated the boundaries of political influence in private, bodily matters. The former was a top-down social engineering that aimed at achieving uniformity across the society, operating with little help of water-related technologies, whereas the latter was a bottom-up assimilation into a technological system that was completely mundane, requiring little interference from state power. Eventually, the New Life Movement produced at most bland results, while water closet prevailed in gearing both discourse and reality about hygiene, gender, and space towards a framework that we are accustomed to today.

During the Golden Decade of the republic years, more Chinese were able to enjoy the convenience of water technologies. Tap water became ubiquitous, and so were the water closets, although to a lesser extent. They were consistently employed in disease control and various state-sponsored sanitary campaigns. The availability of water technologies revolutionized how impurity and cleanliness were perceived, identified, and managed. Shanghai witnessed the slow formation of a uniformed conceptualization of hygiene among urban inhabitants. While some of the changes could be attributed to policies and campaigns, among ordinary people it was in their daily interaction with these technologies that they began to give up the old customs willingly.

In his contention of modernity, Anthony Giddens discusses deskilling and reskilling in everyday life. He suggests that since modern social life is such a complex affair, there are many “filter-back” processes whereby technical knowledge, in one shape or another, is reappropriated by lay persons and routinely applied in the course of their day-to-day activities. The interaction is strongly influenced by experiences at access points.⁷²⁰ A lay person did not need to understand the chemistry behind the process of decomposition or the physics behind functioning pipelines to be able to “survive” in the early twentieth-century Shanghai. The spirit of these knowledge was packed in the form of machines and fixtures. When people flushed away their ordure, they did not think about the massive expert system behind it, or to which nation-state the system belonged to. People were relieved from their duty of emptying nightstools every early morning. However, knowing

⁷²⁰ Giddens, 144-145.

how to operate himself around a plumbing fixture needed a new set of skills. These skills were neither means of survival, nor of intellectual complexity.

On the users' end, using flush toilet did not require a prior knowledge in science and medicine. The expert system of water closet was designed to be of greatest convenience so that more people would use them. And the expert system behind water closet, once put in place, would only want to incorporate more people and household because it would be much costly for the industrial solution to be maintained if the installments were left unused or underused. The operation of the mechanical system of waste disposal was indeed mechanical, with little social forces at play. The perception of it, however, was not. A modern, up-to-date urbanite who agreed with the scientific ethos behind the expert systems would be fine around the system without actually knowing what they were and how they worked. The reliance on the systems was based on trust.

The trust here was different from the trust in tap water in Chapter 3. Trust in sewage system was not based on bodily experience, but based on internalization of the faith in specialists and a vague understanding of their expertise and the complication of the problem. This understanding was kept vague intentionally because the more one learned about the technical details, the more disturbing it tended to be. To facilitate the trust, all users needed to know was that the problem was too complicated for them. In this sense, people becoming bodily attuned to the waste disposal system was a dual process. On the one hand, it was driven bottom-up by the increasingly easy availability of access points – i.e. the prevalence of the new installments; on the other hand, it was driven by the ideology of modernity, which was not entirely imparted by the state, but picked up in day-to-day routines. Modernity only became ideology when it was convenient for urbanites to explain

away their ignorance of the expert systems and their willingness to relinquish control of such systems. The ideology hence was purposefully vague and encompassing so that it could incorporate as many aspects of life as it could. The uncertainty they felt about the systems was set off by the cultural superiority that they enjoyed when someone free from the control of these systems, a peasant from hinterland for example, crossed their path.

CHAPTER 9. CONCLUSION

Through his examination of the history of water supply in three American cities – Philadelphia, Boston, and Chicago - Carl Smith argues that a city is an “infrastructure of ideas.” It is a gathering of people, a layout of streets, an arrangement of buildings, and a collection of political, economic, and social institutions. Smith sees the infrastructure of ideas and the actual physical and social infrastructures as in a form of cocurrence. The former neither precedes nor follows the latter, but the two are inseparable.⁷²¹ However, I intend to focus my attention specifically on the engineering aspect of the history of Shanghai because for too long the figures who were most facilitative to the creation of water supply and sewage disposal in Shanghai had been left in the shadows.

