CITY OF THE RIVER: THE HAI RIVER AND THE CONSTRUCTION OF TIANJIN, 1897-1948

By
AI WANG

A dissertation/thesis submitted in partial fulfillment of the requirements for the degree of

DOCTOR OF PHILOSOPHY

WASHINGTON STATE UNIVERSITY
Department of History

AUGUST 2014

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To the Faculty of Washington State University:

The members of the Committee appointed to examine the dissertation/thesis of AI WANG find it satisfactory and recommend that it be accepted.

___________________________________
David A. Pietz, Ph.D., Chair

___________________________________
Jeffrey C. Sanders, Ph.D.

___________________________________
Heather Streets-Salter, Ph.D.
ACKNOWLEDGMENTS

This dissertation owes a special great debt of gratitude to my advisor David A. Pietz. I readily embraced his invaluable knowledge to advance my study, support my life, and gain encouragement for my career. Without his help, studying Chinese Environmental History would not have been possible. I also want to express my immense thankfulness to Jeffrey C. Sanders and Heather Streets-Salter who inspired me with their expertise, warmth, and dedication to both Environmental History and World History study. Their assistance and knowledge accompanied me on my amazing graduate journey at Washington State University.

This dissertation was financially supported by a doctoral fellowship from the Chiang Ching-kuo Foundation for the International Scholarly Exchange. This fellowship allowed me to travel between Pullman and Tianjin and made my one-year search of multiple historical records for hints and clues and copying many documents at the Tianjin Municipal Archive and Tianjin Library both affordable and enjoyable.


Last, I thank my parents for their always unselfish love and Xiao Qin, who has supported me all through these years and drew all the maps for the final manuscript.
This dissertation explores the modern transformation of the Hai River by the Haiho Conservancy Commission from 1897 when the Commission emerged to 1948 when the Commission became loosely controlled by the Guomindang. Thematically, this research documents the changes to the Hai River and its tributaries and the construction of the city of Tianjin and its waterfront in the modern era. It pays equal attention to the cultural aspects involved, as the river, city, and its people interacted in ways that constructed multiple meanings and new values. The undertaking argues that transforming the Hai River into a navigable river for modern transportation and communication played a critical and dynamic role in building a modern vibrant city.

The discussion begins with the vision that the governors in the Qing Dynasty had for constructing an agrarian state with an emphasis on a water conservancy-irrigation project near the city. It examines the State’s involvement in enhancing the cultural meanings of the river through allowing folk religious practices on the waterfront. It then delineates the major shift from the Qing management of
water and the river to the series of physical transformations of the Hai River launched by foreign engineers in the Haiho Conservancy Commission and their Imperialist determination to make the city into a modern harbor for commercial businesses.

During the lengthy process of change of the natural surroundings, Chinese conservancy commissions also participated in forming and shaping water management policies. The Chinese strengthened its state power by conservancy commission and thus delivered greater influence and incorporated the Hai River tributaries into its own planned economic construction of a state. The river and the city were further transformed by the Japanese. A gigantic Japanese colonialist scheme focused on constructing a comprehensive transportation system in North China, resulting in further changes to both the river and its city.
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NOTES ON UNITS OF MEASUREMENTS

The units of measurements were used differently in the Qing Dynasty (1644-1912) and the Republic of China (1912-1949). The following conversions from Chinese measurements into the metric values show only approximations.

Length units

1 li = 576 m
1 zhang = 3.2 m
1 chi = 0.32 m

Weight Units

1 shi (picul) = 100 jin (catties) = 50 kg

Capacity Units

1 sheng = 1000 ml

Volume Units

1 fang = 1 m³

Area Units

1 mu = 614.4 m²
1 qing = 100 mu = 61440 m²

Counting Units

1 gross = 144 items
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Dedication

This dissertation is dedicated to my parents and Qin
INTRODUCTION

The Making of a River and its City in the Modern Era

In the volume of essays edited by Donald Worster in 1990, environmental historians proposed a diversity of ideas concerning the changes in the relationship between humans and their natural environment. Subsequently, the visionary notion of adding cultural dimensions of change to the categories of environmental history proposed by practitioners such as William Cronon, Richard White, and Carolyn Merchant significantly modified Worster’s framework. The ‘cultural turn’ in environmental history incorporated natural history, material production and its impacts on nature, and cognition of nature as perceived by human beings.¹ Cronon criticized Worster’s model as “excessive materialism” and believed that the lens of capitalist mode of production is too narrow to reveal a comprehensive understanding of ecosystems.² It is equally important for environmental historians to study “the broader cultural systems in which they [ecosystems] are embedded.”³ Richard White also argued that “the role of value judgments and beliefs” is essential to articulate the relationship between humans and nature. White’s understanding of the cultural manifest of nature is well presented in his work that depicts differing modes of interaction between Europeans and Native American in the Great Lakes region and Washington State.⁴ Carolyn Merchant also compared differences of conceptions and ideologies implicated in nature recovery narratives. She presents how Enlightenment ideas of progress, buttressed by a complex of Christian, Greco-Roman, and Enlightenment ideas, have been reflected in the transformation of nature in the New World.⁵

Extending the study of the cultural construct of nature to China, which has a long
history of human-nature interaction, produces a rich and complex study that foregrounds differences and similarities. Chinese water control and urban planning experts explained the rivers and lakes as vessels in which the blood and \( qi \) circulate.\(^6\) The interpretation and understanding of the environment through the metaphor of the human body had been established over time. Chinese water managers equated water-related events such as floods, waterlogging, and drought with diseases of the human body. The flood control expert for the Kangxi Emperor (r.1662-1722), Yu Qing, made the comment that “Waterways are similar with blood and \( qi \). They become diseased when they are blocked. They are healthy when they are dredged.”\(^7\) In the Guomindang era (1928-1948), the well-known engineer Li Yizhi also explained his management philosophies and flood control guidelines by comparing water with the circulation of blood and \( qi \) in the human body.\(^8\) The use of the human body as metaphor for the manifestations of water indicates that China had a long tradition of viewing water, and other elements of the natural world, as serving the productive pursuits, namely agricultural, of its human communities.

One critical feature that differentiates Chinese culture from that of indigenous populations of North America is that China had a centralized state power that guided human interaction with the natural environment. The imperial state became the organizer, designer, and creator in the process of transforming nature. Water control management is a good example. Chinese Confucian texts equate the competence, and ultimately ruling legitimacy, of the emperor with order in the natural world. The legendary emperor \( Yu \), used his determination to reach the ultimate goal of creating a peaceful and harmonious co-existence and interaction between earth, heaven and humans after he was challenged by a disastrous
flood on the ancient North China Plain. Yu was described as a diligent, determined, and mysterious leader who finally harnessed the Yellow River. The first imperial compilations of shuili (flood control, or water conservancy) or Yu’s book Yugong, was believed by Confucian scholars to be the sage words from Yu. In the early stories to describe human interaction with the natural system, Yu became a hero and an exemplary emperor for his imperial followers.

The power to transform nature was manipulated by rulers who considered controlling rivers the moral equivalent of ruling the state. The Qing rulers created an agriculture-based society by means of water control. The massive constructions of diversion canals and canals were used to support expansion of agricultural production. The transformation of the lowland landscape through hydraulic engineering reveals “the Chinese search for power.” Water management and control can be a window to see the infiltration of state into the society. As an example, state power has been examined in David Pietz’s work on Huai River engineering, and the impact of Nationalist China’s management of water at the local and regional levels. Pietz argues against Karl A. Wittfogel’s “oriental despotism” which asserted that only the despotic power of state had the power for large-scale hydraulic management. On the contrary, Pietz indicates that water management on the Huai River was one mechanism by which the Nationalist state sought to centralize its power.

Borrowing ideas from this scholarship on environmental history, this dissertation chooses a perspective of analysis on environmental, political, social and economic change of a Chinese city by examining urban history through the lens of environmental history. To show the changing relationships between humans and nature, namely the city of Tianjin and the Hai River over time, it attempts to produce an environmental historical interpretation of natural
change in an urban setting - where an urban river is usually seen as an appendage entangled with the human industrial artifacts of skyscrapers, bridges, roads and streets. To explain the mutually conditioning influences of river and city, this dissertation examines three dimensions of relationship.

The first relationship refers to the dynamic interaction between people and the river. In the setting of a Chinese coastal city that experienced dramatic historical change in the late Nineteenth and early Twentieth Centuries, what people witnessed in the natural surrounding was a product of how they transformed nature to accommodate a particular political-economic or cultural construct. In particular, this dimension of the relationship examines the human understanding of the urban river, the agenda people devised to withdraw resources from the river, and changes and continuities of conceptions of nature and culture centered on the river. Tianjin was opened to the world in 1860, welcoming not only foreigners who had no experience with Chinese water management of the past, but also ideas that departed from imperial understandings on land and river that were intimately connected to an agrarian state. The infiltration of modernity accompanied by imperialist conquest was reflected in the manner by which foreign engineers re-engineered the Hai River by scientific, technological, and mechanical means. These ideas and methodologies led to a departure from the Chinese past: the depreciation of Chinese water conservancy concepts and experiences of using river channels for irrigation and drainage, accompanied by an admiration of modern engineering technology and knowledge widely applied in controlling European and American rivers.

The more traditional connection of river and people as manifest in the Mazu (sea...
goddess) statue was also weakened in modern era. The river turned into a “chronic trouble,” an obstacle to modern river communication and industry that had to be harnessed by global engineering technology. Dutch, French, Italian, American experts and technicians worked on the river armed with their rich experience in controlling river courses in Europe and America. From a global perspective, it was also the moment to integrate the city and river into the world system of capitalist flows of technology, engineering, commodities, and cargo.

At the same time, the Chinese strengthened their influences on the river. The Chinese Beiyang and Guomindang governments attempted to retrieve the river and made it part of their national economic planning to advance the industrial development of China. As concessions were returned to the Chinese government after WWI, the Chinese participated in shaping the waterfront of the river vigorously. An aesthetic of modern infrastructure, concepts of public hygiene, and cleanliness and orderliness were all part of a package that Chinese leaders pursued for the river. The gradual retreat of junks and sampans from the river, replaced by the coming and going of whistling steamers; the bustling sounds from bunds, dykes, and wharves altogether painted a modern river accommodating ocean steamers and a transport system connecting global markets and businesses. This is was the connection between people and an urban river that was being nurtured in the early Twentieth Century in China.

The construction of the Hai River was conditioned by the evolution of the city into a large commercial harbor in North China, revealing the second dimension of the relationship between river and city. This component of the analysis focuses on how changes of the river impacted the city. How did the transformation of river contribute to the creation and
expansion of a modern urban environment in the early Twentieth Century. The river was not only implicated in the creation of a modern harbor, but was also an actor that shaped the layout of streets and the foundations of urban space. It is common for historians to begin delineating the origin of Tianjin with an analysis of its reliance on the Grand Canal. It is unusual, however, to show how the continuing influence of waterways contributed to the making of city in the modern era. Such narratives have been often overwhelmed by analyses concentrating on rapid development of urbanization and industrialization that offered the city prosperity, unconnected with the river that in fact made such development possible.11

My study indicates that the Hai River was influential in the modern development of Tianjin after the collapse of the Qing Dynasty (1911). The river linked the city to the world; its silt and mud filled lowlands; its marshy waterfront gave rise to foreign concession zones and allowed the construction of the Chinese city; it was also linked to a renovated urban drinking water, drainage, and irrigation infrastructure. The river was also subject to differing notions of exploitation – from complex above-ground sewage diversion channels, passing through cultivated lands, to an underground sewage system. The river lent its services to the creation of a modern bund, facilities to moor large steamers, godowns, and iron bridges. Represented by the powerful foreign water conservancy commission, the river grew into a stream well known by the world’s sailors, mariners and merchants, a modern Chinese Grand Canal stretching into the Pacific for international trade.

This environmental historical perspective also directs the examination of urban construction within a broader geographical focus, connecting the treaty port with its hinterland – the Hai River drainage basin. Rhoads Murphey argued that treaty ports had a
limited impact on the hinterlands. Murphey argued, instead, that the traffic in foreign ideas had greater significance. However, Kenneth Pomenranz’s study of Huang-Yun indicates a more intimate relationship between the treaty ports and interior regions as he explores the ecological consequences to hinterland regions of expanded state expenditures on the modern sectors of the treaty ports. Indeed, this dissertation argues that the impact of re-engineering the Hai River greatly impacted areas outside Tianjin through the Hai River drainage basin. The increasing volume of imports and exports in Tianjin were connected with commodity production and increased demand from the greater Hai River basin region. The tributaries linking Tianjin and other cities of rural areas in North China were environmentally altered by the scheme of the Haiho Conservancy Commission. Joint commissions such as the Commission for the Improvement of the River System of Chihli (CIRC) and the Haiho Improvement Commission (HIC) extended the policy of the Haiho Conservancy Commission beyond the city. The joint engineering works for restoring the Northern Canal and constructing a settling basin impacted the social and cultural lives of millions of people whose lives depended on the river tributaries. The ultimate water conservancy goal of improving river navigation on the Hai River by restoring its tributary channels did not eliminate, indeed aggravated, repeated flooding in the 1920s, 1920s and 1930s – floods that affected the entire region.

The third dimension of this research explores the interactions of powerful state and social agencies. Specifically, it introduces the reaction of the local community to the proposed water conservancy schemes and ongoing environmental changes. The dissertation also examines conflict between foreign and Chinese water conservancy agencies over water
conservancy schemes in North China, showing a complicated situation in the joint water conservancy agencies in the early Twentieth Century when the river and the city were exposed to different management ideas. Agencies such as the Haiho Conservancy Commission, dominated by foreign interests, and the Chinese state were the main drivers promoting the commercialization, industrialization, and urbanization of Tianjin. The transformation of the Hai River to advance these goals was the result of contestation between a variety of organizations that had differing, and occasionally similar, goals. The trajectory of urban development and changes of the river was the result of struggle, conflict and compromise.

Facing the intrusion of foreign ideas and power, many Marxist narratives of the city written in the 1970s and 1980s depicted the Chinese, especially Chinese merchants, as being exploited and oppressed when the city was suddenly opened to the world in 1860. They had little capacity to resist imperialist power. In fact, this study of the river shows the opposite. It was because foreigners were initially so marginalized by Chinese merchants, who were more capable and flexible to master new businesses, that foreign communities took the initiative to change the river in order to reduce shipping fees. It was the gradual transformation of the river that eased their business predicament against Chinese competitors. Chinese authorities also had a voice in water conservancy schemes led by the Haiho Conservancy Commission. Resistance from local communities forced foreign interests to cooperate and negotiate with Chinese authorities. The expansion of the city, the modern process of transforming the roads, streets, bridges, buildings, and sewage pipes were joint outcomes between Chinese and foreign interests. Indeed, it is fair to say that Chinese state power remained powerful at the
local level. The state participated in the making of roads, sewers, ditches, wharves, and bridges of the modern city. The state also enhanced Huanghui (the imperial fair) as a useful instrument in promoting the image of economic prosperity and social stability. This is why the imperial fair was held under local warlord patronage in 1924 and again by the Guomindang municipal administration in 1936. It was not the traditional meaning of the sea goddess that was sustained and extended at the fair, but the usefulness of state power that made the social event a symbol of prosperity for the city.

In conclusion, this dissertation aims to add an additional level of complexity to the urban history of Tianjin in the early Twentieth-Century China by exploring “the role and place of nature in human life.” 14 It generates an environmental explanation to the urban development of a coastal city. It studies the power of the state as it transforms the river and the cultural, social, and economic context of the city. My study attempts to explore the historical passage of treaty port development from an environmental perspective to reveal the complexity of cooperation and conflict between Chinese and foreign interests – a subject reckoned in the works of Rhoads Murphey, Edward Rhoads, Mark Elvin, and Susan Mann Jones, to name a few. I believe the transformation of the environment contributed to the meaning of modernity in the coastal city – part Chinese, and part foreign.

The study of the relationship between the Hai River and the Twentieth-Century transformation of Tianjin is a colossal project-a project that implicates a region with five major tributaries, and a vast economic heartland within the Hai River drainage basin. The dissertation does not attempt to exhaustively explore topics such as engineering history, nor does it attempt to explore the entire range of ecological consequences of the transformations
of the Hai River. So, for example, one could explore in depth the gradual disappearance of the habitats of migrant birds, or the increase or decrease in the populations of certain species of fish. In addition, one could conceivably spend considerable time and verbiage exploring the environmental consequences of lowland and marsh reclamation in the Hai River valley. However, due to the specific focus of this dissertation, these topics have been intentionally omitted.

Chapters are organized chronologically. Chapter One is an introduction to the imperial origins of the river and city in the Ming and mainly Qing Dynasties. It includes the challenges faced by the Qing emperors to harness the threat of the Yongding River and state policy designed to promote agricultural production by introducing Shui-li-ying-tian irrigation projects in North China. These projects reveal the vision of Qing leaders of creating a stable society, and the importance of grain and agricultural production in Chinese statecraft. Chapter One also explores the creation of the city and the cultural connections made by the Qing salt merchants in Tianjin to the river through social activities like Huanghui (the imperial fair).

Chapter Two demonstrates the changes of the river and Tianjin after the city was opened as a treaty port in 1860. Great changes to the river were signaled by the creation in 1897 of the Haiho Conservancy Board. The chapter concludes that the water management and conservancy led by foreign engineers was a departure from imperial patterns of using water for agricultural production and transport. New concepts of river and water from foreign actors and their associated engineering approaches contrasted with imperial emphases on flood control and irrigation. This chapter argues that the concept of modernity had been firmly embedded in the project to re-engineer the Hai River and to remake the urban space and
purpose of Tianjin by early Twentieth Century. It also argues that between 1897 and 1916, the focus of conservancy work shifted from the Yongding River to the Hai River, with an emphasis on linking the economies of the city and its hinterlands.

Chapter Three focuses on the era when the city and river were under the governance of the Beiyang government (1917-28). It was the time when Chinese and foreign interests engaged in conflict and cooperation. This was the period when the Northern Canal breached its protective dykes. Haiho Conservancy engineers insisted on their plan to secure river navigation on the Hai River and requested the restoration of the original river channel of the Northern Canal. However, the focus of Chinese interests was shiye in the capital region, including the production of agriculture, industry, and commerce while eliminating flood threats by diverting the Northern Canal. The Commission for the Improvement of the River System of Chihli (CIRC) was founded as a joint commission to resolve these sorts of conflicts.

Chapter Four introduces Tianjin and the Hai River under the Guomindang regime (1928-37). Different than the Beiyang government, the Guomindang was intent on creating a unified state. Its nationalist and anti-imperialist sentiment was reflected by its determination to retrieve the Hai River from the hands of foreign-dominated institutions. It witnessed escalating conflicts with the Haiho Conservancy Commission and the North China Conservancy Commission after the joint-commission Haiho Improvement Commission had been organized. These controversies and arguments escalated especially when the Yongding River became the new threat in the 1930s.

Chapter Five shows the acceleration of industrial development in the city during
Japanese occupation (1937-45) and Guomindang reunification (1945-48). Instead of investing in improving river navigation on the Hai River, the Japanese worked on a gigantic construction plan to create a new harbor at the mouth of the river to satisfy its aggressive colonialist economic appetite. The creation of Tanggu Harbor changed the trajectory of urban development in Tianjin as a harbor. It showed a declining eagerness of constructing the Hai River and city as the necessary gateway to North China transportation. The transformation of the river and the city during Japanese Occupation shows the militarist and colonial vision of city controllers. Limited by funds and time, the unfinished projects of Japanese occupiers were transferred to the Guomindang who also failed to complete these projects as its effective rule of Tianjing ended in 1948.

This dissertation could not be completed without the contributions of Chinese scholars. Large quantities of gazetteers offered me a clear timeline of change. *History of Tianjin Harbor* and *Gazetteer of Tianjin: Gazetteer of Harbor*, for instance, provided detailed descriptions and timelines of the construction of Tianjin harbor and the engineering work of the Haiho Conservancy Commission. These accounts narrate the progressive growth of city in economic terms under the framework of Marxist analysis. *History of Tianjin Waterway Bureau* briefly introduces the Haiho Conservancy Commission, but the major portion of this source focuses on post-1949 constructions. Information on the river and its tributaries can also be found in the four-volume *Gazetteer of the Hai River* which is replete with technical terminology of hydraulics to explain the history and problems of water management. This dissertation also drew upon information from *Gazetteer of the Hai River Mainstream*, *Gazetteer of Tianjin*, and numerous gazetteers of the tributaries that provide information for
the reconstruction and subsequent change of the Hai River system since the late Qing Dynasty.

Chinese scholarship on the urban history of Tianjin has also deepened my understanding of the city. Works written and edited by Luo Shuwei, Lai Xinxia, Jiang Pei, Liu Haiyan, Zhang Shuming, Shang Keqiang use Tianjin as a window to discover social and economic changes, the relationship between urban space and social status, land management, and the dynamics between the Chinese city and foreign concessions.

Western scholars that interprets the history of Tianjin, represented by Gail Hershatter and her study of the work of Tianjin, Man Bun Kwan and his study of salt merchants, Brett Sheehan with the study of banks and banking system, Ruth Rogaski’s study on hygienic modernity, and many others, explore the social, economic and cultural history of Tianjin beginning in the late imperial era. I hope my dissertation contributes another level of understanding to the urban history of Tianjin.

3 Cronon, “Modes of Prophecy and Production,” 1130.
4 See Richard White’s *Land Use, Environment, and Social Change: The Shaping of Island County and The Middle Ground: Indians, Empires, and Republics in the Great Lakes Region, 1650-1815*.
6 Qi is the animating life-force, or energy, that circulates through the universe and within the body.
8 Li Yizhi, “shunzi shuili weiyuanhui gaizu huabei shuili weiyuanhui zhi zhiqiu”, in *Huabei Shuili Yuekai I*, no.1 (1928), 1.
11 An example can be found in *jindai Tianjin chengshi shi*, edited by Luo Shuwei. The dependence of the city on the Grand Canal and its tributaries is extensively discussed in the
beginning. The analysis of the urban development eludes the importance of the river in shaping the city, even though a chapter had been dedicated to water conservancy works of the Haiho Conservancy Commission. Lai Xinxia’s *Tianjin jindai shi* [Modern history of Tianjin] mentions the origin of the city and its relations with river, but the following analysis omitted the great changes of the Hai River in the early Twentieth Century.


13 See Kenneth Pomeranz’s *The Making of a Hinterland: State, Society, and Economy in Inland North China, 1853-1937*.


15 *Shiyi* (practical enterprise) was created in the late Qing Dynasty and imbued with anti-imperialism and rise of nationalism. In a narrow sense, *shiyi* refers to industry and commerce. But the term had a broad concept that includes nearly all economic sectors of production. For instance, the Ministry of *Shiyi* in Beiyang era included agriculture, industry, commerce, mining industry, fishery and husbandry, land reclamation and forestry, labor, etc. The word is still used today. A *shiyi* Company refers to manufacturing and industry in comparison to an investment company.

CHAPTER ONE
The Hai River and the Creation of Tianjin

The Chinese have interacted with their natural surroundings in North China since ancient history. The meandering source of the Hai River has been marked with evidence and experience of human agricultural activities and water conservancy for millennia. In the Ming Dynasty, a city named Tianjin was constructed on the low stream of the Hai River drainage system as a fortress for sea defense. Since its establishment, the city changed and grew in accordance with the Grand Canal and influence of the Hai River. Interlinked river canals provided the city with economic opportunity and prosperity. Multiple usages of water resources including land cultivation, salt transaction and fishery hatched an imperial, secular and flourishing riverine society.

It was equally prominent for the state to participate in city and river construction. The Qing governors commenced extensive water conservancy projects in the North China plain for the purpose of flood prevention and irrigation, guided and defined by the Qing’s vision of an agrarian and stabilized society. The imperial era of the river and city laid the foundation for modern transformation of the city and the river.

The River and Environment

The Hai River drainage system stretches across the north plain of China and provides essential water resources to sustain and enrich the lives of its peoples. It includes the municipalities of Beijing and Tianjin, and parts of Hebei, Henan, Shandong, Inner Mongolia, Shanxi and Liaoning provinces. The river is embraced by the Yan Mountains in the north
and Taihang Mountain in the south.

The widespread shallow lakes in the Hai River system show the abundance of water existed in the Hai River system in history. Some shallow lakes took on a great proportion of acreage and once were even close to the northern cities. It is believed that one of the reasons for this is that the Hai River basin was created by the retreat of the sea in a pre-historic era. In ancient times, the lower branch of the Yellow River once interfered with the Hai River system and used the Hai River as an outlet to the sea. The Yellow River enriched the land with water and deposited soil as the primitive shape of the shallow lakes.

These shallow lakes or low-lying areas provided water for agricultural production and daily usage. The water conservancy governors in the Ming and Qing dynasties designed systems to discharge floodwater into the shallow lakes through the connected man-made tributary canals. The landscape of shallow lakes produced aesthetic values. One poem expressed the sheer beauty of the lotus lake in the southern part of Tianjin as: “The lotus filed stretched ten li and faced autumn; the fisherman pointed to the lake inside. The boat was hard to turn around because of exuberant reeds, following wind and flow only.” Another poem described the view of the shallow lakes in spring when “light boats [navigated] 10 li or 5 li, thousands branches of thousands weep willows. Songs from the peasants were suddenly heard. This was the moment when red apricot bloomed.”

The Hai River system consists of five major tributaries with more than fifteen branch rivers, e.g., the Yongding River, the Daqing River, the Northern Canal, the Ziya River and the Southern Canal. The Hai River refers to the mainstream of the Hai River tributaries, starting
from the convergence of the Yongding River, Northern Canal and the Southern Canal, flowing eastward via Dagu and ending at the Bohai Gulf. The mountainous terrain in the north and west, where the tributaries of the Hai River system originate, is higher than the southeastern plain. Thus, all five tributaries use the Hai River as a major outlet to the Bohai Gulf. Compared with the long upstream tributary courses, the course of the Hai River is only 73 kilometers in length.\textsuperscript{19} The relatively short and circuitous river course meanders inside the city of Tianjin, crossing its urban economic and cultural centers.

Map 1.1: The Hai River drainage system in the Qing Dynasty\textsuperscript{20}

The Hai River system once caused annual threats of flood-related calamities. Elevation differences caused sand deposits in the lower reaches of the five tributaries. The problem is
especially severe on the Yongding River, which receives soil from the loess plateau. The current collides with the narrow and sinuous river course of the Hai River. Bends and curves hinder the current’s forces of scouring sand and soil. The riverbed accumulates deposits and increases the potential of flood.

The problem becomes obvious when the weak flow reaches the river mouth of the Gulf where, twice a day, it meets the stronger tidal ebbs from the sea. *The Book of History*, written during wartime, describes the Hai River as *Nihe* (the counter-river). The tide floods the river course, raises the water level, and changes the flow direction. Seawater pours into the river and mixes with the plain river water. A thousand-year-old sand deposition formed the Dagu Bar; the sand flats spread over the river mouth.

Moreover, weather patterns in the North China plain cultivate a hostile temperament of the Hai River. The annual uneven distribution of precipitation has repeated disastrous effects. It rains little in most of the regions within the Hai River from March to May, when the warm temperature and water becomes necessary to improve agricultural production. The windy and dry climate suddenly changes when the area enters the rainy season in summer, from June to September. Strong winds in spring are replaced by heavy rain. Precipitation in the Yan and Taihang mountains during rainy season comprises 70% of the total annual precipitation amount. Heavy rain erodes mountainous soil and raises water level of the tributaries, threatening the lower stream with the possibility of inundation. Extreme meteorological phenomena including storms, torrential rain and hail, visit the region throughout summer. In winter, it can get cold enough to ice over some sections of the river. Snow also hits the area
when the wind is mild and the weather is dry.\textsuperscript{23}

These features of the Hai River render the connection of the river the people both beneficial and disastrous. The Hai River has been providing a natural river course for shipping and communications for Tianjin since ancient times, helping sustain population growth and economic development. On the other side hand, it has facilitated disasters, especially floods and drought.

The ancient Chinese imperial government made significant changes to the Hai River system. The first major transformation came during the period of the Three Kingdoms. One of the canals the government ordered built was the Pinglù Canal, a fundamental section to consolidate south-north transportation on the north plain; it became a part of the Grand Canal during the Sui dynasty.\textsuperscript{24} The man-made large-scale construction of canals within the Hai River system in the north plain exhibits the determination and power of the state to conquer its rivals and unify the area. However, early methods to manage water resources were not very effective. In fact, because the primitive goal of building canals and managing river banks was not for flood prevention, but for military use and grain transportation, it may have been a cause of the frequency and scale of natural disasters. The number of floods and droughts increased in the Qing dynasty. In North China, average time between severe floods dropped from 2.7 years to 1.9 years and from 6.6 years to 5.9 years for huge droughts.\textsuperscript{25}

Climate change is one explanation for environmental and ecological degradation during the Qing Dynasty. Zhu Kezhen thinks China had warm winters in the periods of 1500-1600 and 1770-1830, and severely cold winters in 1470-1520, 1620-1720, and 1840-1890. Several
severe winters occurred in the 17th century. Very warm winters occurred in the 18th century, and cold winters in the 19th century. Winter temperatures in the early and mid-20th century were relatively warm, compared with data and records from other centuries. Among them, “the years between 1650 and 1700 were the coldest.” The unstable and sudden changes of temperature may explain the meteorological anomaly over three hundred years. North China was a region that was easily affected by the strong cold winds from Siberia or El Niño.

Besides the inescapable climatological changes, human intervention in the natural ecological system became another main reason for the increasing disasters in the area. The process can be traced further back into the Ming Dynasty. Agricultural development contributed to the environmental deterioration. The Hai River drainage basin had a population of about 40,000 in the Yuan period, about 1.2 million in the late Ming dynasty, about 2 million in the reign of Guangxu Emperor (1875-1907), and 2.3 million in the 1920s. The constant population growth forced expansion of land reclamation that caused environmental deterioration and ecological change in the long term.

Taking Tianjin as an example, the entire Tianjin municipal areas included three forts. A number of garrisons were secured to secure and protect the capital and grain transportation. Along with them were the irrigational methods promoted by the government to reclaim the wasteland and open new lands for grain irrigation. The methods, called tuntian (garrison-cultivation organization), were performed by soldiers or local peasants. For instance, “The third year of Hongwu, [the emperor] ordered northern prefecture and county to recruit peasants to reclaim the near-by wasteland. Every household will be given 15 mu and 2 mu for
planting vegetables. Acreage was not limited if people needed more. All were exempted from taxes for three years.\textsuperscript{30} The policy favoring agricultural expansion was carried on by his successors; in the 11\textsuperscript{th} year of Chenghua (1475), the state encouraged its governors to establish bureaucratic ministries in the north to promote agricultural production.\textsuperscript{31}

**Table 1.1 Number of garrison farmland in Tianjin in the early Ming and mid-Ming dynasty\textsuperscript{32}**

<table>
<thead>
<tr>
<th>Time period</th>
<th>Tianjin Fort</th>
<th>Tianjin Left Fort</th>
<th>Tianjin right fort</th>
</tr>
</thead>
<tbody>
<tr>
<td>The early Ming</td>
<td>391 qing 57 mu</td>
<td>326 qing 66 mu</td>
<td>273 qing 27mu</td>
</tr>
<tr>
<td>Wanli 9\textsuperscript{33} (1581)</td>
<td>1053 qing 35 mu</td>
<td>600 qing 65 mu</td>
<td>639 qing 51mu</td>
</tr>
</tbody>
</table>

Peasants moved into the Taihang and Yan mountains. They reclaimed farmland by chopping down trees and burning grassland. Refugees also fled to the area and carried out agricultural work during and after wartime or disasters. The policy of military agricultural activity to expand the reclamation system in the loess lands led to land desertification.\textsuperscript{34} The expanding loess area influenced the Taihang Mountain, where the major branches of the Hai River originated, and increase the hazards of sand deposits and floods in the area.

Moreover, construction of cities consumed larger amounts of lumber. The construction of the capital Beijing and newly-established fort cities like Tianjin involved land excavation and forest consumption. Trees in the Taihang Mountain and Yan Mountain were cut down to create palaces and mansions, furniture and wooden products, fuel, etc. In 1429, the Ming government established a department responsible for buying and producing charcoal and firewood for imperial usage. An average of 1300-1600 hectares of forest was destroyed each year to produce charcoal\textsuperscript{35}. This over-exploitation progressively diminished the Taihang forest.
In the Qing dynasty, even timber from the nearby regions could not sustain the city’s growth. Wood needed in building the imperial palace had to be “acquired from other regions.”

North of Tianjin, the Pan Mountain grew into a site for temples and royal mansions for imperial families. A splendid villa was built in the ninth year of the Qianlong reign (QL9, 1744). Although the gorgeous mountainous landscape provided a comfortable palace for the emperor, it suffered from ecological changes too. Until the mid-Qing dynasty, more than 50 temples were built in the Pan Mountain area. Villages were scattered throughout the valleys, mountainsides, and along the pass to the mountain. The soldiers who guarded the place and the refugees who fled from war and starvation stayed in the area and engaged in land reclamation. The population of Jixian (Ji County) increased from 16,918 in the Ming Chenghua era (1465-1487) to 205,271 in 1831. To sustain the population growth, the agricultural land increased from 215.6 thousand mu to 349.4 thousand mu in the Qing dynasty. Without detailed records, it is difficult to calculate the acreage of forest and grassland that disappeared from this long-term practice, but the number of radical changes to the forest and soil included denudation and erosion increased in the Qing Dynasty.

War is another factor that caused environmental deterioration in the north plain during the Qing dynasty. Because of its location between Tianjin to Beijing, the Yan mountainous area (including Pan Mountain) became a must-have stronghold for the military who intended to take over Beijing. The Ming emperor built fortresses and walls to guard the pass toward the capital. The fire weapons, traps and ditches, and forts all impacted the forests. Along with the bitter wars between the Jin and Liao, Ming and Yuan, and Qing and Ming, the religious divide
between Buddhism and Daoism during the Yuan dynasty led to the destruction and reconstruction of the Buddhist temples on the mountain.\textsuperscript{39} This resulted in reduction of the forest area and the loss and degeneration of soil.

\textbf{The Origin of the City}

Sitting on the waterfront of the river, the city was widely known as the San-cha-he-kou region (confluence of three tributaries) or Zhigu (riverine places). The place grew into a social and economic center for riparian-related industries. It has the geographical advantage to be connected with Jinghai, Tongzhou, Baodi, Wuqing through roads and canals. It was well-known for being a “southeastern important town” for the capital since the Ming Dynasty.\textsuperscript{40} Facing the urgent possibility that Mongol troops would suddenly invade Beijing from the northwest, the administration of Zhigu Zhai (Zhigu Village) was officially proclaimed by the government to protect and support the capital militarily and strategically.\textsuperscript{41} The location became more important as the Yuan government conquered the Jin and unified China. In the third year of Yuanyou (1316), the Yuan government (1271–1368) changed the municipal and organizational administration from Zhigu Zhai into Haijin Zhen (Haijin town). However, as a general geographical description, Zhigu was still known and used by local people throughout the imperial times.\textsuperscript{42} Zhigu gained a reputation and became a promising spot for expansion in North China during the Ming Dynasty. During the imperial power struggle, e.g. the Jingnan Rebellion, Zhu Di organized a military campaign from Beijing. He and his troops tread across Zhigu on his way to wipe out his rivals in the south. He designated Zhigu with the name Tianjin (The Ford of the Heaven) after he seized the power of the throne.
The trajectory of Tianjin’s development depended heavily on its geographical features, as it was attached intimately to the river navigation systems. Two routes were maintained to manage grain transportation from southern provinces to Tianjin. One was the inner way of shipping through the Grand Canal. Carnaries were constructed along the Grand Canal to assist the shipping and storage of tribute grain. Dissatisfied by the slow grain accumulation in the capital, the Yuan government also opened coastal sea routes. New large wooden sea vessels were built to carry growing amount of grain; “all higher and lower-ranking government officials, as well as peasants in and out of the capital, depend on this.” Cheaper and more efficient, tribute grain transportation along the coastal line was preferred by the Yuan emperors. In both routes, grain vessels moored temporarily at Tianjin. The grain was distributed to smaller junks that were able to navigate on the shallower Northern Canal. After the Ming Dynasty (1368–1644) was founded, the government enhanced sea defense and
implemented a ban on navigation along the coast. The tribute grain transportation in Tianjin then depended solely on the Grand Canal. In order to store the grains, the state expanded the constructing scale of cang (granaries) on the banks of rivers and canals. In the third year of Yongle (1405), “1400 granaries were built along the north Canal and the storage capacity reached 941586 shi.” The government appointed governors in charge of inspecting the construction and operation of these granaries.

The city developed into a fortress under the rule of the Ming emperors. Zhu Di established three wei (protective military forts): Tianjin fort, Tianjin Left fort and Tianjin Right fort. The emperor positioned garrisons and cannons in and out of the city, as Tianjin was in the middle of a short passage from the sea to the capital. These garrisons practiced tuntian (garrison-cultivation organization) and land reclamation. The largest garrison stations could be found in the counties or towns of Qinghai, Qingxian, Xing-ji-xian, Nanpi, and Cangzhou, located along the southern Canal. The process contributed much effort to the development of Qingxian, Cangzhou, and Jinghai, where agricultural production provided basic sustenance. Shipping infrastructure and human labor, including docks, sampans, sailors, sailing guides, and bureaucratic institutions, gradually shaped the city.

The Ming government never ceased to make the fortress city a political and military center of the area. Local governors were ordered to rebuild or renovate bureaucratic houses, charity houses, towers, walls, temples, streets, and gun towers. The Ming governor of Tianjin stressed the importance of a square-shaped city wall and commanded the completion of a consolidated city wall. A drum tower was built in the middle as a representation of the
imperial will for social stability, dynastic longevity and prosperity. The streets inside the city were strictly straight, connecting four gates and the tower from four directions.

The river affected the process of city construction as well. People immigrated as fishermen, masons, kitchen workers, and vendors, settling inside the city and on the riverfront. The business of salt transaction developed fast in the Ming and Qing Dynasties. The amount of salt produced in Tianjin satisfied “both the need for the government and people” as “the livelihood of over one hundred and ten counties of Zhili (capital region) and Henan Province rely[relied] on salt.”

Salt industry produced rich merchants, who engaged in the industry before the government took it over in the Qing dynasty. Such families as Yao and Li made great fortunes when the government allowed individuals to do private business in salt.

Salt industry produced rich merchants, who engaged in the industry before the government took it over in the Qing dynasty. Such families as Yao and Li made great fortunes when the government allowed individuals to do private business in salt.

The growth of markets and economic activities on the riverfront connected local civilians socially and economically. Villages scattered along the river and lived on the geographical advantage of the river. Markets gathered autonomously in the western part of the confluences of rivers and south of the southern Canal. The establishment of Tianjin as a closed and planned square city on the western bank of the Hai River did not change the original socio-economic layout influenced by the river. On the contrary, the river showed its strong impact on the city and the social spaces among its populace. The riverfront was the economically prosperous space in the Ming and Qing Dynasties. Social and economic life inside the city wall was still underdeveloped in comparison with the northeastern part outside
the city wall. The shape of the second city wall and a moat (Qiangzi River) for military defense, built in the year 1850 by the Mongolian general Sengge Richen, reflected the expansion of the city toward the riverfront of San-cha-he-kou and the influence of the river in creating its most populated area.52

Map 1.3: Inner wall, outer wall and San-cha-he-kou53

A Vision of Constructing an Agrarian Society

The imperial leaders in China evaluated agricultural development from social and political perspectives. According to ancient records, agriculture was “the root under the heaven” and “the predominant life of civilians.” In the words of the Qing emperor Yongzheng
(r.1722-1735), agriculture was “an essential under heaven”, while nonessetinals referee to handicraft works and commercial activities.\textsuperscript{54} The imperial emperors’ primary legacy was a long-lasting political culture of placing agriculture as the core for state building. Agriculture was seen not only a method to improve livelihood of peasants and aggrandize the state financial reserve, it was believed to be an effective way to stabilize society in order to eliminate political and social threat to the imperial rule — especially after natural calamities, when the rising grain prices caused food riots and other forms of social unrest.\textsuperscript{55}

In the Qing Dynasty, population growth in the capital added pressure on the capability of the state to provision necessary amounts of grains. It was estimated that Beijing’s population grew from 660,000 in the beginning of the Qing Dynasty to over a million at its end.\textsuperscript{56} The Qing rulers managed the inner bandeded and non-bandeded Chinese troops, while local governors and gendarmerie guaranteed the transportation, transactions, and markets in the imperial region.\textsuperscript{57} Even though the number of food riots was not less than in the previous regime, the Qing governors were able to avoid massive social and political unrest resulting from grain dearth.

To deal with the conflicting problem between population growth and the expansion of cultivated land, the Qing government reformed land taxation, and encouraged emigration and land reclamation. Local governors enhanced the dynastic rule by launching a population census and land surveys and taking part in mobilizing free labor into agricultural production. These works sometimes supplemented the enormous investment in engineering rivers and canals.
The tribute system on the Grand Canal was maintained with greater effort by the Qing state. The Qing leaders adopted and rebuilt Ming granaries. Along the course of the Northern Canal, a large number of granaries were constructed at Beijing, Tonghzou and Tianjin. Granaries along the routes were predominant, essential to collect, restore and distribute grain. These granaries shaped the landscape of the waterfront, where populated spots later grew into towns and cities. The importance of Tianjin as a port for mooring and accommodating the grain ships was stressed when the course of the northern Canal was silted over and the schedule of delivery to the capital was postponed.