My emphasis on engineering does not preclude a discussion of social relations. It would be hard to argue that engineering a nineteenth century city did not require an institutional setup that enabled the travel of knowledge and the moving of specialists. In the case of Shanghai, many foreign engineers and scientists contributed to the creation of city water system, including: Joseph Gibbs, John Clark, Edward Frankland, Charles Hawksley, Nicholas Hill, and Gilbert Fowler. Without a professionalized community of engineers, it would have been an insurmountable difficult for the British in the Far East to reach, consult, and contract the specialists from across the ocean. Foreign engineers in Shanghai went on to form their own association: the Engineering Society of Shanghai, a forum where local achievements were applauded and where recent development of knowhow were introduced and discussed. The infrastructure of knowledge, ideas, data, and

⁷²¹ Smith, 2.

technologies augmented by the British Empire was indispensable in the creation of water system in Shanghai.

That being said, applying Smith's argument to a Chinese city may not produce the same result. The reason is simple: a Chinese city had a much more limited record on the building of physical infrastructure than most Western cities. This shortage of material leads to a bias in investigation that disproportionately focuses on the social aspects of infrastructure and institutions – schools, hospitals, books, diaries, correspondence, scientific journals, translation, government institutions, labor market, pamphlets and posters, newspaper and its advertisement etc. Intellectuals, politicians, educators, and consumers take the center stage, while engineers, entrepreneurs, craftsmen, and others who build and engineer the city are dropped from the story. Ideas and social infrastructures for their transmission are deemed the deterministic factor in the process of change, whereas engineering works are seen either as a natural result of change of ideas, a manifestation of progress, or a backdrop of political and business activities. In the view of some, physical infrastructures were nothing but tools or manifestations of ideas, while modernity could be achieved through education, aspiration, scientific indoctrination, and social mobilization. However, I argue that this explanation is insufficient.

The concept of modernity in the context of early-twentieth-century China is closely associated with consumption. Karl Gerth suggests that the joint endeavor of the government and the market created a version of modernity for women that was considered authentic because it was not about keeping up with the Western-style fashion, but about nationalistic consumption, as practiced in Japan and the West. Gerth contends that the ideological desire for a wealthy and powerful state could be built among consumers

through the activities of consumption and spectacles of commodities. “Participants in the [state-sponsored exhibitionary] movement did not simply wait to recover sovereignty from the imperialist powers,” Gerth says, “rather, they began actively to construct it from below in the minds of Chinese consumers through these nationalized visual and physical spaces.”⁷²² Dong and Goldstein also look to the consumption of modern facilities in everyday life as an antidote to the false binary of modern-tradition. They use the concept of everydayness to frustrate the tendency to devolve into “moderner than thou” rhetorical assumptions and to situate the development of centralized urban development in particular contexts. Nevertheless, the collection of theses they provide examine how the Chinese reacted to everyday modernity – most of them were utilities – and how their perceptions of modernity changed over time. Little attention is given to the production of these goods and as to how these modern fixtures and installments became available there in the first place.⁷²³

Shanghai is an excellent site for the examination of modernist production because it is blessed with abundance of technical records thanks to the continuous and meticulous publication of *The North-China Herald*. By following the doings of engineers and entrepreneurs, we can recalibrate Smith’s contention in the context of China while separating the physical infrastructure from the social one, at least to certain extent. This chapter, therefore, casts a different mold for the term “modernity.” The technocratic-engineering systems are not the result or the expression of social construct. Rather, the

⁷²² Gerth, 306-308, 281.

⁷²³ Dong and Goldstein, 7-8.

systems alone, as well as the story of them coming into being, are worthy subjects of historical interrogation.

9.1 Modernity Revisited

This dissertation explores the history of city water technologies in Shanghai from the mid-nineteenth century to the early twentieth century and the ways these infrastructures – drainage system, water supply, culverted rivers, water closet, and water-carriage sewers – played a role in the shaping of the cityscape, economics, and politics of Shanghai. Chapters 2-5 discussed the engineering history of city water projects in Shanghai, each one discussing one component of the system – drainage, waterworks, culvert, and sewage treatment. Despite their status as the embodiment of state-of-the-art Western knowledge in science and medicine, it was the most mundane of concerns that facilitated their adoption in Shanghai. Accurate scientific reasoning did not have to predate the engineering of the city. Rather, engineering tended to be governed by its own logic, which was founded on practicality, multi-functionality, and cost-efficiency of the schemes.

Chapters 6-8 discussed the influence a variety of authorities intended to impose on the city water infrastructures and on the society, including the councils of the two foreign concessions, early Republic provinciality and entrepreneurs, and Chiang Kai-shek's Nationalist government. The systemic, centralized, legible physical nature of the infrastructures enticed politicians into a vision where the society was to be run in a similar way. All the authorities mentioned above made attempts to achieve sovereign control in their own ways over the water system and over the society in general. They succeeded to varying degrees through measures such as licensing, monitoring, legal battles, epidemic

control, and hygienic campaigns. Yet the most effective change came out of the growing prevalence of new fixtures and installments, which managed to revolutionize people's behaviors even in the most private social spaces.

To engage with mainstream theories of modernity, I apply Anthony Giddens's 1990 theoretical model to each chapter, making use of the following elements that I consider suitable for the story of this research: expertise, globalization, reflexivity of modernity, expert system, trust, nation-state, and reskilling in everyday life. These terms sometimes point to emerging new actors and phenomena in the society, but as I have elaborated at the end of each chapter, the reality of late nineteenth century often infuses these words of the 1990s with new meaning, or in some cases, questions their general validity. By connecting these dots, I am able to retell the story within the conventional theoretical framework of modernity while highlighting the variation and multiplicity of specificities of the past that the day-to-day use of the word "modernity" cannot currently afford to bear.

As the British settlement developed in Shanghai, expertise of engineers went on to become the most important ingredient in keeping the booming town in order. The knowledge of lay persons saw its limit in envisioning and constructing a drainage system suitable for Shanghai's extreme geography. But such division in intellectuality did not mean the instant creation of an abstract system of knowledge and information that could impact to the local from afar. In the story of engineering works of the late nineteenth century, globalization meant an established shipping network through which the movement of machines became easier and faster. However, the local knowledge acquired by engineers on the ground remained critical in the successful implantation of technology. Shanghai Waterworks Company's scheme worked because of the company's successful recruitment

of an engineer who was willing to spend his time studying Shanghai. At the same time, the municipal scheme failed through because they were unable to recruit someone of their own to study in China. In the case of culverting the Yangkingpang, we again saw the weakness of the primitive global knowledge regime that had yet institutionalized their clutches in areas beyond the Western world. Germ theory, miasma theory, and everything else in between were still in competition with one another in Shanghai, decades after the dispute was virtually settled in Europe. Even when the decision of culverting was made in 1914, it was not because of an improved understanding of medicine. Rather, it was for practical need of a wider road. This reflexivity did not happen within the academic, disciplinary boundary. Rather, the intellectual progression was driven by pressure arising from the increasingly complicated local conditions in an increasingly large city.

When an expert system like sewage disposal in Shanghai became so inclusive that heterogeneous types of knowledge like chemistry, microbiology, physics, mechanical engineering, and industrial design were combined into one establishment, the knowledge of these works had to become increasingly abstract so that it could remain legible to lay persons and experts alike. Trust in such a system in the 1920s was based on the awareness that these new, unfamiliar constructions, not directly visible to most, were the result of institutionalized knowledge. People trusted the sewage disposal system not because they understood it or they could see it, but because of the exact opposite. In comparison to the sewage disposal system, the 1880s implementation of tap water happened in another context of interaction. Being able to distinguish the better water did not require any intellectual abilities. Neither did being financially capable of purchasing the better water. Shanghai natives staring drinking tap water was a process of bodily adjustment, facilitated

by financial incentives provided by the Shanghai Waterworks Company and, to a lesser extent, institutional guarantees from the Municipal Council who combined tax collecting and water subscription service into one.

Although the conventional narrative looks to nation-state as the primary unit of action due to its unprecedented capability of mobilizing resources, the political struggle between the Chinese and foreigners in Shanghai showed that on the ground it was not simply the nation-state but a multitude of institutions vying for supremacy: entrepreneurs, magistrates, tenants, property owners, soldiers and police, politicians, party, grass-root associations, etc. The competition was about larger institutional organization and farther-reaching influence so that the business interests generated by the water infrastructures could be better secured. In such situations, the nation-state could well be involved, but it could also stay aside if the corporation's institutional being was robust on its own.

Finally, there was one additional actor historians tend to forget: the things themselves. Change could happen when top-down forces took action in epidemic control, such as the 1932 anti-cholera campaign and in mass mobilization such as the New Life Movement, but change could be more effectively induced when people's behavior was disciplined not by authorities but by things – fixtures, devices, hardware, etc. Social engineering of the New Life Movement fell short of its goal because while state employed great manpower in policing and disciplining unhygienic behaviors and customs, the government did not build enough hydrants, latrines, food stations, and hospitals for the public to use. In contrast, the growing prevalence of flush toilet during WWII managed to bring visible changes in people's behaviors and in their perception of these behaviors. They were not obliged to act by the rules in seclusion, but they did nonetheless. People were

reskilled through the consistent interaction at the access points and acquired new meanings to make sense of these adaptations.