The Grand Canal commanded a large expenditure of state tax revenue. The cost of eliminating the threat of the Yellow River on disrupting the navigational canal was painful. Jin Fu was appointed as the director-general of river conservancy construction in 1677. One of the works concentrated on the convergence region of the Yellow River, the Huai River and the Hongze Lake, where the weak currents caused severe silting that blocked the canal. He recommended strengthening the nearby weirs and confining flow from other rivers. In a sixth memorial, his estimation of construction cost was 2,158,000 liang.\(^{58}\) It was the equivalent of tax revenue from Jiangsu for one year.\(^{59}\) The later generals, including Qi Sule, Ji Zengjun, Gao Bin, and Bai Zhongshan, continued to transform the natural features of the Yellow River with the purpose of protecting the Grand Canal.\(^{60}\) Constantly dredging of shallow or silted spots, which were frequent phenomena in most reaches of the Canal, the Qing rulers paid to heighten the embankments along the Canal for flood prevention purposes. Sluices and gates were constructed to manage and control water and cargo flow.
As the imperial lifeline, the Grand Canal assumed a heavy responsibility for delivering large quantities of grain from southern provinces, but the irregular disruption caused by floods or droughts existed as a deep threat. Some Ming and Qing governors proposed of making North China a self-sustaining region of agricultural production and consumption with massive engineering experiments. The *Shui-li-ying-tian* (using water conservancy to benefit cultivation) scheme in North China was an example of making an agrarian society through water conservancy construction and social mobilization. It reveals the ideal water conservancy outgrowth by the Chinese to transform the *shuihai* (disasters of water) into *shuili* (benefits of water). Throughout the transformation, the power of human beings was magnified. The Qing rulers believed human power was at the core of the process of transformation. One of the governors who supported flood control projects said that “peasants did farm work all the year round. Climate decided whether the land would be harvested or not. Once we [peasants] were short of rainfall, harvest in the fall would not happen. It seems the land should be the one to blame. Indeed, what should be blamed were the ineffective plans of governors.”\(^{61}\) He insisted that humans overcome difficulties and change the harsh environment into a beneficial one.

Supporters of *Shui-li-ying-tian* believed the project to be an ideal way profiting agricultural production and flood control altogether. The project fit into the fundamental concept of water conservancy in the imperial period. Different than other types of agricultural activities that had been practiced for centuries, rice cultivation was a relatively new idea in the less humid and warm North China region. However, the dependence on water of the rice
cultivation would take use of the excessive water when flood season came. Rice paddy fields were introduced into the Hai River region by the advance of the \textit{Shui-li-ying-tian} project. Officials evaluated the methods to utilize the abundance of water restored during rainy seasons. Ming Governor Xu Mingzhen indicated that irrigating land by diverting upstream water could eliminate the threat of inundation, assisted by diversion works completed downstream. Wang Yingjiao believed the full use of water resources in the Hai River system for rice cultivation could eradicate flood and drought.\footnote{The Grande Imperial Secretary of the Yongzheng Emperor, Zhu Shi, framed planned projects in terms of fundamental Chinese water conservancy concepts. He elucidated that the \textit{Shui-li-ying-tian} could be used in enhancing water conservancy because “water becomes disastrous in clusters. It is beneficial if being diverted. Using water gains profit, disusing it produces danger.”\footnote{He persuaded the emperor to follow the experiences of the past and invest in projects despite any dissent.}} But dissenters protested the impossibility of constructing such costly projects in North China. They believed the sand-laden rivers, such as Yonginding River and Hutuo River, were not suitable for diversion by irrigation canals. Cheng Hanzhang thought the nature of the land and climate in the north was very different from that in the south, where rice cultivation had been largely practiced. Others were worried that any diversion canals on the upstream areas of silt-laden rivers would increase the danger of soil inundation downstream.\footnote{But the vision of establishing an agrarian state won the hearts of the Qing emperors, who were also promoters of engineering natural surroundings. With funds allotted for the construction of the costly project, capable governors were assigned to oversee the process.}
Under Yongzheng’s rule, four institutions of *Shui-li-ying-tian* were founded in the Northern Canal tributaries, the Luan River, the Daqing River, and the Hai River regions. These special institutions collaborated with local governmental agencies in order to conduct the cultivation experiments and advanced *Shui-li-ying-tian* schemes.

**Shui-li-ying-tian practice in Tianjin**

The smooth construction and production of the *Shui-li-ying-tian* in North China centered in making change to the Hai River tributaries. The irrigation projects were necessarily supported by an interwoven network of man-made irrigation canals. In Tianjin where the Hai River was influenced by the sea tides, the specific project utilized the nature of sea tides. Floodgates were located between the canals and the river course. With gates open, the rising water was flooded into these canals of the riverfront by the force of sea tides. Gates were closed in order to confine water when tides ebbed. The restored water would pass the interlinked canals and be diverted into the nearby farmland.

Various tests resulted in both success and failure in Tianjin. Xu Zhenming made experiments in the northwest area along the Hai River branches, following the model of cultivating paddy fields in south China. His ideas irritated Wang Zhidong, who pointed out 12 disadvantages including the unstable river conditions, heavy sand sediment and cost as obvious shortcomings of the construction.\(^6\) The state aborted Xu’s plan, although Xu’s supporters, Zuo Guangdou and Wang Yingjiao, thought the methods were feasible and ideal. Wang Yingjiao, who was a minister responsible for coastal defense at Tianjin in the Ming Dynasty, finally obtained permission from the emperor to pursue Xu’s irrigation plan. Locals,
however, said “[the land was] salty and unfavorable for irrigation.” Nevertheless, he implemented the method in Tianjin and set up experimental land in Gegu and Baitang, the two small villages along the Hai River. He ordered laborers to dig river canals and consolidate dykes, withdraw water from the Hai River when the tide reached the water level, and plant rice in 2000 mu with harvests of 4 or 5 shi per mu. Other tested wasteland was reclaimed to plant beans that needed less water. His experience was glorified in the local gazetteer, but it was still controversial because the test paddy field was soon abandoned due to interference of flood and drought.

In the Qing dynasty, Tianjin developed into one of the essential sites of the Shui-li-ying-tian project in North China. Lanli, a Machu governor appointed as military general of Tianjin in 1701, was the first who experimented with farmland irrigation near the city wall by taking advantage of the Hai River. Unlike others who used Shui-li-ying-tian close to the Hai River, Lanli chose low-lying wasteland outside the southern city wall. His garrison built long canals and waterwheels to seize water from the Hai River. He reclaimed more than 200 qing land and asked experienced peasants from Fujian and Zhejiang provinces to cultivate rice. Sluices, earth levees and bridges were built to protect the irrigational canals and make water flow smoothly. Local gazetteers recorded that he made Tianjin a “little Jiangnan,” an imitation of the well-off regions south of the Yangzi River. A Buddhist temple, called Haiguang Temple, was built to honor his achievement in the midst of the paddy fields. Lan Li’s successors, however, failed to continue his plan. The southern part outside the city soon became wasteland.
The ambitious Yongzheng emperor refocused on *Shui-li-ying-tian* as he launched a campaign to fight against food scarcity. After a severe flood inundated the capital area in the third year of his regime (1725), the emperor appointed high-ranking officials, including his brother Yun Xiang, to conduct experiments and apply the methods to larger areas near Tianjin. Unlike the gullible Ming emperor, who easily changed his mind according to biased proposals, the determination of this emperor became the major drive for the successful operation of *Shui-li-ying-tian*. Yun Xiang thought the water conservancy for irrigation in the capital region was unprecedented. The paddy fields, if constructed well, could benefit many generations. He appointed Chen Yi to take charge of the water control construction and agricultural production in Tianjin. Chen thought it was ideal to use *Shui-li-ying-tian* to harness floods. He visited the site of Tianjin, promoting the emperor’s idea of building an agrarian state. He commented that the location of Tianjin was crucial to Beijing, but people were lazy because they “pursued commercial benefit instead of agriculture.” Glancing at the desolate wasteland that was once the paddy fields of Wang Yingjiao, he criticized the “intractable” people of Tianjin. Fishery and salt trades were considered short-term profit, while agriculture was long-lasting benefit to the society.

He made determination to manage water conservancy to benefit agricultural production. The deserted canals were re-dug with sluices repaired. Local governors, bureaucrats, and rich merchants financed the project with donations. Military men and peasants were mobilized to reclaim wasteland along the Hai River. Chen Yi’s canals were longer, deeper and larger, connecting nearby shallow lakes and creating an interrelated irrigation canal network.
The canals reached shallow lakes south of Tianjin and the Hai River and served as effective outlets to discharge flood into lakes when necessary. During the dry season, the water was held into the irrigation canals to nourish paddy fields.

There were difficulties though. Unsatisfactory yields and the incontrollable arrival of floods showed this project was not sustainable, because all these manmade constructions relied on continuous investment and military support from the state. Other difficulties came from the lacked rainfall in the northern plain. Uneven terrain was not naturally suitable for planting rice. Without human labor to dredge river courses, sand deposits impeded normal discharge of flood water and increased possibly of floods. Flood and drought easily led to the death of plants. Also, the rising water of the Hai River contained seawater from the sea, and the salt and alkali in the soil made it difficult to reap harvests. The unsatisfactory grain output made land taxation burdensome for the peasants who cultivated the land. The Shui-li-ying-tian regime thus was legally refuted after the death of Yun Xiang. Without the support from the brother of the emperor, any further attempt became fruitless. In 1731, several acres of the paddy fields reclaimed by the four institutions responsible for Shui-li-ying-tian, were converted into cultivating plants that were suitable for a dry climate.75 In the 1740s, when severe flood and droughts hit Tianjin and further caused damage of the project, the Qianlong emperor announced the failure of the project and analyzed that “land obeyed natural differences, like south or north, dry or wet. It only followed its nature. If all low-lying areas had been made into paddy fields, it would restore water when rain was abundant. [But] how to deal with drought when rainfall was not that rich?”76 More land was reclaimed, but
farmers were encouraged to plant dry plants. Until 1701, “Paddy files were totally abandoned. There were only a few ones, in Gegu as usual.”

The rice cultivation plan remained abandoned until 1859, when the Mongol general Sengge Rinchen garrisoned at the Dagu forts. He oversaw construction of a new city wall around the city in order to monitor potential hostile action of foreign ships during the tension in the late Qing dynasty. A new city wall, larger than the Ming city wall and encircled almost all the populated areas in the city, was built as wartime defense structure. The need for practicing Shui-li-ying-tian to provision grain to the army became more urgent, as it was also the time when the Taiping Rebellious troops sabotaged the Grand Canal and cut off the supply of tribute grain to the capital.

Sengge Rinchen called upon local elites to fund the Shui-li-ying-tian effort again, and started the same projects along the Hai River; he reclaimed agricultural land of 750 mu in Gegu and 3,540 mu in Xian-shui-gu. He did not make any novel innovations beyond the experiments of his predecessors. After Sengge Rinchen, The Manchu leader Chong Hou submitted a proposal and asked the war-ravaged Qing government to open up new land on the northern side of the river. He inspected the deserted land and suggested the opening of new canals in order to rinse salt and alkali from the soil. He also suggested lowering taxation on the lands that were difficult to harvest. The area called Jun-liang-cheng, located on the northern bank of the Hai River and used by the Ming Dynasty to restore grain and station army, was the only part of that region that was included in Chong Hou’s Shui-li-ying-tian project. The blueprint was supplemented by a long irrigation canal from the Hai River to
Jun-liang-cheng. Since the imperial government was busy with the continuous war, huge debts, and complaints from the local peasants, the orginal canal design was modified into a smaller one; 500 mu land were cultivated along the canal into paddy fields.\textsuperscript{79}

This version of the Shui-li-ying-tian project was hindered by desperate political struggles when the imperial government faced external pressure from foreign nations and internal nationwide rebellions. A competent promoter of the Self-strengthening Movement (1861–1895), Li Hongzhang centralized military power when he organized his own Huai troops to conquer the Taiping rebellion.\textsuperscript{80} Two brothers, Zhou Shengchuan and Zhou Shengbo, stationed their Sheng Army in the Qing County, south of Tianjin. In 1873, Zhou Shengchuan recommended building a new road connecting Machang, one of the garrison station, with Xincheng of the Hai River (new town), a military spot constructed by Li Hongzhang for military maneuvers. The long road was divided into eleven small stations and military sites. Zhou later started an experiment of Shui-li-ying-tian in the south of the new town. Canals were built to divert the water from the Hai River into the fields and his methods were not different from Wang Yingjiao’s in the Ming Dynasty. In 1875, Li Hongzhang took the position as the governor for flood control in the capital region. He positioned Zhou Shengchuan as his General for land reclamation and agriculture. Zhou then started a large-scale plan of Shui-li-ying-tian with the center of Xiaozhan, one military station on his constructed road.

Zhou’s project was gigantic and ambitious. The army started to dig new canals along both the Hai River and the Southern Canal. Finally in 1881, the Machang Canal was completed at a length of 180 li.\textsuperscript{81} It connected the Southern Canal and the Hai River in order
to discharge the flood water and served as the main canal to irrigate paddy fields around the region. A systematic construction of sluices, either refined on the basis of the previous constructions or newly constructed, was completed to control volume of flow from both the Hai River and Machang Canal. The project was estimated to finish “eight big stone water gates, six small stone water gates, ten big wooden bridges, fifty-eight small wooden bridges, and fifty-nine man-made canals.” One distinctive feature of Zhou’s project from his predecessors was his project drew water mainly from the Southern Canal. Unlike the Hai River, the water of the Southern Canal was not salty and full of soil and nutrition necessary for plants. The water was assimilated into the land of Xiaozhan in order to scour off the salt and alkali restored in the field. The strong support from Li Hongzhang made the project feasible. He invested in the building of hundreds of waterwheels, windwheels, and automatic housepower water wheels bought from Britain. Zhou made Xiaozhan famous for its paddy rice and the southern part of Tianjin became the major agricultural site in the north plain.

The success of Zhou Shengchuan’s Shui-li-ying-tian was resulted from the centralized power of the Sheng Army. The military power eliminated any objection from the poor peasants whose houses faced resettlement, or the rich ones who considered the unclaimed land as private property. With effluence of funds and labor, his army overcame these difficulties and built a complicated irrigational network on the large chunk of land, which was transformed into paddy fields more than 136,000 mu. In 1896, the government set up the Bureau of Land Reclamation at Xiaozhan and continued Zhou’s work when he ended his
service and moved his army out of Tianjin.

In 1896 during the regime of the Guangxu Emperor, the institution for Xiaozhan irrigated land had been organized and established by the capital governor Wang Wenshao. Wang re-built granaries in Hebei Province and considered Shui-li-ying-tian as the leading method for flood control. Canals in Xiaozhan were re-dredged and funds were collected. Peasants rented agricultural land graded according to fertility level. During his tenure, the 50,000 mu of land were reclaimed and 30,000 mu was used to cultivate rice.86

Map 1.4: Major Shui-li-ying-tian sites along the Hai River87

Conserving the Hai River Tributaries

Along with the construction of the Shui-li-ying-tian, the Qing water conservancy engineers transformed the Hai River tributaries by digging long canals to the sea. The purpose was to eliminate flooding and secure production and safety for the capital. Since the Kangxi
era, the scope of the flood control project kept expanding as the regime of the state was challenged by floods. In 1730, a Grand General responsible for flood control in the Hai River basin was appointed in Tianjin.\textsuperscript{88} Even though the institution was set up mainly for the Hai River branches, especially the Northern and Southern Canal, this revealed the growing interest from the state to placed Tianjin as an essential city in the north.

The Yongding River was the priority among all water conservancy proposals. The river course of the Yongding River meandered near the capital Beijing. The welfare of the capital was under the direct threat of possible dyke breaks. Nearly every Qing emperor had his records to make effort on harnessing the Yongding River. The state organized scholars to compile series volumes of the Yongding River and its changes including \textit{Jifu anlan zhi} (Gazetteer of Water Control in the Capital Region) and \textit{Jifu tongzhi} (Gazetteer of the Capital Region).

The Chinese engineers knew the unstable nature of the river. Indeed, the Yongding River was named Wuding River (unstable river) in history. Its flow from the loess plateau deposited soil into the lower stream of the Hai River. In 1698, a huge Yongding River flood inundated the capital region. The Kangxi emperor investigated the river in person and called for immediate relief work. He approved investments in consolidating dykes and urged local flood control agencies to mobilize villagers to dredge the river. The giant dredging plan stretched from Lao-jun-tang in Liangxiang of the capital region, passed through Guan County and Yongqing County, entered San-jiao-dian (Triangle Shallow lake) and reached Dagu to the sea.\textsuperscript{89} It was not only a political struggle against natural calamities but also a social
mobilization of the peasants in the capital region. In 1699, the Yongding River breached its embankments. Kangxi commanded the building of a tributary canal south of the original course, diverting the flood to the Hai River. This project came at huge cost, and with monolithic planning and social mobilization and resettlement of residents. It was also Kangxi who renamed the river into the Yongding River (permanently fixated River).

His successor, Yongzheng, viewed the success of state construction in term of the achievement of water conservancy. In his regime, the northern and southern dykes along the Yongding River were extended as long as 47,635 zhang 5 chi. The entire Yongding river course was confined by stone and double-level levees. Diversion canals were widely used to eliminate the threat of flood during rainy season. For instance, Yongzheng ordered the opening of a new diversion canal from Guo-jia-Wu to San-jiao-dian to discharge water to the Hai River. The southern bank of the Yongding River was breached again and moved the river course southward in 1754. Earthen and stone banks consolidated as long as 2,200 zhang with a new tributary canal were completed one year after. In the Qianlong ruling regime (r. 1735-1796), Fang Chengguan conducted a series of tributary canal projects and diverted the Yongding River to the Daqing River tributaries, but the threat of the Yongding River was never fully harnessed. In the Jiaqing (r.1796-1820) and Daoguang (r. 1820 -1850) regimes, the reports of floods and changing courses of the Yongding River forced the emperors to reemphasize water conservancy near the capital year after year.

At the same time, the Northern Canal and Southern Canal were also transformed in the water conservancy scheme by the Qing state. Since these two tributaries contributed the
Grand Canal, to keep the river course navigable was the major goals, even though the usage of water for irrigation contradicted navigability during dry seasons. Kangxi Emperor noticed the occasional conflicts and once criticized the officials in Shandong Province because they allowed the peasants to take and cultivate land by diverting water through irrigation canals from the upstreams of the Southern Canal. He stated that maintaining enough water storage in the Grand Canal was a fundamental principle for the local governors to carry out water conservancy plans. Kangxi ordered his officials to investigate shoals in the Southern Canal, draw maps and find origins of the river; he paved the way for his successors on water projects along the Great Canal.\textsuperscript{92}

Yet, the Grand Canal became another threat of floods when the rain seasons visited North China. Thus, complicated and sometime contradictory policies of constructing more diversion canals were made. The Northern Canal had been constructed and connected with several diversion canals constructions. The Kuang-er-gang and Qing-long-wan Canals aimed at diverting floods from the Northern Canal into the sea. This canal system was complexly constructed near Tianjin, where lowland areas, ponds, canals and lakes were highly interwoven. The Qing government was responsible for the construction of the canals of Chen-jia-gou, Jia-jia-gou, Nancang, Huozui, Ditou, and Wang-jia-wu. These canals created new flood discharge passages to the sea by diverting water from the Northern Canal to the shallow lakes; Beitang of the Jiyun River served as the new outlet to the sea instead of Dagu by the Hai River. All these constructions located in the populated regions, which massive resettlement of villages and huge investment and labor raised a challenge. The early Qing
Emperors were capable to finish these constructions, but it was difficult for their successors to open new canals. The existing ones needed constant dredging due to the frequent effect of silting. The space of Tianjin had been shaped by the canals. Shallow lakes, paddy fields, sinous river courses were linked by canals. A gazetteer completed in the Tongzhi Regime recorded 28 canals inside and near the city, let alone the smaller individual shallow ones that terminated at agricultural land. The number of bridges, 53, shows the abundance of water and canals in Tianjin. Along the Hai River, 11,520 *chang* high roadbeds and ditches were built, from Ma-jia-kou in the southeastern city to Dagu. These constructions created and delineated the oringal space of the city in the Qing Dynasty.

Numerous canals were creasted on the river course of the Southern Canal. The Ming government made some improvements, but the canal courses were easily blocked by sand and eventually abandoned. Kangxi, Yongzheng and Qianlong Emperors ordered to dredge and rebuild the Ming canals. The Qing effort also resulted in the construction of new sluices and enhanced flood diversion from the Southern Canal and the Yellow River to the sea.

*Table 1.2: Diversion canal system of the Southern Canal in Ming and Qing Dynasties*[^45]

<table>
<thead>
<tr>
<th>Construction names</th>
<th>Open date</th>
<th>From</th>
<th>To</th>
</tr>
</thead>
<tbody>
<tr>
<td>Si-nü-si Canal</td>
<td>1412</td>
<td>Dezhou</td>
<td>Si-nü-si canal (sea)</td>
</tr>
<tr>
<td>Shao-ma-ying Canal</td>
<td>Between 1488 and 1505</td>
<td>North of Dezhou</td>
<td>Converged with the Si-nü-si canal</td>
</tr>
<tr>
<td>Xingji Canal</td>
<td>1467</td>
<td>North of Cangzhou</td>
<td>Haiqi (sea)</td>
</tr>
<tr>
<td>Jiedi Canal</td>
<td>1490</td>
<td>Cangzhou</td>
<td>Haiqi (sea)</td>
</tr>
</tbody>
</table>
Other Hai River tributaries, including the Daqing River and the Ziya River, were also transformed with the Qing diversion canal system. For instance, the Zhongting River was completed in 1726 and diverted flood from the Daqing River. New canals were made to link the ancient Mangniu River to the Daqing River to reduce the risk of floods near Guan County. The Ziya River was also engineered with new tributary canals in order to reduce water loads in the San-jiao-dian in the Qing Dynasty.

**Growth of Tianjin in the Qing dynasty**

The development of the city was related to the river system and water conservancy constructions. Levees, canals, agricultural fields, and bridges were the common scenes travelling towards the city. The expansion of the urban space relied on the offerings of the Hai River. The investment made by the government, either on water conservancy works or agrarian construction, attracted immigrants and led to social change. Land reclamation policy encouraged soldiers and peasants to do agricultural work. The river and the sea offered fish, salt, and irrigation of vegetables, fruit trees and grains.

The waterfront of the Hai River turned into a bustling spot. Entering the city, the view of large paddy fields was replaced by landscape of busy streets and markets. Temples and monumental halls were located along the two banks. Grain, salt and fishing junks and sampans stopped at a wooden floating bridge across the river. Vendors and peddlers sold necessities to sailors, peasants and traders. This might be a typical San-cha-he-kou view. San-cha-he-kou was located outside the Northern and Eastern gates of the city, open to the
Hai River, and was the most developed and populated area in the mid-Qing Dynasty. The urban space stretched outside the physical wall of the square city and integrated with the riverfront. Outside the square city wall, streets, villages, and temples followed the natural and sinuous shape of the river course. Provincial governors constructed the San-cha-he-kou region by refining the streets, markets and the city walls, and created vibrant riverside culture by organizing social and cultural events. They collected money from the salt merchants to build temples, education houses, monuments and memorial gateway dedicated to chaste ladies.

Table 1.3: The chart follows Jinmen Baojia Tushuo. Illustrated explication of Jinmen baojia tu shuo (Tianjin’s Baojia social security organization), written in 1846, the number was calculated in Hu (Household)

<table>
<thead>
<tr>
<th>position</th>
<th>Total</th>
<th>Number of peddlers and salt merchants</th>
<th>percentage</th>
<th>Number of boatman and fishermen</th>
<th>percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Inside the inner city wall</td>
<td>9914</td>
<td>5226</td>
<td>52.7%</td>
<td>19</td>
<td>0.2%</td>
</tr>
<tr>
<td>Outside east gate</td>
<td>7077</td>
<td>4415</td>
<td>62.4%</td>
<td>200</td>
<td>2.8%</td>
</tr>
<tr>
<td>Outside north gate</td>
<td>6635</td>
<td>4047</td>
<td>61%</td>
<td>131</td>
<td>2.0%</td>
</tr>
<tr>
<td>Outside west gate</td>
<td>3399</td>
<td>1292</td>
<td>38%</td>
<td>327</td>
<td>9.6%</td>
</tr>
<tr>
<td>Outside South gate</td>
<td>858</td>
<td>282</td>
<td>32.9%</td>
<td>0</td>
<td>0%</td>
</tr>
</tbody>
</table>

The table shows 52.7% of the population lived inside the city wall and 62.4% lived outside and near the east gate of the city; 61% of the population lived outside the north gate and were engaged in salt trade and other economic activities. The riverfront of the
convergence of the Hai tributaries, or the San-cha-he-kou was the real populated center during the Qing dynasty. New streets, lanes, and markets were built to accommodate the vehicle transportation from the docks. The number of people who engaged in the Hai River-related works, like boatmen, did not constitute a great proportion, but their numbers also grew.

Salt trade had prosperously developed with the involvement of the state. The government withdrew taxes on salt production and transaction. Salt merchants were rich celebrities and engaged actively in social and cultural activities. The Kangxi emperor ordered a move of the ministry of Changlu salt transaction, inspection and transportation from Beijing to Tianjin in 1669. The official hall was placed in the San-cha-he-kou. As the confluence of rivers grew into a trade and transportation hub, the Qing government moved the ministry of trade and transaction to Tianjin, indicating its growing influence and increasing importance in distributing salt in the capital region. Knowing the importance of the city, the local governor ordered to build a splendid imperial dock for official visits of the emperors.

Both water and soil in Tianjin were rich in salt. Two labor-intensive methods were widely applied in salt production. One was to construct layered earthen ponds. The tidal water was diverted into deep holes and moved into nearby ponds by large bags made from willow strips to be sun-dried. Another method was cooking. A gazetteer introduced the methods and recorded that crude sea ice needed to be obtained in winter before salt-making. Peasants used individual boilers to constantly cook seawater in the following spring, and then the remaining salty products were dried by the sun. The Qing Dynasty established 10 salt fields in and out of Tianjin since the Ming Dynasty. Salt piles could be observed on the major waterfront of the
San-cha-he-kou. The place was originally chosen as a convenient site for the making, storage, and transportation of salt by the Ming salt merchants. The Qing government expanded the scale into 240 strips, with detailed specifcations to classify crude salt and evaporated salt. To protect these piles, a 600-zhang-long dyke was consolidated in the early Yongzheng years. One poem written to describe a celebration of fork religious practice on the waterfront stated that: “Golden and magnificent ancestral temples bended toward the river, Sea Monster Tianwu was tamed and the red dragon driven, people like ants in front of the new salt piles in May, drums and flutes played to honor the sea gods.”97 It described the social and religious events held at a temple located on the waterfront every May, when the San-cha-he-kou was packed with visitors and boats.

Located in the middle of the Hai River course, a village of Gegu, was another place for salt production. The administrative house was surrounded by temples and ancestral monuments. The salt transactions in Gegu made it one of the most famous and largest villages. Other salt piles dotted the coastal regions of Tanggu, Dagu, Denggu, and Hangu. These salt piles and fields were symbols of economic prosperity of the city.

**Linking the River and the City**

The Hai River not only shaped the city socially and economically, it also brought cultural nexus on its riverfront with the city and its people in the Qing Dynasty. Culturally, the relationship between the river and the city and people can be symbolized by the two Mazu temples (sea goddess temples) near the Hai River in the Yuan Dynasty. Both were built on the riverfront near San-cha-he-kou.
These Mazu temples reflected the influence of immigrants in the growth of the city. It was possible that the practice of worshipping Mazu (the sea goddess) originated in southern China and settled in Tianjin by the arrivals of the sailors. The early host monks in these temples were all from southern provinces. A record can be found on a tablet of one of the temples located on the riverfront, saying: “Wu (today’s Fujian area) monk Zhi Ben hosted six years and died in the eleventh year of the Zhizheng Regime (1351). The host of the west temple, monk Fu Ju, succeeded his position.” The Mazu temple of the San-cha-he-kou was so prominent in the growth of the city that it gradually developed into a market place. The practice of worshipping Mazu became prevalent among the masses in the Ming and Qing Dynasties, and the religious practice deeply affected people and the city.

The Hai River culture was mixed, with an imperial interpretation of multi-religious harmony. Combining the concepts of Buddhism and Taoism, the Mazu temples shaped cultural and religious life inside the city on the river. It integrated the worship of the sea with other folk religious practices, e.g. the Buddhist practice of Guanyin (Avalokiteśvara), with a kind-looking Buddha who was believed to bring peace and happiness. The temple’s influence expanded as the population grew, and worshipping Mazu was interlinked with daily happiness and more significantly reproduction. Other Buddha and Taoist divine figures were added to the temple along with the statue of Mazu. The temple and is square grew into a significant riverbound architecture with a medley of multi-religious prayers.

The temple became a crucial social spot for constructing relationships between people and the river in the Qing Dynasty. It experienced the shift from a local and folk culture in the
Yuan dynasty to a state-organized religious practice starting in the seventeenth or eighteenth century. The Qing government saw the religious practice at the temple as an effective way to transmit the meaning of imperial power and benevolence among the populace. The power of the state infiltrated the waterfront society and took part in enhancing the cultural and religious meaning of an urban river. This overshadowed the original meaning of the temple — of attracting the prayers for safe sea voyages — but offered a manifestation of state control. The scale of Tianjin in the Qing Dynasty was so extensive that it could no longer be explained as a small village for fishing and boating. It had been so long since maritime trade had been banned that it seemed unlikely that the local people would understand the original meaning of worshipping Mazu. As Table 1.3 shows, until the late Qing dynasty, only a small percentage of the population worked in sea trade. However, the cultural dependence of the city on water provided an opportunity for the state to manipulate society. Mazu was exalted by the name “Heavenly Empress”. The temple was refined with splendid roofs and walls; ritual rules became complicated and regulated; ceremonies and celebrations received increasing investment.

The Huanghui appeared as a socio-economic event organized by the local governors and salt merchants in the Qing Dynasty. In spring, the event was held near the religious birth date of the Heavenly Empress. Various types of folk recreation, entertainment, and parade were held in the temple’s square for five days. Besides the usual religious practices, merchants and vendors flocked to the temple fair. Folk arts, including dance, stilts, acrobatics and opera were performed. The event was originally a folk gathering, but it was more
significant when the pageant was made into a new way of representation of the imperial influence on the society. The success of each imperial fair was a symbol of stability, peace and prosperity of the state. Local governments and the wealthy event participants painted the image of the Heavenly Empress. On that day, “the boats of worshippers came [came] from far distances, from Yuhe [the southern canal] to Beihe [the northern Canal] and the Hai River. Poles and sails stand [stood] everywhere…all the areas suitable for anchoring the boats are [were] taken.” The Huanghui was well-organized, with specialized teams responsible for rituals, logistics, and recreation. The decorations and symbols presented the prosperity and priority of life and power enjoyed by the real imperial family. The sedan chairs of Mazu and flags embellished with pictures of dragons implied the state rule. Jade products symbolized luxury, fortune and power, and were used to decorate the statue of the Heavenly Empress.

The event was especially important when the new emperor succeeded to the throne. For instance, in the first year of Guangxu, the imperial pageant celebrated on the riverfront was especially grand and royal. Besides the usual routines and parade routes, another small celebration of a few days was held. In the 30th year of the Guangxu Regime (1904), the date for the imperial fair was moved to October in order to celebrate Empress Dowager Cixi’s birthday.

This is not to say that worshipping the Heavenly Empress was the only religious and cultural practice relating to the ocean in imperial Tianjin. Other temples related to sea gods, Buddha and deities were also set up along the river or canal branches close to the sites of flood control projects or salt fields on the Hai River. The Wanghai Temple and Wanghai
Tower (Temple and tower of Ocean-seeing), located on the northern outskirts of Tianjin along the Hai River, served as two waterfront structures representing the importance of the river and sea, as well as the royalty of the state because the emperors visited the place during their regimes. At the mouth of the Hai River, one temple for worshipping sea gods was established in Dagu. The temple was dedicated to the desire of people for a safer living environment and the imperial determination of flood control. The temple had a tablet with propitious scripture of the emperor. Similar temples were commonly constructed on river banks after each successful attempt for flood control, or after canals and water gates were completed. The decorations and the Buddha or Taoist figures were imperial; the flying dragon flag indicated the sovereignty and leading role of the Qing family.

The expanding cultural influences of these religious sites satisfied the religious need for a stable society, mitigating the risk of unrest as the growing population required greater food supply. But as imperial power waned in the late Qing Dynasty, the river and the city experienced a sea change in more ways than one.

Abbreviations:
These abbreviations are used in notes and bibliography. Details and information of these records can be found in bibliography:
JFTZ: Jifu tong zhi [Gazetteer of the Capital region]
TJTZJDJJ: Tianjin tong zhi jiu zhi dianjiao juan [Gazetteer of Tianjin, volumes of edited and punctuated old gazetteers]
TJWSCK: Tianjin wenshi congkan [the series of History and culture of Tianjin]
TJWSZLXJ: Tianjin wenshi ziliao xuanji [selective historical documents of history and culture of Tianjin]
YSB: Yishi bao [Yishi Newspaper]
DGB: Dagong bao [Dagong Newspaper]
The historical course changes of the Yellow River have been studied by Tan Qixiang. See *Huanghe shi luncong*, ed. by Tan Qixiang (Shanghai: Fudan daxue chuban she, 1986). Also in Zou Yilin, “Huanghe xiayou kedao bianqian ji qi yingxiang gaishu,” Fudan xuebao shehui kexue ban 1 (1980).


―Shuidian za shi shou,” *Chongxiu Tianjin Fuzhi*, 4.


Map adapted from Haihe zhi bianzuan weiyuan hui, *Haihe zhi*, vol. 1 (Beijing: Zhongguo shuili shuidian chuban she, 1997), 123. The map shows the general layout of the Hai River tributaries in the Qing Dynasty. The system changed as the tributaries of the Yongding River and the Daqing River broke dykes and changed river courses.

For instance, the torrential rain in 1917 and 1939 were influenced by torrent that hit the Bohai Gulf.

The exact location of the canal is still controversial due to the different names of locations and potential errors in historical manuscripts. But concluded from various records, it is believed to be in the Hebei Province, where the South Canal passes today. See Shi Xuling, “Pinglu qu bu zai shanxi,” *Jinyang xuekan* 3 (1983), 78.

Inaccurate description is considered highly possible in records of the Yuan Dynasty concerning the instability of the government.


See journal paper Li Xin and Li Qun, “Mingdai juntun dui huang tu gao yuan diqu tudi ziuyuan de yingxiang,” *Ganhan ziyuan yu huanjing* 3 (2009), 114-117.


Jixian zhi biaoxian weiyuan hui, *Jixian zhi* (Tianjin: Nankai daxue chuban she, 1991), 185. Ji county is large than the Pan Mountain region. Pan Mountain is located in the north of the Ji County. Here, I use the figure from Ji county to show the trend of the population and agricultural land.

Ibid, 208.

Han Jiagu, *Tianjin gushi xunyi* (Tianjin: Tianjin guji chuban she, 2006), 257.

Gu Zushu, *Du shi fang yu ji yao* vol. 5 (Shanghai: Shangwu yinshu guan, 1937), 585.
used. Therefore, Zhigu was perhaps not a name having municipal meaning, but a descriptive term
to describe the confluence of the three rivers.
42 Bian Senghui, Tianjin shi zhi yanjiu wenji (Tianjin: Tianjin guji chuban she, 2011), 14.
43 The map shows the river course and condition in the Late Qing Dynasty but before 1897.
44 “Da yuan hai yun ji”, in Da yuan ma zheng ji (Taipei: Guangwen shuju, 1972), 33.
45 Wei Jiliang, Beichen wenshi ziliao, Bei yun he, vol.9 (Tianjin: Tianjin guji chuban she, 2003), 39.
46 “Tianjin Weizhi (Kangxi)” in TJTJZDJJ, vol. 1, ed. Lai Xinxia et al. (Tianjin: Nankai daxue chuban she, 1999), 29.
47 Zhang Tao, Jin men za ji (Tianjin: Tianjin guji chuban she, 1986), 13. Zhili or Zhili Province
refers to the capital region. The term was used in the Ming Dynasty to describe the provinces
that were under the direct rule of the imperial family, centered in Beijing and Nanjing. It was divided
to Bei Zhili (Northern Zhili) and Nan Zhili (Southern Zhili). Bei Zhili (or Zhili used in Beiyang
governmental era) included Beijing, Tianjin and parts of provinces of Hebei, Henan, and
Shandong. Nan Zhili was composed of Nanjing, Shanghai, and parts of provinces of Jiangsu, and
Anhui. The term was banned in 1928 by the Guomindang
48 Ibid.
49 More stories about these salt merchants can be found in Luo shuwei, Tianjin de mingmen shijia
(Tianjin: Tianjin guji chuban she, 2004).
51 Luo Shuwei believed the development of Tianjin was the growth of a walled city without a wall,
which means that the populated areas developed beyond the walled region and settled towards the
riverfront.
52 Tianjin shi chengshi guihua zhi bianzuan weiyuan hui, Tianjin shi chengshi guihua zhi (Tianjin: Tianjin
kexue jishu chuban she, 1994), 35.
53 Map adapted from “Tianjin xian jing yutu,” in Jinmen zaji (China: n.p., 1884).
54 The two sentences are quoted from Shi ji [The Records of the Grand Historian] and Guoyu
[The Discourses of the States]; and Yongzheng’s statement in May, Yongzheng 5 (1727). See Qing shi lu,
vol. 7 (Beijing: Zhonghua shuju, 1985), 867.
55 Examples can be found in R. B. Wong’s “Food Riots in the Qing Dynasty”. In the article, Wong
shows three examples of food riots in the Zi River, Xiang River regions. He shows the success of
the local governors and state to manage food supply and reduced the food price.
56 Han Guanghui, Beijing lishi renkou dili (Beijing: Beijing daxue chuban she, 1996), cited by
Lillian M. Li and Alison Dray-Novey, “Guarding Beijing’s Food Security in the Qing Dynasty:
57 State-society relationship on regulating food price was examined by Lillian M. Li. Both the
article “Guarding Bei jing’s Food Security in the Qing Dynasty: State, Market, and Police” and the
monograph “Fighting Famine in North China: State, Market and Ecological Crisis, 1698-1998”
cover this issue.
58 Peng Yunhe, Ming qing caoyun shi (Beijing: Shoudu shifan daxue chuban she, 1995), 165.
59 R. Kent Guy, Qing Governors and their Provinces: the Evolution of Territorial Administration
in China, 1644-1796 (Seattle: University of Washington Press, 2010), 246.
60 Peng, Ming qing caoyun shi, 169.
62 Li Chengyan, “Ming qing bei zhili de shuili yingtian,” Wenhua xuekan 3 (2009), 100.
63 Wu Bangqing, ed., Jifu he dao shuili congshu (Beijing: Nongye chuban she, 1964), 223.
64 Ibid.
65 Wang Peihua, “Yuan ming qing dui huabei shuili renshi de bianhua,” Xueshu yanjiu 10 (2009),
107.
66 Wang, Yuan ming qing dui huabei shuili renshi de bianhua,” 107.


Jiang, “Ming qing shiqi Tianjin de shuili yingtian,” 238.

Wu, Ji fainto shuili congshu, 345.

Jiangnan referred to the regions located in the south of the lower reaches of the Yangzi River. The region covered areas of the Jiangsu, Jiangxi, and Zhejiang provinces. The nature and climate of the region was suitable for agricultural production. It was a geographical symbol of prosperity and affluence in the imperial periods.

Li Chengyan, “Qingdai yongzheng nianjian de jing dong shuili yingtian,” Zhongguo jingji shi yantanji 2 (2009), 63.

Wu, Jifu hedao shuili congshu, 344.


The remarks of Qianlong was quoted in Li Hongzhang’s submission in GX 16 (1890). See “Zhi yi bai si, He qu si” in Qing shi gao, vol. 13 (Beijing: Zhonghua shuju, 1976), 3853.

Wu, Jifu hedao shuili congshu, 344.


The Self-strengthening movement (1861–1895) was vigorously carried in Tianjin. Machinery factories were established. When Li Hongzhang was appointed as Tianjin superintendent, he promoted the establishment of arsenals, factories, and shipyards for military modernization. See Chapter two for the change that Tianjin experienced during the Self-Strengthening Movement.


The position of Zhili Hedao Zongdu (the Grand Governor of rivers and canals of the capital region) was discarded in QL 1 (1736). The responsibility for flood control belonged to Zhili governor since then.


The position of Zhili Hedao Zongdu (the Grand Governor of rivers and canals of the capital region) was discarded in QL 1 (1736). The responsibility for flood control belonged to Zhili governor since then.

Data was imported from database on Zhangwei nanyunhe wang (website of the Zhang River, the Wei River, and the Southern Canal) http://www.zwnj.gov.cn/ (accessed in August, 2012).
Data were collected from “Jinmen baojia tu shuo,” in TJTZJZDJJ, vol.3, 435-439.


Li Zhiqiang, Zhongguo beifang li qu su qing, 40. Also in Guo Yunjing et al. Tianjin gudai chengshi fazhan shi, 423.

Wei Su, “Hedong da zhigu tianfei gong jiu bei” in Tianjin wei zhi, vol.1 of TJTZJZDJJ, 76. The tablet transcript of Mazu temple was also quoted in TJWSCK, vol. 4, 47.

There are two stories about the change from imperial fair to imperial fair and both of them are related closely to Qianlong emperor. However, the exact date when Huanghui was formally organized in the city is controversial. See Luo Chunrong, Mazu wenhua yanjiu, 158-160.

Luo, Mazu wenhua yanjiu, 161-163. Dates and days for the imperial fair changed over time.

Zhang Tao, Jin men za ji (Tianjin: Tianjin guji chuban she, 1986), 76.

Dai Yu’an, Gu shui jiu wen (Tianjin: Tianjin guji chuban she, 1986), 75.

Guo Fengqi and Dong Jiquan, Tianjin wenhua tonglan, vol.1 (Tianjin: Tianjin shehui kexue yuanshe chubanshe, 2002), 98.
CHAPTER TWO

Departure from the Past, 1897-1916

Tianjin was constructed as a defensive fortress city and a transshipment center on the Grand Canal for tribute grain transport in the Ming and Qing Dynasties. The development of the city was dependent on the state-led monopoly over grain and salt trade. At the same time, the city’s cultural life was imbued with vibrant and dynamic religious practices that connected the river, city, and residents. The city attracted increasing attention and investment from the imperial court and local literati-bureaucrats, merchants, and gentry. Imperial rulers extended its sovereign power into society through the promotion of religious and social events.