As helpless consumers, people in Shanghai restructured their relinquished control over expert systems into a term that projected sense of superiority towards the others – those who were equally ignorant about the inner working of the technocratic-engineering systems as they were, but were not reskilled enough to culturally adapt to the new material setting. Modernity as ideology, therefore, was not an aspiration for average consumers. It was a capitulation.

9.2 Hydraulic Modernity Revisited

We have hereby revealed the duality of the term modernity. From an engineering perspective, it means progression of expertise, characterized by vast engineering systems and the delicate interconnection between them. From the viewpoint of consumers, it means cultural adaptation to new sets of code of conduct, hygienic behaviors being one of them, and the sense of superiority built on and assured by the trust in numerous expert systems, or by the ignorance of them. The former version of modernity is tangible, grounded by local conditions, embedded in concrete geographical and geological context. It only became abstract and ideological when the systems grew to such extent that it brought a significant chunk of population into subscription or interaction, and when bodily adjustment was accepted as the new norm. Previous scholarship has overwhelmingly focused on the latter. To assume that consumers enjoying modern life styles is the same as engineers pioneering innovative techniques is to turn a blind eye to the heterogeneous nature within the concept of modernity and the social context, distinct from each other,

within which various actors operated. Conflating the two aspects by force can only result in a reductive version of modernity, which may be good at describing development, but not at explaining why the development happened and why it happened the way they did. One would probably be told that things happened because of the aspiration of modernity, not because of the acts that comprise it. To break away from this closed cycle of reasoning, we need better terms to further break down the components behind advancements in engineering, medicine, and the progression of people's behavior and values. This dissertation aims to address the first half of these inquiries through what I will term 'hydraulic modernity.'

Hydraulic modernity refers to the process in which practical aspects of the technocratic-engineering system of city water – like scale, physicality, and financial sustainability – dictate the pattern of engineering works and consequently impact the way government and markets are organized. The rules of how technocratic-engineering systems operate are rooted in the materiality and practicality of the system, rather than being imposed from the outside by intellectuals or politicians. The “things” – works, pipes, fixtures, and stations – lay the groundwork and set the rules for government intervention. Only within the spatial and economic limits allowed by the engineering feasibility can the authorities have its political influence materialized.

My argument traces the development of hygienic modernity by measuring two criteria: capacity and homogeneity. The former is the indicator of maximum output of an engineering system and the latter refers to reduction of the number of heterogeneous interest groups inside a technocratic-engineering system, done in order to lower the risk of malfunction. Using these two criteria offers at least three advantages in the discussion of

history of technologies. First, the word modernity ceases to implicate an inaccurate demarcation in time that separates the modern from the pre-modern. Second, it provides a clearer picture of how the patterns of superstructures are subject to the mechanical features of engineering works. Finally, it refutes the simplified argument that the nation-state was “the owner” of technologies and restores the social and technical complication in the diffusion and the assimilation of technology.

9.2.1 Capacity

Hydraulic modernity is about maximizing the capacity of an engineering system without exhausting the environment. This pertains to both the mechanized and the manual parts of the system. Previous scholarship often speaks highly of the innovation that the West brought to China, but the reality is that the traditional Chinese practices remained vibrant and reliable throughout the century of technological revolution. The old and new ways of doing things coexisted. This is best shown in the case of nightsoil management in Shanghai. Even before the construction of a water-carriage sewer system, Shanghai experienced fewer outbreaks of cholera and typhoid comparing to cities of similar latitude. The careful collection of human-generated waste as fertilizer must have helped by reducing the effluent pouring into the adjacent rivers. While an increasing number of flush toilets were installed in marble-faced buildings in the Central District, the system of municipal contractor and nightsoil coolies was still largely in place in Shanghai. Manual labor was especially needed in emptying the cesspools and septic tanks in areas where vacuum wagons had little financial incentive to go.

The manual system was cheap and eco-friendly, nevertheless it could only handle a limited amount of waste matter before the system reached its limit. This was indicated by severe river pollution since the 1910s. As was shown in the debate of culverting the Yangkingpang, more cases were spotted and reported to the authorities, in which nightsoil coolies failed to fulfill their duties to remove the ordure and appeared to be dumping their buckets of waste into various water bodies. The situation became even more acute when the use of flush toilet added voluminous unwanted water to the ordure, making them undesirable to the peasants. The system ran into a technical deadlock that it could not resolve without outside intervention. In comparison, the water-carriage system could deal with a significantly larger amount of waste matter. This, however, did not mean the “modern” system was innately better with respect to public health. A water closet without a proper receptacle was no less of a danger than an outhouse unattended. Without treatment plants built in proper locations, the water-carriage system would easily stress the environment. The advantage of the mechanized system was not its ‘modernity’ but its larger capacity, given the permit of economics, technologies, and environment.

Hydraulic modernity is thus not situated on the linear timeline of technological progression. It is a metric on which a combination of systems, labor-intensive and/or labor-saving, are measured in their capacity of completing their designated tasks. This capacity does not answer to political will, but to the pressure of overpopulation and to the extent of environmental stress that the surroundings of the city can bear. In this sense, to declare China as being pre-modern compared to the West is misleading and unfair. Shanghai at its size in the mid-nineteenth century did not need a mechanized system. The capacity of the old system was well above what was needed. This is proven by the water samples the

Municipal Council sent to London in the 1870s when the commencement of waterworks was underway, all of which were free of sewage matter. In fact, Western cities around the same time were employing labor-intensive systems of waste removal as well. The City of New York in the early nineteenth century was still dependent on manure sales to maintain the cleanliness in the streets.⁷²⁴ In London, sewage was not defined as pollution until 1834 when a parliamentary select committee on metropolitan improvements used it to refer to specifically to household cesspool discharges and street runoff. Until then, a sewer was considered more like a drainage ditch than an underground pipe.⁷²⁵ No city was born modern. It only became modern when it had to.

Another expression of capacity is multi-functionality of a system. If a technocratic-engineering system can fulfill more than one task without compromising its assigned specialty, it is certainly preferable. A good example would be the fate of the earth closet, a scheme for waste removal that relied on removable buckets to promote cleanliness. When the idea of earth closet was introduced to Shanghai, it was also gaining popularity in rural America and in some big American cities. In the 1870s, officials in Washington D.C. and Savannah investigated earth-based disposal system which would include a private company in charge of supplying and removing the buckets as needed. The renowned sanitarian George E. Waring Jr. purchased an interest in Henry Moule's patent of earth closet and tirelessly promoted its usage in rural regions as a generator of fertilizer. Maureen Ogle argued that this enthusiasm waned because America of the 1870s had a deeply embedded belief in progress. Few sanitarians expected Americans to abandon technologies

⁷²⁴ From February 1803 to February 1804, the city sold manure for £6066.6, whereas the carting and cleaning the waste only cost £3584.16. See Goldman, 25.

⁷²⁵ Porter, 54.

that embodied modernity in favor of old-fashioned arrangements like the earth closet.⁷²⁶ I would argue that regardless of the belief in progress, the earth closet was bound to fall out of favor because the water-carriage system was part of a better multifunctionality.

Water supply provided by mechanized waterworks was multi-functional. As is shown in the case of Shanghai, pressurized water could be used in extinguishing fire, delivering potable water, scouring drains, even dispersing an angry mob in the street. Flushing away ordure in a second was merely one of its many functions. In contrast, the earth closet system was designed for a single task. The prevalence of the water-carriage system was not a result of ideological context of the academic universe, but a natural outcome based on practical calculations. This kind of calculation does not require the parties involved to be equipped with a set of abstract values historically built in the Western civilization. The wisdom is programed in human nature. Even at the height of its popularity, the earth closet did not gain ground in Shanghai, but the water closet did. Some systems won out not because they were labeled as modern, but because they did more things and made more economic sense than others.

9.2.2 *Homogeneity*

As for the social implication of water engineering, hydraulic modernity was about streamlining the operation of water infrastructures, i.e. the reduction of actors involved in the process. It was, in other words, about homogeneity. Homogeneity in many cases leads to an increase in the capacity of the system, but the purpose of homogenizing the process

⁷²⁶ Ogle, 127-128

is not about boosting the output, rather it was to make the risks of malfunction predictable and manageable.

In the case of Shanghai, we witness the growing presence of the Municipal Health Officer. During the years 1881 and 1882, when pipe laying was under way, the Health Officer was powerful enough to halt the work for months based on sanitary concerns. This could be easily mistaken as a sign of political authority over the engineering work. The truth is that the Health Officer's power was greatly boosted due to the fact that the construction was carried out by a single company, the Shanghai Waterworks Company. Some thirty years prior to the founding of the company, pipe-laying and drain-building was performed by native labors under the employment of individual landowners. The Municipal Council simply could not bring these actions under their control even with rules written in the Land Regulation. The increasingly influential public health regime in Shanghai relied on the reality that the system building had become centralized and that there were fewer random individual actors that the Health Officer and the Municipal Council needed to engage. In the following years, the job of Health Officer became more manageable, especially when Arthur Stanley assumed the title. While Stanley's endeavor in standardizing the public health policies and procedures should not be understated, it is also fair to say that his job would be much more challenging if hundreds of household, including various hospitals and nursing homes, received their water from coolies instead of from a single waterworks company.