The process of imperial cultural construction in the city was crippled during the late Qing Dynasty when foreign cultures intruded militarily, impaired the dynastic system, and became politically dominant in the city. The interruption of imperial cultural influence had a great impact on the city and society. Significant changes occurred in the relationship between the river, city, and people.

New Observations on the River

A new chapter had been written for the river and city by the foreigners who came to the port armed with modern machinery and weaponry. The Qing government and the allied British and French forces fought the second Anglo-Chinese war in 1858. Following the footprints of Lord Macartney (visited in 1793), Amherst (1816), and Karl Gutzlaff (1831), the allied foreigners navigated north along the Chinese coast and proceeded to the forts at Dagu.

Foreign observers established intimate contact with the river and the city on their days
of arrival. Prior to this expedition, little information of the river was known to the western world. From the reminiscences of Stephen Court, the Master of the H.M.S. *Furious*, the only information of the environment of the river and its city was from an American survey made by an officer named John Hancock.¹ When foreign steamers reached Dagu from the open sea, the first difficulty they encountered was not the Chinese artilleries, but the Dagu Bar. The flooding of the Hai River eroded the estuary and deposited a great amount of sand, clay, and mud at the river’s mouth. A firm flat bar stretching over the bottom of the sea had been formed over centuries. Its Chinese name, *Lan-jiang-sha* (sand detention of the river), expressed the reality that the flat bar was so firm that it presented a strong force to detain the flow of the river. The joint forces of wave, wind, and current also created the Deep Hole – a natural narrow passage of deep water over the flat bar. It offered a natural channel for large grain junks and fishing boats to move across the bar.

The four-nation squadron (i.e., France, Britain, America, and Russia) anchored outside the bar in April 1858.² The view of the sea brought back memories of the Sea of Azoff, but the flat view over the Dagu Bar elicited anxiety among their crew.³ Waiting for the arrival of other gunboats, the crew on board conducted studies to gather information of the composition of the bar, gale direction, water level, and tidal changes over the course of a day. It was recorded that the Dagu Bar had “9 or 10 inches of earthy deposit from the river.”⁴ At low tides, there was only “2 feet [of] water upon the bar in the deepest places.”⁵ These observations and records of the strange and exotic environment were reported in scientific and western units of measurement.

Chinese fishing junks continued moving into the nearby area, and the allied troops
identified a narrow channel of deep water, the Deep Hole, from the marks of the remnant fishing bamboo strips and stakes made by the Chinese. Foreign buoys replaced bamboo strips cut off by the Chinese in order to direct position. With the knowledge of the channel and depth of the water, the squadron attempted to move the heavy gunboats across the bar by pulling and hauling. Lord Elgin, his secretary Laurence Oliphant, and Captain Sherard Osborn witnessed the failure of their first attempt to maneuver across the bar on April 28th, 1858.6

The majority of the shallow-draught dispatch gunboats sailed past the bar and bombed the Dagu forts the next day. With the forts conquered, gunboats navigated up the river, and sailors reflected on their personal impressions of the river and city. Their accounts varied from one another, but all showed strong interests in narrating the condition of the river course. Osborn wrote that a few areas of the river were difficult to pass and, “at a point about four miles below Tientsin, the river makes a most extraordinary series of curves and twists…. The junks were packed so close in this reach that we had some difficulty in screwing our way through them.”7 In other reaches of the river, however, the condition of the river was safe for navigational purposes because “there was always abundance in mid-channel, the soundings never giving less than two fathoms, and sometimes as much as seven.”8

Difficultly steering around the narrow bend, the deep-draft steamers like the French gunboat Fusée and the British Coromandel faltered and failed to navigate up the river. The other three deep-sea ships reached the Chinese city.9 The voyage enriched the information of the river and the city. Reports made by the masters of these crafts were published by the Royal Geographical Society, and a detailed chart of the river from Dagu to Tientsin was submitted to the British Admiralty.10
These travelers closely observed the city and river as they navigated up the river. They were struck by the dense population and the busy local agricultural activities. They described the view with reference to nostalgic memories, comparing what they saw with memories of past experiences. For instance, the village of Dagu resembled one fellow’s home village on the banks of the Nile; the width of the Thames at Richmond was similar to the view of the Hai River; the junks along the river made the river look like Liverpool; the flat and barren land along the river banks was compared with the view of the south of Russia.  

Through the passage, these sojourners made conclusion that the civilization they were encountering was inferior. Osborn felt nostalgic about his European homeland and referred to Tianjin as a “dull, dirty town, with no large fixed population, and not exhibiting [because it does not retain] any of the wealth which is constantly passing through it.”  

The British editor and journalist Alexander Michie made a similar remark. He described the city as “the filthiest and most offensive of all the filthy places wherein celestials love to congregate.” In another book written in 1888, he used the terms “dirtiest” and “repulsive” and described the people of Tianjin as “the most turbulent, predatory and wicked race in the Empire.”

Distinguishing of Chinese culture as inferior and backward led to culturally oblivious conduct. The experience of the allied troops in Chongxi Guan (Temple of Supreme Felicity) was a typical example of the impact of imperialist power on Chinese cultural patterns. The Taoist temple was located in the northern part of San-cha-he-kou and was extolled by a visit of the Qianlong Emperor in the early Qing Dynasty. As a religious temple, Chongxi Guan not only helped enhance imperial state-society relations by disseminating the meaning of imperial sovereignty, as suggested by the luxurious decoration and sophisticated architecture, but also
forged a religious and cultural fusion by unifying the people and the river on the waterfront. The temple was embellished with the magnificence of the Qing, and even a foreigner could at first glance differentiate royal architecture from that located in other parts of the city.\textsuperscript{15} As soon as the foreign troops occupied the temple, they converted the site into military headquarters. A process of “shaking down” Chinese culture and tradition then took place – “altars were turned into washhand-stands; looking-glasses were supported against little gods; tables, chairs, and beds were intended for certain venerable [foreign] citizens.” \textsuperscript{16} Tian-hou-gong (Temple of the Heavenly Empress) was also forced to undergo a similar process. The British military general Charles George Gordon chose a big, broad house inside the temple as a prayer house for Sunday services before Christian churches were built.\textsuperscript{17} The Temple of the Seagod at Dagu was also transformed by imperialist takeover. The temple was used to greet Lord Macartney in 1792 and fortified as headquarters of the Qing troops during wartime. After occupation, the statue of Guanyin (Avalokitesvara) was taken away, and the temple was partially converted into the custom-house agent.\textsuperscript{18} Imperial power had been undermined at a surprising speed by the sudden intrusion of the weapons and religion of the imperialist powers.

Derogatory comments on Chinese religious practices were reflected in Jane Rowbotham Edkins’ diary. She and her husband, Joseph Edkins, traveled to Dagu and waited for the boat to Yantai in 1861.\textsuperscript{19} The Temple of the Seagod was taken as her bedroom when she traveled to Dagu. She wrote with self-mocking tongue in her diary about “a large red table of incense” before the niche, which “‘barbarians’ desecrate by using as a sideboard.”\textsuperscript{20} When two Chinese servants showed their discontent against the behavior of profanation, Edkins
interpreted her privilege of staying in the place as such: “I suppose they cannot recognize in the pale-faced English lady, who wrapped in a great brown plaid, walks about the verandah after sunset, [and has] much affinity to their goddess.”

The state sovereignty of the Qing Court was weakened because of social turmoil and economic crises. It marked the decline of imperial cultural and the social construction of state-society relations. As the city was forced to be opened as a treaty port, foreigners who observed this alien land and its large population through a pair of imperialist lens and formed new interpretations about the river, city, culture, and society. The prejudiced and belligerent wartime mindset towards the defeated led to the description of Tianjin with derogatory terms like “uncivilized” and “backwards,” in contrast with “civilized,” “modern,” and “advanced” that were employed to describe European civilizations. Imperialist concepts were not only reflected in the endeavors to make the city an economically prosperous port, but also in the way that the river and the city changed with the infiltration of western modern technology, water conservancy designs, modern management, and organizations.

**Early Anchorages: Dagu and Zi-zhu-lin**

Tianjin was opened as a treaty port after the Beijing Convention was signed by the Chinese government and the allied British and French troops in 1860. The opening of Tianjin to the world cleared the barriers that prevented foreign settlers from establishing a nearby base to cast influence over the capital. This also fit the desires to incorporate Tianjin and the territories of North China into a global market.

A river navigable for steamers would accelerate the process of opening Tianjin to the international market. However, the shallow channel of the Dagu bar and curved river course
made the Hai River a less-than-perfect choice to achieve such goals. The U.S. missionary Samuel Wells Williams commented that the environment of Tianjin “would be of little avail for trade if it was thrown open.”\cite{23} But French and British authorities thought the city owned the potential of turning into a large city like Shanghai through massive constructions. Two anchorages were chosen as anchorage zones, with natural deep water areas for mooring. Dagu and Zi-Zhu-lin became early anchorages to accommodate foreign steamers and two spots of making the modern city.

Dagu was well known among foreign residents because it was constructed as strategic forts for coastal protection by then imperial leaders. The place consisted of numerous fishing villages. The Chinese erected high poles and illuminated lights on the tower of the Temple of the Sea God in the village as signals for the fishing boats to guide their way. Foreign marine squadrons suffered defeat in 1859, largely as a result of their clumsy maneuvering of large steamers over the shallow mud and sand flat.

After Tianjin was opened as a treaty port, the British controlled the entrance of the river and built its vice consulate near the Dagu forts in order to process paperwork for arriving sailing vessels. The Tianjin Maritime Customs appointed surveyors to make regular surveys of the spring tides.\cite{24} A junk was stationed at the Dagu Bar as the mark for the anchorage for large steamers unable to navigate across the sand bar. The deep-draft vessels waited on the sea until the rise of the tide elevated the water level in the Deep Hole. The anchorage also facilitated steamers to unload cargo to shallow-draft lighters. The Customs and foreign shipping companies constructed docks along chosen sites in the villages of Dagu and Tanggu to ease cargo transport.
Tianjin had few similarities with Shanghai, where large-scale water conservancy construction had been carried out in areas like Wusong spit and the Yangzi estuary, with well-constructed lightships, lighthouses, beacons, and buoys before 1860. Tianjin was the last major Chinese coastal city opened to the world. It was not until 1867 that buoys and beacons were placed at Dagu Bar, guiding ships to the Deep Hole and the entrance to the river. The Customs placed a fixed light on the China Merchants’ Steam Navigation Company’s hulk Aden. The vessel produced light visible for 10 miles on clear nights and marked the 17 feet low-water tides. Later the hulk sank outside the Bar. Another light vessel was built to replace Aden in 1880. Painted red with the word “Taku” (Dagu) in white letters on each side, Aden was fixed at the 17 feet low-water tide, with the red entrance buoy bearing N. 36°45’ W. and 3.5 miles distant.²⁵

On the other end of the Hai River, Zi-zhu-lin (Purple Bamboo Grove) was developed as the second anchorage. Two miles from the native Chinese city, this location was chosen because it was near the earliest foreign settlements. During the occupation of 1860, the British diplomat Harry Smith Parkes investigated the areas outside the native city and selected a parcel of land measuring 311 zhang long and 70 zhang wide to be used to build houses.²⁶ The British Consul J. Mongon investigated the same spot and marked Zhi-zhu-lin on the western bank of the Hai River as the northeastern end for the British concession. Charles C. Gordon measured land and placed boundary stones to delineate the foreign claim. British, French, and American concessions, all adjacent to each other, comprised the western bank of the river.

Zi-zhu-lin was originally a less-developed suburb area dotted with marshy ponds and a few villages, but its geographical location of easy access to the river was more beneficial to
the development of foreign concessions. The Tianjin Customs designated regulated the river reach from Liang-jia-yuan to Zi-zhu-lin as zone to build the inner anchorage. The waterfront of Zi-zhu-lin was soon modified with reinforced concrete. Different from the dykes along the river which were used to prevent floods and the agricultural for Shui-li-ying-tian projects, the Zi-zhu-lin bund began to define a new social and cultural construct for native inhabitants.

Map 2.1: Concessions, Chinese city and the early Zi-zhu-lin Bund in the early Twentieth Century.

As soon as the concession zones were settled, British and French settlers created a city premised on the knowledge, experiences, and images of what a colonial city should be. The Chinese defeat in China-Japan war and the Boxer rebellion gave foreign nations opportunities
to expand influences in Tianjin. The Qing court was too weak to defend the large country and accepted requirements from foreign countries of establishing or extending their concession zones. German, Italy, Russia, Japan, Austria-Hungary, and Belgium followed examples of Britain and France and measured land on the two banks along the Hai River. These concessions took up to 23350.5 mu land on the riverfront. Foreign municipal governing boards consisted of land renters, political figures, and well-off merchants. They made decisions regarding municipal fairs, policing, construction, transportation and navigation, and communication and sanitation systems. Seeing Tianjin as a promising land for businesses, the board propagated a plan for transforming Tianjin into a large port in north China.

The future of the river was tied to the desire of foreign merchants for developing global businesses from the city. The greatest departure from the imperial past of the river resulted from the arrivals of steamers, the new dominators over the river and sea shoulder by shoulder with Chinese wooden crafts. The rising competition between shipping companies accelerated Foreign shipping companies played a critical role and engaged in connecting Tianjin with other ports in China and globally. Competitions were fierce for river navigation on the Hai River during the 1870s. One of the leading competitors was Russell & Co. This American company engaged in opium and tea trade and opened for business in Shanghai in 1862. Its main rivals were the British Butterfield & Swire Co. and Jardine Matheson & Co.

The Butterfield & Swire established the China Navigation Co. in 1872 as its main subsidiary operating in China. The company saw the importance of the newly-founded Tianjin port and took stock in the shipping business in the Bohai Gulf. Five steamers sailed the waters between Shanghai and Tianjin. Securing a price advantage with Russell & Co. and
demonstrating higher skill in managing its relationships with Chinese and foreign businessmen and compradors, Butterfield & Swire edged out the Russell & Co. and became a dominant force in the coastal Chinese shipping business in the early Twentieth Century.

The Chinese government also joined the competition by opening sea routes to sustain grain transportation that collapsed with the deterioration of Grand Canal system in the late dynastic era. The government came to the realization that steamers would replace grain junk with their capability to provide safe grain transportation by sea routes. Chinese entrepreneurs wrestled with foreign interests and extended the Qing’s sovereignty over the open sea with the creation of the state-invested China Merchant’s Steam Navigation Co. (CMSN) in 1872. The CMSN opened business in Shanghai and founded its Tianjin branch in 1873. The company shipped the largest proportion of tribute rice transportation. Seeing Tianjin as an ideal site for the modernization of shipping and navigation, the CMSN built two wharves in Tianjin and one in Tanggu to accommodate and maintain steamers.\textsuperscript{32} It also constructed a naval dockyard at Dagu and produced steam-driven vessels.

Like the CMSN, state-funded industries were promoted by the Self-Strengthening Clique in the Qing government and equipped with western and technology. In the late nineteenth century, these entrepreneurs invested in industrial enterprises, one of which was the Kailan Mining Administration in today’s Tangshan. The completion of canals and railways bridged Tianjin with Kailan mines. Municipal and civil services, such as the postal system and telegraphy, were booming in the 1870s. Seemingly springing up in one day, these endeavors indicated the Qing’s quest of rapid modernization by adopting western technology within the Chinese imperial system. With the support and privileges from the government, the
Kailan Mining Administration monopolized coal production in North China and reduced the state’s dependence on foreign fuel imports.

The imperial effort to develop Tianjin as the center for the transshipment for grain tribute navigation system and as a site of heavy industrial works, frequently requiring coal transportation and railway facilities after the 1870s, invigorated the development of Chinese shipping companies. The CMSN purchased the entities owned by Russell & Co and expanded its steamer numbers increased from 11 to 27. The CMNS also maneuvered and threatened British leadership in the shipping industry. To calculate the number of ships that reached Tianjin, the CMNS had 96 steamers with tonnage of 74,088 in 1876; this number increased by 202 and 146,847 in 1877, 116 and 123,392 in 1878, and 174 and 132,042 in 1879, respectively. By comparison, the British had 191 steamers and tonnage of 93,941 in 1877, 212 and 104,919 in 1878, and 172 and 97,290, respectively, in 1879. In the late 1880s and early 1890s, the Chinese proportion of coal shipments outstripped shipments by Japanese, British, and German companies. Its railway facilities were the largest among those of its competition.

Competitions on lightering and barging business were equally intense. Tugs, lighters, barges, and cargo boats suitable for shallow water were the main subject of investment by foreign shipping companies. The British Taku Tug and Lighter Co. was founded as early as 1874 and funded by early foreign firms, including Collins Co. and Wilson & Co. The company invested in 3 tugs and 6 barges navigating on the Tianjin-Dagu line. In 1889, the Taku Tug & Lighter Co. Ltd. was formed by the Taku Tug and Lighter Company and the Peiho Tug and Lighter Company with a joint investment of Tls. 500,000. The company possessed 10 tugs and 20 barges in the early 1900s. The companies also owned several
dockyards and factories near Dagu.

The CMSN purchased 4 tugs and 8 lighters and funded the Chinese lighter companies to divide up the profit from Dagu-Tianjin shipping, but the ill-managed company did not survive the Sino-French War. The company was sold to Russell & Co. and finally to Butterfield & Swire.37 The French and Japanese companies also established wharves in Tanggu and Dagu and provided tugging and lightering services, extending their own shipping interest from the inner port to the river mouth. In addition, one German and two British sailors founded Tianjin Pilot Company in 1870.38 The company took charge of in piloting steamers. A settlement was established devoted to sailors and pilots named in Dagu named “Pilot Town.”

The landscape on the waterfront changed as buoys, shipping marks had been fixated along the deep channel across the Dagu Bar. The foreign companies occupied geographical advantageous points on waterfront for smooth transportation with their steamers and cargos. The wasteland at the river mouth experienced change when high buildings, organized shipyards, wharves, and godowns had been constructed. Along with the Chinese villages, they marked something new on the riverfront since the late nineteenth century. Machines, technology and ideas constructed foreign concession zones were delivered to the inner anchorage on the Hai River. It was the river that delineated the future of the city.

The Haiho Conservancy Commission

Although Tianjin was opened as a promising and fast-developing port connected the city to the world, the overall economic situation was unfavorable to foreign merchants. Chinese firms earned significant profits in Tianjin. Compradors and Chinese businessmen,
who enjoyed the advantages of language and better knowledge of the traditions and cultures of local communities, profited from their own management for international trade. The Commissioner of Customs complained in 1867 that, as a port opened to the world, Tianjin had not benefited from foreign interests. The volume of trade and transactions increased in Tianjin, “but barely is there one bale of goods that ever finds its way into the godowns of the foreign merchants.” Tianjin had suffered from “a heavy tax imposed by transshipment charges at Shanghai,” even the freight from Shanghai to Tianjin, “amounting to 3 per cent ad valorem,” was higher than the “freight from the United Kingdom to Shanghai [at] 1 per cent ad valorem.” Chinese businessmen transported goods from Shanghai to Tianjin at lower cost through the effective manipulation of intermediate brokers and agencies. To outwit the Chinese in economic competition, foreign authorities believed that “the access of foreign vessels to the port mitigated those consequences; since foreign vessels were able to import the manufactured article at a lower price than it would have had to bear if Chinese vessels had been employed.” If foreign steamers shipped cargo directly to Tianjin from the sea, it would result in the reduction of transshipment fees and the elimination of manipulation by Chinese brokers and agents.

The condition of the Hai River did not meet the needs of foreign firms. Only three steamers shipped to Tianjin directly from Great Britain in 1868. The shallow river course was navigable to light steamers but not ocean-going steamers. Steamers laden with cargo needed to offload their cargo to lighters at Dagu anchorage. This increased shipping expenses. The inaccessibility of the river for foreign cargo steamers reduced the enthusiasm and passion of foreign merchants to open new businesses in Tianjin. Among the newly opened business in
1867, only one firm engaged in international trade.\textsuperscript{44} Since steamers could not directly reach Tianjin port, foreign merchants lost out in the competition with Chinese companies who managed the transshipment of products from Shanghai.

As a result, the Hai River was seen as “the bugbear of the port” or “chronic local trouble” in the eyes of foreigners.\textsuperscript{45} Unpleasant conditions for navigation along the river amplified the unsatisfactory voices among foreign merchants and shipping companies and cast a shadow on the dream of making Tianjin a wealthy treaty port for foreign business. In 1884, 1885, and 1886, “the river had silted up badly and even the smallest steamers had to discharge their cargos into lighters at the bar.”\textsuperscript{46} The disappointing and deteriorating shipping industry generated a host of river management discussions. In 1886, the Commissioner of Customs, Gustav Detring, proposed a scheme of large-scale transformation of the river to the Chinese government. The scheme indicated a millions-taels plan of “cutting through the necks of several of these bends” to make the entire river “an almost straight channel.”\textsuperscript{47} The scheme was not put into practice due to its tremendous investment requirement. A more expedient plan was adopted that sought to engineer contemporary anchorage at Baitang, about 12 miles downriver from the Tianjin bund for lighters to discharge cargo.\textsuperscript{48}

The challenge of the Hai River to the dreams of foreign shippers was aggravated in the 1890s when floods frequently occurred. Freshets from the Yongding River rushed towards the Hai River and silted the river bed. In 1896, steamers were obstructed “for more than seven months of the year.”\textsuperscript{49} Thus, the Kailan Mining Administration persuaded the government to open Qin-huang-dao in 1898 as an auxiliary port to Tianjin to maintain shipping for coal in 1898. Foreign business interests made pressure on the Commissioner of Customs to find a
solution. Followed the proposal of Detring, Danish engineer A. De Linde was entrusted by the Tianjin Chamber of Commerce to take a survey of the river. However, five or six hundred villagers attacked foreign engineers by pulling up the survey pegs and threatening them with bodily harm.\textsuperscript{50} The strong resistance to De Linde’s scheme reflects the tensions between the foreign perspective and Chinese traditions on the issue of how to intervene in the river system. The foreign intervention contradicted many aspects of the Chinese understanding of the river and city.

The Chinese imperial family perceived the river and regulation of the river as instruments of achieving an agricultural society based on notions of Confucian harmony between the state and society. Tianjin was founded as an important juncture of the agricultural and transportation nexus all designed to sustain the imperial economy of the capital region of Beijing and much of the North China hinterland. The scholar-elites of the Qing bureaucracy built canals, diverted floods, and detained flows - all intended to promote agricultural production and agricultural transportation-by the establishment of \textit{Shui-li-ying-tian} water projects.\textsuperscript{51} Priority of for shipping and water control investment was centered on the Grand Canal, the artery of imperial sovereignty over north China. In Tianjin, imperial water management methods centering on consolidation of levees, building of locks, and construction of diversions perfected the imperial irrigational system. Irrigation projects enhanced the imperial goal of managing the environment in order to create a stable and prosperous agricultural foundation of the state. The complicated network of canals or diversions linked the Hai River with nearby shallow lakes, agricultural fields, and the city with the double purpose of flood prevention and agricultural cultivation. Major diversions
helped to discharge flood water from both the northern and southern canals while dozens of small ones withdrew water from the Hai River to hydrate agricultural lands.

The scheme proposed by western engineers undermined the established Qing system of water control serving agricultural production. The promotion of ocean-going steamer navigation on the Hai River led to shrinking efforts premised on expanding agriculture. Local villagers based their economic livelihood on exploiting the agricultural benefits of river water usage. The cutting of river bends led to the resettlement of villages and graveyards, and the sacrifice of agricultural interests. A river that furthered the need for steamers would also alter the social lives of irrigation communities. Both the Chinese government and local people strongly opposed the new water conservancy schemes. But in the eyes of foreign interests, resistance against these new schemes was selfish. The foreign community largely believed the straightening of river courses resulted not only in an increase of water levels to serve shipping, but also as an effective method to achieve flood prevention for the benefit of local farmers.

The situation of the river in 1896-1897 was intolerable because, “for over six months, the depth of water ranged between 5 and 8 feet only”; “even lighters and tug-boats could not come up to the Concessions.”52 Negotiations were arranged between foreign and Chinese authorities. Under great pressure from foreign authorities, the Qing court changed its policy. In 1897, Count Du Chaylard, Consul General for France and Doyen of the Consular Body, H. B. Bristow, H.B.M.’s Consul, Edmund Consins, Chairman of the Tianjin General Chamber of Commerce, and A. De Linde negotiated with Chinese governor Wang Wen Shao.53 An agreement was reached to raise funds for water conservancy from two sources. The Chinese Viceroy contributed Tls. 100,000 for future projects. The other Tls. 150,000 was borrowed
from land renters in foreign settlements as Loan E of August 1, 1898. An extra duty of ½ per mile ad valorem on all merchandise would be levied to amortize the loan and the interest generated on the loan. It was further agreed that a commission would be organized to continue and supervise river conservancy work. The Haiho Conservancy Commission (HHCC) was established with a governing board consisting of the Tianjin Customs governor, two representatives of the principal Chinese companies – China Merchants Steam Navigation Company and Chinese Engineering and Mining Company, the Commissioner at Tientsin of the Chinese Imperial Maritime Customs, representatives of the shipping and lighter companies, representatives of Foreign Concessions, and representatives of the General Chamber of Commerce.

The commission immediately launched projects to harness the Hai River in 1898. Fundamental work included the rounding off of several bends and river training by use of piles and lateral groins in some of the shallowest reaches. Three locks were constructed at Chen-jia-gou, Jun-liang-cheng, and Xigu. The first lock was finished in January 1900; it increased water volume by 65%, and in ten days, the water level near the bund increased about 2 feet.

Construction was halted in 1900 during the Boxer Rebellion. For the restoration work that followed and the rehabilitation of the damages resulting from the Boxer Rebellion, about Tls. 80,158 was required from the Chinese government. In January 1901, the council of the provisional government of the district of Tientsin was authorized by the allied powers to “maintain and improve the communications by the rivers and canals.” Major General de Wogack, Lieutenant-Colonel Arlabosse, and Lieutenant-Colonel Bower constituted a
commission to prosecute and supervise the conservancy work. The board appointed Dutch engineer A. De Linde as Engineer-in-chief, Dutch Engineer J.C.Vliegenthart and French Civil Engineer G. Guiotton as assistant engineers. From January to March 1901, the consular representatives of foreign municipal councils discussed the commission organization, financial management, and detailed plans to manage the Hai River. The members of the conservancy board consisted of both high-ranking Chinese officials and representatives of foreign interests including shipping companies, municipal councils, and the Commissioner of Customs. Foreign interests, especially foreign shipping companies, had a critical voice in formulating river conservancy policies.

With support from the Haiho Conservancy board, the HHCC advisor and engineer A. De Linde stated with much confidence that the ultimate goal for future improvement on the Hai River was to “get ocean-going streamers from Europe across the Taku Bar [Dagu Bar] on a draft of more than 20 feet and to improve the river so that coastal steamers drawing upwards of 14-15 feet may proceed to Tientsin [Tianjin].” The Commission would reach the goal by “improving the navigability of the Hai-Ho [Hai River], technically and financially… such steps as would satisfy all parties interested in the matter.” Supported financially from the Chinese government, loans, and river dues, the Haiho Conservancy Commission chose foreign advisors and appointed engineering staff. The commission intervened in the water system in such a way that both the landscape and relations between river and city were transformed during the Twentieth Century.

**The Hai River Conservancy, 1897–1916**

From the late nineteenth century to the early Twentieth Century, the Hai River
experienced a series of transformations infused with modern conceptions of water management. The natural environments of Tianjin were changed in ways beyond the imperial imagination. The Haiho Conservancy Commission designed schemes to transform the river into a river navigable for steamers. Throughout the process, modern and Western vocabulary, technology, knowledge, and experience were inextricably interwoven with Chinese knowledge, experiences and practices.

The sinuous river course was divided into different reaches. The names Dagu (Taku) Reach, Tanggu (Tangku) Reach, New City Reach, Xinhe (Hsinho) Reach, Gegu (Koku) Reach, and Tientsin Reach used the names of the original Chinese towns and rivers along the river. The Windy Reach, Stone Reach, and Powder Reach interpreted natural surroundings, and names such as Tombs Bend, Arsenal Bend, Brick Kiln Bend, Nine Forts Reach, Farm Reach, and Salt Reach originated from the particular settings along the river banks.

The HHCC executed surveys in order to collect hydraulic data and establish standards for the science of water conservancy. The H.M.S. Rambler conducted a thorough survey of the Dagu Bar and river reaches in 1902, recording data on the current, tide, and sand deposition at the Dagu Bar and working out charts and maps of the river. Engineers decided references and criteria to standardize hydraulic data. At the mouth of the river, a granite stone was placed on the bank near the North Fort and set as a reference. Observers used tide gauges placed on contour lines and marked the mean average at high and low water levels at the river mouth. The mean low water level was determined to be 16.115 feet below the stone base on shore. This served as the imaginary line of the Taku Datum (T.D.), which turned out to be the rational and legalized standard unit of measurement adopted by foreign and Chinese water
conservancy and engineering personnel through the Twentieth Century.\textsuperscript{62}

The HHCC also deployed numerous surveys aimed at broadening the knowledge of the Hai River reaches and its tributaries. These surveys applied hydraulic knowledge widely accepted by foreign engineers and technicians. Scientific and experimental observations, calculations, records, and drawings were all part of the technical catalog of modern hydraulic engineering. Tide gauges stood along the river course at the river bends; tide surveyors were dispatched with reports of observations as references for the engineer-in-chief to design blueprints for river conservancy works.

The new style of water conservancy included modern technology and machines. Horsepower-driven dredging was a fundamental method used to excavate silt from the riverbed. The selection and purchase of these dredgers implied cooperation between locality and the world. The HHCC reviewed specifications and price quotes of dredging facilities from British, Dutch, French, and German firms. Successful tenders signed contracts with detailed explanations of duties, benefits, and deadlines for the completion of future works. Machines and components were produced and assembled in Europe, transported to China, and assembled on the riverfront. The English company Priestman Hall produced two grab dredgers in 1902 and mounted them on Chinese wooden boats. Another bucket dredger was produced by Smulders & Co. in Holland and riveted up at the conservancy’s workshop for the preparation of the first cutting. Sand pumps, earth boats, and steam launches were also prepared at the workshop.\textsuperscript{63} The HHCC owned numerous tugs, tenders, barges, launches, and pipelines—many of which were produced in Europe.
Table 2.1: Imported dredgers were put into the work of dredging on the Hai River.\textsuperscript{64}

<table>
<thead>
<tr>
<th>Name of dredger</th>
<th>Year of purchase</th>
<th>Price (Taels.)</th>
<th>produced by</th>
<th>Capacity</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pei Ho</td>
<td>1902</td>
<td>19,000</td>
<td>A.F. Smulders Schiedam</td>
<td>125 C.M.</td>
</tr>
<tr>
<td>Hsin Ho</td>
<td>1910</td>
<td>262,800</td>
<td>A.F. Smulders Schiedam</td>
<td>500 C.M.</td>
</tr>
<tr>
<td>Chung Hua</td>
<td>1913</td>
<td>190,000</td>
<td>A.F. Smulders Schiedam</td>
<td>500 C.M.</td>
</tr>
<tr>
<td>His Ho</td>
<td>1914</td>
<td>129,900</td>
<td>Osaka Iron Works</td>
<td>300 C.M.</td>
</tr>
</tbody>
</table>

The methods used to protect banks also were an outcome of international cooperation and exchange of Chinese and Western knowledge. A mattress sank in the river bottom to protect bed from erosion called Zinkstuk was introduced to protect the banks that suffered from rapid erosion. The HHCC invited a European expert on Zinkstuk in 1911 and explained the methods to native Chinese workers. Zinkstuk was widely used in protecting the banks after the cuttings of river bends was finished along the Hai River.\textsuperscript{65} Immigrant workers from southern provinces helped construct these apparatuses using local bundles of brushwood and reeds. Another method was Gabbioni or stone box that centered on embedded stones for bank protection. The HHCC studied traditional Chinese knowledge and made use of bamboo in order to reduce the cost and enhance the effectiveness of Gabbioni. Accompanied by building groins, the Zinkstuk and Gabbioni methods became two of the major methods for bank protection in the early Twentieth Century. The Chinese tradition of planting brushwood for bank protection was also widely adopted. The HHCC purchased land and planted local brushwood and willows.

In other respects, the concepts of water conservancy adopted by Western engineers
conflicted with Chinese experiences of water control and irrigation. Foreign engineers saw the mainstream of the Hai River as essential and crucial for connecting Tianjin to the world market. They criticized the Chinese approach of diverting floods of the Hai River tributaries by constructing canal networks, some of which led to the reduction of water volume in the mainstream Hai River.\textsuperscript{66}

To increase the water levels and enhance navigability, the HHCC proposed confining water in order to raise the water levels by closing Chinese canals and taking advantage of tidal waves to raise water levels.\textsuperscript{67} In addition, long and sharp bends made river navigation a time-consuming and dangerous enterprise as steamers constantly became stuck as they swung around the sharp bends. The HHCC engineers’ reports indicated that cutting these bends would not only shorten the length of the river, but also result in enhancing the effects of tidal floods that would significantly elevate water levels.

Loans were sought to procure the funds needed for these constructions along the river. In 1902, Loan A of Tls. 250,000 was issued by the Haiho Conservancy Board to accomplish the first two cuttings. The loan was paid off in 22 years and guaranteed the investors a 7\% profit as well as an additional 1\% for customs duties. In 1903, Loan B of Tls. 300,000, paid off in 25 years, was issued with similar provisions of Loan A.\textsuperscript{68}

With funds in hand, the HHCC made purchases of necessary machines and materials. A workshop was set up on a dry dock constructed along the Liuzhuang near Tianjin reach to facilitate the work of dredging, river arm cuttings, and maintenance. In 1908, the HHCC moved the workshop further downstream to Xiao-sun-zhuang, along with a new floating pumping station, new pipes, and a canal dredger. As dredging was necessary to keep deep
water in the port, the plant was further enlarged thanks to the new financial support of
Scheme B (the River and Bar Improvement Scheme), worth Tls. 870,000, in 1910. The
scheme was financed through a river tax of 4% customs duties or 2 per mil ad valorem and by
a tax on the steamers coming to the port, as voluntarily agreed to by seven shipping
companies.69

These efforts led to changes in water conservancy traditions and methods. Foreign
engineers clattered the network of canals, channels, and diversions in the city. The HHCC
repaired the Chen-jia-gou Lock after it was damaged in the Boxer Rebellion. In 1902, it
constructed a new lock to accompany the old in order to close the Lutai Canal (Jinzhong
River)—a major source of water being diverting from the Hai River. In 1914, locks at
Hai-guang-si and Liang-jia-yuan were also completed.

The HHCC maintained the width of the river at the mouth and in the concession areas
to enhance navigation. Technicians built piles and lateral groins to round off several bends of
shallow reaches.70 They also demolished wartime structures (e.g., the north fort at Dagu) to
widen the river mouth. Dredgers maintained regular and frequent work in places near Tianjin
Bund and swinging berth to maintain enough water and sufficient width for maneuvering
steamers. The original swinging berth was stationed at Liuzhuang, more than a mile from the
bund. Steamers coming to the bund moved downstream to the stern in order to find enough
water to execute a swing.71 In 1903, the HHCC built a new swinging berth near Tianjin Bund
by demolishing a German pontoon bridge built during the wartime era. Dredging continued in
such places to maintain sufficient water. In the 1910s, the HHCC began constructing
permanent swinging berths.
At the same time, G. Detring’s plan of large-scale reduction of the river bends was finally carried out by the HHCC. The board members discussed Detring’s plan, and engineers offered suggestions and a detailed work design. In only three years, the HHCC engineers ambitiously executed three large-scale cuttings along the river course to shorten the length of the Hai River. Another cutting was accomplished in 1913, ultimately shortening the length by 5.64 miles. (See Map 3.2)

Table 2.2: Four Cuttings accomplished by the HHCC (1902-1913)²²

<table>
<thead>
<tr>
<th>Open year</th>
<th>Starting place</th>
<th>Ending Place</th>
<th>Shorten length</th>
</tr>
</thead>
<tbody>
<tr>
<td>1st</td>
<td>July, 1902</td>
<td>Guajia Temple</td>
<td>Yang Zhuang</td>
</tr>
<tr>
<td>2nd</td>
<td>Sept., 1902</td>
<td>Xia Quan (Double bend)</td>
<td>He-jia-zhuang (Vegetable Bend)</td>
</tr>
<tr>
<td>3rd</td>
<td>July, 1904</td>
<td>Yang-jia-chang (Lower Tombs Bend)</td>
<td>Xin Zhuang (Boards Bend)</td>
</tr>
<tr>
<td>4th</td>
<td>June, 1913</td>
<td>Da-zhao-bei-zhuang</td>
<td>Dong-ni-gu</td>
</tr>
</tbody>
</table>

By accomplishing the cuttings, sharp bends or river arms such as Tientsin Bend, Match Factory Bend, Double Bend, the Arsenal and the Vegetable Bend, and the Tombs Bend all were cut. The HHCC made decisions based on cost and time considerations. The application of excavators, dredgers, and transporters saved construction costs, but the operation of machines was time-consuming. The HHCC also used manual labor to complete large projects in a short time.
Table 2.3: Summary of Excavation and Dredging carried out by the Conservancy (the Dagu Bar was not included)\textsuperscript{73}

<table>
<thead>
<tr>
<th>YEAR</th>
<th>PLACE</th>
<th>No. of fang</th>
<th>Method</th>
</tr>
</thead>
<tbody>
<tr>
<td>1900-02</td>
<td>1st&amp; 2nd Cutting</td>
<td>600000</td>
<td>by hand</td>
</tr>
<tr>
<td>1902</td>
<td>Upper Tombs Bend</td>
<td>14720</td>
<td>Hand</td>
</tr>
<tr>
<td>1904</td>
<td>3rd Cutting</td>
<td>682000</td>
<td>Hand</td>
</tr>
<tr>
<td>1911–12–13</td>
<td>4th Cutting</td>
<td>855000</td>
<td>by dredger</td>
</tr>
<tr>
<td></td>
<td>&quot;</td>
<td>10000</td>
<td>Hand</td>
</tr>
<tr>
<td>1913</td>
<td>Upper Tombs Bend</td>
<td>28218</td>
<td>Hand</td>
</tr>
<tr>
<td>1914</td>
<td>River Mouth</td>
<td>13000</td>
<td>by hand and dynamite</td>
</tr>
<tr>
<td>1916</td>
<td>Pei Yun Ho</td>
<td>200000</td>
<td>Hand</td>
</tr>
<tr>
<td>1902-16</td>
<td>River and Harbor</td>
<td>1256338</td>
<td>by dredger</td>
</tr>
<tr>
<td></td>
<td>Grand Total: 3659276</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Similar to the \textit{Shui-li-ying-tian}, large-scale river cutting transformed the landscape and greatly affected the local communities near the old river arms. Houses, garden lands, and vegetable fields were removed or resettled due to the sudden environmental changes. The removal of graveyards especially challenged the core value of Chinese tradition and brought strong resistance from local villagers. Villagers petitioned the HHCC through the Chinese administrator, the Tientsin Customs official, showing their anxiety about and resistance to changes. The resistance was especially persistent after the engineer’s decision to embark on the largest construction effort near a \textit{Shui-li-ying-tian} site, the fourth cutting. Rumors spread
among the villages located along the old river arms. Local villagers petitioned the imperial offices, complaining that anxieties over the proposed projects meant they could “neither eat nor sleep.” The cutting would deprive them of their means of livelihood and “the destruction of graves for the purpose of diverting the river is [was] hard on the corpses.” Negotiations led to higher prices paid by foreign interests to compensate for dislocated graveyards and garden lands.

The cutting also challenged the everyday lives of a dense population. Fishing, ferrying, and even drinking were tremendously affected by these constructions. Villagers voiced concerns about the danger of being deprived of their water supply and required the HHCC to guarantee benefits from the Hai River. Engineers installed water boxes as an expedient way to solve the problem, but the boxes easily silted up. Protest petitions were presented to the board. To make the cutting successful, the HHCC constructed locks to connect the cut river arms to the main stream and to maintain regular dredging along certain parts of the old arm.

Another consequence of HHCC’s river construction was its effects on Shui-li-ying-tian. As the HHCC closed Chinese canals one after another, the river became disentangled from its history as the major setting for the social and economic context of rice cultivation. The development of Shui-li-ying-tian in Zhou’s legacy of Xiaozhan, the earlier paddy fields of Jun-liang-cheng, and other smaller tracts of land dependent on the river were heavily impaired. Conflicts of interest, struggles for water usage rights, and mismanagement of water resources between state property and private companies in the late Qing Dynasty expedited the deterioration of grain cultivation along the Hai River.

As a result, the amount of cultivated land near the site of Xiaozhan, Xincheng, and
Jun-liang-cheng, significantly declined.\textsuperscript{78} When the Qing Governor for Capital Region Chen Kuilong investigated these areas in 1910, he described the wastelands along the Hai River and reported to the royal family that “the vast stretches of barren lands and the barren fields counted some thousands qing.”\textsuperscript{79} He proposed that the Qing court establish an agricultural ministry called the Administration of Zhili Land Reclamation. He also proposed a scheme to oppose foreign agencies and restore canal construction, but the Qing government never committed to the proposal.

**The Dagu Bar Raking**

The Dagu Bar was an intractable bottleneck against the making of a well-organized steamship navigation system. The shallow flat bar continued to be an obstacle for large-draft crafts coming from the sea. The HHCC promoted efforts to improve the Dagu Bar and conducted experiments towards those ends.

From hydraulic surveys, the HHCC engineers learned that the Dagu Bar was a large swath of sand and clay lying under the mouth of the river. The energies from wave action, tidal movements, wind, and movement of soils and semimetal influenced the formation and conditions of Dagu Bar. Sedimentation resulted as the force of the river current was reduced after it passed through the winding river course and met the counter-force of the tidal flood from the sea. A natural deep channel was also shaped by the force of the current flow, but its direction constantly changed. In 1858, the deep channel was marked in a direction N.N.W3/4W, in 1901 the channel moved to S51°E, and 1905 it changed to S45°E.\textsuperscript{80}
A. De Linde proposed making the cuttings on the flat bar so that the water level in these cuttings would be deep enough to support large draft boats. Herr Schellhoss, another chief engineer, designed a similar scheme of cutting to “eliminate the cause of the evil.” He suggested constructing dikes in order to use the energy of the current after each cut to flush silt out to sea. Implementation of such plans was postponed by a limited amount of funds available during the late nineteenth century.