Another example would be British India, where the appearance of sewerage system in Bombay and Calcutta showed up even earlier than in American cities. These infrastructures had been serving the European quarters of the cities already through the

1860s, but the long tradition of organized religion created a special form of heterogeneity within the society. According to Hinduism, the Ganges River had fallen from the sky when Vishnu Purana washed away the dirt and sins by her touch. Releasing sewage into the Ganges was culturally far more upsetting to the Indians than polluting the Yangkingpang was to Shanghai natives. In Calcutta, the European businessmen found septic tanks a desirable solution to the issue of refuse in their increasingly crowded factories. But when septic tanks released the treated water into the Ganges, the natives saw it as a serious religious offense. The Septic Tank Committee of Calcutta had to consult scholars and pundits on the scripts for a religious explanation as to why the treated effluent would not ruin to the Ganges.⁷²⁷ Taken at face value, this example seems to suggest that religious tradition overwhelmed urban development. Yet the compromises were not made at the expense of the waste removal system, but that the religious ideas needed to be reorganized in a way that fit the practical needs of the populace. The usage of septic tanks could not be displaced because the need of these fixtures at overpopulated factories was absolute. Homogenizing thus did not take place by abandoning necessary engineering arrangements, but that religious disagreement had to conform to practical concerns.

The real struggle with homogeneity did not come from outside the system. The interest groups stemming from inside always posed a bigger challenge. For example, in exploring the Mombasa water-supply project, Justin Willis argues that the British officials had to form an alliance with the African “big men on the spot” so that state power could take charge to bring policies into being in spite of the political frictions.⁷²⁸ David Mosse

⁷²⁷ Wilhelm, 6-7, 125-132

⁷²⁸ Willis, 1995.

presents a similar case in south India with the history of irrigation when engineers were changing the way water flowed and creating new interest groups. In this case, state power did not present itself as a uniformed political force. Rather, the conceptualization of water rights originated from chaos after several arbitrary court judgements. In order to ensure their own rules, the British authorities needed to help elect those who favored their rule. The rationalized system of governance that resulted was not imposed from the top. Rather, the system arose out of this hybrid of agencies amidst the practices on the ground.⁷²⁹

Homogeneity is not the result of political will alone. This idea of utility of the people, by the people, for the people was not new. In the early twentieth-century America, the ownership of waterworks was already linked to the public's collective character and integrity. But Puritan teaching in condemning the evil nature of an economy in which individuals did not have to look out for each other did not prevent the formation of a private company that took charge of the business of water supply in Boston.⁷³⁰ To make public spirit a reality, engineering prowess is a must. In its early years, the communists in Shanghai took over the entire system of water and waste and established a fairer way of distributing fresh water with state-issued tickets, and accelerated the process of culverting dirty waterways that had plagued neighborhoods for decades. While political will was critical in the execution of these policies, it was the existing systems built over the years by a variety of authorities that made centralization in the 1950s possible. Without them, homogeneity imposed by statecraft is meaningless, sometimes even counterproductive.

⁷²⁹ Mosses, 2006.

⁷³⁰ Smith, 65-66

The Maoist regime learned the hard way in the following decades when projects of collectivization failed one after another as they went beyond the permit of engineering.

9.3 Beyond the Reach of State

Controlling individuals' habits and behavior is a tough challenge for any state. Nationalists had many ideas about how to build the best privy, yet the authority was somehow powerless in preventing promiscuous defecating (Figure 28). Similarly, the American sanitary regime in the Philippines might have been able to collect plenty of information on diet and nutrient through the feces of natives, but their intervention into the native's bodily disposition was only mildly successful.⁷³¹ In the space of seclusion, conformity to the modern code of conducts was especially weak. The lukewarm results of the New Life Movement proved the ineffectiveness of inculcation, even with propaganda machine at its full force. How, then, did the change of hygiene behavior happen, and why?

I argue that the notion of localization of technology forced this change in behavior. Bodies are no more than another place where technology travels. Thus, localization has two features. First, behavioral change is induced through constant interaction with the engineering system at the access point. Technologies cannot be localized if the accessibility of the material embodiment of them is inadequate. Second, habits take time to form. As the water supply in Shanghai took years to be integrated as a taken-for-granted part of social life, body re-engineering toward flush toilets as the only acceptable cultural norm took even longer.

⁷³¹ Anderson, 1995.