In 1906, the Deputy Commissioner and HHCC engineer Thomas Ferguson introduced the method of raking. This low-cost scheme to improve the Dagu Bar was supported by the knowledge the HHCC gained from its engineers and technicians. Ferguson explained raking as an artificial disturbance of the natural system and “a mere disintegration and stirring up” to produce scouring of the channel. The HHCC invested and launched another in-depth study of currents, tides, and silt. It also sent experimental results to Europe and consulted hydraulic experts. Ferguson then suggested raking in the direction N67E° from the extremity of the
Deep Hole toward the sea by which the composition of sand and clay were easier to achieve disruption.

The engineers who supported raking believed the method to be suitable for the nature of the fine sand and clay of the Dagu Bar. Their knowledge and experience of water conservancy in the Western world helped them arrive at this sort of conclusion. They understood that raking was a historical water conservation method widely adopted to initiate changes in sedimentation long before the practice of dredging was applied. When Ferguson explained the plan for the Dagu Bar, he used the history of scraping and pulling in the short bars and gravel of the Mississippi as a reference. The European experts made comparisons between the Dagu Bar and the ports of Rotterdam or Magdalena. The engineers indicated that the fine nature of the sand and clay and circumstances around the river mouth made raking appropriate for the Dagu Bar.

The HHCC engineers designed suitable rakes to be attached to the tugs. A tug with at least 100 horsepower was chosen and installed with several types of rakes. After discarding several appliances that could not work with hard soil, a “rolling rake” of cast iron disk wheels with steel teeth as stated in the HHCC’s No. 8 plan was accepted. Four tugs—Fa’fu, Fa’tsai, Hilaire, and Sheng Shun, with draughts from 5’ to 7’—were chosen from Tianjin or Shanghai for the experiments of the Dagu Bar Raking. A narrow channel was completed in 1906 and it allowed the steamers to increase its draughts by nearly two feet.

Ferguson understood that European experiences were insufficient for comprehending the nature of this particular challenge. After signs of renewed silting were observed in the channel, engineers made modifications to the original design and tested them along parallel
channels. In 1906, Ferguson claimed that such experimentation “would go a long way to prove the correctness of the various data assumed and lines of reasoning followed.” In order words, the raking experiment involved a great amount of uncertainty in terms of the nature of the silting and the future of the operation. Without waiting for a more reliable analysis of the Dagu Bar, the engineer took the plunge and continued the experiment until the winter of 1906. When the ice was cleared in the spring of 1907, it was reported that the manmade channel had maintained its original shape, although with no obvious scouring effect that was thought to keep the channel subsequently clear.

The HHCC and shipping companies were satisfied enough to conclude that the situation had been improved by the raking. As the channel was raked deeper than the natural Deep Hole channel, the scheme was financed on a larger scale. In 1909, the HHCC used Scheme B of 1910 to extend the scale of raking by purchasing new raking equipments. Four tugs built in Kiangnan Dock and Engineer Works, universal steel barges, floating pipes, the tug Hun Ho, and the 500 C.M. dredger Hsin Ho joined raking and dredging operations.

<table>
<thead>
<tr>
<th></th>
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<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>1907</td>
<td>3.0</td>
<td>3.0</td>
<td>3.0</td>
<td>3.0</td>
<td>4.0</td>
<td>3.0</td>
<td>3.0</td>
<td>3.0</td>
<td>3.5</td>
</tr>
<tr>
<td>1908</td>
<td>3.5</td>
<td>3.5</td>
<td>3.5</td>
<td>4.0</td>
<td>3.1/2</td>
<td>3.1/2</td>
<td>3.0</td>
<td>3.0</td>
<td>3.0</td>
</tr>
<tr>
<td>1909</td>
<td>3.0</td>
<td>3.0</td>
<td>3.0</td>
<td>3.5</td>
<td>4.0</td>
<td>4.0</td>
<td>3.5</td>
<td>3.5</td>
<td>4.0</td>
</tr>
<tr>
<td>1910</td>
<td>4.0</td>
<td>4.50</td>
<td>4.75</td>
<td>5.0</td>
<td>4.5</td>
<td>4.5</td>
<td>4.5</td>
<td>4.5</td>
<td>4.75</td>
</tr>
</tbody>
</table>

The Ferguson Channel increased the depth of the water at the bar through continuous
raking and dredging absent the expected scouring. Raking remained the dominant practice for securing a deep channel for the passage of steamers until 1912. It was fruitful when the Hai River tributaries—especially the Yongding River, the major cause of the silting at Dagu—remained tranquil. However, the situation changed in 1911, when precipitation in the North China Plain intensified and the consequences of increased summer freshets of the tributaries became noticeable in the Hai River. The opening of the Ferguson Channel in the spring of 1912 showed a clear sign of deterioration and, although “raking [had] been going on since the 14th April with 4 tugs, […] the depth of the Channel [did] not show any appreciable increase.” On July 25, the channel depth was only 3’6.”

Any attempts to deepen the Ferguson Channel failed. In August 1912, the channel had silted up heavily. The HHCC decided to move passage to a new natural channel created by the increased Hai volume at S88 E°, which at the time had enough depth without requiring any raking. Shipping companies complained about the waste of public money invested in the failed project and made fun of the Ferguson Channel project publicly in newspapers.

Ferguson’s successor, the commission’s acting engineer T. Pincione, studied the channel and identified two mistakes with Ferguson’s bar raking in his report of 1913:

The raking operations are in no way an efficient means to dig and maintain a channel across the bar and therefore the adoption of this method was a mistake.

The direction of the Ferguson Channel across the Bar was wrongly selected for a permanent crossing and therefore it was another mistake.

Pincione believed that even the new natural channel was better than Ferguson because it was based on natural formation and its direction was harmonious with the Deep Hole.
Following Pincione’s advice, raking efforts were completely moved to the new channel, thereby conceding the failure of Ferguson’s raking. The commission also funded lead marks made by steel beacons with dioptric white lights along the channel and the Deep Hole to the river’s mouth so that steamers could navigate safely across the bar.\textsuperscript{97}

Pincione emphasized dredging to deepen the Dagu Channel, but this approach was more costly than raking. In 1914, the HHCC purchased the 500 C.M. dredger \textit{Chung Hua} to improve the efficiency of dredging. Instead of using the old method of raking by tugs and rakes, the \textit{Chung Hua} served as both a suction dredger and stationary pumping station. It was powerful enough to suck the silt from the channel and send it through a floating pipe to the open sea.\textsuperscript{98} The method proved effective. Since 1914, \textit{Chung Hua} and other dredgers had moved day and night along the Dagu Bar to maintain sufficient water depth for steamers.

\textit{Map 2.3: The Ferguson Channel of 1907 (left) and the New Channel of 1914 (right)}\textsuperscript{99}

\textbf{Ice-breaking Operations}

Winters in Tianjin were another threat to making Tianjin a favorable port for international business. The Tianjin port and certain sections of the river froze when the temperature dropped. The discontinuation of shipping in Tianjin harmed the rapidly developing economic activities and increased the risks and costs of winter transportation. In
severe cases, the Dagu Bar itself froze. Thus, the endeavor to approach Tianjin Bund was abandoned. Tianjin Customs asked for assistance from the HHCC to maintain navigation during winter from Dagu to Tanggu, where large steamers could have a foothold at the river mouth. The Board of Reference paid to have European ice-breaking experts investigate the situation in Tianjin in 1912.

After several short experiments, it was decided that the Hai River reaches and the Dagu Bar were suitable for launching ice-breaking campaigns. The report on the winter investigation of the Dagu Bar indicated that, if the raking and dredging at Dagu Bar continued to make the channel deeper, assisted with the ice breakers working along the reaches and bends, “a steamer could navigate the river to the bund without difficulty at any time during December.” Based on such suggestions, three ice breakers were purchased from Kiangnan Dock and Engineering Works and were put into operation in 1913 and 1914.

<table>
<thead>
<tr>
<th>Name of Ice-break</th>
<th>Price (Taels.)</th>
<th>Year of Purchase</th>
</tr>
</thead>
<tbody>
<tr>
<td>Tungling</td>
<td>84,550</td>
<td>1913</td>
</tr>
<tr>
<td>Kailing</td>
<td>47,250</td>
<td>1913</td>
</tr>
<tr>
<td>Meiling</td>
<td>104,500</td>
<td>1914</td>
</tr>
</tbody>
</table>

The HHCC designed the ice breakers to be capable of smashing the packed ice that accumulated at the river mouth and navigating along the river to break the ice accumulating at river reaches. These ice breakers hit packed ice with their bumpers, and the ebb force washed the smashed ice away. The application of the ice-breaking mission involved quite
sophisticated maneuvers of the commission’s assets. The 12’ draft *Tungling* worked in the river, but the 4’6” draft *Kailing* was designed to work on the bar. As the river conditions were either shallower than 12’ or accumulating ice thicker than 4’6”, the smooth maneuvers of these ice breakers was crippled, jeopardizing the safety of sailors and ice masters.\(^{102}\)

Although the ice breakers were equipped with substantial horsepower and bumpers, the outcome was largely determined by natural forces. Not all the early attempts ended satisfactorily. The winter operations in 1914 did not go smoothly, highlighting the struggles the HHCC faced in this unfavorable environment. During the winter of 1914, the situation of the consistently low temperatures and strong gales with velocities reaching 51 mph made work burdensome and dangerous. *Tungling* and *Meiling* worked along the coast, cutting ice and escorting steamers up to Dagu Bar. The accumulated ice was broken and washed away by the tide. However, the heavy easterly winds brought back much of the packed ice, impeding steamers’ navigation efforts. The number of breakers seemed insufficient to accomplishing the mission. While *Meiling* helped the S.S. *Fengtien* on the morning of January 19, the steamers *Fukushu* and *Kashing* drifted about in the ice.\(^{103}\) Ice breakers reached the requisite position one after another, cut the ice, and led the steamers to an area with thinner sea ice. The steamers *Fukush* and *Kashing* could not reach more maneuverable positions until January 23, and the ice breakers were also grounded at times due to poor maneuvers among the packed ice at low waters. The situation continued to deteriorate in February. On January 29, three steamers reached the wharf but the ice breaker had to find a route for them to navigate off of the bar. The ice breaker *Kailing* worked in the channel and had to navigate circuitous routes in order to prevent damage to itself. The powerful *Meiling* was responsible for cutting a route in
the 3000’ span of ice, working over the bar until it had to stop when the water shoaled.\textsuperscript{104} The 150’ width of broken ice brought \textit{Tungling} into the Deep Hole. On February 19, the ice breakers cut the ice to Tanggu reach and coaled, escorting the three steamers out to the bar.

These ice breakers spent the rest of February continuously struggling with the ice jams, troublesome waves, flood tides, and strong winds that brought ice back to the cleared paths. Even as temperatures gradually rose at the end of February, observers still reported that much of the packed ice had not melted and still lined the channel and the Deep Hole.\textsuperscript{105} The HHCC announced that steamers coming to Tianjin needed to be equipped for winter conditions, including double plated hulls and reinforced bows, cast steel propellers, extra strong rudders, etc.\textsuperscript{106}

As funds and energy were injected in improving the conditions of the Hai River and Dagu Bar, people in Tianjin experienced changes resulting from the large-scale transformations of the river and the city. The increasing number of steamers arriving in the Tianjin Bund generated more economic opportunities, challenges, and even conflicts. New ideas of modernity, economic development, markets, and business practices transformed changed Tianjin into a modern commercial port in the early Twentieth Century.

\textbf{Constructing the modern Riverfront}

The re-engineered Hai River laid the foundation for the modern construction (or reconstruction), expansion, and development of the riverfront. After the Boxer Rebellion, the British and French authorities were granted expanded concession areas from the Chinese government. These areas were located in immense shallow watery and muddy tracts against their modern concept of hygiene. These lands were considered unsanitary and threats to
public health. The HHCC used the dredged sediment from the river as fill for these low-lying lands. Thus, water conservancy activities were directly connected to the modern make-over of Tianjin.

In the prior years, the French and British concession governments used the same methods as the Chinese did in city construction. Individuals who planned to construct houses or other buildings in the concessions concluded a deal with a contractor, who secured available land and hired labor to dig soil for the construction site. The “malarious” mud was transported by long lines of wheel-barrows and dumped on the site and left to dry.\textsuperscript{107} Digging in the nearby regions, however, led to the creation of another lowland pond, so foreign municipal governments prohibited digging in the concessions.\textsuperscript{108}

The HHCC saw an opportunity to sell Hai River sediment, both dredged and accumulated through the cutting of river bends. Before the scheme of filling was proposed, dirt was transported and dumped in the lower reaches of the river, which increased the risk of silting. As the first experiment, a boat packed with dirt navigated through the Hai-guang-si canal to the British concession. About 13,000 fang of earth was deposited in a large pond at the end of Meadows Road. Half of the pond was reclaimed.\textsuperscript{109} The pond was totally filled in the following year, and the business for dredging and filling was fully launched by the HHCC.

Beginning in 1907, the HHCC established pumping stations to replace the rather low efficiency of human labor. The commission invested in building floating pumping stations and pipes ashore, so that the dredged dirt was delivered to the pond through pumping machines. Foreign municipal administrations were required to report the amount of dirt they
needed. In the following years, dredging, filling plants, and machines worked as scheduled in the French “Schroeter” pond, the Belgium pond, German pond, the recreation ground, or in the ponds located in the Japanese concession.

The pumping stations remained in service until 1910, when it was unable to keep pace with the dredgers. A new pumping plant was purchased from Messrs. Smuldens and put to work. The test to fill in Deutsche Niederlassungs Gesellsechaft property was satisfactory. One hundred and thirty Cubic Meters of mud were discharged into the pond in 13 minutes. The fill served construction of roads and foundations of apartments in the concession areas. Located in the low-lying areas, the British, French, and Japanese concessions received the bulk of sediment pumped from the Hai River.

Table 2.6: The total quantity dredged and filled, 1906-1916

<table>
<thead>
<tr>
<th>Year</th>
<th>total quantity dredged in fang</th>
<th>quantity disposed by dumping</th>
<th>Quantity disposed by filling</th>
</tr>
</thead>
<tbody>
<tr>
<td>1906</td>
<td>14000</td>
<td></td>
<td>14,000 Dumped in B.M.C Pond</td>
</tr>
<tr>
<td>1907</td>
<td>11000</td>
<td></td>
<td>11,000&quot;&quot;&quot;&quot;</td>
</tr>
<tr>
<td>1908</td>
<td>20000</td>
<td></td>
<td>20,000 pumped by Prov. Plant</td>
</tr>
<tr>
<td>1909</td>
<td>12783</td>
<td></td>
<td>12,783&quot;&quot;&quot;&quot;</td>
</tr>
<tr>
<td>1910</td>
<td>40250</td>
<td>1644 River</td>
<td>38,586 Pumped by New Plant</td>
</tr>
<tr>
<td>1911</td>
<td>61390</td>
<td>420&quot;&quot;&quot;&quot;</td>
<td>60,970&quot;&quot;&quot;&quot;</td>
</tr>
<tr>
<td>1912</td>
<td>63720</td>
<td>9835&quot;&quot;&quot;&quot;</td>
<td>53,885&quot;&quot;&quot;&quot;</td>
</tr>
<tr>
<td>1913</td>
<td>142339</td>
<td>48815 Old Arms</td>
<td>93,885&quot;&quot;&quot;&quot;</td>
</tr>
<tr>
<td>1914</td>
<td>145000</td>
<td>14000&quot;&quot;&quot;&quot;</td>
<td>131,000&quot;&quot;&quot;&quot;</td>
</tr>
<tr>
<td>1915</td>
<td>235406</td>
<td>42035&quot;</td>
<td>193,371&quot;&quot;&quot;</td>
</tr>
<tr>
<td>------</td>
<td>--------</td>
<td>--------</td>
<td>------------</td>
</tr>
<tr>
<td>1916</td>
<td>347150</td>
<td>21760 River</td>
<td>326,390&quot;&quot;&quot;</td>
</tr>
</tbody>
</table>

Dredging and filling promoted the business of land investment. The real estate market received a boost as ponds were filled and roads were flattened. One of the earliest and largest real estate businesses was the Tientsin Land Investment Co. The company was founded by prestigious British and Americans from the Tientsin provisional government, including Charles Daniel Tenney and Charles Denby, both secretaries in the Tientsin provisional government; Herbert Clark Hoover, an engineer from the Kailan Mining Administration; W. W. Dickinson, the chairman of board for the British Municipal Council; and the HHCC engineer A. De Linde. The company was chartered and incorporated under the Hong Kong ordinances with a capital of Tls. 25,000. It later added another Tls. 500,000 as capital and authorized debentures of 7%. A property of 271 mu was purchased from the British and French extensions and the underdeveloped American concession land. The company earned substantial profits from the price differential between land of undeveloped shallow ponds and more expensive reclaimed land.

The riverfront landscape changed rapidly. The foreign settlements overshadowed the native city and became the new economic center. Foreign residents praised the growth of the concessions and believed it was the concessions that a promising city had been constructed from. From reclaimed land in the concession zones architectural styles arose that mimicked the styles of the respective metropolis. Modern roads provided arteries both within and between the respective concession areas, as well as the nodes of communication on the river and the port. Churches with splendid Gothic style overshadowed the imperial
temples and became landmarks of the modern city. Telephone and telegraph lines connected Tianjin to Dagu. A postal system linked Tianjin with the world via trans-oceanic service. Printing presses were founded by literate men and women for sharing ideas and business information. Splendid mansions and parks were all part of the concession landscape.

The riverine landscape was also transformed by the construction of modern bridges. Chinese pontoon bridges consisted of chained wood boards connected to several riverboats. The pontoon bridges easily assembled and disassembled to facilitate navigation of junks and sampans. The bridges also developed as a busy social site for sailors to rest and gather as the floating bridges were disassembled to allow passage. After the constructing the new outer city wall and moat by the Qing military leader Sengge Rinchen in 1850, the government enhanced communication not only by connecting waterway network, but by the construction of numerous wooden bridges over various waterways to enhance the communication between and within sections of the city. The bridges were usually located near official administrative houses, such as the Chaoguan pontoon bridge (taxation administration pontoon bridge), the Yanguan pontoon bridge (salt ministry pontoon bridge), the Yuan-men-kou pontoon bridge (bridge near the salt minister’s house), and the only pontoon bridge over the Hai River, the Lao-long-tou pontoon bridge (the old Dragon Head bridge). These bridges were constructed in the early Qing Dynasty during the Kangxi, Qianlong, and Yongzheng eras.

In the 1880s, modern iron bridges began to be constructed to replace the old wooden bridges. Li Hongzhang ordered British engineers to build an iron bridge to replace the Yuan-men-kou pontoon bridge on the southern canal. Yet the local Chinese, who were engaged in operating businesses for transportation and navigation, fiercely resisted the
scheme. As a result, the nearly finished iron bridge was dismantled and moved to the Ziya River where the navigation of wooden crafts was less than that on the southern canal. But resistance did not stop the process of modernizing Chinese bridges. Later, the French Lille & Co., the well-known bridge builder from Europe, was offered the opportunity to build an iron bridge with “a single arch of 120 feet span, with a rise of 15 feet, resting on two masonry abutments in cement.” Another bridge with the ability to open and shut mechanically was completed to replace the Yuan-men-kou pontoon bridge in 1888.

The competition of the Lao-long-tou (old Dragon Head) railway station in 1888 further stimulated the need to end the era of wooden bridges. Foreign engineers proposed to erect an iron bridge over the mainstream of the Hai River and connect foreign settlements on the two banks to the railway terminal efficiently and safely. The French Municipal Council had controversy against the idea proposed by the British of constructing the bridge near the Zi-zhu-lin bund, in which the bridge would be made an obstacle structure for the French gunboats to access the French bund. A site was ultimately chosen below the French settlement. But the bridge was again opposed by Chinese engaged in the old grain transportation business. The Chinese governor officially objected to the proposal with great anxiety. The bridge, then under construction, was dismantled with only one concrete pier erected in the water. A concession newspaper Chinese Times concluded that the removing of the bridge showed “another weakness of the Chinese character: the incapacity to look beyond the narrow circle of immediate impressions.”

The situation was finally resolved during Yuan Shikai’s rule when Chinese junks and sampans were disappeared from the Hai River navigation system. With little resistance, iron
bridges replaced wooden bridges one after another, under the advice and management of construction experts and teams from Europe. In 1902, a swinging bridge was built to replace the Lao-long-tou pontoon bridge connecting the eastern and western bunds together.

The Hai River contributed to the change of the city. The water from the Hai River was a necessary resource to sustain the Chinese and foreign communities. The Chinese exploited water from the river and canals before the arrival of foreigners. Well water was not popular in Tianjin because the water contained too much alkali, creating a bitter and astringent taste. Alum and niter were widely used to expel pests and toxins to purify water. After the arrival of the Europeans, many foreign soldiers suffered from dysentery and diarrhea, two diseases frequently encountered in summer. In need of clean water, the foreign settlers adopted the same methods of water purification used by the Chinese. Chinese workers poured muddy river water into a pot; alum was applied, and a shallow bamboo tube was used to suck mud deposited on the bottom of the pot.122

To curb the spread of diseases from unsanitary water, the Tientsin Water Works Co. Ltd. was organized under the guidance of the British Municipal Council. Large British firms funded the company in the spring of 1897 with an investment of 65,000 Taels. The company obtained the exclusive right to supply purified water to the British settlement for 25 years.123 Early shareholders and provincial committee members included Messrs. C. Poulsen (chairman), R. A. Cousens, J. M. Dickinson, A. De Linde, A. Philippot, A. D. Startseff and Jas. Stewart, some of whom had direct or indirect relations with the HHCC.124

The factory installed a pumping house and a water tank on the eastern bank of the Hai River. Pipes were laid through the British concession to convey water. River water was
pumped into a steel settling tank then filtered in two filter beds and stored in a clean water reservoir.\textsuperscript{125} The majority of facilities and materials of construction were oversea imports. The company also provided water to hydrants built on the corners of each block in the concession areas.

As a Chinese rival, the Tientsin Native City Water Works Co. or Ji’an Water Works Co. was founded as a joint-venture mainly by Chinese compradors and merchants with a guarantee from the secretary of the Tientsin provincial government. Supported by the Chinese governor Li Hongzhang, the company was registered as a British company in 1901 with the appointment of A. De Linde and Oliver Crone as engineers.\textsuperscript{126} Different from the British Tianjin Water Works Co., which relied on the Hai River, this new company was constructed at the Jieyuan region along the Southern Canal and extracted water from the Ziya River. The company owned three deposition ponds, two filter beds, and one clean-water reservoir.\textsuperscript{127} In 1903, the company concluded 15-year contracts for the water supply of the Russian, Austrian, and Italian settlements located on the eastern bank of the Hai River.\textsuperscript{128}

By 1916, foreign settlements were thoroughly integrated by and suffused with the artefacts of modernity. Roads were built and paved. Mansions constructed. The city was illuminated by kerosene lights. Four-wheel horse carts and rickshaws popular in Europe and Japan had been introduced into the city. The Belgium company Compagnie de Tramways et d’Éclairage de Tientsin monopolized the construction of tramways in both the foreign and Chinese districts of the city. The company imported tramcars from Belgium and established plants to generate electricity. A tramway within the Chinese city was built in 1906.\textsuperscript{129} And by the second decade of the new century an additional iron bridge was proposed by a Belgium
company to replace the old Eastern floating bridge.\textsuperscript{130} A visitor to the city recorded his impressions:

\textit{The walk about Tientsin is to travel. An afternoon’s stroll from the native to the British, French, Italian, Russian and other foreign quarters, gives the sensation of a magic tour through Peking, London, Paris, Rome and Petrograd. And the windmills among the salt mounds just outside the city add a touch of Holland.}\textsuperscript{131}

\textbf{Economic Development}

Tianjin was not a natural port; the Hai River and the Dagu Bar were not naturally endowed to accommodate ocean-going steamers, but the HHCC engineered a port suitable for the web of connections that developed between China and the world during the last decades of the Qing dynasty.

The number of wooden junks and sampans comprised 27\% in 1877 and 36\% in 1878 of the total number of shipping crafts on the river. The proportion dropped to 15\% in 1887 and 10\% in 1888.\textsuperscript{132} After the Qing government officially ended the Imperial system for grain shipment in 1901, the river experienced a sudden decrease in the number of grain junks. Only four junks were found in 1904 on the river. Hardly a junk reached Tianjin, except for an occasional wayward sailor an individual from a pleasure yacht after 1909.\textsuperscript{133}

The number of steamers, on the other hand, increased dramatically. Three hundred and thirteen steamers reached the bund or Dagu in 1881. This figure jumped up to 514 in 1888, and 533 steamers reached the Dagu Bar in 1890.\textsuperscript{134} One hundred and seven shallow-draft steamers, with no more than an 11-foot draft, navigated up to the Zi-zhu-lin bund during the summer. The Conditions for navigation on the river had improved so much that 333 steamers
navigated directly to the Zi-zhu-lin bund in 1903.

Table 2.7: Number of steamers reached Tianjin, 1899-1919

<table>
<thead>
<tr>
<th>Year</th>
<th>No. arriving at Tianjin Bund</th>
<th>Year</th>
<th>No. visiting the port</th>
</tr>
</thead>
<tbody>
<tr>
<td>1899</td>
<td>2</td>
<td>1908</td>
<td>511</td>
</tr>
<tr>
<td>1900</td>
<td>4</td>
<td>1909</td>
<td>623</td>
</tr>
<tr>
<td>1901</td>
<td>15</td>
<td>1910</td>
<td>617</td>
</tr>
<tr>
<td>1902</td>
<td>134</td>
<td>1911</td>
<td>698</td>
</tr>
<tr>
<td>1903</td>
<td>333</td>
<td>1912</td>
<td>620</td>
</tr>
<tr>
<td>1904</td>
<td>374</td>
<td>1913</td>
<td>703</td>
</tr>
<tr>
<td>1905</td>
<td>395</td>
<td>1914</td>
<td>814</td>
</tr>
<tr>
<td>1906</td>
<td>444</td>
<td>1915</td>
<td>768</td>
</tr>
<tr>
<td>1907</td>
<td>513</td>
<td>1916</td>
<td>658</td>
</tr>
</tbody>
</table>

The improvement of river navigation was not the only factor that impacted the economic development of the city in the early Twentieth Century. Other factors, such as the development of foreign settlements, international economic conditions, local business environments, supply and demand, and oscillating gold prices also influenced the economic future of the city. However, it was the improvement of the river during this period that attracted increased investment by foreign businesses.

For instance, 374 steamers reached Zi-zhu-lin in 1904, and, a few years later, 623 steamers arrived at the bund. The commissioner of the customs praised the river conservancy which was positive to the development of the port. In only five years, the number of
steamers increased 67%. From 1904–1916, the port witnessed an average increase of 24 steamers each year.

The increasing number of steamers on the river signaled an economic boom in the city. This situation as a result of water conservancy works. The reduction of intermediate expenses and the convenience of direct oceanic navigation provided stimulated investment in Tianjin by foreign and Chinese merchants. The elimination of transshipment fees from Shanghai provided a particular stimulus for small foreign firms to open new businesses. These firms had been competing with larger companies by seeking any opportunity to lower shipping costs by eliminating intermediate expenses.

As a consequence, Tianjin underwent a shift from a treaty port dependent on Shanghai for economic prosperity to an independent treaty port economically supported by the enhancement of communication with foreign countries and its economic hinterland by development of tributaries and canals, and the inland railway. In 1895, imports into Tianjin through transshipment from Shanghai were still threefold greater than imports direct from foreign countries. In 1905, however, 52% of total import came by direct shipment from foreign countries. The number jumped to 77% in 1915.137 Direct international freight saved costs of employing Shanghai agencies and intermediate transshipment fees.138 As such, cargo prices in Tianjin were more competitive in the Chinese and world markets. Individual foreign firms located in the concessions had an advantage in transactions with world markets and gained growing profits. Forty foreign firms survived the rivalry with Chinese merchants in 1902. The figure rocketed to 160 in 1905 and 232 in 1906.139

The amount of exports also increased. The relations between Tianjin and its hinterland
were strengthened by these broad changes. Goods produced in the provinces of Shanxi, Shandong, Henan, and Inner Mongolia had access to global markets via the Tianjin port. The expansion of the railway and waterway systems allowed the creation of a web of profit shared by producers, Chinese intermediates and brokers, compradors, and foreign and Chinese firms.

Table 2.8: Trade value of Import and export in three decades

<table>
<thead>
<tr>
<th>Year</th>
<th>Total value</th>
<th>Imports</th>
<th>Exports</th>
</tr>
</thead>
<tbody>
<tr>
<td>1884</td>
<td>23,939,057</td>
<td>20,328,981</td>
<td>3,610,076</td>
</tr>
<tr>
<td>1894</td>
<td>44,277,054</td>
<td>37,412,806</td>
<td>6,864,248</td>
</tr>
<tr>
<td>1904</td>
<td>68,954,694</td>
<td>54,059,315</td>
<td>14,895,379</td>
</tr>
<tr>
<td>1914</td>
<td>123,639,776</td>
<td>88,938,000</td>
<td>34,701,706</td>
</tr>
</tbody>
</table>

The amount of exports took 13.3% of import trade value, 18% in 1884, 18% in 1894, 28% in 1904, and 39% in 1914. The increased ratio of exports to imports shows that, after 1904, Chinese local merchants were instrumental in opening world markets. Local Chinese producers, intermediate brokers, foreign and Chinese firms benefited from the changes initiated by transportation linkages abroad and in the interior. In order to increase the profit, shipping companies such as the Butterfield & Swire Co. established new companies and managed shipping lines in Tianjin. Besides the long-established Taku Tug and Lighter Co. and the Tientsin Lighter Co. of 1904, a joint-venture begun by John Swire and Alfred Holt, became another profitable shipping company navigating on the Hai River. Wharves and shipyards were built in Tanggu to provide maintenance to steamers. The company imported 17 barges and four steam-tugs from Europe and participated in the competition for
Along with the emergence of a modern navigational system, the traditional economic products that offered economic prosperity, salt trade and fishery, underwent an industrial transformation. The riverfront occupied once by the Chinese fishing salt piles changed. These changes not only assisted the economic expansion of the city, but also changed the way of withdrawing resources from the sea and river by the riparian societies. The imperial symbols of the economic prosperity of the city, the salt piles along the river were made into modern forms of salt industry. The number of salt piles decreased sharply as one inescapable result of environmental construction of the river.

The modern salt industry emerged on the waterfront as the river experienced engineering transformation. As a state monopoly that constituted one of the principle sources of tax revenue, salt transactions were strictly controlled by the government and not open to foreign countries. British authorities negotiated the possibility for salt import and export, but the idea had been rejected several times by Chinese authorities. Foreign agencies, however, did engage in private salt transactions in the coastal region. Yuan Shikai negotiated with world powers and used the salt tax as a major guarantee for foreign loans. After this, the production and trade of salt was gradually joined by foreign interests. The Republic government established salt storage facilities, abolished the imperial restrictions free trade the unlimited transactions for salt in 74 counties of Hebei and Henan provinces (adjacent to Tianjin).

In Tianjin, the traditional salt business had been impacted by the powerful forces of change that accompanied the transformation of the Hai River and Tianjin. The Beiyang
government (1912-1928) reduced the number of salt fields from eight in the Qing Dynasty to five in 1914. The largest salt storage field along the Hai River, often described as an exotic landscape by foreign observers, was gradually removed. Merchants withdrew small packs of salt from the huge salt stack and shipped them for sale. After the Boxer Rebellion in 1900, the eastern bank was claimed by Russia, Italy, and Austria-Hungary as foreign settlement areas. The giant salt stacks ceased to exist. Salt merchants explored southern and northern salt stacks near the native city with the hope that the salt could be shipped by canal, but the traditional way of managing the salt business continued to change as the city and river were transformed by large and modern construction.

The Beiyang government overturned any remnants of imperial salt production and marketing by the issue of licenses. The government also promoted the establishment of the Chiu Ta Salt Refinery in 1914. The company was located in Tanggu and owned the Fengcai salt field. But the pace of change was slow. The established group of salt merchants resisted change and persuaded individual salt makers to avoid selling crude salt to the new company. But the forces of change continued. The Chiu Ta Company bought an extra six salt flats from leading salt makers in 1916 and opened a variety of businesses in related areas.

The majority of salt makers still struggled for their livelihood. Social divisions among salt producers remained largely unchanged since the Qing. Rich salt makers cooperated with salt merchants and made great fortunes. Many producers attempted to establish relationships with the Chiu Ta Company to earn better profits. Others lost interest in the competition and lived miserable lives. Some salt makers had to sell salt flats in order to pay their debts.

In conclusion, the river, the city, and its people experienced profound changes since
1860. Guided by the ideas of modernity and the imperialist water conservancy practices, the HHCC’s transformation of the Hai River had a great influence on the layout and development of the city. With the improvement of the river, Tianjin was connected with the world in a web of international trade. The river also had an impact on the social lives of people. As the next chapter shows, the relationship of the river, the city, and the people continued to change up to 1916 as the HHCC continued to struggle with the river.

1 Sherard Osborn and Stephen Court, “Notes, Geographical and Commercial, Made during the Passage of H.M.S. Furious, in 1858, from Shanghai to the Gulf,” Proceedings of the Royal Geographical Society of London 3, no.2 (1858-1859), 68. According to his words, even the American ambassador did not have a copy of the survey. The captain received a copy from the Russian envoy, Count Putiatin.
2 During the time, France and Britain were at war with China; America and Russia remained neutral.
4 Osborn, “Notes, Geographical and Commercial, Made during the Passage of H.M.S. Furious,” 69.
5 Ibid.
6 Oliphant, Narrative of the Earl of Elgin’s Mission to China and Japan, 272.
7 Osborn, “Notes, Geographical and Commercial, Made during the Passage of H.M.S. Furious,” 48.
8 Oliphant, Narrative of the Earl of Elgin’s Mission to China and Japan, 319-320.
10 Osborn, “Notes, Geographical and Commercial,” 68.
11 Oliphant, Narrative of the Earl of Elgin’s mission to China and Japan, 304, 314, 318.
12 Osborn, “Notes, Geographical and Commercial,” 54.
13 Alexander Michie, the Siberian Overland Route from Peking to Petersburg: through the Deserts and Steppes of Mongolia, Tartary, &c. (London: J. Murray, 1864), 12.
15 Oliphant, Narrative of the Earl of Elgin’s mission to China and Japan, 326.
16 Ibid, 330.
17 Rasmussen, Tientsin, 43.
19 Yantai (Chefoo) is a northern port of the Shandong Peninsula. It was opened as a treaty port in 1861.
20 Edkins, Chinese Scenes and People, 237.
21 Ibid.
22 The original sentence is “They are only Asiatics…They are to us what the child is to the man: bear that in mind – treat them as children; make them do what we know is for their benefit…” from Sherard Osborn and Stephen Court, “Notes, Geographical and Commercial, Made during the Passage of H.M.S. Furious, in 1858, from Shanghai to the Gulf,” Proceedings of the Royal Geographical Society of London 3 (1858-1859), 58.
23 Samuel Wells Williams was a U.S. missionary and the editor of The Chinese Repository.


26 Tianjin dangan guan, ed. *Tianjin zu jie dang an xuan bian* (Tianjin: Tianjin ren min chu ban she, 1992), 5.

27 Margaret Armstrong Hitch, “The Port of Tientsin” (PhD diss., University of Chicago, 1924), 54.

28 About the relationship between bunds, power and space, see Jeremy Taylor’s “The Bund: Littoral Space of Empire in the Treaty Ports of East Asia” *Social History*, 27 (2002), 125-142.

29 The construction of the American concession was authorized in 1860 by the Chinese government, but the ambition for expanding influences of the Municipal administration was exhausted by the American Civil. The concession of the United States had been transferred to the British Municipal Council in 1902.

30 Lai, *Tianjin de jiu guo zujie*, 21. Concessions of Britain, France, and the United States were founded in 1860. Concessions of Germany, Japan, Russia, Italy and Austria-Hungary were between 1895 and 1901. The British and French concession extended their acreage in 1897, 1900 and 1902. In 1902, the concession of the United States was merged into the British Concession.

31 John Swire only owned two steamers among the five steamers navigated between Tianjin and Shanghai and one steamer between Shanghai and Fuzhou. Others were entrusted to Swire in Hongkong, one owned by Chinese comprador Tang Jingxing and others.


33 Ding Richu, ed., *Shanghai jindai jingji shi*, vol. 1, 542.

34 The calculation of steamers during wartimes might be inaccurate. During wartime CMSN Co kept running by using flags of other Countries. For instance, during the Sino-French War 1883-1885, CMSN Co entrusted ships to the Russell Co. and used the American Flag, then purchased these ships back after the war.


37 Zhongguo renmin zhengzhi xieshang huiyi Tianjin shi weiyuan hui, ed., *TJWSZLXJ*, vol. 35, 203.

38 Ibid, 205.

39 Tientsin Customs: Report on the trade of Tientsin for the Year 1866, TMA 1:IV-6, 16.


41 Wu, ed., *Jindai haijuan maoyi nianbao*, 56.

42 The example is the cotton trade. It is recorded that Ningpo men received cotton goods from foreign importers in Shanghai and sent the goods to the Tianjin agents in Shanghai. Goods were shipped to Tianjin and handed to the Tianjin merchants, usually in a lower prices than those sold by foreign firms in Tianjin., details see: Tientsin Customs: Report on the trade of Tientsin for the Year 1866. TMA 1:IV-6, 16.

43 TMA 1:IV-6, 1.


Shui-li-Ying-tian project refers to the agricultural experiments along the Hai River and its tributaries adopted by imperial governors in Tianjin. The military leader Zhou Shengchuan of the Qing Dynasty carried out the largest scale Shui-li-Ying-tian project by constructing new towns, irrigation networks and cultivation lands along the Hai River and the Southern Canal.

The eastern part referred to the land developed near New City. The major Xiaozhan agricultural field was located as the western part, depended mainly on the water from Southern Canal instead of the Hai River. Therefore, the transformation did not impact greatly on the western part.

“Xuantong er nian shi er yue xia,” in Qing shi lu, vol. 60 (Beijing: Zhonghua shuju ying yin ben, 1985), 583.


Map 2.5 and 2.6 are adapted from “report on Daku Raking Operations, 1907, being an account of work executed by the Haiho Conservancy Commission, by Thos. Ferguson, deputy Commissioner of Customs, temporarily detached to Harbour Department, Printed by E. LEE, Tientsin,” TMA 1:VIII-187.


Ibid.


Summary of Work to 15th April 1912, TMA 1:VIII-187, 288


The conservancy should get Dr. Sun Wen to pass over the old Bar on his way back and afterwards call it ‘The Sun Wen Channel.’” September, 19, 1912, The Ferguson Channel, To the Editor of the P.& T. Times. TMA 1:VIII-187.


Pincione wrote in his report the New Channel was “almost in a line with the last reach of river to the deep hole.” Report of 1913, TMA 1:VIII-187.


Ibid, 14.


Rasmussen, Tientsin, 56.

TJWSZLXJ, vol. 46, 164.


Report for 1916, Table (G), TMA 1:VIII-187.

TJWSZLXJ, vol. 91, 65.


Rasmussen’s account for Tianjin in his Tientsin: An Illustrated Outline History depicts the development of foreign concessions. The concessions were seen as the city of Tianjin. By comparison, the backward Chinese city was referred as the native city.


TJWSZLXJ, vol. 21, 23.

The North - China Herald, 6 Jan. 1888, 12.

Ibid.

Rasmussen, Tientsin, 87.

Ibid.

The North - China Herald. April 27, 1889, 496. The Chinese Times (1886-1891) was a weekly newspaper founded by G. Detring in British concession with Alexander Michie as the major editor.

Rasmussen, Tientsin, 106.

The London and China Telegraph, June 28, 1897, 26.

Ibid.

A. De Linde Engineer’s report, the North - China Herald, July 18, 1898, 120.

TJWSZLXJ, vol. 21, 37.

Ibid.


TJWSZLXJ, vol. 46, 149.


Data gathered from reports on trade for the years of 1877, 1878,1887, 1888 in Wu, ed., *Jindai haiguan maoyi nianbao, 1865-1946*.

Rasmussen, *Tientsin*, 301.

Data gathered from reports on trade for the years of 1881, 1888, 1890 in Wu, ed., *Jindai haiguan maoyi nianbao*.

Report for 1916, Table (F), TMA 1:VIII-187.


The figure was influenced by the outbreak of WWI. Figures comes from Hongming Wu, ed., *Jindai haiguan maoyi nianbao*.


Shang Keqiang, *Jiu Guo zujie yu jindai Tianjin* (Tianjin : Tianjin jiao yu chu ban she, 2008), 70.

Rasmussen, *Tientsin*, 298-299.


The Five Changlu Salt fields in Tianjin and Hebei province were named Fengcai, Lutai, Shibe, HaiFeng and Yanzhen.

“Yan tuo” in *Tianjin zhengsu yan ge ji*, vol.3 of *TJTJZDJJ*, 36.

Ibid, 36-37.


See the folk songs recorded from the salt makers lived in Hangu (Lutai Salt field) in *Zhongguo Ge Yao Ji Cheng Tianjin Juan* by Zhongguo minjian wenxue jicheng quanguo bianji weiyan hui (Beijing: Xinhua shudian, 2008), 13.
CHAPTER THREE

Shiye and the River, 1917–1927

Since the late Qing Dynasty, the Chinese have used their strong anti-imperialist and nationalist feelings to join in the economic competition against their Western counterparts. The term shiye (practical enterprise) was used in the late nineteenth century as Western ideas and ideologies of imperialism penetrated China.1 The Self-strengthening Qing governors, such as Zhang Jian, saw shiye as an essential means for saving the country from imperialist oppression. It served as a necessary means for stabilizing China’s economic, social, and—ultimately—political life. The idea of shiye altered the way in which the Chinese viewed the river system and became a lens for creating new visions of how to manage water.

The idea of shiye was intertwined with the power struggles between the Chinese and foreigners. Centered on the Hai River, the conflicts and cooperation between Chinese and foreign water conservancy agencies led to the transformation of the Hai River and its tributaries. Along with the imperialist construction of the concessions and new riverfront, it enhanced the city’s process of breaking from the imperial past to become a modern harbor, with great changes occurring in the social and economic lives of the riverine society.

Shiye and Water Conservancy

Heavily influenced by the growing presence of Western-style businesses in China, the idea of shiye showed similarities and differences from the ideas brought overseas. Although the Westerners developed and expanded their influence over the economy, the Chinese idea of shiye was accompanied by the goal of freeing China from Western influences and a
systematic plot for developing industry and commerce as well as a full-scale modernization of traditional agriculture, the fundamental economy and ideology that had sustained the existence of the imperial system for centuries. Accompanied by the call to win the “trade wars” against the imperialist countries, the idea of shiye included a series of overall management and outlay of industries, agriculture, water conservancy, transportation, and communication. Taking advantage of crude natural resources and the network of rivers, canals, railways, and roads, the Chinese shiye accelerated the construction and connection of the hinterland and treaty ports of the country. It also involved the human intervention in the natural environment in order to facilitate and protect the process of shiye business in northern China.

As a treaty port exposed to modern and Western technologies and business styles, Tianjin was a center for displaying and disseminating the ideas of trade wars and shiye. Since the 1910s, such rhetoric had frequently shown in newspapers and magazines. Not only were the imperialist methods for trade and economic competition introduced as a success and example for the Chinese, who struggled against foreign counterparts, but the idea was also used as a way to show nationalist feelings and to unify the society. Sometimes, the idea of trade war was used as an advantage to advertise and attract Chinese buyers.

Tianjin was the pioneer for promoting shiye through expositions of industrial products. A manufacturing and industry site was founded in Tianjin in 1904 to hold exhibitions and introduce Western industrial products to the Chinese. In the 1900s, Tianjin held several local expositions for industrial and agricultural products. The 1906 exposition included 76 products and attracted 5,000 to 6,000 visitors per day while the one in 1907 grew to more than 100 stores and 15,000 visitors. In 1915, the first national exposition was organized in Beijing. It
quickly became one of the hottest topics of discussion, and news was widely broadcast among Tianjin manufacturers and merchants. The local newspaper Yi-shi-bao established the same year, expressed its will to support shiye by offering an extensive coverage of the event. On October 20, 1915, the newspaper published an editorial discussing the relationship between the exposition of national products and trade wars. It concluded the exposition was a necessary way to distinguish products with good quality for businessmen while it also enhanced China’s competitive power against foreign powers.

In the 1910s, shiye magazines were created in each province to highlight the endeavors of the newly rising Chinese entrepreneurs seeking to exclude Western influences from China by equipping commerce, industry, and agriculture with Western-style ideas. In Tianjin, a magazine founded by Zhou Xuexi focused on introducing contemporary Western news, laws, management, and the organization of Western industry, commerce, and agriculture. Investigations into and statistics related to Chinese products and natural resources were gathered and published. Schools of shiye were also created to facilitate the inculcation of shiye knowledge. Special schools for mathematics, machinery, engineering drawing, telegraphy, handicraft, and commerce were founded in the early Twentieth Century to prepare the Chinese to make contributions to shiye businesses in Tianjin.

Agriculture still existed as an essential part of the new ideas of shiye as agriculture was considered “the foundation of making the nation prosperous and the prosperity of shiye.” As an important agricultural site near the capital, Tianjin’s agricultural activities were under the examination of the shiye promoters. The Zhili (capital region) agricultural experimental site was built in the eastern part of Tianjin and was originally a government-led plantation site in
the late Qing Dynasty. After the establishment of the Republic of China, the site was organized as one of the largest experimental sites for local seed and breeding improvement, the introduction of improved Western breeding and seeds, and crop and animal experiments. Experimental reports were first produced in 1914 and included information on the experimental plantations and comparisons of rice, sorghum, wheat, and corn seeds from different countries and regions as well as seeds from economic plants (e.g., cotton, fiber), data on animals, information on mulberry and silkworm, and tests on soil and fertilizers, including their effects on output. Experimental sites for industry and marine products were also established to expand shiye knowledge from different perspectives and enhance the competitive power of Chinese products.8

The Xiaozhan and Jun-liang-cheng Shui-li-ying-tian agricultural fields exhibited their importance in the 1910s. The regions for rice cultivation were controlled by the administrative body under the new Beiyang government (1912-1928) overseeing land reclamation. The administration managed and rent lands, collected taxes, and improved irrigation systems to increase rice output. Agricultural experimental sites introduced better rice breeds from other countries and distributed new seeds to local peasants.

As cotton became popular cash crop needed in the development of textile industries, new land was reclaimed to create agricultural sites for cotton cultivation. “As the profit from cotton growing is nearly double that realized from sorghum or wheat,” cotton cultivation substantially expanded in the Hai River tributaries. The Kaiyuan Company purchased land in Ninghe County, north of Tianjin, in 1917 and expanded cotton cultivation.9 In 1920, the company invested 5 million Yuan to reclaim land in the northeastern part of
Soil was studied systematically and improved for cotton plantation, as raw cotton and cotton products were eagerly needed for cotton industries in northern China and abroad.

Water conservancy was seen as a necessary step to improve shiye production. Water resource supplied irrigation and improved navigation. Under the guidance of the Beiyang government, programs of water conservancy were put on the major meeting agenda of the Ministry of Interior, Ministry of Agriculture, and Ministry of Commerce. In 1914, the National Water Conservancy Bureau was founded as an independent official agency. Water conservancy works were carried out in collaboration with the Ministry of Interior and the Ministry of shiye. In the capital region, the development of shiye connected closely with the Hai River water conservancy and river transformation. Li Yuzeng investigated geography and society in the region and proposed that the future of shiye relied on cotton yarn, husbandry, forestry, and water conservancy. This “complete scheme” shows the importance of Tianjin in the early Twentieth Century as the bridge connecting the economic hinterland with the world. The mountain, plains, and river resources were all subjects to use to improve shiye.

The scheme emphasized the importance of applying water conservancy to the shiye development in the region so that it would increase the reclamation of new land, reduce the hazard of disasters, and improve navigation. Gu Shiji believed it was the environment that made Shanghai and the Guangzhou the two economic and industrial centers for industry. Rivers were still of importance as the railway developed. He analyzed the possibility of developing navigation, irrigation, and hydroelectric power in the capital region.
A drive behind the promotion of water conservancy and shiye development was to establish a unitary nation with united water conservancy agencies. As Xiong Xiling stated, the nation “owned rivers like a man owned blood vessels. If blood vessels had a problem, [the man] should be cured by ren and du meridians together. If one meridian was open but the other was blocked, it still led to disease.”\(^{15}\) He urged national authorities oversee water conservancy constructions and improve communications among different provincial and local authorities for flood prevention. Sun Yat-sen’s *The International Development of China*, written between 1919 and 1921, is another good example highlighting the relationships between shiye, water conservancy, and the nation. The book consolidates connections between the development of shiye and the establishment of a comprehensive network for communication, transportation and navigation. Sun sought opportunities to make China a powerful state by taking chances in re-adjusting war industries after the World War I. He indicated that new post-war industries were established in China to overthrow China’s unfavorable economic situation of being the “dumping ground” for foreign nations.\(^{16}\) Sun designed the development of shiye in China from a national perspective and thought each province of China needed to be united together and go through an industrial revolution to compete with world powers. A mature communication system consisted of railways, canals, roads, telephone and wireless systems was the infrastructure of an industrial country. China was expected to build “three ocean ports with a future capacity equaling New York Harbor.”\(^{17}\) A port in the north was the economic center to facilitate the development of commerce, industry, and agriculture as well as the use of rich natural resources. Although Tianjin was a large commercial port in the 1910s, it was not chosen as Sun’s great harbor in the north. Sun
selected a place midway between Tianjin and Qin-huang-dao for construction of “the great northern port.” He acknowledged that the confinement of navigational environment in Tianjin and Dagu could never allow it to be made into an ice-free port suitable for oceanic steamers. He took consideration of the location of salt fields and nearby mining sites and was persuaded to use the area between Dagu and Qin-huang-dao as the site for the port, even though the construction of such an ideal place would be costly. Sun Yat-sen’s blueprint of a unified nation and making a nationwide planning of water conservancy to improve economic development for anti-imperialist purpose had been sundered by prevailing wars among warlords in North China Plain. Yet it laid the foundation for practising river conservancy with a national scope by Sun’s followers, the Guomindang, after 1928.

The Flood of 1917 and Establishment of the CIRC

The Haiho Conservancy Commission (HHCC) engineers believed the construction of river arm cutting as well as improvements to the course and Dagu bar were not only beneficial for shipping interests, but also theoretically healthy to increase the scouring force of the riverbed while enhancing the ability to provide for flood discharge. However, the flooding problem was not largely improved in North China. In 1917, a huge flood disturbed the river system of the Hai River and inundated Tianjin.

The Hai River’s flood problem came from its tributaries. Current flow of the tributaries was torrential compared to the mild flow in the narrow course of the Hai River. The Yongding River and the Northern Canal were especially troublesome. Chinese water conservancy and shiye pioneers urged the Beijing government to unfold detailed surveys and examine the root issues of flooding as early as the 1900s, but the unstable political
confrontations made it impossible to complete any large-scale ones. The dyke breaks at a town called Li-sui-zhen in 1912 and 1913 were notable as they made the Chaobai River, an upstream branch river of the Northern Canal, change course. Instead of discharging flood water through the Northern Canal and Hai River, this upstream branch founded a new river course towards the Jiangan River and shared the course with the Jinyun River before headed out to sea at Beitang instead of Dagu. The changed course of the Chaobai River had a large impact on the navigation of the Hai River as it contributed a major water source to create the Northern Canal. The depletion of clean water from the Chaobai River and the reduction of water of the Northern Canal into the Hai River system made silt of the Yongding River significantly destructive when being accumulated at the Dagu Bar.

In a 1915 report, the acting engineer-in-chief of the Haiho Conservancy Commission, T. Pincione warned the Chinese authority of the need to execute the improvement works in the Northern Canal to restore the old river courses and improve the navigation of the Hai River. As the old course of the Chaobai River at Tongzhou was silted up, the engineer suggested the construction of a cofferdam at Li-sui-zhen or a cutting at Niu-mu-tun. These constructions aimed at connecting the new Jiangan River and the Northern Canal with the assistance of embankment construction to prevent bank burst in order to restore the flow to the old course and benefit the Hai River.

In response, the Chinese authorities dispatched observers and surveyors to the northern tributaries. They observed that, as the terrain of Li-sui-zhen was too precipitous, the river bed below Li-sui-zhen silted up quickly and the dyke break was not easy to repair. The Chinese authorities suggested building a new diversion canal to divert flood water from the Chaobai
River into the Jiyun River and restore the old course of the Chaobai River to prevent outflows only in summer and autumn.\(^{22}\) The Hai River engineers petitioned to the Ministry of Interior and objected the plan. The HHCC insisted on building a dam at Li-sui-zhen and restoring the Chaobai River completely. A final agreement was reached in May 1916 after the Chinese authority yielded. A dam was to be constructed at Li-sui-zhen, with the cost advanced by the HHCC and later refunded by the Chinese government.\(^{23}\) Yet the local construction team met troubles. The excavation work over the old course was inadequate to restore the river’s course. Chinese engineers reported that height, slope, and size of the cross-section of the riverbed could not withstand strong flood discharge. In face of the threat of upcoming floods, they “decided to give up the idea of restoring the whole output of the Pei Ho [the northern Canal] to the old bed.”\(^{24}\) A weir was constructed at Li-sui-zhen to allow for the passage of low water output into the old bed and the diversion of excess waters into the new river.

Even the construction of the weir went challenging when the summer rainy season arrived. In July, 850 Chinese workers fought to elevate the height of the dam while the water level increased hour by hour. When the effort to save the dam failed, they moved on to construct a provisional dam above Li-sui-zhen. The heavy load of water made a terrible burst in the middle of the provisional construction, meaning the entire construction effort had been in vain.\(^{25}\) Sign of deterioration in the Hai River upset its engineers. In July 1916, the Hai River bed “in places shoaled from 7 to 9 feet in 48 hours.”\(^{26}\) Dredging plants navigated busily along the Hai River and the Dagu bar. Although 1,200,000 cubic yards of silt were dredged from Tianjin Harbor, the bed of the river was almost two feet higher than it had been twelve months earlier.\(^{27}\) The sudden increase of precipitation made the situation worse. In August,
the burst of the Yongding River dyke resulted in flood water running toward Tianjin and Beijing. The northwestern district outside Tianjin, home to thousands of villages, suffered from torrential floods.\textsuperscript{28} The Yongding River created a new water course by nature with the demise of the old course.

All conservancy agencies struggled in 1917. The Li-sui-zhen weir was completed in May, and the provisional dam above the weir was opened to a width of 500 feet. Another two dams built on the Northern Canal were also finished as they lowered to a level two feet in preparation to discharge the overflow of the Northern Canal.\textsuperscript{29} These projects, however, were damaged again in July and August 1917, when heavy precipitation hit the region repetitively. Water levels at Li-sui-zhen rose up to 88 feet T.D. (Taku Datum) on July 16 and reached 103 feet T.D. nine days later. The current with “a breadth of more than 200 feet” passed across the unprotected bend at Li-sui-zhen and washed away its eastern dyke.\textsuperscript{30} Water levels at Tianjin Harbor decreased significantly. The channel at Dagu bar deteriorated with the signaled depth of −7 feet T.D. (7 feet below the Taku Datum), making it too weak to maintain minimum water for oceanic steamers. The situation became unacceptable in September in spite of non-stop dredging operated. The shallow depth of the channel reduced to −2.5 feet T.D.\textsuperscript{31}

As the bottom line for the HHCC’s survival was irritated by the deterioration of river navigation, foreign agencies put more pressure on the Chinese side. The HHCC, the National Conservancy Bureau, and relevant conservancy commissions met and negotiated. A joint commission was established and composed of three representatives from the Chinese government and three persons nominated by the board—namely, T. Pincione from the HHCC and H. von Heidenstam, engineer-in-chief of the Whangpoo Conservancy Board; W. F. Tyler,
coast inspector represented the Chinese Maritime Customs; Van der Veen of the National Conservancy Bureau; Xiong Xiling, Yang Baoling, and Wu Yulin of the Chinese water conservancy authorities and provincial government.\(^{32}\) Headed by Xiong Xiling, the purpose of the joint commission was to ease controversies between different institutions of interests and maintain “the prevention of floods in Chihli [Zhili] province; the conservancy of the waterways of the hinterland; and more especially the measures which should be adopted” in regard to the Northern Canal and the Yongding River.\(^{33}\)

The conflicts of opinion outside the joint commission about how to solve the problem of the Hai River and its tributaries became new quarrels inside this joint commission. The HHCC insisted on restoring the old route of the Northern Canal to guarantee navigation and improve the economic growth of Tianjin whereas the Chinese side emphasized harnessing the Yongding River first and working on a water management plan to improve irrigation and eliminate disasters. The engineers of the Hai River never stepped back, though they agreed with the Chinese experts that the Yongding River was the paramount threat in North China.

As these controversies remained unresolved, rampant floods inundated the majority of areas along the Hai River system. Millions suffered from the floods throughout the year. Refugees were everywhere in the northern cities and towns. Foreign journalists reported on “occasional house-crowed mounds, isolated stretches of dykes standing a foot or two above water, trees with trunks submerged, houses with the lower portions in water, junks sailing over the fields that are now shallow seas, like Noah’s arks and as jammed with people as the biblical craft was with animals…villages are submerged, or gone, the mud-walled houses
melted.” Tianjin Municipal administration carried out emergency work by consolidating dykes along the canal systems around Tianjin to protect native city and concession zones.

The flood gradually retreated after 1918, but the conflicts over the Hai River tributaries extended after. The British hydraulic engineer F. C. Rose, whose expertise in agriculture fit the needs of the Chinese National Conservancy Bureau, was appointed as the chief of technical departments for the Chihli River Commission. He voiced the Chinese focus on improving the Yongding River, but the HHCC again showed the only interest on restoring the Northern Canal and protecting the economic welfare of Tianjin in a timely manner. Pincione criticized Rose’s omission of the maintenance of the Hai River from his radical plan to improve the Hai River system. In response, Rose showed his idea that the restoration of the Northern Canal would benefit little in the region. The reduction of the silt brought by the Yongding River would benefit livelihoods along both the tributaries and the Hai River. Yet, such benefits would not be seen in a short time, and the shallow river course and Dagu bar in the river fayed the nerves of the shipping companies and the HHCC.

The establishment of the Chihli River Commission showed that Tianjin was growing into a center of prosperity for the wealthy and businesses in North China. The commission disagreed with the HHCC over problems of the Hai River tributaries, but its shiye dreams lived in concord with foreign agencies on implementing work for economic development in Tianjin. The commission also developed a grand scheme bridging together the idea of shiye and national water conservancy constructions in North China.

**Plans to harness the Hai River Tribuaries**
The flood of 1917 was a stimulus for the improvement of water conservancy infrastructures in North China. By 1923, the Chinese had built 73 precipitation and stream gauging stations along the rivers of the Daqing River, the Hutuo River, the Yongding River, the Chaobai River, the Beitang River, and the Northern and the Southern Canals.\textsuperscript{37} Precipitation was recorded every month. Surveyors, draftsman, observers, and technicians were trained to conduct investigations on the terrain and river courses, precipitation calculations, flow and current tests, and charts as well as assist with construction.

In Tianjin, a series of constructions were executed aimed at protect the city from the flood. The completion of the inner levees of Tianjin, built along the relic of Sengge Rinchen’s wall, aimed at protecting the city and concessions. Tianjin’s outer levees were also consolidated higher around the city, especially near the railroad terminals, tracks and stations. These projects were not easily conducted as they stirred resistance from the local residents.\textsuperscript{38} Negotiations, compromises, and modifications to the plan resulted in a workable solution. For instance, the idea of constructing a southern levee along the railroad was initially challenged by the railway administration, and the location of the levee was subsequently questioned. Both the HHCC and the CIRC felt it was difficult to obtain the land from unsatisfied landowners. The whole plan was delayed two years, eventually being constructed during the flood of 1924 through an agreement between civil and railway authorities.\textsuperscript{39}

The Chihli River Commission became a necessary Chinese representative for the HHCC to expand its ambition to fulfill an immediate cutting at San-ch'a-he-kou. The proposal said the cutting would result in better flood control, but shipping companies in Tianjin were more interested in seeing the results in elevating the water levels of the Hai River. This plan,
once developed by De Linde, involved the resettlement of the most populated area consisting of rich and gentry groups. Cooperating with Chinese water conservancy agencies empowered the HHCC to complete the cutting of the populated bend that the freshets met when entering the Hai River mainstream. The cutting of 1918 ended with the purchase of land and demolition of 300 houses and a Ming temple.\textsuperscript{30} The CIRC consulted Provincial Governor Cao Rui and Police Chief Yang Yide. Local gentry and rich merchants were included in the decision-making process related to construction and fundraising.\textsuperscript{41} Led by the intervention of police forces and representatives of the gentry class, resistance was finally quelled.

The so-called San-cha-he-kou Cutting or Cathedral Cutting was carried out from June to September, with satisfactory outgrowth as reported by the HHCC’s engineering reports. The tidal height near the region rose from 3 feet to 5 feet.\textsuperscript{42} A year after the opening of the cathedral cutting, the mean range of tide in Tianjin Harbor in May and June was 6.25 feet, with a maximum of 8.6 feet, compared with the figure of 5.04 feet with a maximum of 7.7 feet before the cutting.\textsuperscript{43} The cutting ended the history of discharging flood water from the Northern Canal via the diversion canal of the Jinzhong River constructed in the Qing Dynasty. A lock was constructed to cut the Jinzhog River from the Hai River. Following the cutting, the CIRC made another cutting on the Southern Canal in order to shorten the length of the river course and enhance the benefits of the San-cha-he-kou Cutting to the Hai River. The construction was conducted in 1918 and 1919.\textsuperscript{44}

When positing a change to the Machang Canal, the scheme was challenged with resistance. The use of water for \textit{Shui-li-ying-tian} agricultural fields on riverfront conflicted with that of the HHCC’s need for river navigation. The resistance was especially strong when
during the dry season. Instead of closing the sluice gate to guarantee enough water in the Hai River, the villagers at Xiaozhan opened it to divert water from the Southern Canal to irrigate their wetland rice fields. In order to enhance the Machang Canal’s capacity for flood discharge, both the HHCC and CIRC decided to reconstruct the old wooden sluice into a new one further upstream. The villagers sent letters to the governor and said “the diversion river was the lifeline of Xiaozhan fields…the water for fields was similar with food to humans, with it humans live, without it humans die.” The villagers pointed out this conspiracy fed the greedy drinking companies while sacrificing their agricultural production. The provincial governors appointed investigators to meet with both local agriculture institutions and peasants. In 1921, the long-lasting controversy was settled with a new sluice being constructed. The control the sluice was then transferred to the HHCC.

Map 3.1: The flood of 1917 and the restoration of the Northern Canal
The Northern Canal was also updated as the result of the flooding. Old sluice gates were replaced with concrete and iron ones. The diversion of the Northern Canal in Tianjin to the Xinkai River had been dredged. Yet, like the fate of the Machang River, the plan to restore the old river course of the Northern Canal from Jiangan River created during the flood of 1917 met resistance from local communities. The CIRC balanced the flood discharge requirement and the need for increasing water levels in the Hai River. It was decided to partially restore the course at Suzhuang, a village not far from the breach of the Northern Canal. The CIRC raised 158,199 yuan to purchase 3,307 mu of land and help with house demolition and the resettlement of houses and graves. The construction started in 1922, but was slowed going forward.

The CIRC’s grand scheme sought to transform the natural environment to eradicate the threat of inundation in the northern China region. Corresponding with the national shiyé plans to “make the country rich” by improving navigation of river systems and in-land tributaries and canals, the complete plan included investments in facilities and projects for hydraulic measurement and construction as well as the large-scale mobilization of human labor and changes to local agricultural communities.

The implementation of this scheme was delayed by warfare in the northern plains among warlords and factional militants. Investment in investigation and surveys including topographic surveys, weather and precipitation observations, flow measurements and calculations, and chart drawing also consumed time. The CIRC struggled to request financial aid from the Chinese government to conduct research to better understand the entire Hai River water system, ultimately not publishing its Final Report and Grand Scheme until 1925.
This report of a grand scheme presented a comprehensive flood control system on the Hai River tributaries. Freshets of the tributaries were either diverted into the sea via diversion canals or confined within the reservoirs.

The flood from the Chaobai River was controlled by a mechanism at Niu-mu-tun, which served as a critical spot for the Northern Canal course restoration after the 1917 flood. Freshets were diverted into the Hai River by the old course, but excessive flooding could also be diverted into the Jiangan River and Jiyun River by managing the engineering mechanism. The diversion canals constructed by the Qing government, such as Kuang-er-wan and Qing-long-gang canals, were managed and dredged to prevent the breach of dykes and to discharge floods when necessary. To completely solve the flooding problem of the Northern Canal, large-scale construction of changing the northern shallow lakes into reservoirs was included in the scheme. F. C. Rose suggested that the commission construct 570,000 kilometers of reservoirs along the Jiangan and Jiyun Rivers in order to confine flooding during flood season when not all the water could flow into the Northern Canal and the Hai River into the sea.\textsuperscript{49} The reservoirs were beneficial for flood control and shiye development by supplying water resources for irrigation. The plan of reservoir constructions stretched into the drainage systems of the Ziya River. A new diversion river that passed across the Southern Canal was proposed to connect the Ziya River to the Southern Canal and its diversions to the sea.\textsuperscript{50} This scheme was unrealistic at the time because it led to a reduction of water in the Machang Canal and the Hai River.

The Yongding River was targeted for control by a reservoir near Guanting of the mountainous region where the Yongding River flushed downwards with a large quantity of
water. A canal to divert flood waters from Yongding River to the sea without passing the Hai River was also one part of the grand scheme, as was the idea to make the river cut through the original areas of sand deposition and take advantage of the Jinzhong River. The commission focused on opening a 580 square-kilometer area as settling basin to deposit sand from the Yongding River. The Daqing River was under control as the course of the Yongding River was fixed. A diversion canal was designed to discharge the overflow south of Tianjin. The HHCC engineers contributed their knowledge to the plan. Pincione agreed with the CIRC that these plans were only temporary methods. He believed only “barrages and subsequently afforestation in the mountainous regions” would solve the threat of floods,” which needed centuries to be finished.

The grand scheme expressed the determination of Chinese authorities to transform rivers in order to eliminate the threat of floods. It shows the eagerness to promote commerce and agriculture by constructing modern water management structures and techniques to use water resources, like reservoirs and settling basins. Western water conservancy engineers were the major brains behind the outcome of the overall plan and management. However, the plan could not be put into practice because of the northern expedition of Guomindang after 1925.

The joint commission with Chinese river commissions provided a chance for the HHCC to extend its influence over Tianjin to the tributaries in the northern plain. But disagreements with the Chinese authorities over the restoration of the Northern Canal existed due to long-term disruptions and conflicts on points within the CIRC. The HHCC never gave up a significant position of the Hai River in the entire Zhili water system, but the Chinese representatives needed to focus on a broader region than Tianjin to care about the welfare of
the country and avoid losing their authority and control over the water resources. The controversies extended into the 1930s. The city and the people living in the city changed over the years as the river was transformed. As the river was modified and divided by powers, and Tianjin rapidly grew into a large independent distributing center with the hinterland stretching over the northwestern territories, the relationship among the people, the city, and the river changed.

The Creation of Tianjin Harbor

The Hai River and the port of Tianjin went through transformation in the hands of the HHCC engineers. The river’s transformation shows the different way people viewed and interacted with the river. The Hai River was used for shipping and navigation throughout history as the sole route from the city to the sea. In the 1910s, the number of shallow-draft junks and sampans decreased heavily due to the river’s need to accommodate steamship navigation, yet they never disappeared entirely. As the traditional mooring sites for these wooden shipping crafts were updated and expanded with advanced technology, designs, and materials, the major sites for seagoing steamers, Zi-zhu-lin, Dagu, and Tanggu, became the landmarks for reshaping the layout, space, and relationship between the river and the city.

The river continued to be transformed to facilitate the Western conceptions of steamers. The river reaches of mooring places were further made into modern harbor facilitating shipment. In the 1920s, in addition to the use of “bund” in describing the riverfront where cargo and warehouses were located, the phrase “Tianjin harbor” was frequently cited in newspapers. The creation of Tianjin harbor reflected the imperialist vision and imagination of building the relationship between humans and nature, knowledge, experiences, and power on
a Chinese coastal river. Fundamental harbor facilities like swinging berths and leading marks favoring the advanced needs for steamers had been renovated one after another to make Tianjin a real harbor.

By the 1920s, the entire river course had been divided according to the two anchorages: Tianjin bund and the Dagu anchorage site. Except for other traditional anchorage places where Chinese junks, sampans, and steamers usually chose to moor, such as the anchorage sites near East Gate and Gegu, Tianjin and Dagu garnered the greatest interest among the imperialist powers as places to construct harbors. Large shipping companies, markets, and warehouses were located along the bunds, benefiting from the convenience of shipments. Institutions and individuals were appointed to operate in the complex transaction and transportation system on the bunds.

The Haiho Conservancy Board was more ambitious and confident than Sun Yat-sen about the future of Tianjin. The board never wavered in making Tianjin a harbor for free trade in North China. Foreign engineers and technicians had been carrying out schemes to construct a port with a larger berth for mooring steamers since the 1900s. The General Chamber of Commerce and the shipping companies authorized the Conservancy Board to make a lower swinging berth in 1917. The chief engineer designed the lower swinging berth in the form of a bay and the whole construction was completed in June 1918. However, the new bay was not attractive to steamers. Although nautical enquiry pointed out that the lower swinging berth was the most suitable for steamers, the result was that more steamers navigated upwards and used the upper swinging berth taxed by the British Municipal Council. The Haiho Conservancy Commission then leased the upper swinging berth from the British Municipal
Council in 1919 for 20 years at a cost of Tls 4,000 per annum. After the purchase, the engineers consolidated the upper swinging berth and made it suitable for swinging and mooring for steamships with a maximum length of 350 feet from the original place for accommodating steamers not exceeding 280 feet in length.

The HHCC struggled to change the harbor space with the purpose of constructing a modern harbor in the 1920s. The engineering department submitted its proposal to the Chinese government with the purpose of expropriating and enlarging the bund space, enhancing bunding facilities, and expanding the space for steamers. An agreement was reached aiming at creating a harbor bay suitable for transporting cargo from ocean-born crafts to on-land facilities. New bunds of the Tianjin harbor had the specification to facilitate dredging and allow for the mooring of steamers of 20 feet draught at a distance of 20 feet.

The purchase of land for the expanding area of the swinging berth faced difficulties, especially from the Kailan Mining Administration as the company had to surrender its frontage along the center of the swinging bay. The Kailan Mining Administration asked the board to either lease the 300 feet of frontage at the same lease conditions as those of British Municipal Council or make the protection of the whole frontage extend to 850 feet to favor the needs for their own steamers. However, the commission could hardly afford either plan. The engineer adjusted the plan between the upper and lower swinging berth to strike a balance for accommodating steamers as large as possible at the lowest cost. In the late 1920s, dredging continued to sustain the existence of these swinging berths, deepen riverbed, and increase water levels in the river.
The river course had been transformed to enhance the fruit of harbor construction. Another cutting was in chief engineer’s proposal to further increase the depth. The Haiho Conservancy Board decided to issue a special loan in 1921. Funds were raised by the inspector general of the Chinese government’s Maritime Customs. The Tombs Bend Loan of Tls. 212,000 was to be repaid in five annual installments of Tls. 42,400. The interest was raised to 9% and guaranteed by the river dues. The loan was used to purchase land for the new Tombs bend cutting. Like all the cuttings the HHCC had managed, the purchase of land faced obstacles from local people. Wealthy and prestigious men took the opportunity to raise money by asking the HHCC to pay more for the land they owned. One landowner received the land from the HHCC in 1915 for the price of $15 per mu but sold it to the Haiho Conservancy Commission for the price of $600 per mu. The resistance was solved by a Chinese magistrate, who was more powerful than the Haiho Conservancy Commission and sometimes coercive. The magistrate suggested waiting until all other land had been purchased and then persuading the rich. If the price was still unreasonably high, the magistrate suggested “the dredger should cut through his property and that the owner will get no redress.”

The completion of the Tombs Bend cutting improved river navigation. A draft of 18 feet was capable to navigate to the bund and 1.5 to 2 feet more depth was made over the bar on tide. Cutting was a necessary means to regulate the sinuous course of the Hai River and elevate water level. Seeing the progress, the chief engineer proposed another two cuttings in order to enhance the results.
Table 3.1: The Proposed cuttings, 1921-1923

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<tr>
<th>Name</th>
<th>Open year</th>
<th>Shorten length</th>
<th>Bends eliminated</th>
<th>Earth excavated</th>
<th>Methods</th>
<th>Notes</th>
</tr>
</thead>
<tbody>
<tr>
<td>Tombs bend cutting</td>
<td>1921</td>
<td>9000 feet</td>
<td>Upper end and lower end of second cutting, upper and lower Tombs bend, vegetable reach</td>
<td>670,000 fang</td>
<td>Bucket dredger</td>
<td>sixth cutting</td>
</tr>
<tr>
<td>Jun-liang-cheng Cutting</td>
<td>1925–1926</td>
<td>6,000 feet</td>
<td>Hupeh reach and stone reach</td>
<td>660,000 fang</td>
<td>Mainly dredger</td>
<td>Continuation of the fourth cutting, unfulfilled</td>
</tr>
<tr>
<td>Nankai Cutting</td>
<td>1927–1929</td>
<td>14,000 feet</td>
<td>Salt reach (4 bends)</td>
<td>1,360,000 fang</td>
<td>By hand and dredger</td>
<td>unfulfilled</td>
</tr>
</tbody>
</table>

Map 3.2: The Six Cuttings and Proposal cuttings of the HHCC

![Map 3.2: The Six Cuttings and Proposal cuttings of the HHCC](image-url)
The Haiho Conservancy Commission further reshaped the canal network left by the Qing government. More Qing canals were blocked. To increase the water levels and prevent any diversion of water volume from the Hai River during dry season as well as discharge floods during flood season, the HHCC used the taxes paid by the river dues to build new locks at Niuzhuang and Liang-jia-yuan. A new lock at Chen-jia-gou was also suggested and constructed to prevent silting in the cut arm of the river of the Cathedral cutting.\(^6^4\)

The chief engineer wanted the river course to be “systematized” and “regulated.” A series of minor regulation work aimed at systematizing and regulating the river course demonstrated the HHCC’s monopoly over the river. New regulations for wharves, docks, and bridges further displaced Chinese wooden crafts from the system as the regulations favored the grand goal of turning the river and city into a modern harbor for steamers. The original normal line announced by the HHCC in 1902 regulated the width of the river course for steamship passage and ease of water conservancy work, but the shipping companies did not follow the rule restrictively. In 1920, the normal line of the Hai River required the collaboration of the companies whose irregularly shaped docks and wharves impeded the propagation of the tide.\(^6^5\) At Tanggu, the engineer reminded the railway administration of regulating their docking accommodations. The Peking-Mukden Line responded to the HHCC requirement by considering the connecting of the scattered wharves together to create a systematic location.\(^6^6\)

The prosperous sea traffic and affluent river dues enlarged the HHCC’s reserve to spend on river conservancy facilities. The \textit{Yü Ho} motor boat was purchased in 1923; the ice breakers \textit{Kung Ling} and \textit{Fei Ling}, built by Kiangnan Dock and valued at Tls 76,000 and 6,000,
respectively, joined the commission in 1923 and 1925; two hopper boats from Eastern Engineering Works were launched for dredging in 1924. Telegraph and telephone wires were installed on dredgers and ice breakers to improve working efficiency.

A Permanent Entrance Channel

Dagu was the other principal target in the water conservancy plots. In the 1920s, Dagu became the gathering site for advanced shipping technologies and firearm productions. It held the strategic position as gateway to Tianjin and Beijing. As Dagu always maintained deeper water levels than the Tianjin port along the inner part of the river, large foreign shipping companies, including Jardine Matheson & Co. and Butterfield & Swire Co., erected wharves and dockyards in Dagu and nearby Tanggu to accommodate large-tonnage ships and cargo if these could not reach Tianjin during low water levels. Large heavy industrial companies, such as Kailan Administration and American oil companies, also chose Dagu as a convenient place rather than the Tianjin harbor to moor heavy draught steamers and transport basic fuel products at a lower cost than via railway transportation.

The HHCC made deepening the Dagu flats a top priority. Scheme B was launched in 1912 to deepen the water level by purchasing new dredgers and through raking. New engineers made proposals for new trials to deepen the Dagu Bar using different water conservancy means. In addition to these both successful and unsuccessful attempts over the sand flat, shipping guides, docking facilities, and berth accommodations were erected in the mouth of the Hai River and in Dagu. All these served as essential components of constructing the Dagu port.
The facilities in Dagu served the needs for heavy draught oceanic ships. As the plans for deepening the sand bar showed tangible progress, the Hai River engineer Pincione proposed building dykes to detain flow and increase the effect of scouring. The Haiho Conservancy board sanctioned his proposal of building an organized system consisting of godowns, wharves, coal yards, and jetties along the northern bank in order to “give an impetus to the general trade of Tientsin” in the early 1920s. This proposal shows the increasing importance that Dagu played in city growth as the port of Tianjin had been challenged by the issue of silting up. The established railway infrastructure and the rapidly expanding business activities led by the Kailan Administration for coal production and shipment the rising economic involvement of oil industries in Dagu and Tanggu, were the decisive drive behind this plan. The plan, called the “Taku Reclamation Scheme,” required reclamation of 4,000 mu land and 12,000 feet flats for wharf accommodation at the mouth of the river.

The plan was widely discussed but rejected by members of British Consul General, who thought it favored the needs of the Kailan Mining Administration of Tanggu without fulfilling the goal of “making provision for the future expansion of the trade and shipping interest of this important trade centre by the construction of a deep water port at Taku.” They believed rather than spending huge money on the flat bar, the inner Tianjin Harbor should be the major target they invested in. Other concerns focused on engineering difficulty. These people indicated making Dagu a deep port could be made only if the overall improvement of the Hai river system in North China was completed. The plan also contradicted interests of the local companies profiting from coastal steamers, lighters, and
tugs. Kailan Administration’s concerns about extending their warehouses and shipping facilities in Qin-huang-dao instead of Dagu were an obstacle to authorize and finance the plan.

In spite of the fact that the expensive attempt of creating a deep water port was aborted, plans of improving shipping accommodations and facilities to make Dagu the suitable anchorage for ocean-going steamers and a transshipment center won enthusiastic support from the Haiho Conservancy Commission. Engineers’ plans to transform the Dagu bar and shipping accommodations were carried out along the coast and river band on Dagu. Leading lights, shipping marks and steel bacons were installed to improve shipping safety at Dagu. Long-distance and flashing lights guided the ongoing steamers along the right track. Sailors operated two wooden light boats fixated over the flat, signaling and sounding horn when steamers approached. The system of provisional and pyramidal beacons flashing in dioptic red or white was located along the deep channels or along the southern bank as inner leading marks. Mariners checked the direction and frequency of the lights to ensure their position and change directions accordingly. The HHCC was responsible for maintenance and added machines and facilities to accommodate the situation and adjust lighting guides when weather changed. In 1920, lights from a new signal tower powered by a diesel generator on the Dagu light boat were visible beyond 8 miles.71

Not far from Dagu, Tanggu port captivated Chinese shiye practitioners as railways connected Tanggu with the nearby coaling station Tangshan and the docks for transporting coal owned by the Kailan Mining Administration. The world’s large shipping companies had agencies in Tianjin and wharves in Dagu for shipping navigation between Tianjin, Dagu and
oversea destinations. The shipping facilities and accommodation in Dagu and Tanggu helped found new shipping lines and increase the number of steamers arriving in Tianjin. Shipping companies such as Indo-China Steam Navigation Co., Jardine, Matheson & Co., China Navigation Co., Butterfield & Swire, and China Merchants Steam Navigation Co. operated routes from Tianjin to Shanghai; Japanese shipping companies such as Nippon Yusen Kaisha navigated between Tianjin, Kobe and Niuzhuang, Osaka Shosen Kaisha operated shipping routes from Tianjin to Kobe, and Dairen Kisen Kaisha was responsible for the route from Tianjin to Dalian. Other international shipping lines were shared by Pacific Mail Steamship Co., China Mail Steamship Co., Canadian Pacific Ocean Services, Messageries Maritimes, Peninsular & Oriental Steam Navigation Co., and Glen and Shire Line.72

In order to sustain the growth and construction of the harbor, dredging at the Dagu bar was carried out in all seasons. Ice-breakers kept the channel open to winter navigation. Yet the continuous shift of the deep water area of the Dagu sand bar was still a troublesome problem that the comission had to solve. The flood of 1917 silted up the channel and, in the following years, the chief engineer suggested remarking the channel from S82°40′E to S72°40′E.73 Correspondingly, buoys, marks, and light boats, were relocated to the new channel.

Dredging the channel in the following year showed ineffectual results. The chief engineer Pincione observed that, “even if a channel were not dredged across the bar, the level of the bar could under ordinary conditions maintain itself 3 feet deeper than at the commencement of the foregoing conservancy works.”74 Re-silting in the manmade channel was so severe that the heavy workload of the dredgers led to no signs of improvement. The
flood of 1918 was noticeable as an alarm for aggravating channel silting. Regarding the palliative plan to divert the Yongding flood to other sea outlet, the engineers were worried that the silt deposited from the Yongding River had imposed its negative effect on the Dagu bar and the channel could not be maintained without building a barrier for protection.

The HHCC enhanced its dredging power to counter silting. The hopper dredger *K’uai Li*, assembled in Renfrew by Lobnitz & Co., was the longest, largest and most expensive device purchased by the HHCC, costing 135,000 pounds. It was consisted of two boilers, diagrammed at 14’ by 10’ by 11’, with a heating surface of 4300 square feet. Its capacity was twice that of another suction dredger *Chung Hua*. The dredger was shipped to Tianjin in 1921 and docked at Messrs Butterfield & Swire Dock at Tanggu. The engineer-in-chief was satisfied with the performance of this powerful plant and urged that the plant be put to work.

In the early 1920s, Pincione strived for a plan to fix the channel. He proposed the construction of a series of giant training dykes, 18,000 feet in length to prevent sand and ice accumulation. The proposed dyke connected the north fort with the western part of the Deep Hole. As an experiment, a dyke more than 2000 feet long was constructed on the south flat in April 1920. In 1922, Pincione polished his plan and ambitiously sanctioned a channel direction. He studied the flow and identified that, at the inner end of the present channel, the water flows to N.103°26’.3 but moved to N135°at the end of the outer end of the channel. He thought the straight channel made in 1912 and 1918 did not take full advantage of the force and velocity of water flow, flood waters, and ebb tides. On the contrary, the channel was neither deep enough nor at the most ideal angle. The force of water flow diminished when it met the force of the flood waters and ebb tides from the sea, making scouring
impossible and increasing the possibility of silting up. The right shape of the channel, as Pincione stated, “ought to have the shape of a parabola governed by the constant speed of the Deep Hole and the increasing speed of the ebb tide.” He understood an ideal curve had “great variations” and was “impossible” to design, yet he pointed out the possibility that the right direction should lie near the Deep Hole and be located from the direction of N.103°26’.3 at the inner end of the channel and N135° at the outer end. After the careful study of the water waves, wind direction, and formulation of deposition, he finalized his proposal by allowing the construction of a new channel through the south flat of 28,000 feet with the same radius of the river’s entrance reach. The extension of the retaining dyke reached the -4 feet T.D. contour line in the sea.  