Figure 28 – Promiscuous defecation during the Republic. The cartoon is titled “Where is the bathroom?” and depicts the difficulty in enforcing rules to eliminate the unsanitary practices. It also reflects the acute shortage of public restrooms.

Source: Bao Sheng, 1941.

Localization of technology is designed to refute the conventional notion that technologies travel between countries or nations. Indeed, localization entails a movement of and internalization of know-how. This movement, however, does not go between nation-states or civilizations. When the water tower was inaugurated in Shanghai, the monument drew a crowd (Figure 29). This surely can be interpreted as a cultural shock among the Chinese, but similar fanfare took place in the West too. When a pumping station and water tower were completed in Chicago, Americans were amazed by its cream-colored limestone façade and its appearance of a medieval fortress. This was also true of the pump station in Philadelphia. The square in front of it, decorated by a pine statue of the Water Nymph and

Bittern, immediately became the favorite gathering spot of the wealthy.⁷³² In New York City, the Croton Reservoir embodied the city's mid-nineteenth-century aspirations to cosmopolitanism. In the painting by Augustus Fay, the Reservoir sat in between the rural area where brick houses were in the near and the growing urban architecture inched towards the Reservoir from afar.⁷³³ If engineering caused a “cultural shock” that only took place between the West and China, then none of the above should have happened.

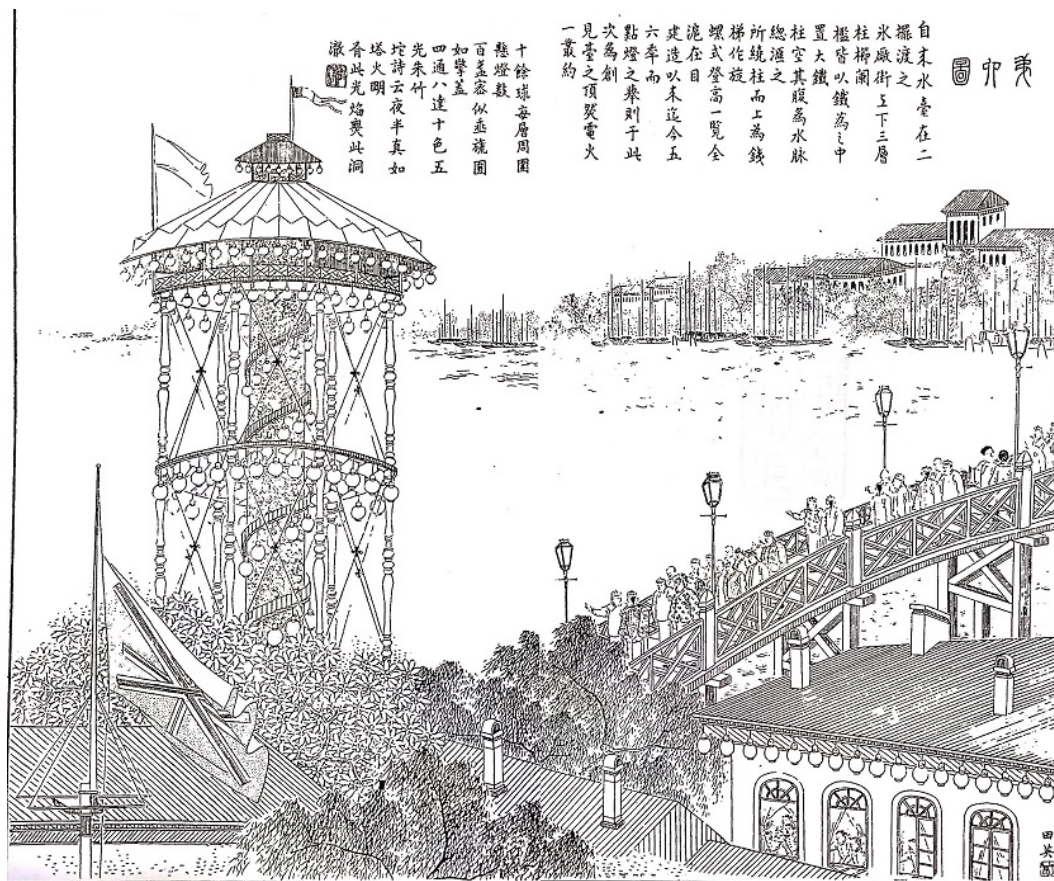


Figure 29 – The opening of water tower. Source: Tian Ying, 1887.

⁷³² Smith, 47-48, 71-73.

⁷³³ Soll, 29-30.