Pincione designed the experiment step by step. The dredger with shoot pipes worked to move the soil dredged over the retaining dyke. The dredger K’uai Li joined the dredging work on a 125-foot wide trench. If the trench was successfully created, another trench of 175 feet would be dredged to make the channel 300 feet wide in total. Then the official channel dredged by Chung Hua would be abandoned, and the old channel would be blocked by the construction of cross dyke at the river mouth. Dykes were to be constructed to replace the wall in order to detain spoils and fix the channel. Pincione was satisfied with his proposal and expected the construction to begin in 1923 and all the shipping to transfer to the new permanent channel in September 1925.  

The method of dyking the channel was not Pincione’s invention. The earlier hydraulic expert Hauptmann Schellhoss suggested dyking the Dagu sand flat in 1903, and De Rijke advocated a single dyke on the concave side of the channel. Vliegenthart proposed the same
method after studying the condition of the Dagü bar. De Linde was also among those who strongly recommended the method, but his proposal was far beyond from the conditions of the 1910s. Pincione’s proposal was examined by the experienced engineers, including De Linde, who was in London at the time. De Linde generally agreed with Pincione, but envisioned many difficulties the construction would encounter. He predicted failure when closing the dyke. He recalled the difficulties he faced to make changes over the bar flats and suggested that engineers fully understand and gain accurate data about the Dagü bar before construction began. De Linde emphasized the method of dredging and persuaded those in charge to purchase a new powerful dredger. Pincione’s plan was also sent to Louis Perrier, an experienced French expert engineer. Perrier agreed with the plan, with slight suggestion to modify original designs and constructing steps. He proposed that two small dykes as long as 18,000 feet and as high as five feet above ground level be built along the channel for retaining sand. K’uai Li was used mainly for dredging the channel, and the dredgers Hsin Ho and Chung Hua were used to dredge sand near the dyke or in the channel. Like De Linde, Perrier also suggested that the board purchase a new powerful dredger to work with K’uai Li.
The construction of Pincione’s plan had not been implemented until 1924 due to the foreseeable huge expenditures and difficulties. After Pincione’s dyking system was finally approved, the Haiho Conservancy Commission started to train staff and launched a few experiments to observe results. In the following months, Pincione modified the original plan to enlarge the channel width. He also chose cheaper materials to build dykes to overcome financial difficulties. The plan was further postponed by unstable political situations. Shipping at Dagu was suspended by the military’s interruption of the warlords’ fleets in 1926. The experiment resumed after the recovery of regular river navigation. The dyke made of rubble stone had satisfactory effects so the construction of the retaining dykes along the new channel was adopted and constructed at a grand scale. In addition to the experimental dyke, the following lengths of dyke were constructed from June to November: the 3,595-foot north dyke, 6,921-foot south dyke, and 1,058-foot cross dyke stretching over the Dagu bar.
The commission signed a contract with Messrs. McDonnell & Corman and extended the length of the north dyke to about 17,700 feet, the south dyke to 18,000 feet, and the cross dyke to 1200 feet, according to the drawings produced by Pincione.90 Since 1926, “more than 1,500,000 m$^3$ of mud” had been deposited by the deep sea on south flat.91 The engineer again adjusted his plan based on the fact that dredging at a certain point was inefficient and due to the price of materials needed for the construction. Later, the dykes were constructed by sections according to the modified design. The price of rubble stone and other materials also had an effect. Pincione announced postponement of the construction of the north flat dyke because of the lack of available funds for construction in 1927.92

**Transformation of Lowland Landscape**

The waste silt dredged from the river was re-used in constructing the expanding territories of the concessions. The HHCC applied mud and silt dredged from works of river arm cutting, widening and deepening river channels to fill in marshlands and ponds in concession areas. In 1922, the British Municipal Council asked the HHCC to accelerate the work of filling the British area. The requirements of 250,000 fang per annum monopolized all HHCC dredgers. The commission asked to purchase a new dredger to fulfill the work and asked to raise the price to $0.70 per fang per 100 English cubic feet for the annual delivery.93 This filling work changed low-lying waterfront and paved the road for the expansion of British orginal and extramural concessions.

Throughout years of improved methods of piping, filling, and dredging, the business became a solid supplementary income for the HHCC. The quantity of silt dredged from Tianjin port totaled 128,822 fang, among which 119,625 fang was used in filling low-lying
areas in concessions in 1917. 208,431 of 209,754 fang was used in filling work in 1922.\textsuperscript{94} The total amount of filling work increased drastically from 1917 to 1926, with an average of 432,517 fang per year, compared to 241,532 fang per year during the previous decade.\textsuperscript{95} The profits totaled 173,201.95 dollars in 1916 and 31,877.27 in 1917 for the HHCC. Profit kept growing, culminating in 207,330.99 dollars in 1922.\textsuperscript{96}

The HHCC dredgers and pipes took the heavy workload in filling the low-lying areas in the former German, British, French, and Japanese Concessions. The business was even extended into the Chinese residential area. Just as the foreigners saw the ponds as unsanitary areas that would generate bacteria, the filling work in the Chinese City was guided by the concept of public hygiene and modern city planning proclaimed by Chinese city builders. In 1919, the Chinese assigned engineering teams of the public security office to employ workers, carts, and two pumping machines to fight against the southern ponds.\textsuperscript{97} With the help of the HHCC, an estimated number of 170,000 fang silt was dumped into the ponds.\textsuperscript{98} The Yen Yün pumping station and the Chung Hua navigated between the bar channel as a suction dredger and Tianjin harbor as a pumping station to help with the filling work. The Hsi Ho and Pei Ho dredgers, the Hun Ho and Kai Ling tugs, and other barges moved alongside the Yen Yün and Chung Hua, supplying mud to the pumping station.\textsuperscript{99} The ponds were finally filled with river sediment by the HHCC using dredgers, pipes, and pumping machines from 1921 to 1923.

The dredging and filling operations transformed the low-lying nature of the riverfront. It complemented Tianjin’s need to convert from an agricultural basis in the Qing Dynasty to the city infused with shiye development. Ponds were filled with silt from the river; on the raised, flattened, and paved land, buildings, houses, and recreation sites were constructed.
Correspondingly, the companies that had invested in these reclaimed land gained considerable profits resulting from a bustling real estate market. Land investment companies found new ways to exhibit imperialist commercial success. A new house built by the Land & Investment Co. in 1924, for instance, was a complex of four stories based on the reinforced concrete, equipped with a four-passenger Otis elevator. The prosperity of real estate stimulated profits from every aspect of economy when the J.E. Hayes Engineering Corporation supplied reinforcing metal, the Eastern Engineering Works brought in the sanitary installation, the General Electric Co. created electric fittings and the Pacific Trading Co. offered the lift. To ensure the pace of filling and construction, Tianjin entered a period of fast development, infused with modern ideals of city management, hygiene, aesthetics, and fashion.

The ponds in the low-lying region were not the only constructing target; the complex branch canals dug in dynastic China was also the subject waiting for change. In the eyes of the concession managers, the canal system threatened the public health and increased the possibility of the concessions being inundated during flood seasons, but these changes strongly challenged the established drainage system, authority, and finally the long-lasting pattern of agriculture. The lock was built over a stream built during the Kangxi years under the experimental Shui-li-ying-tian project in the southern part of the city. For many years, the stream was used as the canal system for river navigation, a necessary diversion canal to withdraw water for irrigation and a necessary component of the drainage system. Yet this drainage river had a foul smell and ebbing water that threatened the health of concession dwellers and created a flood discharge menace. The foreign administrations used pumping stations to empty flood water after concessions were inundated from the 1917 flood. In 1920,
the commission moved further and built locks near the Haiguang Temple close to the Chinese city to cut the link between the Qiangzi River and other canals. The scheme to empty the river finally reached a compromise by the consular bodies affected and Chinese representatives so that a new lock was placed beyond concessions and the native city to suffocate drainage canals that threatened public hygiene of foreign concessions.101

The landscape of a modern harbor was reshaped by new bridges, bunds, and space defined by shipping facilities. The renovation and reconstruction of these bridges showed the changes in landscape, terrain, and expansion that Tianjin experienced in the 1920s. The iron used in spinning bridges helped enhance communication within the city and divided spaces over the river. The bunds of Zhi-zhu-lin and shiping swinging berths were bustling with traffic on well-paved road with godowns and wharves were erected. The managed layout of the place witnessed a new type of waterfront and way to communicate with the river compared to the direct communication by local communities via ferrying, fishing, and drinking. With the power to stretch their powers to a larger scope than the foreign communities, the Chinese shiye pursuers, engineers, entrepreneurs, and members of the gentry class reacted with their participation in the modernization of the waterfront and the river. When building and constructing roads, electric wires and telegraph lines, and bridges, they followed Sun Yat-sen’s grand scheme to improve communications and link Tianjin to the large economic hinterland. The process of replacing wooden floating bridges with iron ones was adopted by Chinese authorities and shipping companies owning steamers. The authority employed experienced engineers to investigate the construction site, design and deploy the scheme, and mobilize resettlement for the nearby residents. In 1921, the wooden
bridge near the Chinese city and the Southern Canal was rebuilt by iron and concrete structures.

Chinese authorities also moved further to renovate the old iron bridge. The iron Jingang Bridge was located beside the provincial administration in the northeastern part of the city, serving as a symbol of modernity for the Chinese city. After decades of use, the mechanism of maneuvering the bridge declined, and the functions and body of the bridge were vulnerable to the pressure of expanding usage for cars and pedestrians. The provincial authority decided to purchase a new iron bridge for 200,000 Taels from an American firm in 1919.\textsuperscript{102} The materials for the new bridge were shipped from the United States, and the entire construction project was finished in 1925. Notable personages in agriculture and commerce, education, and the security and police system showed up for the opening ceremony. The old bridge was moved to the northern part the city for later use to improve transportation.

The most outstanding change over the Hai River in the 1920s was the reconstruction of the International Bridge. The iron body turned out to be a landmark for foreign concessions and an iron gateway highlighting modernity and the privileges of steamers. As the concession areas expanded, the old dimension of the bridge was “in all respects inadequate” for meeting the needs for the growing number of communities and expanding commerce and transportation.\textsuperscript{103} In 1922, the Haiho Conservancy Commission announced a plan for the new bridge and called upon world-wide construction firms to submit proposals for a new bridge. The requirements included construction materials, general dimensions, and specifications.

Shipping interests were given top priority for building such a bridge. The HHCC required firms to design a bridge with a main span that could leave a free fairway of 140 feet
for the passing vessels. Meteorological information was also provided to the bidders to improve their designs of this all-season functional bridge. In May 1924, 31 submissions from construction companies were received by the HHCC office.\textsuperscript{104} The proposed designs included the Waddell type, Zimmermann type, Strass Bascule type, and Scherzer type, the world’s most advanced and popular iron bridge structures for controlling the bridge mechanism during the passage of ocean-navigating crafts at the time.\textsuperscript{105}

The Haiho Conservancy Commission finally accepted the Scherzer design, proposed by Establissemnts Dayde & Messrs. Schneider & Cie and represented by Olivier & Co.\textsuperscript{106} The bridge type was originally designed by engineers, including Ingolf Erdal and Craig Potter Hazelet from the Scherzer Rolling Lift Bridge Co. of Chicago.\textsuperscript{107} Of the five (out of 31) companies that submitted the Scherzer design, their original drawing was picked for pragmatic and aesthetic reasons.\textsuperscript{108} It “afforded double the traffic facilities of the old one and enables steamers to berth alongside the bunds of the Italian and Japanese concessions.” In 1924, the HHCC issued a special loan for the International Bridge worth 500,000 Tls. at a 7% interest rate.\textsuperscript{109}

**Economic Growth and Urban Expansion**

Large draft steamers maintained the power and priority for shipping at Tianjin and Dagu ports, coexisting with Chinese wooden and small-draft steamers mooring at traditional sites also reconstructed with the modern concept of modernization and management. The Hai River became an essential component for the socio-economic change in Tianjin. The establishment of the CIRC and the increasing expenses of the HHCC revealed the importance of the city in the northern plains and the reshaped ties and concepts among the river, city, and
residents. The economic growth of the city could be read from the increasing number of steamers arriving in Tianjin.

The economic growth of the city could be read from the increasing number of steamers arriving in Tianjin.

**Table 3.2: The number of steamers reached Tianjin, 1917-26**

<table>
<thead>
<tr>
<th>years</th>
<th>Blow 13’</th>
<th>13’or above 13’</th>
<th>total</th>
</tr>
</thead>
<tbody>
<tr>
<td>1917</td>
<td>462</td>
<td>11</td>
<td>473</td>
</tr>
<tr>
<td>1918</td>
<td>500</td>
<td>29</td>
<td>529</td>
</tr>
<tr>
<td>1919</td>
<td>657</td>
<td>90</td>
<td>747</td>
</tr>
<tr>
<td>1920</td>
<td>718</td>
<td>284</td>
<td>1002</td>
</tr>
<tr>
<td>1921</td>
<td>770</td>
<td>461</td>
<td>1231</td>
</tr>
<tr>
<td>1922</td>
<td>622</td>
<td>550</td>
<td>1172</td>
</tr>
<tr>
<td>1923</td>
<td>514</td>
<td>755</td>
<td>1269</td>
</tr>
<tr>
<td>1924</td>
<td>517</td>
<td>794</td>
<td>1311</td>
</tr>
<tr>
<td>1925</td>
<td>602</td>
<td>1100</td>
<td>1702</td>
</tr>
<tr>
<td>1926</td>
<td>671</td>
<td>994</td>
<td>1665</td>
</tr>
</tbody>
</table>

The total number of steamers arriving in Tianjin increased from 759 of 1918 to 1889 of 1926, with slight decreases during times of unfavorable economic environment and unstable political and social impacts. The river was created as a river for steamers to the sea as the river course had been dominated by the arrival of heavy draught steamers. Being optimistic by the modern miracle created by sciences of hydraulics and engineering, the ambitious chief engineer asserted it would be possible “in the near future for ocean-going vessels of 26 foot
draught to berth at Tangku [Tanggu] and for ships drawing 20 feet to reach the Tianjin Bund.\textsuperscript{112}

The improvement of the river’s navigation stimulated economic growth in Tianjin. Total trade value of imports and exports increased from 189,000 Taels in 1919, to 244,516,000 Taels in 1922 and 277,574,000 Taels in 1926.\textsuperscript{113} British, Chinese, American, and Japanese cargo shippers navigated routinely on the river course. The opportunity for profits throughout the populated northern China was so promising that Germany sent its first trade ship to Tianjin in 1922 after the World War II.\textsuperscript{114}

Table 3.3: Value of direct foreign trade of the leading ports, 1922 and 1923\textsuperscript{115}

<table>
<thead>
<tr>
<th>Port</th>
<th>1922</th>
<th></th>
<th></th>
<th>1923</th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>import</td>
<td>export</td>
<td>total</td>
<td>import</td>
<td>export</td>
<td>total</td>
</tr>
<tr>
<td>Shanghai</td>
<td>419,593,331</td>
<td>218,051,344</td>
<td>637,644,675</td>
<td>417,870,452</td>
<td>276,838,233</td>
<td>694,708,685</td>
</tr>
<tr>
<td>Dalian (Dairen)</td>
<td>65,667,395</td>
<td>95,446,075</td>
<td>161,113,470</td>
<td>68,416,348</td>
<td>113,906,777</td>
<td>182,323,125</td>
</tr>
<tr>
<td>Canton</td>
<td>54,232,571</td>
<td>89,016,601</td>
<td>143,249,172</td>
<td>73,846,423</td>
<td>90,228,494</td>
<td>164,074,917</td>
</tr>
<tr>
<td>Tianjin (Tientsin)</td>
<td>96,421,515</td>
<td>46,471,488</td>
<td>142,893,003</td>
<td>76,178,355</td>
<td>49,953,666</td>
<td>126,132,021</td>
</tr>
</tbody>
</table>

Tianjin became one of the leading northern ports of direct international trade. Exports increased noticeably, economic growth of the city alleviated dependence on transshipment products from other ports. The economic hinterland of Tianjin stretched into northern and northwestern provinces including Shandong, Henan, Gansu, Inner Mongolia, and southern Manchuria. Trade routes stretched on the railway network consisting of Peking–Suiyuan, Beijing–Mukden, Beijing–Hankow, and Tientsin–Pukow lines. Canals and waterway were
still effective to reduce the shipment cost. The major imports of Tianjin in 1920s included cotton piece goods, dyes, electrical materials, machinery, kerosene and lubricating oils, paper, timber, iron and woolen goods. In return, Tianjin exported bristles, carpets, raw cotton, furs, feathers, hides, animal skins, and straw braids. The city was praised as “the principal trade port and distributing center of North China.”

As one of the destinations in the Pacific economic region, Tianjin benefitted greatly in terms of economic growth from steamers navigating the Pacific. Besides the established leadership of the British flags over the river, ships from Japan and the United States became heavily involved in Tianjin trade, especially in the realm of exports. Countries involved in the WWI ceased their navigations to Tianjin, but Japanese shipping companies, with the help from the government and manufacturing enterprises, filled the void. Japanese shipping companies (e.g., Kinaki Yusen Kaisha, Osaka Shosen Kaisha, Dairen Kisen Kaisha) competed with the leading British ocean-going shipping agencies. American firms in China sought Japanese shipping agencies to undertake cargo, but shipping preferences were frequently given to Japanese enterprises. In the late 1920s, Japan surpassed the British as Tianjin’s largest international trading country.

The United States recovered from its lukewarm attitude toward trading with China in the late 1890s and increased its active involvement in trading with Tianjin starting in the 1900s. Its growing interest in Tianjin was tied closely with the agenda to surpass the competitors around the Pacific and with the improvement of the shipping environment in Tianjin. During World War I, American shipping industries expanded in number and scale, taking a further step in controlling shipping throughout the Pacific. The Chinese Pacific
Commercial Committee, with its agency in Shanghai, organized the shipping to Chinese trade
ports, including Dalian and Tianjin. The United States was also the main buyer of a large
proportion of exports, including fur, wool, skins, carpets, rugs, bristles, and cotton goods from
the economic hinterland of Tianjin. Tianjin was among the top trading ports with the the
United Stated as “nearly half the furs and skins, about a third of the bristles, hemp and jute,
the about half the straw braid” were transported from hinterland to Tianjin and from Tianjin
to the world in the mid-1920s. Tianjin contributed to the export of 86% to 90% of wool
clips produced from the northwestern hinterland, including Gansu, Outer Mongolia, and
Chinese Turkestan. These products headed their way into trading networks and were
subsequently shipped overseas from the Hai River.

**The Huanghui of 1924**

*Huanghui* (imperial fair) was a necessary cultural and social component for
constructing the city during the Qing Dynasty. It made the social, economic, and cultural
union between the river and its people on the waterfront, enhancing state–society
relationships. The event was terminated and criticized by social revolutionaries since it was
treated as a corrupt event exalting the corrupt Qing court for its superstition and imperial
power. However, as a legacy of celebrating prosperity, *Huanghui* was still an effective way to
mobilize society and consolidate rulers’ authority, even the dynastic regime had been in
history over a decade. This seemingly anachronistic event revived shortly in 1924 and created
celebration and pageant in the city. The fair was recreated by the city builders in the new
*shiye* era. Acrobatics shows, and the varied activities were evocative of the prosperity among
the masses. Just like the splendid event sponsored by the Qing salt merchants, the image of
power and disparity between the rich and poor was deeply diffused into society. The ruling class took advantage of Huanghui to mobilize the masses and consolidate power. The idea to open the fair was proposed by the Chinese gentry-merchants to support the ruling figure of the Beijing government, Cao Kun, a warlord born in a poor family of Dagu.

The agenda of the 1924 imperial fair was discussed against a rising wave of opposition. Nationalist revolutionaries believed the imperial fair was the warlord Cao Kun’s practice of coveting bliss from the sea goddess in the political competitions against other cliques. They called Huanghui a “reactionary” event for “worshipping superstition.” A letter criticized Huanghui as perpetuating superstitions, and the masses that planned to join in the activity as foolish and ignorant. One author thought the pageant harmed society and frittered money. Another writer thought the fair was illegal because it had been banned for many years. Educational associations begged the provincial leaders ban the event. The Huanghui was thought to result in “hundreds of harms but no single benefit.” Merchants argued that the imperial fair would not disseminate superstitions, although it could benefit society with its promotion of commerce and industry.

Despite doubts, criticisms, and objections, the imperial fair was opened on April 19, 1924, and soon became an eye-catching public event of the city. On the first day of the event, the masses rushed towards the East Gate from every direction. One journalist described the scenario as “mountains and oceans…the wives of the rich men sat on the high stand and hid their faces behind bamboo curtain, looking like the empress listening to a report for the imperial court.” The protest from educational institutions seemed ineffective when local schools took the event as a holiday and closed early in order to enable students to join the
parade route. Crowded groups were packed from the southern canal to the northern part at San-cha-he-kou. The four goddesses representing happiness, peace, fruity, and fertility were worshipped and escorted back to the temple near the East Gate by the masses. Folk singing and dancing attracted more viewers. People were packed on parade routes. Accident occurred when crowds got out of control.125

Behind the scene for economic prosperity and political stability, the imperial fair was a good way to show the power of the Beiyang government. Police officers and bureaucrats of Tianjin saw the event as a good opportunity to demonstrate the power of the Cao Kun government. Police patrolled the masses on the route, keeping peace and order. “There were some police held horsewhipping, chasing and beating of the masses” when their governmental leaders passed by.126 The royal color yellow of the Qing family was used during the parade. Parade slogans showed the new state’s same desire for peace, stability, and prosperity.

The 1924 parade included the most crowded waterfront centered at the city’s East Gate, a century-old businesses and social activities. The Huanghui parade passed economically and socially prosperous regions near the old city wall. These places along the Hai River, Southern Canal, and Northern Canal also served as waterfronts, where people shaped their relationships and ideas about the river. The worshipping of the Heavenly Empress and other deities was incorporated into local beliefs and people’s desire to enjoy better lives, becoming especially stronger during the unstable years of the Beiyang government.127

The existence of opposition’s voice expressed changes of modern rhetoric of the Huanghui in the 1920s. In the age of industrialization and urbanization buttressed by science and technology, criticism and ridicule described the Huanghui worshippers and followers by
using words such as inferior, fool, and superstitious. These descriptions indicated that the Huanghui lost its power, as it had in the Qing Dynasty, on the waterfront, compared to the rising status of modern foundations and wharves that created new relationships and thoughts of viewing the river and water. Yet it was still influential, as the pageant of 1924 shows, to promote state–society interactions as well as exhibiting the government’s power to control society.

In conclusion, from 1917 to 1926, the Hai River experienced large-scale physical transformations. Foreign and Chinese engineers had plans to make a navigable river exclusively for steamships. The inner port of Tianjin and outer port of Dagu became two harboring sites with constructed facilities for mooring and swinging of oceanic steamers with deep draught. The rivefront had been constructed by different groups of interests. While modern harbor work took place on the concession bunds, traditional mooring sites in the San-cha-he-kou changed with an abrupt practice of worshipping the Tianhou (Heavenly Empress) in 1924. All these different ideas and social constructions on the riverside explained the gradual economic, social and cultural changes of the city.

1 See Endnote #15 in introduction for a definition of shiye.
2 In Zhongguo Jingji Sixiang yu Dangdai Jingji Fazhan (Beijing: Shehui kexue wenxian chuban she, 2011), the author Wei Wei thought both the nationalist ideas of shiye and trade wars originated from the late Nineteenth Century.
3 Two pieces of advisement entitled “the biggest issue in trade wars” and “the necessity of today’s trade wars” were published by Xianshi insurance Co. on Yishibao (Yishi Newspaper) in 1917. The Britain-registered Chinese company managed the business of insurance for international trade to cover water and fire risk. See advisement YSB, Sep.9, 1917, page 1 and Nov. 2, 1917, page 5.
5 YSB, October 2, 1915, 3.
6 YSB, October 20, 1915, 2.
7 YSB, June 26, 1918, 2.
8 The first report of the agricultural site was created in 1914 by Li Yingao. Details see Fulong Cheng, Zhili nongshi shiyanchang di er san ci baogao (Beijing: Du yi xuan, n.d.), 1.
9 Julean Herbert Arnold and United States Bureau of Foreign and Domestic Commerce, China: A
The description of “the Great Northern Port” in Sun’s book is neither addressed in geographical detail nor supported by scientific calculations. Today both the sites of Caofei dian and Jingtang Port acclaim their origin as “the Great Northern Port”.

Beitang is located north of Tianjin. Connected with Jiyun River, it has been another important outlet to the sea.

Ibid, 9-10.
Ibid, 10.
Ibid, 2. Information can be also found in “Outports: Conservancy in Chihli Commission Given Full Powers,” North-China Herald and Supreme Court & Consular Gazette, May 4, 1918, 256.
“Amid the Great Floods,” The North–China Herald and Supreme Court & Consular Gazette, October 27, 1917, 219.
“Report No. 1194,” Tientsin, May 4, 1921, TMA 1:X-81
See Shunzhi Shuili Weiyuan hui, Shunzhi hedao zhiben jihua shu, 31-32. The commission decided to build earthen dykes on the embankment of Chentang Village. The department for road construction objected the decision in consideration of possible damage of building dykes to the paved roads. The project had been postponed until 1924 when another flood was approaching the city.
Shunzhi Shuili Weiyuan hui, Shunzhi hedao zhiben jihua shu, 33.
SB, May 1, 1918, 2.
Shunzhi Shuili Weiyuan hui, Shunzhi hedao zhiben jihua shu, 33-34.
The Future of the River Hai Ho and it Approaches, TMA 1:X-82, 16.
Shunzhi Shuili Weiyuan hui, Shunzhi hedao zhiben jihua shu, 34.
YSB, July 8, 1918, 7.
Shunzhi Shuili Weiyuan hui, Shunzhi hedao zhiben jihua shu, 37.
YSB, September 29, 1927, 3 and Xiong Xiling, Shunzhi hedao gaishan jianyi an (Beijing:
Beijing cixiang yinshua gonchang, 1929), 10.
49 Xiong, Shunzhi hedao gaishan jianyi an, 16.
50 Xiong Xiling, Shunzhi hedao gaishan jianyi an, 20.
Shunzhi Shuili Weiyuan hui, Shunzhi hedao zhiben jihua shu, 71, 72, 74, 82.
Ibid.
53 Ibid.
58 A. de Linde, “Report on the Scheme of the Engineer-in-chief to form a new permanent channel,”
6, November, 1922, TMA 1:X-83.
59 Loan amortization from agenda for meeting to be held Sunday, July 3, 1921, TMA 1:X-81. The
original amount was Tls. 200,000 Tianjin Currency, cited in “this agreement made the day of
January One,” TMA 1:X-81, 2.
60 Ibid.
62 Map adapted from the Hai-Ho Conservancy Commission: plan of Hai Ho from Tientsin City to
G7822.H31 1921 .M8, also in Hitch, “The Port of Tientsin and its Problems,” 371; Donnelly, The
“Hai Ho,” 39. The map includes the 6th cutting mentioned later in this chapter.
63 Report No. 1172 Re Chen Chia Kou Lock, TMA 1:X-80.
64 Normal line meant a set of two lines limiting the breadth of the River, as ascertained by
calculation.
66 Hollington K Tong, “Better Oceanic Communication for Tientsin,” Millard’s Review of the Far
East (1919-1921), May 1 1920, 426.
68 http://www.china.amdigital.co.uk/ (accessed Nov. 19, 2011)
and the Improvement of the River System of Chihli (1915-1920).
http://www.china.amdigital.co.uk/ (accessed Nov. 19, 2011)
69 Tianjin Haiguan Bianyi Weiyuanhui, ed., Jin haiguan shi yaolan (Beijing: Zhongguo haiguan
chubanshe, 2004), 116.
70 Arnold, China, 343.
71 W. Jiaihua maoyi nianbao, 357.
72 W. Jiaihua maoyi nianbao, 357.
74 “Report No. 1197” June 10, 1921, TMA 1:X-81.
75 “Memorandum for Governor re reclamation Scheme at Taku,” TMA 1:X-80, 4.
78 Ibid.
81 Tientsin, October 1930, TMA 3:171.
83 A. de Linde, “Report on the Scheme of the Engineer-in-chief to form a new permanent channel,”
6, November, 1922, TMA 1:X-83.
84 Ibid, 4.
85 Map adapted from Pincione’s report “Plan of the Hai Ho Entrance and Bar Channel,” TMA
1:X-82. The Dagu dykes were named A-B, C-D, P-Q, Q-C. In his 1922 report “systematization of
the River Entrance” in TMA 1:X-82, Pincione explained in detail how to build these dykes by
steps in detail.
Ibid.
97. YSB, August 15, 1919, 6.
102. YSB, March 7, 1922, 10.
107. It was believed by many scholars that the bridge was designed by a French company, but sources indicate it was an American Company that finished the design. The bridge was probably constructed by a French Construction Company. Information on and introduction to these engineers can be found in *Who’s who in Engineering: A Biographical Dictionary of the Engineering Profession* Vol. 6 (New York: John W. Leonard Corporation, 1948), 594 and vol.8 (1959), 1068.
111. Ibid.
113. Figures see Wu, 363 and He Yuxi, “Tianjin maoyi zhi da shi,” *Yinhang Yuekan* 8, no. 10 (1928), 1.
115. The figure was adapted from “Value of direct Foreign Trade of Each Port, 1922 and 1923” in *China Year Book 1925*, by H.G.W. Woodhead (Tientsin: Tientsin Press, 1925), 282-283.
119. E. M. Gull, “increasing importance of Tientsin as center for internal trade is told in review for
120 Arnold, *China*, 541.
122 *YSB*, April 22, 1924, 13.
123 *YSB*, April 16, 1924, 10.
124 *YSB*, April 20, 1924, 10.
125 *YSB*, April 23, 1924, 11.
126 *YSB*, April 20, 1924, 10.
127 The regime of Cao Kun was ended by a military mutiny led by Feng Yuxiang in December of 1924.
CHAPTER FOUR

Rivers of the Nation, 1928–1936

The city and the river could not escape political and social turmoil in the late 1920s. The Dagu bar not only experienced ecological and environmental transformations caused by the construction of Pincione’s dykes, but also suffered from bombing between the factionalized warlords and the intrusion of foreign gunships. The 1926 political confrontation between the Feng Clique and Feng Yuxiang’s army occurred at the bar, and the city sat amidst a swirl of turmoil and confrontation.

The year 1928 marked a turning point in the history of the city and the river. The Northern Expedition of the Guomindang (GMD) army’s triumph resulted in the end of warlord rule. In June 1928, the GMD army took over the Tianjin Municipal Administration. The GMD subsequently launched a campaign — greater than that during the Beiyang era — to transform the river and city through a construction plan, to build a unified nation. Water conservancy organizations such as the Commission for the Improvement of the River System of Chihli and the Chihli River Commission (CIRC) became targets of the GMD reorganization; they were reformed into an integrated, larger and more powerful entity focusing on rivers in northern China. Through this, the relationship between the city and the river was reshaped under a new national plan for economic development.

**The Nationalist Reunification in Tianjin**

The GMD Northern Expedition seemingly ended the era of warlords and the Beiyang government. In 1928, GMD’s victory was buttressed by the Manchurian warlord’s
willingness to cooperate with the Nationalist government. Cooperating with the Communists during the military campaigns, Chiang Kai-shek succeeded in becoming the paramount ruler of China under the single-party rule, although his rule was constantly challenged by his political opponents. As soon as reunification was accomplished, the GMD took over the Beiyang institutions; it carried out a series of campaigns to reorganize them and incorporate them into the new national institutions ruled by the central Nanjing government.

The Tianjin Special Municipal Administration was formed in 1928 as the official GMD municipal institution for urban management. The Zhili Province was renamed Hebei Province, and Beijing became Beiping. The GMD departments of taxation, hygiene, and provincial agencies soon conducted nationwide investigations into the population, cultivated land, factories and industries, etc. Foreign companies were also under scrutiny; they were required to report to the provincial departments their locations, machinery, production and products, number of male and female workers, and working conditions.379

The Nationalist reunification allowed for the implementation of a national plan for economic and industrial construction. The GMD nation-builders designed a grand scheme of infrastructure for communication, transportation, and navigation in order to assist the national picuslye plan. They adhered to the picuslye planning principles guided by Sun Yat-sen’s The International Development of China, even though it was considered too idealistic and even unrealistic on its release date. Nevertheless, the GMD took up the torch to free the nation from endless struggles against an imperialist economic monopoly in the coastal cities by enhancing overall economic and industrial power.
The central government set up institutions to promote economic development, such as the Ministry of *piculsy*e. Subsidiary departments were responsible for agriculture, mining, industry and commerce, etc. The Department of Agriculture and Mining Industry administered and regulated relevant local agencies and established national order in the promotion of land reclamation, the improvement of agricultural products, water conservancy methods and the organization of agricultural and coal factories. Large numbers of agricultural schools and research institutes were established to inculcate scientific agricultural knowledge, to introduce better seeds, and to develop effective planting methods and tools. The Department of Industry and Commerce regulated economic activities, locations, and organizations, including patents, trademarks, labor unions, commodity inspection, business laws and regulations, employment and unemployment. Local governments followed suit and established regional administrative departments to regulate the activities and development of *piculsy*e. In the early stages, the central government received responses to a national survey of factories and companies. Other organizations included the National Committee of Railway and Transportation and the National Commission of Commerce. National events like games, educational conferences, and conferences on cotton production were organized and conducted. The aim was to show that the country was ready to be unified and integrated by the Guomindang.

However, foreign concessions and firms in treaty ports became a significant obstacle in the reunification. The Guomindang was anti-imperialist – not only because foreign interests were deeply embedded within Chinese civil affairs and because foreign interests were leveraged by its political rivals — but also because a nation free of foreign influences was the
mandate established by the party’s founder, Sun Yat-sen. Imperialism became a politically sensitive issue during the era of the GMD’s campaign to unify territories where foreign influences remained strong. Retrieving sovereignty over communication, concession areas, and in-land river navigational rights became the main goal in negotiations with foreign countries. Highlighted by the Japanese invasion, the mission of anti-imperialism was intertwined with the legitimacy of the government.

As a prosperous treaty port, Tianjin could not be eliminated from the national map of the GMD. Foreign investments and companies there were under severe scrutiny. For example, the Belgium Tramcart Company was denounced by the Guomindang agency for “broaching the contract” in expanding the scope of the tramcar trail, expanding assets, and operating the business of motor power without authorization. The Office of Supervision and Regulation decided to take over machines and businesses as a warning to foreign investors who showed resistance to the penalties from the new government. The issues of the Hai River and its tributaries remained the toughest struggle between the Chinese and foreign agencies during the GMD’s rule in Tianjin.

Nationalist power sought to effectively control the Hai River and port by establishing the Harbor Affairs Bureau in 1928. The bureau was responsible for flood prevention and regular inspection of affairs relevant to navigation and port construction. After the designation of Tianjin as the capital of Hebei Province, the Ministry of Communications promoted the establishment of the Maritime Administration Bureau to continue administrative reform and centralize administrative control along the Chinese coast. These bureaus became rivals of — and collaborators with — foreign interests on a variety of issues such as dredging, collision
dispute mediation, and inspection of navigational facilities. Then the Tianjin administration announced restrictions on foreign shipping companies and the activities of the Haiho Conservancy Commission.

By 1928, Nationalist administrative oversight was reestablished in the formerly German (1st Special Area), Austrian (2nd Special Area), and Russian (3rd Special Area) areas. In 1928, the Belgium Municipal Council returned to Guomindang control after the Belgian cabinet collapsed at home. Therefore, along with its British, French, Japanese, and Italian rivals, the Nationalist government controlled the largest parcel of land along the Hai River. The Tianjin government then announced a series of plans to renovate the shipping facilities in these areas. In order to receive large-tonnage steamers, the Harbor Affairs Bureau decided to reconstruct wharves “worn by years without repair” and suffering from decay and collapse. The plan included new mooring areas and maritime schools for sailors and pilots.

The competition between the Chinese and foreigners over the river escalated. The British Municipal Council encouraged the expansion of Jardine Matheson & Co. and Butterfield & Swire Co. by providing them shipping, dredging, and maintenance services, thereby upholding the engineering scheme preferred by HHCC. As the strongest rival to the British, Japan accelerated development of its shipping facilities as well. Tianjin was integrated into the Japanese network of Chinese coastal shipping that connected Niuzhuang, Dalian, Qingdao, and Shanghai. The four leading Japanese companies—Dairen Kisen Kabushiki Kaisha, Japan-China Steamship Company, Osaka Shosen Kaisha, and Kawasaki Kisen Kaisha—all opened new shipping lines in the 1920s.
Foreign institutions and agencies continued to influence and shape the inner Tianjin harbor, represented principally by the HHCC. In addition to the annual dredging programs along the river, the HHCC maintained the regular opening of the swinging berth by dredging. Renovating it to accommodate expanded shipping was incorporated into the engineering agenda. The new HHCC engineer Jean A. Hardel abandoned his predecessor’s ideas of employing sheet piles in fixating and consolidating Tianjin bunds due to the heavy scouring effect on these loose materials. He instead chose materials that would reduce the cost and meet the requirements for pressure and endurance. Local concrete composed of earth and lime was suggested for filling caissons.\textsuperscript{385}

The Japanese concession pressured the HHCC, suggesting the need for another swinging berth above the international bridge in the 1930s. A new swinging berth was proposed near the Jintang Bridage (Austrian Bridge) and along the Chinese city and the second special area above the Japanese and Italian concessions. The new berth would have a total width of 340’ to accommodate steamers 300’ long.\textsuperscript{386} The engineer proposed constructing the bunding with concrete sheet piles. The construction was estimated as Tls. 192,500, including the expenditures for removing old bunds and constructing the new bund with sheet piles, bolts, washers, nuts, wood fenders, etc.\textsuperscript{387} Construction resulted in a harbor with three swinging berths and well-organized wharves, docks, yards, and godowns.

The foreign shipping companies, led by the Japanese and British, also dominated the process of constructing the Tanggu port. When the Hai River silted up in 1927 and 1928, threatening navigation, mooring steamers used Tanggu. With the full-fledged development of
railway construction, it was a strategic spot for accommodating military gunboats and warships as well as transferring and maneuvering troops.

Japanese shipping agencies had been eyeing Tanggu ever since Tianjin was opened to the world. The Japanese authority in Tianjin planned to invest in making Tanggu a permanent port. Two Japanese firms announced the purchase of land and began construction for new wharves in 1927.\(^{388}\) The Japanese municipal council even proposed establishing a branch police office in Tanggu, as Japanese merchants immigrated there in great numbers.\(^{389}\) The Tianjin municipal government sent security guards and diplomats in order to maintain social order amid the growth.

### The North China River Commission

Reorganizing the Chihli River Commission (CIRC) into the North China River Commission (NCRC) reflected the Guomindang’s determination to rule a unified nation by removing the warlords’ power over the river system in the northern plains. The GMD’s vision was to manage rivers and river conservancy agencies with a centralized and integrated bureaucratic structure.

The Beiyang government was financially incompetent when it came to accomplishing any large river construction. Obstacles originated from the fragmentation of the water conservancy agencies, conflicts of opinions regarding foreign interests, and the ineffectiveness of establishing collaboration among provincial authorities riven by warlords’ factional interests. In addition, the Beiyang government was accused of allowing tax- and revenue-related corruption to spread throughout water conservancy agencies. These factors led to the failure of the CIRC as the leading water conservancy agency in the late 1920s.
The flood of 1924 in the capital region provoked anger among the Chinese in the area. Some blamed the CIRC officials for lacking the initiative to improve flood control. The CIRC leader Xiong Xiling became the main target of criticism. Dissatisfaction with Xiong resulted in the establishment of regional and local water conservancy teams near the capital. As of 1928, the CIRC had only partially completed construction of the Qing-long-wan Canal; it reverted to the Northern Canal. A comprehensive scheme for improving the Yongding River, the Southern Canal, and other tributaries in the northern plains as alternative outlets to divert floods was drawn up. However, it was never put into practice due to the abrupt political changes wrought by the GMD in northern China.

These massive, incomplete construction projects were left to the Guomindang. After the establishment of the national government’s Reconstruction Commission (Jianshe Weiyuanhui), the Guomindang asserted control over local and regional construction agencies from each province. The province of Zhili (the capital region) was reorganized into Hebei Province. The central government decided to reorganize the Chihli River Commission into a national water conservancy commission that included rivers and streams of a larger territorial and geographical scope. Yet the Hebei provincial administration expressed concerns about turning over direct control to the central government. However, negotiations between the central government and representatives from Hebei Province succeeded in 1928; the central government was now able to annex the regional river conservancy agencies in Hebei Province. The NCRC was founded in late 1928, removing many representatives of the Beiyang government. The Guomindang hydraulic expert Li Yizhi was appointed to head the new agency. Its administrative power over water conservancy plans stretched into Hebei, Shanxi,
Henan, and Mongolian provinces, where various provincial warlords had failed to acknowledge the cooperative scheme proposed by the impotent CIRC.

The administrative scale of the NCRC included both the Hai River and the Yellow River drainage basins. Unlike the Beiyang government, the Nationalist government accentuated national sovereignty over the rivers in northern China. However, the existence of non-Nationalist water conservancy commissions, such as the Haiho Conservancy Commission, posed an obstacle to a uniform policy. Li Yizhi stated that “the rights of water conservancy belong to the country…sovereignty should not fall into others’ hands.”

During the Nationalist era from 1928 to 1937, while the Hai River was further transformed by foreign hydraulic experts, the efforts of the Nationalists to reunify the northern rivers resulted in unceasing conflicts of opinion related to the management of these waters.

The NCRC was the national agency to carry out the scheme of a great northern port as envisioned by Sun Yat-sen. The project of the northern ports was necessary components of his nationalist economic, industrial, and commercial construction program. The plan meant competing with foreign firms because it would open new routes to connect world markets with the resources from the northwestern hinterland and Manchuria. Building a new northern port that would allow bypassing commercial ports dominated by foreigners, and that would rival the ports of New York, seemed overly optimistic. Nevertheless, after the North China Water Conservancy Commission was created, a special Guomindang preparatory office opened in Tianjin. The engineers Li Yizhi and Li Shutian were appointed as chairman and vice-chairman, respectively, responsible for “the Great Northern Port.” The commission consulted foreign engineers regarding an appropriate construction site. Sun Yat-sen had
vaguely described the site as the nearest coastal point accessible to deep water, a location somewhere between Qinhuangdao and Dagu. The chosen site was not far from the mouths of the Luan River and Daqing River. A supporting network of roads, railways, and waterways was also planned, with expected completion within fifteen years.\textsuperscript{394}

The estimated cost was approximately $57,700,000. A considerable sum was raised through the Netherlands Boxer Indemnity Funds in 1930, along with governmental bonds and financial loans from foreign banks.\textsuperscript{395} Observation houses, barometers, thermometers, water gauges, rain gauges, and meters for measuring wind direction and speed were subsequently purchased. River survey and hydraulic observation teams were sent out in 1929 to measure the exact position of the anticipated port. The NCRC published a special issue in its official monthly journal to inaugurate the opening of the project, praised as a benefit to society. Officials claimed it would be comparable to the achievement of Yu the Great.\textsuperscript{396}

The giant project proceeded under the bureaucratic sponsorship of the GMD’s Reconstruction Commission. Geographical, geological, meteorological, and hydraulic investigations were launched. The scheme was studied and modified based on advice from worldwide experts. Construction was divided into three periods. The first period focused on improving communication and transportation between port and economic regions with the establishment of basic shipping facilities, including wharves and warehouses. The second period aimed at enlarging the port and creating municipal agencies. All construction was expected to be finished in the third period.\textsuperscript{397}

But the project encountered financial and technical difficulties from the very beginning. The construction of docks, wharves, and power stations as well as the underlying scheme to
broaden the roads, dig canals, and purchase dredgers, ice-breakers, and pilot boats consumed enormous financial reserves of the central government. New engineering calculations and environmental observations resulted in constant modifications to the original scheme. The port site moved from the mouth of Daqing River to the mouth of the Luan River as per geological and hydraulic findings by the preparatory office in 1931. In addition, the long-term investment in machinery and labor required could only happen through political integration and stability. Such stability crumbled after the Mukden Incident of 1931, when Japan began its systematic control of Manchuria. The central government had no extra funds or energy to monitor the progress of the project. The project failed in the first period. Surveys and investigations resumed after the incident, but progress was again affected by the government’s inefficiency. The Department of Communications and Railroads announced an official halt to preparatory work in 1935.

The Establishment of the Haiho Improvement Commission (HIC)

The depth of the Hai River influenced the prosperity of the city as river-bound navigation evolved. As Tianjin was built as an international harbor for commerce and as the volume of transactions grew, the duties of maintaining a navigable river grew heavier on the shoulders of the HHCC engineers; each silting event led to great economic loss.

The river’s situation began deteriorating in the spring of 1927. The Haiho Conservancy Commission pressured the Chihli River Commission (CIRC) to address the issue without delay. Surveyors’ reports found that nearly all tributaries of the Hai River had problems with heavy silting, and dredging had hardly mitigated the severe danger of inundation. With the rainy season approaching, the potential of the dyke breaking on the Yongding River generated
serious concerns, as detailed in reports by Yongding River water conservancy agencies. After August, the freshets of the Yongding River grew stronger, which resulted in heavy silting in the Hai River. By October, the situation was one “unseen in several decades.”\footnote{400} Tianjin was under threat of becoming a “phantom port.”\footnote{401} Tianjin Customs announced that steamers with drafts exceeding 11 feet were not allowed to call at Tianjin harbor. This meant labor and cost to foreign companies, which had to transfer cargo or passengers from steamers to lighters and barges.

The use of Tanggu as a temporary port did not counterbalance the economic loss of the city. The risk of Tianjin’s demise jangled the nerves of foreign interests. Discontent and disgruntled, shipping companies and merchants headed into the building of the HHCC. Although dredgers were dispatched to work day and night to deepen the river bed, the problem of siltation was not solved until the winter of that year.

To deal with the situation, a special meeting was organized in October with representatives of CIRC, T. Pincione, the Ministry of Interior, the Ministry of Chihli River Bureau, etc. A palliative scheme was agreed to and put into execution immediately. The representatives decided to support engineers’ efforts at restoration of the Northern Canal, and urged the CIRC to create an immediate outlet for the Qing-long-wan diversion. They agreed to put regulating works into place along tributaries such as Suzhuang (Northern Canal), Machang Canal, and the Xinkai River, under the orders of one agency.\footnote{402} But with the political situation in turmoil and the lack of funds for the separate water conservancy ministries, CIRC found it difficult to make these agreements effectual.
The HHCC tested various means of dredging to maintain the minimal water depth for navigation, to no avail. Even the depth of the Dagu channel was reduced to such an extent that the chief engineer’s efforts were denounced. Facing the rising tide of criticism, the Italian engineer resigned from his position. Pincione’s successor, French engineer Jean A. Hardel, submitted an immediate palliative scheme in his “Report on the General Conditions Affecting the Hai-Ho with an Outline of Both a Temporary and a Radical Improvement Scheme.”

Echoing Chinese philosophies, the proposal called for following the natural tendency of the rivers and taking advantage of floods to benefit society. He called for an end to local and regional water conservancy works, stating that they were detrimental to the overall picture. To solve the silt problem, Hardel suggested dyking the Yongding delta located on the northeastern site of Tianjin, and using it as a natural reservoir to deposit sand while simultaneously irrigating agricultural land.403

Hardel praised F. C. Rose and CIRC’s general scheme of diverting the Yongding freshets through newly built sluices at Lu-gou-qiao Bridge and Ji-men-zha weirs into the Xiaoqing River and then the Daqing River. He believed it was the natural tendency of the Yongding River to became a tributary of the Daqing River, and therefore put forward a radical plan to explode “the sills of these ancient and obsolete works” and encourage the convergence of the Yongding River with the Daqing River.404 The confluence, he said, must be supplemented with the construction of a storage reservoir at the Xidian to detain the silt-laden freshet.405 Not knowing that the Chinese also practiced flood irrigation, he used as an example the Egyptian idea of using floods from the Nile for irrigation.406
The HHCC engineers kept piling up the pressure on the Guomindang, as they had done before 1928, to solve the problem of Yonding River silting and reduce its negative effect on the Hai River. Hardel’s immediate scheme was soon authorized by the HHCC, and passed to foreign consul generals and Chinese authorities. The HHCC urged the Chinese side to ameliorate the condition of the Hai River “by any means available to the Government.”

The year 1928 marked the beginning of cooperation and confrontation between the HHCC and the North China River Commission. In October, the Haiho Improvement Commission (HIC) was founded through the joint effort of the Chili Provincial Government, Tianjin Municipality, the National Reconstruction Commission and representatives from the HHCC. The institution was affiliated with the North China River Commission, whose chairman was Shang Zhen. The HIC, like the Chihli River Commission (CRIC), was a collaborative institution that aimed to solve the problem of the Hai River. However, the more powerful Nationalist engineers were aware of the imperialist presence in managing the river. Hardel’s plan became the scapegoat for their allegations of imperialist influence behind any HHCC river conservancy scheme.

The anti-imperialist voice was unanimously strong among engineers and advisors of the NCRC. They saw the control of natural resources as a symbol of national integration and an acknowledgement for the Guomindang reunification efforts. Zhu Yanping, the leading voice of NCRC, described the former Chihli River Commission as a dummy agency that allowed for foreign powers beyond its administrative boundary: “It [the CIRC] should be called the HHCC.” Zhu believed Hardel’s scheme threatened the welfare of Chinese residents of Hebei Province. He criticized the palliative schemes, especially the diversion of the Yongding
River to Xidian and extension of its drainage pass across the land mass of Hebei Province, as a plot contrived to nourish foreign powers in Tianjin—with the sacrifice of millions of people.

Xu Junti argued that foreign engineers had ulterior goals of navigational benefit. Chinese people should not “keep silent.” He disagreed that the Egyptian model of irrigation could be used in China due to the differences in land and climate. The priority should be given to flood prevention, not the river navigation of the Hai River, he argued. In his proposal to the NCRC, he supported dredging the Northern Canal and constructing the Guanting Reservoir. He agreed with the palliative plan to build diversion canals near Beicang to connect the Yongding River with another shallow lake located in northwestern Tianjin, the Ta-he-dian (Tahe Lake), as a natural reservoir to detain silt.

The tension between the HHCC and the NCRC mounted even with the existence of the HIC as a mediator. Chinese engineers studied every detail proposed by the HHCC and thwarted the possibilities for the HHCC to extend its foreign influence to the inner lands via water systems in the northern plains. Compromise and consensus had to be reached when the destruction of the Hai River and floods hit Hebei Province. In December 1928, the NCRC announced its final palliative scheme, which included constructing Guanting Reservoir, managing the Yongding River Delta, dredging the Northern Canal, building a canal at Beicang, and diverting the Yongding flood to the Ta-he-dian settling basin. Politically, rather than practically, Hardel’s scheme was modified to a certain extent. It was decided that the freshets of the Yongding River would be diverted to the Northern Canal, rather than the Daqing River. Thus, the HHCC’s influence would be contained in the region of the Hai River.
and the Northern Canal. Water conservancy projects along the Daqing River, the Ziya River, and the Southern Canal were monopolized by the Chinese.

The scheme was first challenged by the Yongding River flood of 1929. When HIC dispatched observers to complete surveys along the tributaries in the spring, shipping companies were optimistic that there was enough depth for navigation. The harbor regulation limit on navigable drafts for steamers proceeding to the upper reaches increased from 10 feet to 13 feet in February.\textsuperscript{413} However, in March the Yongding River brought tons of silt with its spring freshet into the Hai River, and the upper and lower reaches of the Hai River became scarcely navigable. Rampant rainfall occurred during July of 1929, and the sudden summer freshet swelled the Yongding River, leading to a series of dyke breaks along the southern bank. The suburbs of Beiping and Tianjin were inundated. HIC employed and mobilized villagers to repair the collapsed dykes. Emergency funds were used to prevent the breaks from spreading.

Upset foreign communities fought HIC. Shipping companies asserted that the river dues they paid for the Haiho Improvement Loan, levied by Customs to finance the 4-million-dollar scheme, should be invested solely for ameliorating the situation of the Hai River. The friction between foreign and Chinese communities escalated when the Yongding dykes burst, inundating Hebei Province. The foreign agency representing the shipping companies asked why the partial funds were appropriated to the Hebei government to repair the dykes, which were believed to have a loose relationship with the Hai River improvement.\textsuperscript{414}

These conflicts between Chinese and foreign interests revealed the ramifications of water conservancy goals, methods, and concepts in the northern China plains. On the one hand, anti-imperialist and nationalist sentiment remained intense among Chinese engineers,
who wanted river management and conservancy to meet the national goals for economic development. The HHCC, on the other hand, worked with the Chinese government in order to extend its influence over tributaries in order to improve the Hai River’s navigation. The HIC’s existence was doomed from the very beginning. It generated doubts and criticism among both Chinese and foreign interests. To make matters worse, the scheme was also opposed by local Chinese citizens, who believed they were exploited by water conservancy policies.

When Yongding River floods inundated Hebei Province, the HIC could not afford to hold regular committee conferences. The hope for immediate action was not met until 1929, when the central government enacted a Custom surtax and made several personnel reorganizations. The effort was further impaired by political friction in 1930. The conservation of the Yongding River required the cooperation of northern provinces not fully under control of the central government. Tensions between the Shanxi faction and the central government remained intense even after the Guomindang announced its victory in reunification. Factional fights inside the Guomindang also posed a barrier. The reunification of land and rivers in northern China echoed like a meaningless invocation rather than a pragmatic political agenda in 1930 when Tianjin was occupied by the Shanxi faction; correspondingly, the HIC’s work ceased once again without any financial support from the government.

The strongest resistance to the enforcement of the palliative plan came from the local people. The change in the natural environment resulted in land reclamation and resettlement of communities in the targeted regions. Peasants living near Ta-he-dian (Tahe Lake) also opposed the plan of establishing a settling basin on their cultivated fields. The farmers of
Ta-he-dian refused to allow their land to be inundated and opposed the idea of selling to the provincial government.

The government established a sub-committee to address these difficulties. According to the sub-committee’s field study, the land around Ta-he-dian was fertile and rich. Peasants held the firm conviction that they would not benefit from the inundation. Rather, their property would be ruined by floods. Yet the government successfully persuaded peasants who lived in the Northern part of the Settling Basin to welcome the inundation of their land. Facing these complex situations at the societal level, the HHCC made adjustments to its original plan to divert the floods into a new settling basin north of Ta-he-dian, but never compromised to sacrifice the Hai River’s shipping industry. The Engineer-in-chief insisted on digging “an escape channel connecting the South-western corner of the new Settling Basin with the bend in the Pei Ho at Nan Tsang [Nancang]” and reverting to the Hai River with a “considerate quantity of water.”

The compromise turned out to be a complex issue when it was put into practice in 1932. The strong spring freshet of the Yongding River was diverted into the basin by operating sluices. Yet the earthen dykes broke. The cultivated land near the region was inundated. Angry farmers gathered and petitioned the provincial and municipal administrations, forcing them to stop flooding their lands. The compensation for ruined crops exacerbated the financial difficulty of the joint commission.

The HHCC engineers were not satisfied with the substitute plan proposed by the Ministry of Interior to divert water from the outlet channel of the Jinzhong River to reduce water supply to the Hai River. The engineers cited the long distance between the river and the
The year 1933 was full of numerous obstructions, arguments, bargains, and compromises. The HHCC immediately began diverting spring and summer freshets of the Yongding River. The task of filling the settling basin was detailed, verbose and complex; the same village that rejected the spring freshet welcomed the summer one. The diversion from the Yongding River to the settling basin changed constantly, according to the levels of resistance from the farmers.

The public considered the HIC a corrupt, bureaucratic agency. The commission staggered under the monetary crisis of the Tianjin Municipal government and the Hebei Provincial Government. The Chinese Ministries of Interior, Finance, and Foreign Affairs decided to defund the commission in 1933. This decision was overruled by the HHCC engineers, who persisted in their construction on the Hai River tributaries. In early 1934, the HIC was dissolved, leaving only the Technical Bureau to complete the Hai River Improvement Scheme. In June, the south dyke of the Yongding River broke in the same section where it broke in 1925, and the flood merged with the Ziya River, leaving the Hai River “in a deplorable condition.” The HHCC chief engineers blamed Chinese institutions for their inability to implement expropriation law, maintain dyke safety, and release necessary funds. The Hai River engineers urged immediate action from the NCRC to block the breach and fix the Yongding River’s course within the delta.
Despite the bureaucracy and corruption within the river conservancy institutions, the Nationalist government transformed the northern plains more than the HHCC had expected between 1931 and 1933. All construction on the settling basin, the Yongding and the Northern Canal, including machinery, switches, sluices, bridges, regulators, culverts, and locks, the Yongding River, and the Northern Canal were built. However, they took extensive time to be designed, contracted, constructed, and tested. Local flood prevention committees were mobilized to strengthen state–society relations through flood-prevention activities. Observation stations and telephone lines were erected along the Yongding River to collect accurate data and operate each gate and sluice systematically. HIC staff listened to the disputes among farmers and reported them to the Ministry of Interior. The Committee for Land Reclamation was founded to estimate and calculate reclaimed acreage.
The HHCC focused on deploying conservancy plans centered on the Hai River. At a certain point this conflicted with the goals of the Chinese government, which wanted the improvement of the Yongding River catchment area. The Chinese river commissions focused on harnessing floods in northern China to prevent the loss of millions of lives and acres — as well as potential hostility caused by social instability.

Some Chinese engineers cooked up a grand scheme in 1925 to conserve the Yongding River. These NCRC and HIC engineers promoted an expensive hydraulic project of damming the Yongding River with reservoirs. In 1929, the North China River Commission engineers updated the grand scheme. Xu Shida traced the history of water conservancy to ancient times and proposed various methods, including building three reservoirs, dredging, damming, and diverting the river’s course. Zhu Yanping summarized Western experiences, including American engineers’ arguments and observations of correlations between forestation and river conservancy. He opposed the idea of diverting the Yongding River southward to the Daqing River. Fixing the Yongding River to its current course and applying the existing settling basin to detain and deposit sand and dirt, he said, were the best ways to avoid river resettlement in populated areas.

But the NCRC could not afford any of this. Moreover, like the CIRC, the NCRC was powerless to include the Hai River in its administrative sphere. The technical bureau for completion of the Hai River Improvement Scheme struggled until 1935, when it published its final report on improving the condition of the Hai River.

**Hai River Improvement**
From 1928 to 1936, the Hai River experienced changes much milder compared to the radical transformation of the previous era. No large-scale or expansive projects were executed during this time. Now the HHCC concentrated on the mouth of the river and dredged it to maintain 20-foot depths for steamers. Cutting and straightening were also part of the engineers’ new proposal, but were left unfulfilled due to several factors, including tightened financial limits. Yet the deposited silts continued to plague the Hai River.

When J. A. Hardel succeeded Pincione as the chief engineer, he recommended excavation at Gegu, Jun-liang-cheng, and Nankai in order to eliminate the shallow reaches and sharp bends. He also proposed another modification at the Dagu river mouth to enhance tidal effects. Studying his predecessor’s report, Hardel modified Pincione’s plan and expanded the radius of construction with a budget of Tls. 4,825,000 and 9 years for completion.

Since 1928, the HHCC had struggled to pay off loans and address increasing operating costs for equipment such as sucker dredgers, tug boats, and ice-breakers. Since the groynes used in protecting river reaches proved effective, they were extensively used. The HHCC accelerated the making of mattresses or fascines, supported by short piles and covered with rocks. Groynes protected banks against the current’s erosive effects.

In 1928, the commission built a new workshop at Xinhe, located between the Tianjin harbor and the Dagu bar. The old workshop at Xiao-sun-zhuang was dismantled because of the geographical disadvantages in maintaining the dredging at the Dagu bar. The new workshop contained a concrete dock, a factory house, and a boiler room to facilitate dredging and filling. The Haiho Conservancy Commission also built accommodations for the
engineers and workers. The resettlement of the HHCC workshop indicated a shift of focus in water conservancy projects from the inner port to the Dagu bar, marking the rise of Tanggu as a new port addressing the needs of shipping companies.

All these works and changes consumed the commission’s already limited funds. Seven years after Loan E was released, the HHCC decided to convert Loan E to reduce the redeemable amount and provide steady financial support for maintenance and expansion of projects meant to change the river. Loan E’s annual 7% interest in 1926 was discontinued. Instead, the HHCC issued a new conversion loan and reduced the interest to 5.5% per annum.431

After the heroic transformation and deepening of the Yongding River, the HHCC now faced a critical mission to save Tianjin’s harbor. Both 1928 and 1931 were harsh on the Hai River. The riverbed was thick with silt. In March 1928, the depth shrank 3’44”; the situation worsened in the summer when freshets hit the port once more.432 All dredgers were dispatched, working more than 14 hours to barely maintain the navigation depth. Such adversity helped boost Tanggu as a preferred alternative for shipping businesses.

The HHCC invested in maintaining dredgers and filling pipes that pushed the silt to either the lower reaches of the river or the filling ponds, thereby flattening marshy areas and facilitating the extension of the flattened urban roads. But there was increasing peril in maneuvering dredgers and pumping machines along the shallow reaches. The dredgers Gaolin and Hsin Ho and the suction-dredgers Zhonghua and Yanyun were assigned to the reaches of the British and French concessions, and their operators extended their working hours.433
Table 4.1: Summary of Excavation and Dredging Carried out by the Conservancy

<table>
<thead>
<tr>
<th>Year</th>
<th>1928</th>
<th>1929</th>
<th>1930</th>
<th>1931</th>
<th>1932</th>
<th>1933</th>
<th>1934</th>
<th>1935</th>
<th>1936</th>
</tr>
</thead>
<tbody>
<tr>
<td>No. of fang of 100 cub.ft.</td>
<td>351,705</td>
<td>218,552</td>
<td>182,164</td>
<td>139,162</td>
<td>168,520</td>
<td>161,826</td>
<td>147,850</td>
<td>201,820</td>
<td>214,185</td>
</tr>
</tbody>
</table>

The operation and maintenance of these dredgers were costly. According to Account C, expenses were heaviest in 1930 and 1932, accounting for nearly 46% and 43% of total yearly expenditures.

Political conflicts also posed peril. Independence from foreign institutions became difficult to uphold until the 1930s, which brought a rising tide of nationalism and anti-imperialism. Newspapers circulated opinions on the miserable treatment of Chinese workers by foreign agencies and the discrepancies between them. Chinese workers organized an HHCC labor union in the late 1920s. The union launched a strike against the HHCC in 1931. Taking advantage of this, the Guomindang party members investigated the HHCC, made reports to the municipal government, and called for governmental retrieval of the administrative rights to the Hai River. Any planned project on the Hai River faced demonstrations or strikes from Chinese workers and pressure from the government. Under such circumstances, the HHCC board accepted mediation from the government and compromised on most, if not all, of the requirements for raising salaries and ensuring worker welfare.

In October 1934, the unexpected death of J. A. Hardel left his position vacant. Both foreign and Chinese communities presented nominees, through which they vied for control of the commission. The Chinese nominated Yang Paoling, a Perdue University graduate and the
assistant of Xiong Xiling at the Chihli River Commission. The Chinese government negotiated with various foreign institutions and the Haiho Conservancy Board in order to promote Yang. The idea was even supported by foreign ministers, as it was might alleviate conflicting opinions among river conservancy organizations concerning how to divert the Yongding River. Yet the Haiho Conservancy board chose Danish expert P. E. Müller as their chief engineer after careful consideration of “the welfare of the Port of Tientsin”. Müller “possessed the widest knowledge of the conditions affecting the Hai Ho and the Taku Bar.”

After a series of negotiations, it was decided to keep the HHCC as “a semi-foreign institution and the Consular Authorities have a great deal of authority in connection with its policy.”

More Chinese engineers, technicians, and workers were appointed by the board, as these Chinese engineers had greater experience in Chinese water conservancy practice. For example, Huang Airu was nominated by the Chinese government in 1929 as the HHCC advisor to conserve the Dagu bar.

**New Plans for the Dagu Bar**

The tightened expenditures for the river course marked a sharp contrast with the increasing amounts spent on the Dagu bar. As the gateway to the city, the Dagu bar channel needed improvement. The 1928 flood sapped Pincione’s efforts. At the end of 1929, the dykes were still being constructed, but both the new and old channels silted up when floods appeared. Hardel studied the situation at Dagu and concluded the shoaling of the river resulted from the temporary, exceptional dryness during the preceding two years — as well as previous alterations to the province’s river system. Efforts were turned over to Hardel, who came with five years of experience in engineering the bar of the Senegal River.
Hardel repudiated Pincion’s scheme, arguing that it was careless and full of errors. Pincione’s dykes were not long or high enough to prevent silt from being washed back into the channel. His calculations of the speed of flow and the expected dredging load were inaccurate. Hardel recalculated Pincione’s plan and found that “all the elements of this [his] estimate are wrong.”

He determined that a cut 125 feet wide and 9 feet deep in Pincione’s modified plan led to a 68,000 m³ excavation capacity (instead of 45,000 m³), not to mention the excluded amount of excavation caused by continuous silting. The estimated workload for dredging and the related expense would be much higher than Pincione had expected.

Hardel’s on-site investigation turned up signs of deterioration on the northern and southern dykes. The northern dyke, as he stated in his report, had been damaged by ice packs. The bolts joining the whaling beams of southern dykes were missing. The beams had been further deteriorated by teredoes, seaworms living in the Gulf.

Hardel thought that dredging the channel was possible only if the HHCC invested in reconstructing the dyke with materials impervious to teredoes; he also called for lengthening the northern dyke by 6000 feet and increasing it to the +10’ T.D. contour line.

Hardel did acknowledge the financial difficulties facing Pincione in realizing his plan. He proposed extending the north dyke as much as possible, which would take years to complete.

Hardel developed a new plan for the gradual diversion of the existing channel southward by using the K’uai Li dredger on the south side of the present channel and the Hsin
Hod dredger at a point where the present channel made its bend. But this grand scheme of shifting the existing channel, at a cost of Tls. 350,000, would take many years and increase the danger to navigation. The northern dyke, cross dyke, and outer part of the southern dyke had to be demolished in this scheme. The materials would be used to construct a dyke along the northern bank for ice-breaking purposes. Hardel persuaded the board to stop spending on a channel “which experience contradicts and to continue a work which would very soon entail insuperable difficulties and risks.” The second advice was to purchase another large dredger; Hardel also put forward an alternative plan for river-cutting across the last bend.

Map 4.2: Hardel’s plans to transform the Dagu Bar

Experiments in dyking and dredging were launched by Hardel and a board consisting of experienced foreign experts. The board studied the engineer’s proposal and made modifications and suggestions. However, it became even harder to afford Pincione’s permanent channel after the commission lost revenue due to the cessation of river navigation.
in 1928. The board and the Haiho Conservancy Board finally made a decision in 1930. The natural channel over the bar remained the permanent passage for entering Tianjin from the sea. Construction of the dykes on the two sides of the permanent channel stalled after the decision was announced to shipping companies. Materials at the construction sites were either used in other sites or sold.449

Hardel was still a firm believer in dykes. After studying speed measurement data collected in October 1930, he suggested building dykes to maintain a permanent channel.450 He argued with the engineers who had rejected the idea of dykes. Hardel stated that dyking would be the only method to improve the depth of the Dagu bar. His Plan V illustrated dyking the entire channel from the river mouth to the sea across the sand bar. He not only detailed the expected effects of the dyke by studying the efficiency of the dredgers, but also determined the hydraulic measurements of speed and direction at North Fort, Spit Boat, Deep Hole, and inner, middle, and outer ends of the bar channel.451 He divided the whole system into sections and indicated that it followed the shape and tendency of the Deep Hole and the existing natural channel. However, the estimated cost of Hardel’s radical plan was as much as Tls. 8,840,000.452
The Haiho Conservancy Board did not have enough funds to bring Hardel’s plans to fruition. At least, Hardel succeeded in revealing uncertainties and contingencies regarding transforming the Dagu flat. He debunked the overblown confidence in terms of what engineering, mechanical, and scientific efforts could do, and advanced a decisive and fruitful consideration of the natural system.

As maintaining the minimum depth of the bar became increasingly difficult and expensive in the 1930s, engineers began to ponder possibilities in the channel itself. Frequent, cheap surveys were conducted with tacheometers, wireless signals, tugs and onshore signal stations. Hardel believed “the bar channel is merely the continuation of the river,” meaning that the shape of the natural channel should follow the river’s natural tendency, which included adequate depth at the bends. His observation was buttressed by the understanding that erosion happened at a certain point in the natural channel. Thus, a sinuous course, instead of a straight one, might provide extra depth. Unlike previous officials, who were confident in
the power of human beings to regulate the natural tendency of the flow, Hardel believed it was impossible to make a straight channel at the Dagu bar, and attempts to dredge a straight channel would “oppose nature.”

Hardel designed a systematic and accurate marking system as a result. The system located at the Dagu mouth consisted of six leading marks on the northern, center, and southern lines of the bar channel, only giving the indication of a straight line. The lights were not clearly visible, and the locations caused miscalculations in distance and the width of the channel by sailors and captains. They also misled engineers of the dredging projects. Buoys were suggested according to periodical surveys. Hardel submitted a proposal for a systematic organization of two concrete towers, 9 platforms, 10 red and green flashing lights, and 2 large lights on the northern and southern flats to make the lights visible at a greater distance.

Hardel’s suggestions stirred discussions among board members and representatives. The final decision on the channel change was left to the shipping companies, including Jardine, Matheson & Co., Ltd., Butterfield & Swire, Kinkai Yusen Kaisha, Dairen Kisen Kaisha, Taku Tug & Lighter Co., Osaka Shosen Kaisha, China Merchants S.N. Co, and Tientsin Pilot Co. Shipping company representatives met informally with the HHCC engineers, technicians, and secretaries in November and December 1930 to discuss topics ranging from the possibility and feasibility of the sinuous channel to the improvement of the visibility of leading marks and navigation safety. The discussions lasted into 1931, when a few shipping companies gradually began to support Hardel’s plan, lured by the promise to increase the Dagu bar by 2 to 3 feet after unsatisfactory years of shipping. However, other
shipping companies, including S.N. Co and Osaka Shosen Kaisha, expressed their inclination to follow a straight system.

Meanwhile, correspondence continued among the HHCC, the commissioner, and related decision-making institutions. Not all experts, including the coast inspector and engineer-in-chief of the Huangpu Conservancy Commission in Shanghai, were as optimistic as the Hai River engineers. They questioned the need to invest in changing the channel into a sinuous course for minor increases in depth.\textsuperscript{461} They also suggested that the HHCC wait to see the results of the scheme. Thus, Hardel’s plots proceeded slowly.

**Ice-breaking Operations**

The warm winter of 1928–1929 was followed by a much different winter of 1929–1930. In December all the ice-breakers were assigned to work continuously on the bar and the river course. The HHCC’s engineer-in-chief now had to design new methods to keep the port open in winter. The only financially feasible way to improve winter navigation was Hardel’s plan to build an ice-dyke on the northern flats at the Dagu bar to prevent ice packs from flowing toward the river mouth. The materials were obtained from Pincione’s demolished bar dykes. The engineer-in-chief requested authority to build an experimental ice-dyke 1,000 feet long along the northern flat. In September 1930, Hardel extended the construction of the ice-dyke and expedited the demolition of Pincione’s construction.\textsuperscript{462}

It was difficult to fairly judge the effectiveness of the ice-dyke, as the winter of 1930–1931 produced the severest ice conditions in 15 years.\textsuperscript{463} Records showed that, on January 8, 1931, a strong north-westerly gale caused the temperature to drop drastically, and the low water levels at the bar made it difficult for the broken ice to drift away from the mouth of the
The condition was serious; even the winter ports of Tianjin and Qin-huang-dao were impacted by ice accumulation and closed.465 In Dagu, the frozen ice grew more than 10 feet high, with floating ice endangering navigation and risking the work of ice-breakers.466

Laborers worked day and night to smash and bump the ice packs. The two largest ice-breakers, *Tung Ling* and *Ching Ling*, worked on “a huge mass of ice 20 miles long and 10 miles wide.”467 The Japanese newspaper *Keipiculsu Nichinichi Piculsmbun* reported the damages suffered by Japanese shipping companies in navigating the Hai River. Eight Japanese steamers and one Chinese steamer were damaged, including bent propeller blades and rudders, and loosened rivets. The damage, delay in shipments and cargo delivery, and the trading uncertainty related to Tianjin caused the chief engineer to advise spending Tls. 450,000 on a new sea-going ice-breaker. However, the expense was not approved by the board given its deep financial dilemma.468

The extended ice-dyke reached 6,000 feet in 1932. The HHCC reported that it effectively prevented ice from floating north toward the bar.469 Its usefulness was highlighted during the following warm winters (1932–1934). Minimal work, like dispatching ice-breakers, was necessary to keep the port open for navigation. Yet the effectiveness of the ice-dyke was questioned again in 1935, when another severe winter hit the port. The bitterly cold gale caused drastic temperature drops in December and led to more than 10 fatalities in the city.470 Ice accumulated at the river’s mouth and halted all dredging work. Large ice chunks floated over the dyke and flooded the channel.471 Despite the ice-breakers, steamers and tugs were constantly trapped in ice masses. The harsh weather even dislocated the Dagu lightboat.472 It
was especially dangerous when the water level was too low to keep ice-breakers afloat. Finally the gale changed its direction, the temperatures rose and the sea tide flooded in to provide the minimum requirement for navigation. Only then could ice-breakers smash the ice chunks.

The winter continued to cause navigation issues until February 1936. It was reported that “the cumulative temperature from the 7th of November to the 28th of February of this winter was -388.8°C. That is the lowest for the last 13 winters.”\textsuperscript{473} For about 13 days in February, the lowest temperature in Tanggu stayed below -10°C, causing ice to pack quickly and block the channel.\textsuperscript{474} When the temperature dropped as easterly winds rose, ice-breakers were immobilized. For nearly two months, the port of Tianjin was cut off from the outside world. Cargo was transported by lighters and train. Larger shipping companies increased original fees by as much as 80% to cover the higher risks of navigation.\textsuperscript{475}

The shipping disaster ended with the rising temperatures in March. The Chinese criticized the HHCC’s projects as a million-dollar waste. In 1936, the Tianjin Municipal Administration discussed the possibility of reorganizing the commission with the HHCC, adding its own board members and engineers to the commission.\textsuperscript{476} As arguments continued regarding the rights of the river and the commission, the Japanese built their shipping bases in Tanggu. It provided an alternative solution to the adversity that the inner port suffered. It was a strategic key to the rise of Japanese status in Tianjin in the early Twentieth Century.

\textbf{Modern Appearance of the City}

The International Bridge, an iron link between the concession zones on the two sides of the river, became a symbol of foreign power and interests over the Hai River. Although it
required huge financial outlays, the HHCC regarded the iron structure as one of the most valuable foreign possessions in Tianjin.

The bridge was built using the technology of the day. It included separate paved areas for tramway, rickshaws, and pedestrians. Its opening and closing involved a complex technical system of electric generator, wires, hinges, and gadgets. From proposal to completion, its construction took the HHCC nearly three years. On October 18, 1927, a splendid opening ceremony was held in Tianjin, attended by the vice president of the Ministry of Interior, representatives of Tianjin, foreign politicians, British, French, and Japanese consul members, and Chinese celebrities. It was a huge social event, reminiscent of the Huanghui.

The Netherlands Minister and Dean of the Diplomatic Corp M. Outdendijk stated that the bridge “testified to the growth of trade and shipping in Tientsin.” He said it was “symbolic and a happy omen” that the best Chinese and foreign minds were trying to forge new relationships. It also demonstrated that “old things must be removed in time before they collapse and cause a catastrophe. Sympathetic cooperation can build a new and mightier International Bridge.”

The bridge’s symbolism was two-edged. It was a representation of a new beginning of international cooperation and relations, a symbol of friendship between Chinese and foreign interests. Yet it also reinforced the image of imperialism. It symbolized the rapid economic development of Tianjin, mainly in foreign concessions through ocean-borne navigations.

The bridge not only represented the Haiho Conservancy Commission’s long struggle against Chinese authority, but also the struggle against the natural environment to turn the Hai
River into a modern river suitable for steamship navigation. In the eyes of foreigners, the completion of such a brilliant engineering work “mark[ed] a milestone in the history and progress of Tientsin.” The bridge divided the river into two general sections. The section below the bridge was the Tianjin port, which welcomed the moorings of steamers with less interference from Chinese fishing boats. The section above the bridge was the river crowded with steamers, mainly Japanese, and scattered Chinese fishing boats — not always existing harmoniously.

The road from the native city to the international bridge was a path to modernity and rationality. The bund of the Japanese and French concessions above the bridge was decorated with wharves and stores that were clean and organized. The concession bund was a social place for fashionable people; foreigners and locals mingled there in the hot summer. It contrasted sharply with the view toward the eastern gate of the native city, which was crowded with decayed banks, unorganized fish markets and dirt piles.482

Regulations and rules for passage were announced to smooth the operation of the bridge. Cars and tramcars used the middle tracks, slow vehicles and rickshaws used the big track, and pedestrians walked along the side. But the traditional fishing boats were banned from hooking onto or lingering near the bridge to avoid damaging the complicated electric wires buried in the riverbed.483 This marked another step by which the Hai River was systematically severed from its past. The bridge gave great priority to the existence of steamship development, deeply marginalizing navigational rights of Chinese fishing junks. As the icon of imperialist occupation over the river, the bridge also received special designation as a socially crowded market of Chinese vendors.
The Chinese fishermen regarded the bridge as a representation of imperialism. In addition to incidents of being beaten and bullied during the opening ceremony, the Chinese felt looked down upon even when standing on the bridge. One commentator wrote: “European and American gentlemen and officers can stand here [on the bridge] and prospect sea waves. Their nostalgic feelings are unleashed. […] However, for the Chinese] who wanted to hold the rail and stood still, police would follow and interfere.”^484 Another agreed with the self-mocking comments that “Chinese are not qualified to stand still over the bridge.”^485 The denunciations of the bridge grew stronger in the 1930s. One writer vividly described a scene: “Tramcar twisted its waist…crawled over the spine of the international bridge. The senile and poised bridge closed eyes. Endless aged tears fell out. Countless economically imperialist products moved across here.”^486

The estimated budget for the bridge was around Tls. 700,000, but the actual cost was about Tls. 2,060,000. The Chinese police seized custody of the bridge, accusing the Haiho Conservancy Commission of corruption. The national Ministry of Finance ordered the Tianjin special municipality, Hebei provincial administration, and related inspection agencies for coastal affairs to investigate the HHCC. Investigators noted that “it[the corruption] was not allowed during warlords period, let alone the National government who made efforts on reformations.”^487 But the investigation was ineffectual.

In 1927, the Hai River engineers and technicians took charge of operating and maintaining the bridge. The number of openings was recorded in engineers’ reports. Whenever the bridge opened in the middle, traffic stopped, following the commands of the bridge operators. All traffic from both sides had to wait and salute until the steamers passed.
When the Japanese military organized exercises and parades in 1932, it chose the bridge as an essential spot along the parade route.\footnote{488} This heightened Chinese perception of the structure as “the capitalist iron.”\footnote{489}

From 1928 to 1936, the dredged Hai River continued to facilitate foreign concessions. The process gradually changed not only the layout, but also the environmental, geological, and ecological personalities of the city.

Suction-dredgers and extensive pipe systems helped fill low-lying ponds. The existence of these ponds removed the impediment of developing a modern municipality. On them rose a complex system of roads and dwellings. Filling also benefited other places under Chinese control, including the wharves at Tanggu and villages along the Hai River reaches. This came before the establishment of the foreign settlement. In the 1930s, the British occupied nearly 940.7 acres of land and, having been involved in the construction from the beginning, owned not only the established shipping facilities on the bund,\footnote{490} but also well-designed public facilities including drainage and sewerage piping systems, municipal buildings, monuments, recreation halls, schools, hotels, hospitals, police offices, graveyards, and a horse race course. The uneven earthen roads were continuously paved and modified, first with macadam, then asphalt concrete—the type that gained popularity in the United States and Great Britain.\footnote{491}

Areas under Chinese administration also experienced change. The Chinese government announced its plans to flatten and widen roads, regulate wharves, and organize waterfront areas in the late 1920s. Filling counterbalanced the nature of the land, which was so soft and loose that it caused the newly constructed road to easily subside, creating water pits. Seasonally epidemic diseases were tied to the existence of fetid dark water pits.\footnote{492} The fight
against these lower-lying pits was related to concepts of managing the “city appearance” or “hygiene.” The Chinese government also took this opportunity to mobilize society and persuade civilians to take part in the renovation of the city.

The state-led filling program faced occasional protests where no sewage systems were built. A municipal construction project was often accompanied by hassles of resettlement. Ponds were used autonomously by nearby villages to discharge rainwater or floods. Filling these ponds increased the danger of inundation. In 1935, in the 1st Special Area, villagers rebelled against any change to their discharging waste into ponds, until they received the municipal government’s commitment to build sewers.

In general, the Chihli River Commission’s filling program changed not only Tianjin, but also all of northern China. It resulted in drastic changes to the ecology of northern shallow lakes. Conflicts between farmers and the provincial police were constant. Regulations were enacted to allow the filling to continue without delay and hassle.

Shipping and Economic Development

The efforts of water conservancy did not live up to the golden days of the HHCC from 1924 to 1926, yet allowed for the steady increase of steamers navigating the Dagu bar. In the unstable years of the river, facing silting up from the Yongding River, the river could only handle ordinary steamships with draft under 13 feet, except during summer with freshets of the Yongding River.

The increase of international trade in Tianjin was not only handicapped by the unstable situation on the Hai River, but also the hostility between the Guomindang and the Japanese in northeastern and southern China. Moreover, the frequent floods on the Yellow River in the
1930s led to drastic challenges, hindering smooth transportation between the economic hinterland and Tianjin. Economic embargos, disruptions over municipal agencies and Customs by the hostile warlords, the economic slowdown in international markets, and fluctuating gold and silver prices all boded ill.

The reduced tonnage draft and increasing expenses on cargo for employing tugs and lighters discouraged shipping companies. In 1928 and 1929, a yearly fee of Tls. 1,500,000 was applied to transferring barges between Tianjin and Tanggu.496 This occurred along with fluctuating supply and demand in the international market and raised taxes on products such as wool and coal, causing merchants in Tianjin to complain about their declining profits.497 Until 1930, political and social turmoil and natural disasters throughout the hinterland further reduced trade volumes for Henan, Shaanxi, Gansu, and Chahar routes.498

Still, the city made progress on economic and industrial development, until 1931 when Tianjin lost part of its market because northeastern China was occupied by the Japanese. The economy staggered, recovering only in 1935.499

The fate of the city was tied to its hinterland. Natural resources and raw materials provided by the vast territory of the countryside were connected with the industries in the United States, Japan, and European countries. Agricultural production, industries of husbandry in the hinterland, and mining were stimulated by the increasing international demand. For example, Tianjin was the third-largest cotton trade port in China, behind Shanghai and Hankou.500 The supply of cotton came from plantations distributed over the drainage of the Hai River tributaries and valleys of diversion canals, including Beitang River, Daqing River areas, and the Southern Canal area.501 The Guomindang stimulated cotton
production through local committees and experimental sites, circulating improved seeds among peasants. The production and marketing of cotton products were mobilized by committees for transport and marketing, research, and improvement, and funded banks. The American cotton seeds tested in a few agricultural improvement institutions since the late Qing Dynasty were now widely used in hinterland areas. Cotton traders in Hebei Province organized a special committee to improve and regulate the transport, examination, and transaction sites.\textsuperscript{502} Raw cotton from Hebei Province headed to Tianjin and was then transported to the world market. The cotton output increased from 814 \textit{piculs} in 1926 to 1,445 \textit{piculs} in 1933, and the output of Shandong Province increased from 518 \textit{piculs} in 1926 to 1,469 \textit{piculs} in 1933.\textsuperscript{503}

The government promoted land reclamation, turning waste land into cotton fields. But the process was not radical in the late 1920s and 1930s; the planting and harvesting of cotton was environment-driven. Cotton fields needed the digging of canals and drilling of wells for constant water supply. With yearly droughts or floods repeatedly hitting northern China, output from cotton fields was not predictable. The total acreage of cotton fields in Hebei Province shrank rather than increased in the 1920s, with 4,391,032 \textit{mu} in 1920 but only 2,567,400 \textit{mu} in 1929. The figure increased drastically in 1932 and 1933, to 5,142,895 \textit{mu} and 6,121,971 \textit{mu}, respectively. In Shandong Province, the acreage increased from 3,218,000 \textit{mu} in 1919 to 6,544,276 \textit{mu} in 1930 and 7,974,094 \textit{mu} in 1931.\textsuperscript{504} The expansion inevitably resulted in land reclamation, the improvement of water conservancy, and disputes over the arrangement of water resources.