The point of celebration in these examples was not the nationality of the technologies, but the technology itself. Technology embodies the presence of know-how and attracts public interest just as any artwork would do. In the same vein, a technology does not become localized because it ceases to be alien, it becomes localized because it loses its aura of novelty and became internalized as one of the countless engagements with things in a day. In today's Shanghai, a sizeable portion of population still live in areas where nightstools are common. This is largely due to the fact that their neighborhood was not profitable enough to be piped in colonial days. However, it is unlikely that there will be a debate today about the sanitary benefits of water closets. Few urban Chinese today find it okay to defecate in the street, not because they are told not to, but because the omnipresence of plumbing fixtures generates a network of rules for behavior. Defecating in the street no longer implicates a shortage of devices, but a lack of knowledge of the existence of these devices. The variety of scientific explanations and social interpretations regarding this device has gone extinct over the years and the cultural universe of toilet collapses into one single trajectory of progress that points to the full replacement of nightstools. It has become irrelevant that the water closet was a Western invention; average Chinese people today no longer think about that fact.

9.4 Conclusion: Modernity as a Western Project

In his work on the embankment of the Thames, Dale H. Porter contends that cleanliness is in the eyes of the beholder, and there is a difference between the dismal levels of sanitation and public health that historians perceive in hindsight and how most

contemporaries perceived them.⁷³⁴ This thesis endeavors to recover technological and scientific understandings of the environment during the nineteenth and the early twentieth century so that we can contextualize and make sense of the choice of technology the people made in the moment. Technology transfer from the West to Shanghai did not lead to immediate displacement of old practices because the new and the old each had their own merit in the given economic and geographical circumstances. This approach is thus able to restore the complexity of engineering process by bringing practical concerns and material constraints into the discussion. It also avoids a teleological summary of why the society progressed the way it did.

My work reveals a variety of curious decisions made by the British in Shanghai. These decisions took place in a technical and social context that may no longer make sense to us today. The fact that the early British struggled with building a drainage system with a proper gradient, that the Chinese drains worked better in the rivery land of Shanghai, that the waterworks was built for flushing the defective drains, and that the British still believed in the miasmatic cause of cholera in the 1910s all point to the reality that the colonial rule did not bring a totalizing modernity. The British, although fluent in engineering know-how, were not versed from the beginning in its application to a specific locale. In the early era of modernity in the late nineteenth century, space should not and cannot be cancelled, especially when the technologies being relocated were still in primitive stage.

Shanghai was endowed with the advanced machineries imported from the British Isles. The shipping of machineries was one-sided, but the Chinese metropolis was an

⁷³⁴ Porter, 55.

important site of knowledge development, on par with London, Glasgow, Calcutta, and Mombasa, where new engineering know-how arose from geographically specific localities and medical theories competed with each other to enter the circulation of scientific ideas. In his investigation into the history of gravitation schemes of water supply across the British Empire, John Broich points out that projects of water supply were undertaken simultaneously in Britain and in its colonies. The transformation of urban life was replicated in Britain and the empire and often by the very same individuals and on the same grounds of sanitary and moral theory. The practical challenges engineers were facing and the reformative social effect by the environmental solutions were nearly identical. “Therefore,” writes Broich, “Bombay and Manchester were ‘colonized’ in the same way”.⁷³⁵

Nevertheless, it would be futile to discredit the influence and contribution of the Westerners in Shanghai in the making of a modern city. Engineering projects in Shanghai were made possible by techniques in machinery, long-distance shipment, institutional connections between the core and the periphery (albeit primitive), and transcontinental business networks, all of which were creations of the West and had no parallel elsewhere in the world. Anthony Giddens points at two distinct organizational complexes of particular significance in the development of modernity: the nation-state and systematic capitalist production. Both have roots in specific characteristics of European history.⁷³⁶ We have solved the myth about the nation-state as the primary actor in the international exchange by illustrating a variety of organizations coordinating with one another so as to reach the

⁷³⁵ Broich, 2007.

⁷³⁶ Giddens, 174-175.

maximum institutional capacity. As its replacement came corporations and their engineers, which enabled the movement of technologies around the world, funneled millions of sterling pounds in from Britain, adapted to the institutional settings in Shanghai, and fought back when their interests were at risk. The corporations too were the creations of the West. Reassessing the role of the nation-state in the historical discourse of colonial Shanghai does not mean that the Chinese in Shanghai would develop in the same direction and to the same level without intervention from or engagement with the West. It just means that instead of framing the process of modernity as a clash between civilizations, we need to pay more attention to the actors – people, group, and things – who brought about meaningful changes, be it in the British Isles, in the tropical South Asia, or on the coast of China.

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