Tianjin was the largest port in northern China. Although the total amount of direct trade
in Tianjin was slightly less than that of Dalian in certain years, it continuously attracted international traders, and even the domestic trade of Tianjin increased by limited margins. Tianjin was followed by Qingdao in terms of foreign trade.505

Chinese and foreign communities reacted to the rise of Japanese power in Tianjin. The formerly powerful European powers retreated from Tianjin after World War I. British businesses shrank in the 1930s. Other nations, including France, Germany, Belgium, the Netherlands, and Russia, still had business agencies in the city, but their influence was overshadowed by the rise of the competition among the Pacific states of Japan and the United States.

Economically, the top three world powers in Tianjin were Britain, Japan, and the United States. Exports included peanuts, eggs, flax, wool, raw animal skins, coal, salt, and bristles. Imports included cotton goods, wool products, dykes, industrial products, bicycles, mechanical parts, and iron and steel. The United States led Tianjin exports in the early 1930s. Wool and animal skins from the northwestern hinterland were still gaining favor in the North American markets. In return, America supplied California kerosene to Tianjin. Japan dominated imports, with its advantage of strongholds in Manchuria and with smuggling.

Japan surpassed Britain to become the dominant power in exporting cotton piece goods in northern China, as the latter world power suffered from economic recession before World War II. After Japan took over Manchuria, the economic competition between Britain and Japan was fierce in northern China. Britain invested in natural resources, including petroleum and coal via the Asiatic Petroleum Company, the Chinese Engineering and Mining Co., and its holdings of Chinese government obligations for Tianjin-Pukou, Tianjin-Hankou railways,
and Beijing-Mukden Railways. The development of the British holdings threatened the Japanese goal of monopolizing Chinese natural resources and communication lines.\textsuperscript{506}

The competition between the two countries extended into rivers and oceans, with a sharp decline of Chinese shipping interests in the 1930s. The British Swire group made new purchases to protect its shipping shares along the Chinese coast.\textsuperscript{507} Japanese shipping companies such as Nippon Kisen Kaisha, Osaka Shosen Kaisha, and Dairen Kisen Kaisha tried to monopolize the shipping industry by purchasing steamers. As a necessary stop in the shipping lines connecting Shanghai, Tianjin, Dalian, and Qingdao — the four ports under the great influence of Japan — Tanggu was an ideal site for the erection of new Japanese wharves and docks.

Japan’s rise was represented by Tianjin harbor. The ability of Japan to extend the mooring site across the International Bridge highlighted its rising influence in shipping interests. Tianjin Customs agreed to construct another mooring site at the Japanese concession, emphasizing Japan’s dominance while expelling Chinese shipping boats.\textsuperscript{508} Yet the location of the Japanese concession was disadvantageous compared with that of the British concession. Japanese steamers sometimes disrupted the HHCC’s already clumsy operation of the international bridge. Larger Japanese steamers chose to moor at the British concession, which marked one of the major drawbacks for the Japanese authority. The confrontation between Japan and other powers in the city seemed inevitable in the latter half of the 1930s.

**Reshaping the Waterfront**

Modern settlement among the existing and defunct foreign concessions on the riverfront defined a point for urban expansion. It defined the modern imperialist
transformation of the city and river since the Qing Dynasty.

The waterfront was reshaped and reorganized by the ideas of a modern city. The municipal government regulated the length and shape of the bund. Dumping waste into the rivers was deemed unsanitary and contrary to the Shirong (urban appearance) effort. It was agreed that beggars and the homeless could not encroach upon the waterfront. Poor people’s temporary houses were removed. The waterfront was under the control of the Nationalist government when construction teams repaved roads or enhanced dykes.

State-funded homeless shelters were built starting in 1928. Churches and charity groups were also encouraged to establish shelters for women and children. The shelters were responsible for distributing clothes and food and fulfilling the Nationalist goal of hygiene. Related education was compulsory for the young.

The poor in shelters were provided with uniforms and regularly assessed for public hygiene. Movement in and out of the shelters was monitored. Tianjin police warned vendors and storekeepers to return escaped shelter members. Lacking funds and advanced facilities, these places became vulnerable to infectious diseases, like scarlet fever, malaria, cholera, and influenza. These shelters often suffered most during wartime. A national campaign cast begging and vagrancy as obstacles against modern development. Newspapers used terms like “catching beggars” that treated the homeless as illegals and outlaws. In radical terms, the beggars were demonized, being banned along with street dogs.

The waterfront was a public place for strict municipal organization. Individual properties were not allowed to be constructed on the riverfront. Markets were reorganized, with riverfront sites relocated to other places controlled by the government. Dumping trash
into the river and its branches became unlawful in the 1930s. Bridges were especially important to leaders. Trash dumped gathered near the bridges blocked the flow and caused dangerous conditions, especially during the rainy season. The municipal government blamed dumping trash into the river as one reason for the silting up of the river in the 1930s.

In the 1930s, the government announced a series of policies to renovate the roads along the waterfront. Wide roads were suggested along the riverfront of the Northern Canal, the Southern Canal, the Xinkai River, and special areas along the Hai River, so that these places could “improve Shirong (urban appearance)” and “compete for attention against foreign concessions.” The budget for road construction nearly quadrupled between 1933 and 1934. Parks, trees and flowers were also on the government's construction agenda to improve populated areas such as San-cha-he-kou and riverfront areas near bridges.

The waterfront, marked by the foreign concession areas, highlighted social discrepancies. Rich Chinese purchased real estate and settled there, while the poor gathered in the outskirts or in the native city, where limited modern facilities were established to ease their living conditions. Social classes were further delineated by distinct urban spaces. A place called San-bu-guan (a place without three authorities) was located in the western part of the Japanese concession and south of the native city. Since the place was seen as a buffer zone adjacent to foreign settlement, the Chinese government claimed loose authority rights. The historical small market for commodities evolved into a “commoners’ recreation site” in the 1930s. Folk art performances, including martial arts, folk acrobatics, comic acts, magic acts, and especially operas, were held on the site. Gamblers, scoundrels, and gangs also sought it out as a major source of money-making. The site was also criticized by the literati as
a site of superstition and decadence.

Markets like San-bu-guan were located far from the river, seen as the place of modernity and advancement. But even their existence was subject to the infiltration of the state’s power. Starting in 1928, the Nationalist government received proposals for rational and scientific city planning. Surveys and detailed investigations were made. The southern market where San-bu-guan was located was one of the targets for change. The municipal government imposed a sales tax, constructed infrastructure, and created a modern “Shirong”. Chinese land investment companies built houses on the spare land, neglecting the rights of the poor.

The Huanghui of 1936

Nationalist power also infiltrated into traditional cultural and social sites. It seemed aberrant for a party to hold Huanghui (imperial fair), which was appropriate for neither modernity and democracy nor the revolutionary goal of the Guomindang youths to overthrow the Qing government three decades earlier. However, the Tianjin Municipal administrators vigorously took part in promoting the imperial fair in 1936, when the political situation and social turmoil jeopardized the GMD’s regime.

In 1936, the Japanese Kwantung army annexed northern China, and students in Beiping launched Nationalist movements. In addition, the Communist party was finishing the establishment of new bases in Yan’an; they announced that northern China was the stronghold from which to challenge the Guomindang and claimed their political legitimacy in the anti-imperialist movement.

Unlike the imperial fair launched by the Beiyang warlord in 1924, which was strongly
criticized as a show of “peace whitewashing.” Huanghui was treated differently in 1936 by the pro-Guomindang media. Although the Guomindang’s rivals doubted the real intention of the Tianjin Municipal Administration in manipulating the Huanghui, a large number of newspaper and magazine critics praised this social event as effective in stimulating the market and benefiting society. The local newspaper Yi-shi-bao praised the imperial fair as a way to reinvigorate the economy that was both “aboveboard and fair.” The event was seen as a way to support Chinese tradition.

The core coterie of the imperial fair consisted of business tycoons, celebrities, and political barons who had close relationships with the two. The strongest promoters were members from Tianjin unions, banking and monetary associations. The Huanghui of 1936 seemed no different from any social event before the Guomindang era, yet it reflected differences in the way that the municipal governors and financial activists wielded power and established the state–society relationship in a new turbulent and crucial era.

The Tianjin administrative authorities considered Huanghui to be a historical and traditional means for linking suburban agricultural communities. The preparation committee occupied rooms inside the temple and discussed organization, finances, and specific events. Newspapers offered full coverage of the events. Streets, lanes, and corners were covered with news posters.

Starting in March, prestigious elders from the suburbs decided on the procedure and routines for the parade, and the traders’ union informed the police and constabulary forces of the decisions so they could raise the level of vigilance to maintain security and social order. They were also responsible for circulating news, procedures, and regulations of the fair to the
populace. As the opening date approached, Guomindang police and soldiers were dispatched to strategic posts in order to prevent sabotage from the Communists. River boats were examined by police on gunboats.\textsuperscript{522} The municipality even cancelled parades because of the rumor of potential social instability.\textsuperscript{523}

The event lasted for six days, with cannons sounding for three days to attract attention. It marked a clear difference from the military parade inside Japanese concessions, where the imperial fair was seen as a confrontational event that might cause damage to the Japanese military presence in Tianjin. News of the Japanese military showed growing concern from the Chinese perspective.

On April 8, a social stir among the suburban villagers and travellers from other provinces occurred. The symbols of the imperial family and the color yellow were exhibited in decorations and dress during parades, showing not only prosperity and order, but also the ruling legitimacy and power of the Tianjin Municipal Administration. Individual vendors were exempted from taxes at the fair.\textsuperscript{524} Salvage corps and rescue crews were also on hand to eliminate potential social unrest.

After the largest parade on April 13, newspapers and commentaries used “lively,” “crowded,” and “prosperous” to describe the event, even though the number of parades had been reduced. Observers even praised the event as “unseen in the last decade.”\textsuperscript{525} Albums and films praised the event’s pageantry. Although critics believed such a superstitious event should be avoided, they applauded the government’s success in stimulating the local economy and maintaining peace.

Yet \textit{Huanghui} served as more than a cultural tie to bring residents and the river together.
It was also understood as a way to effectively deepen social discrepancy. Whereas intractable commoners were beaten up and rascals and criminals were arrested by the police, celebrities and guests of the municipal administration were given easy access to the event. Streets on the routines were blocked off for the passage of official vehicles. VIPs sat in special areas, usually higher floors and balconies that commoners could not easily access.526

The Huanghui of 1936 marked a clear difference from confrontations pushing the Guomindang to retrieve territories militarily occupied by the Japanese. However, the superficial economic benefit did not last long, as Tianjin was soon invaded and taken over by Japanese troops in 1937. Still, the imperial fair of 1936 was a window into the efforts of the Guomindang to enhance the state–society relationship and the continuity of the religious river culture that had been so influential along the riverfront since the Qing Dynasty.

380 YSB, January 31, 1929, 2.
381 YSB, November 4, 1927, 3.
382 “Jin hangzheng ju zhengdun hangzheng,” Sihai ban Yuekan 2, no. 12 (1931), 82-83.
383 YSB, September 21, 1931, 6.
384 “Tianjin gangwu ju chouban haihe matou chuanzheng,” Yinhang Yuekan 8, no. 9 (1928), 19.
385 Engineer-in-chief’s office, report No. 1444, October 19, 1929, TMA 1:X-90.
386 Report No. 1518, Appendix No.1, Swinging Berths, November, 1931, TMA 1:X-91(1).
388 YSB, November 24, 1927, 11.
389 The media reports the number of the Japanese immigrants was only forty to fifty before but reached three or four hundred in 1929. See “Tanggu fangmian jian zhen fansheng,” YSB, October 28, 1927, 11.
390 For instance, one of the local commissions was the Water Conservancy Commission for Beijing and Zhili. See SB, March, 23, 1927, 2 for more information.
393 The commission underwent re-organization from 1928 to 1931. Li Yizhi resigned the position in 1929. Chen Maojie and former vice-chairman Li Shutian led the commission. Chen Maojie resigned in 1930 and the commission was subordinate to the Ministry of Communication and Railway in 1931.
394 Xu Zongshi, “Zhongyao jiaotong jianshe: beifang dagang kanding gangzhi,” Shishi Yuebao 8, no.2 (1933), 75.
395 Heng Chao and Thomas Ming, “Eastern and Northern Harbor Projects,” The China Weekly

See the poems written by Xiang Dizong and others, “Zhuci,” Huabei shuili yuekan 2, no.9 (1929), 9,10,14.

Li Shutian, “Beifang dagang zhi chubu jihua,” Huabei shuili yuekan 2, no.9 (1929), 122-123.

Chen Julai, “Zuijin zhong ai dashi zeyao,” Qinghe 1, no.3 (1932), 1.

YSB, July 24,1935, 1.

YSB, September 3, 1927, 12.

“The Phantom Port of Tientsin,” The North - China Herald and Supreme Court & Consular Gazette, October 19, 1929, 86.


Engineer in Chief’s report No. 1040, August, 1928. 1:X-86, 3-4.

Ibid, 6.

Xidian (West Lake) was a shallow lake located in the drainage basin between Daqing River and Ziya River.

Engineer in Chief’s report No. 1040, August, 1928. 1:X-86, 6.

A letter to C.E.Gauss, Esquire, American Consul General and Senior Consul, August 30, 1928, TMA 3:3

“The Phantom Port of Tientsin,” The North - China Herald and Supreme Court & Consular Gazette, October 19, 1929, 86.

Zhu Yanping, “Duiyu yongdinghe gaidao zhi wo jian,” Huabei shuili yuekan 1, no.2 (1928), 11.

SB, August 31, 1928, 11

ibid

SB, Dec 31, 1928, 9.


“The Haiho Funds,” The China Press, November 1, 1929, 16.

YSB February 15, 1931, 6.

Letter to Sir Frederick Maze, Haiho Conservancy: Silting of River and Closing of Harbour to navigation, TMA 1:VI-321, 12.

Ibid

YSB, September 13, 1932, 6.

Memorandum the cause of the deterioration of the Hai Ho, TMA 1:1:VI-321, 3.


Ibid, 7.

Ibid.


YSB, April 25, 1932, 6.

Xu Shida and Xu Zongpu, “Yongdinghe zhiben jihua dagang,” Huabei shuili yuekan 2, no.11 (1929), 54-56.


YSB, April 21, 1928, 11.

LOAN E…For Consideration at the Next Board Meeting, August 15, 1934, TMA 1:X-86.


YSB, April 23, 1931, 6.

Report for 1937, Table XVII, TMA 1:1-113. The amount of excavation at Dagu Bar was not included in the table.


*YSB*, October 18, 1929, 10.

Memorandum No. 3 Summary of the Opinions Expressed by Various Engineers between 1900 and 1922 on the Means of Improving the Bar Channel, TMA 1:X-91(2), 7.


Ibid.


Map adapted from the map with Report No. 1446, TMA 1:X-90.


Memorandum No. 2 Output Measurement at the Mouth of the River and at the Bar Channel and conclusion to be drawn from these Measurements regarding the possible effects of a System of Dykes, TMA 1:X-91(2), 1.


Map adapted from Haiho Conservancy Commission, Taku Bar and Haiho Entrance, TMA 1:X-91(2)


Memorandum Outline of the Board’s Policy in regard to the Taku Bar Channel, October, 1930, TMA 3:171, 2.

Ibid.

Report No. 1461, 2.

Memorandum, Suggestions for a possible system of Marking the Taku Bar Channel, 2, TMA 1:1-171.

Summary of the Second informal Meeting to ascertain the opinion of the shipping of the port…Dec. 10th 1930


In the Letters “Engineer in chief to coast inspector, dated 24th August, 1931” and “From Coast Inspector to Tientsin Commissioner” dated August, 1931, L.T. Stodart, the engineer in chief of the Huangpu Conservancy Commission showed his uncertainty of changing the course. He suggested deferring action and waiting to see the improvement in the depth of the river brought by the palliative measure. The Coast Inspector, H.E. Hillman supported Stodart’s comment and said “it is premature to make any changes in respect to the present aids to navigation for the Bar Channel.” Documents in 3-171

Memorandum Outline of the Board’s Policy in regard to the Taku Bar Channel, October, 1930, TMA 3:171, 3.

Appendix to ice breaking report March 1931, TMA 1:X-91(1), 3


Ibid, 5.


Appendix to ice breaking report March 1931, TMA 1:X-91(1).
By contrast, the cumulative temperature from Nov. 7 of 1930 to Feb. 28th of 1931 was -116.1°C. Information see Zhao Shu, “Minguo er shi wu nian er yue bohai wan haihe zhi bing zai,” Qixiang zazhi 12, no. 4, 195.

For instance, the tariff rate was raised from 3.9% of 1928 to 27.2% of 1935 after several tax reforms implemented by the Nanjing government. Local taxations on controlling exports were also raised frequently in the 1930s by local governments. Data collected from Li Luozhi, Tianjin de jingji diwei (Tianjin: Nankai daxue chuban she, 1994), 15and Wu, Jin haiguan maoyi nianbao, 458.

Tianjin and Dalian served as alternative second largest port for direct international trade. Mostly, Dalian exceeded Tianjin with its geographical advantage close to Japan and its advantage of being a natural ice-free seaport. The total value of direct foreign trade in Dalian and Tianjin were 321,925,450 Hk. Tls. and 198,053,323, taking 13.65% and 8.4% of the total value. In 1932
however, the value of direct foreign trade in Dalian dropped to 141,394,238, while Tianjin was 167,425,503, taking 9.09% and 10.76% of the total value. The sudden drop was mainly a result of Japanese intrusion in Manchuria and unstable market in North China. (Figure adapted from *The China Year Book, 1934* edited by H.G. W. Woodhead, 94.)

506 Jones, *Shanghai and Tientsin*, 150.
508 *YSB*, November 30, 1933, 5.
509 For instance, the government announced it was illegal to stay and interfere in the river conservancy work on the waterfront of Xinkai River. See news *YSB*, December 12, 1932, 6.
510 *YSB*, April 29, 1929, 15.
511 *YSB*, December 24, 1928 10.
512 *YSB*, May 15, 1931, 6 and October 7, 1934, 4.
513 *YSB*, June 26, 1931, 6.
514 *YSB*, October 30, 1936, 5.
515 *YSB*, October 14, 1934, 5.
516 *YSB*, June 6, 1936, 5.
518 Shuang Qinguan, Tianjin huanghui jinian ce (Tianjin: n.p., 1936), 1.
519 Editorial, *YSB*, April 1, 1936, 1.
521 *YSB*, April 8, 1936, 15.
522 *YSB*, April 8, 1936, 5.
523 *SB*, April 7, 1936, 3.
524 *YSB*, April 10, 1936, 13.
525 *YSB*, April 12, 1936, 5.
CHAPTER FIVE

The Power of Water, 1937-1948

The river was the site of escalating military tension between the Japanese and the Chinese in 1936. Almost as soon as the Huanghui (imperial fair) ended, the splendor of the Guomindang imperial pageant was replaced by a horrific scene on the riverfront. In May of 1936, less than one month after the Huanghui, the bodies of young men were seen floating on the river. By the 18th of that month, the GMD police had fished out 200 corpses.¹ More bodies surfaced from the Tianjin Bund to the Dagu reach. By June, rumors said that these young men had been beaten to death on secret Japanese construction sites near Tianjin but the government claimed that the dead men were drug addicts.² Still more corpses were found in the spring and summer freshet of 1937. On the night of April 30th, another nine bodies were discovered.³ The authorities posted pictures of the dead, hoping that their relatives would claim them, but no one came forward. The nameless corpses gave rise to suspicions not only among the Chinese but also among foreign visitors who might glimpse a body in the water as they crossed the International Bridge. The GMD municipal polices caught people throwing corpses into the river and knew that the bodies were those of opium addicts who had died in the narcotic dens of the Japanese concession after interrogation.⁴

The corpses in the Hai River reminded the municipal administration of the Japanese military presence. The case was followed by the outbreak of war between Japan and China on July 7 1937. The Japanese occupation of Tianjin was the inevitable result of Japanese plan to connect North China with its industrial base in Manchuria, colonizing and exploiting the
region's natural resources and waterways for military transport and agricultural and industrial expansion. Like these Hai River floating corpses, the relationship between the river and city was associated with Japanese presence of militarism and colonialism in North China.

**The Activities of Japanese Military in North China**

With Tianjin as North China's dominant import and export center, resources from its economic hinterland were emphasized in Japan’s political and economic agenda towards China as the expansion of heavy industry in Japan and nonstop military campaigns increased Japan’s reliance on resources in North China beyond Manchuria. Hundreds of state-sponsored intelligence and information-gathering activities about agriculture, industry, and the distribution of natural resources were deployed, first by the Toa Dobunkai (East Asia Common Culture Society) in the 1910s, then by the Hokushi Keizai Chosajo (Institution of Economic Investigation), a subsidiary of the South Manchuria Railway Company. The content consisted of geographical and agrologic analysis on traditional agricultural production, location of natural resources, statistical trade records, charts and maps detailing transport and navigation networks, reports on the number of steel mills, cotton textile factories, political and military observations of Guomindang and Communist anti-Japanese movements. The surveys were well-structured and exhaustively documented with diagrams, charts, statistics, and calculations.

Agricultural and natural resources were essential for agricultural and industrial prosperity. Numerous reports on agricultural and natural resources of North China appear in intelligence reports sent to the Japanese government and military headquarters. The richness of resources was one reason for Japan to colonize North China. Agricultural products such as
rice, sorghum, wheat, cotton, millet, tobacco, in addition to natural resources such as iron, bronze, gold, silver, charcoal, saltpeter, sulfur, lime, and lead had been under surveillance of the Japanese “straw shoe-wearing” filed investigation.\(^5\)

Mopping up the remaining Chinese military powers in its occupation areas, Japan promoted the image that the corrupted Chinese authorities were in no position to make the best use of the resources in North China. It was said that the GMD’s technological and economic reliance on imperialist European and American countries was unsubstantiated to develop China and improve the lives of peasants who suffered from social turmoil and natural catastrophes. The GMD was requested to adjust the international and diplomatic policy, minimize the economic linkage with western imperialist countries and enhance economic cooperation with Japan, supported by the “new international order” and the “new order in East Asia.”\(^6\) It was mutually beneficial for China and Japan to maintain friendship and construct the “the Great Asia” region to reinvigorate eastern Asian culture against in the face of oppressive western culture.\(^7\)

These militarist and colonialist terms, known as “the Greater East Asia Co-Prosperity Sphere,” was the euphemism of the Japanese ambitious grand scheme of exploiting resources from China. Japanese armies invaded the lower Yellow River and lower Yangzi River in 1938 and made North China one integral part of Japan's grand scheme. As a frontier agency, the Kitashina Kaihatsu Kabushiki Gaisha (KKKG, or the North China Development Co.) was founded to bring about “Japan-China co-prosperity” and advance economic exploration of the North China.\(^8\) The government raised funds in the form of bonds and liabilities. The company knew precisely what North China's resources were. It had branch businesses
extending the militarized arm of exploitation and colonization into the vast hinterland through transportation hubs seized by the Japanese army along the eastern coast that. Branch agencies were founded in Beijing and Shi-jia-zhuang after Beijing was chosen as the new capital for the Chinese government under the surveillance of the Japanese. The KKKG invested in heavy industries including coal and charcoal production, steel and iron production, electricity supply companies in Datong, Jingxing, and Longyan, in addition to the chief coal mines in Shandong, Hebei, Shanxi and Henan provinces. It also funded cotton industries to stimulate domestic textile industries. Machinery and guns were equally important in the system.

The exploitative economic system of North China was militarist and colonialist. Natural resources were exploited to promote agricultural and industrial production, supporting Japan’s deadly wars in Southeast Asia and the Pacific islands. With anti-Japanese sentiment spreading, the Japanese army and navy, and the puppet Chinese government were the only props of the colonial system. The autonomy of the Chinese was marginalized. The Chinese investors and entrepreneurs earned little from the newly established joint companies. The Japanese army sent Chinese workers to industrial and military construction sites.

Tianjin was critical in the rise of Japanese colonialism in North China. The world market at Tianjin was the collection and distribution center for products from Shandong, Shanxi, Hebei and Henan provinces. Roads, railways, and waterways linked hinterland to city, and city to world. Facilities for restoring and transporting cargo had been well established along the traffic lines. The complex system of banking, financing and insurance facilitated commerce, and the textile, wool, dye, chemicals and metal industries made Tianjin China's second-largest commercial port and the first of six ports to open the market of hinterland in
North China.\(^{10}\) It became the region's economic capital after a political center was established in Beijing under the guidance of Japanese army.

The ambitious plan to remake North China required a huge Japanese investment in Tianjin's heavy industries and infrastructure. Japan not only planned to dig a new channel with 10,000,000 Yen from Central Hebei province to Tianjin to improve communication, but also planned to build airports to connect Tianjin Beijing, Tianjin and Shanghai. Another 10,000,000 Yen was slated for investment in coastal fishery industries.\(^{11}\) One subsidiary of KKKG, the Kochu Koshi (China Development Co.) was established by the South Manchurian Railway Company in 1935 for 10 million Yen. It invested in many companies and industries to exploit the natural and industrial resources in North China. Equally important, the companies invested in and held stocks of subsidiaries including Tianjin Electricity Company, Tanggu Transportation Company, and North China Cotton Company in 1936.\(^{12}\)

Harbor construction was essential in this grand development plan. Japan's plan to develop Tianjin and exploit, process, and transport resources of North China involved full scale improvement of communication network. It was “politically and economically important” to “construct railways, renovate harbors, pave roads and prepare airport facilities.”\(^{13}\) Japan raised funds and invested in navigation improvement over the Bohai Gulf and on the Hai River. In the 1930s, Tianjin harbor and Tanggu witnessed the extensive construction of shipping and mooring facilities for Japanese shipping companies engaged in developing coastal lines. Japan had long considered navigation rights and benefits the way to raise its national power. Until 1938, Dairen Kisen Kabushiki Kaisha (Dalian Shipping Co.), Osaks Shosen Kaisha (Osaka Commercial Shipping Co.), Kinhai Yusen Kaisha (Costal Mail
Shipping Co.), Kokusai Unyu Kaisha (International transportation Co.), Kawasaki Kisen Kaisha (Kawasaki Steamship Co.), Nisshin Kisen Kaisha (Nisshin Steamship Co.), and Toyo Kisen Kaisha (Oriental Steamship Co) operated shipping lines connecting Tianjin and other ports such as Dalian, Shanghai, and major Japanese ports, wrestling with the British Butterfield & Swire and Jardine, Matheson & Co. which still were leaders of business of shipping and navigation along the Chinese coast. The increasing investment on shipping fit into the larger state scheme of increasing the power of Japanese shipping companies over the China Sea, the Pacific Ocean and the Indian Sea – the sea routes once monopolized by the British and American shipping companies.

However, the presence of other foreign powers in commercial treaty ports was an obstacle to Japan’s economic expansion. Besides China's active resistance to Japanese invasion, western interests and influence affected commerce and industry. Their political privileges including extraterritoriality and the control of the Tianjin customs were impediments to Japanese objectives. After 1937 when the puppet North China administration was founded, river navigation on the Hai River was still in the hands of the British, French and the United States, preventing Japan from annexing North China into the Manchukuo and the Sino-Japanese economic sphere.

Britain held a “large tangible stake” in Tianjin by controlling the lucrative Kailan Mining Administration, the British-American Tobacco Co., the Hongkong and Shanghai Banking Corp., the Chartered Bank of India, Australia and China, the Asiatic Petroleum Co., The Dunlop Rubber Co., and Imperial Chemical Industries, most of which were on the list to supply the Japanese military. Even the puppet government enacted laws and revised tariff
rules to favor the Japanese economic monopoly, the British still insisted on protecting their own commercial interests in the port.

The United States was the second-largest investor in Tianjin and took a great proportion of imports and exports from Tianjin. The businesses included trade, banking, insurance, manufacture, construction, navigation, real estate, hotels, and communication. It was the leading importer of wool, animal skins and fur from the northeastern hinterlands. The United States also supported the Guomindang with loans and technology.

The existence of world powers produced a threat against the aggressive move of the Japanese army. Through international talks and diplomatic channels, western nations doubted Japan's ability to develop North China and inadvertently supported anti-Manchukuo and anti-Japanese movements deployed by either Guomindang or the Communists. Every move of the Japanese military was reported in English newspapers. The Hai River corpse mystery, for instance, was closely followed. In 1938 the Japanese military defeated the Guomindang troops in Tianjin but gained the prevalence of internal unrest and strikes in the Japan-controlled areas. The Japanese army asserted that these Chinese “terrorists” were based in British and French concessions thus the evacuation order had been secretly made by military authorities among the Japanese residents in the foreign concessions.

As tensions between Japan and other foreign countries grew, the Japanese military occupied the foreign concessions liquidating the economic and political interests of the British, the American and the French in North China and legitimizing the Japanese monopoly of North China through the Provincial Government. On April 9, Japan demanded the surrender of four alleged Chinese terrorists. The Japanese army then blockaded the British
and French concessions on June 16. All vehicles and pedestrians were searched by Japanese soldiers. The Hai River was occupied. Foreign steamers and lighters were intercepted. The Hai River became a river exclusively for the navigation of Japanese lighters and small steamers. Japanese army ordered the expulsion of all foreigners from Tianjin and handed the British and French concessions to the Japan-controlled Beijing government in 1942.

**The Rise of Tanggu**

The port of Tanggu was one of Japan's engineering creations. The planning, operation and making of Tanggu reflected Japan's colonial and military ambitions for the Hai River and the Bohai Gulf.

Japan’s ambitious economic scheme in North China needed a large northern harbor. The older ports in North China could not transport ten thousand tons of coal, salt and other resources for chemical products. In 1938, the Koain (East Asia Development Board) investigated the coast of North China and developed a plan to design a new and larger harbor. Among the prospective construction sites were Tanggu, Qingdao of the Shandong Peninsula, and the Northern Port at the mouth of the Daqing River, chosen by the Guomindang. The Japanese evaluated all of these sites. The Qingdao promoters believed Qingdao was the only natural port for accommodating oceanic steamers and it had been a stronghold under the greater Japanese influences. Others supported the Northern Port site chosen by the Guomindang. Compared with Tanggu where freezing winter and shallow entrance channel posed serious challenges, the Daqing River site could more easily be made into a natural port with less manipulation and dredging.

None of these sites matched Tanggu, the strategic throat along the coast to Tianjin and
Beijing from the sea. Its historical significance had been reiterated by the Japanese army's ability to take control of North China. Located at the mouth of the Hai River, Tanggu was the closest port to Tianjin and Beijing. The established railroads and canal system bestowed it with communication with the economic hinterland. After Japan announced a plan to build a railway from Shi-jia-zhuang to the southern part of Tianjin, the possible construction site of a port capable of accommodating the flow of cargo inevitably pointed to Tanggu.\textsuperscript{21} With an inland transportation line, Tanggu could be connected with Manchukuo where Japanese military had established heavy industries. The new harbor was designed not only as the port of Tianjin, but also the new outlet of North China.

The conflicts of interest on the Hai River among world powers were a factor in the selection of Tanggu instead of the established port of Tianjin. These conflicts and internal rivalries finally separated Tanggu from Tianjin and remade the river and the city. As the British controlled the river through the Haiho Conservancy Commission, they had the advantage for shipping and maintaining harbor, wharves and numerous godowns. The British monopolized piloting businesses at the river mouth and earned profits through businesses of mooring and shifting steamers with two major mooring sites along the river course near the British concession. The Japanese steamers had rent space from the British. Thus, in the early 1930s, Japan announced a plan to create another mooring site.

Japanese shipping companies increased their investment in Hai River in the 1930s to take over Tianjin-Tanggu navigation. The Peiho Lighter Company, a branch company reorganized by the Dairen Kisen Kabushiki Kaisha, and the Tanggu Transportation Company had been founded in Tianjin. Yet the success of these attempts was intangible. In 1938, the
British shipping interests represented by the Taku Lighter Co. and Tientsin Lighter Co., owned 43 barges and lighters, 16 tugs, suppressing 16 tugs and 17 barges and lighters owned by Japanese companies.\(^2\)

Another dispute revolved around the International Bridge. The construction of the International Bridge symbolized bifurcations among world powers. Located at the French concession, the bridge created a physical boundary of the British, the French concessions from the Japanese and the Italians territories. While the French and the British set strict regulations for less interference from the erratic moves of small wooden vessels, the Japanese steamers faced greater challenges of maneuvering clumsy steamers alongside Chinese ferry boats and fishing junks due to its geographical location. Moreover, challenged by the International Bridge, the Japanese commercial steamers and warships yielded to the Haiho Conservancy Commission of lifting bridges span to reach their own bund.

Therefore, Tanggu was one way to circumvent the western powers on the Hai River. In Tanggu, Japan owned shipyards and wharves to facilitate steamers and warships. Japanese also placed troops in Tanggu to guard Japanese property and secure logistics transport. Japan seized this point at the river mouth and enhanced deterrence over Chinese and western powers in Tianjin and North China by treating it as a military fort. As a result, the choice of building a new Tanggu harbor rather than expanding Tianjin harbor came from Japan's desire to incorporate Tianjin and Tanggu into its grand plan for economic development.

The city lost its status as a commercial port created by the multinational forces. Japan tied North China politically and economically to Manchukuo. The future design of Tianjin was accommodated with an integral urban development plan for Beijing and Dalian. The tight
bond with other urban cities made Tianjin into an essential part of North China's economic exploitation. It also slowed Tianjin's evolution into an independent, commercial port by separating Tanggu harbor from Tianjin. After 1939, the Japanese press referred to the new Tanggu harbor as Tianjin Harbor.

Japan's army in North China constructed Tanggu. In 1938, the army invited a team of Japanese engineers and technicians to investigate Tanggu. The Japanese water conservancy engineers proposed a ten-year construction plan to build a master harbor for military use and a secondary harbor for coastal trade. The water conservancy fully deployed over the Hai River tributaries, especially the Yongding River was a prerequisite. These experts believed only the completion of the water conservancy scheme could maintain the long-term usage of this new harbor. The plan went through several modifications as to meet Japanese military requirements for a speedy completion. The final harbor plan reflected Japan's plan for North China exploitation. The military, having received conflicting advice from the army and the navy, decided to compromise. It required the completion of the harbor in only three years by at a cost of 20,000,000 Chinese Yuan. The decision was based on the fact that wars against the Chinese consumed resources and funds.

The Kochu Koshi was responsible for investigation and financing. It established a provisional harbor construction commission in Beijing and conducted field investigation on the geologic composition and created a blueprint for the harbor. The team drilled and collected earth and soil along the southern and northern coasts for analysis.

The harbor system was built on the northern part of the sand bar. The northern flat bar was reclaimed, followed by a cement and timber system of wharves and docks. Two long
breakwaters stretched along the northern and southern edges of the harbor system, surrounding the harbor and preventing drifting sand and stirring silt. The southern breakwater was 17 kilometers long, starting from the navigation lock connecting the Harbor with the Hai River to the deep sea. The northern breakwater stretched eastwards into the sea as long as 13 kilometers. The ice dyke conducted by the Haiho Conservancy was lengthened and modified into the breakwater. The second component was the harbor system consisting of a shallow trade harbor and a deep harbor. The inner coastal trade harbor, more than two kilometers, extended from the navigation lock. It connected the deep water harbor, about six kilometers from the coast to the deep sea. Piers, wharves, docks for transporting coal, commercial products, and passengers were also fabricated into the complex engineering system. Workshop, houses, and a hospital were scheduled for construction.

The plan to transform Tanggu and also Dagu sand bar was designed to meet the needs for both commercial and military navigation. It was led by Japan’s ambitious plan to incorporate Tianjin's hinterland into Japan’s economic sphere. To complete this project, stones, timber, iron and steel were brought to Tanggu. Chinese laborers were sent to the construction site. Machines, dredgers, cutters were imported from Japan and shipped to Tanggu. The three-year construction was divided into terms which would consume enormous amounts of money and resources. The first term saw the use of three million cubic kilometers of stone, 50 thousand tons of iron, 70 thousand tons of cement, and the dredging of 54 million cubic kilometers.

The project was constructed in the hostile environment of the Dagu Bar. The fine silt and soft flat base increased the possibility of timber walls and stone dykes sinking. The
experiments of the Haiho Conservancy Commission (HHCC) had presented that river currents, wind direction and the ocean waves added the threats of silting and difficult maintenance. The new HHCC engineer-in-chief A. Tritthart questioned the need to complete such a project, but the Japanese insisted that “the new harbor would be constructed regardless of its cost and expensive maintenance.”

To make the project even more costly, and expedite the speed of exploiting resources, Japan also planned to build railroads linking Tanggu with Datong, the coal mines in Shanxi province which would cost 190 million Yen, in addition to numerous railway track, motor car road or paved roads connecting wharves with buildings or stations, or linking Tanggu with the outside.

The Japanese military started this unprecedented engineering project. The construction, along with similar constructions in other ports, became a financial burden for Japan. The Japanese military believed in colonizing the Dagu Bar by scientific investigation and modernist construction despite signs of silting. Dredgers were put into making cuts and channels over the flat bar and maintaining minimum required depth of the harbor. The construction team borrowed dredgers and carrying barges from harbor construction sites of Hokkaido, Osaka, and Nagoya.

The cost of the project was underestimated because the increased price of constructing materials and higher labor costs during wartime was not deliberately considered. The original plan was modified again in early 1942, leading to a dramatic shrinkage of the harbor acreage. The northern breakwater was shortened by one kilometer. The total capacity of the harbor decreased to 10.7 million tons.

The Japanese military announced the completion of the harbor project in 1942 even
though only the first term had been completed. The northern breakwater was unfinished and the wharves under construction barely met the minimum requirements in the original plan. A warship tested the capacity of the harbor for shipping, mooring and docking in April with satisfactory result.\textsuperscript{34} The Tanggu Harbor symbolized a successful attempt by the Japanese military to access resources in North China. Compared to the Hai River, the Tanggu Harbor was convenient and capable of exploiting resources. It was “unnecessary to use the Hai River to transport natural and military resources.”\textsuperscript{35}

HHCC’s chief engineer A. Tritthart believed the entire project was a mistake when the Guomindang took over Tanggu harbor after the Japanese surrendered. However, the radical harbor project engineered by the Japanese was merely a colonial and military version of Pincione’s “Taku Reclamation Scheme” proposed in 1920.\textsuperscript{36} Before the Japanese, nearly all the HHCC engineers attempted to engineer the sand bar but projects were limited by funding constraints. The difference between European and Japanese engineers is the HHCC engineers made Tianjin the center of their projects but the Japanese military that strived to erase western influences and establish the new East Asian order, bypassed the Hai River and Tianjin and made North China with Beijing the plan center. The use of Tanggu harbor prevented the growth of Tianjin into a “free” commercial port. The historical passage of the Hai River as the economic lifeline of Tianjin was gradually altered.

\textbf{The Hai River and the HHCC under Japanese Control}

Wars between the Chinese and the Japanese led to deterioration of important water conservancy projects. Troops breached dykes to delay enemy advance. The situation grew worse during summer when summer freshet rose and the torrential rains hit North China. In
1937, both dykes on the Southern Canal and the Ziya River were broken and as a result, areas between Tongzhou and Tianjin were inundated. The city however, was supervised closely by the HHCC engineers and survived.

Before the Japanese occupation, the North China River Commission (NCRC) oversaw all water conservancy projects on the Hai River tributaries. Projects such as dyke consolidation, silt release, bridges, weirs, and sluices had been built on the upper branch rivers of the Yongding River. The commission carried out extensive experimental projects for diverting silt from the Yongding River for irrigation. The Guanting reservoir was modified and re-designed by international experts. All projects were suspended when the war reached North China. The Commission's staff moved to Shanghai and the attention of the Commission turned to the southern provinces.

The navigation order on the Hai River was disturbed by the war. In 1938, the Chinese ambushed, sabotaged, and shot at steamers hanging Japanese flags along the reach from Dagu to Gegu, where fishermen and villagers were ordered to evacuate. All navigation on the river was cut off. Even the HHCC suffered from the war as it was still running after the Japanese took control of the municipal administration in Tianjin. Its property and staff were constantly in danger when all sides saw the river as a strategic barrier for military operations. Chinese militants and guerillas fired at the Japanese engineer, technician or staff on the HHCC tugs or dredgers. Its headquarters became the place where the Japanese staff was shot down. The Japanese patrolled the Hai River and shot at the militias.

The HHCC came under increased pressure from the Japanese. After Japanese occupied North China, the number of Japanese steamers visiting Tanggu and transporting warfare
resources and material dramatically increased. Steamers owned by the British Taku Lighter Co. were inspected by the Japanese. The Hai River Conservancy board was influenced by the Japanese occupation. In 1938, Paul Muller resigned as HHCC engineer-in-chief and was replaced by the Austrian engineer A. Tritthartt. At the same time, Japanese Council-General T. Horiuchi and S. Tashiro were in charge of the Consular Body and the conservancy board, respectively. The decision-making power over transforming the Hai River shifted to Japan, even though other world powers kept their seats on the board.

The HHCC monitored the situation of the Yongding River during spring and summer freshets which had been tense since the mid-1920s. The HHCC understood the danger of inundation in Tianjin and expressed great concern to the Chinese or Japanese authorities. The smaller freshets in 1937 and 1938 saved Tianjin from inundation but in 1939, as the Japanese became hostile towards foreign communities, the city suffered from a flood described as “one of the worst, if not the worst” or “unseen in eighty years.” The flood of 1939 showed how vulnerable the city was from the inconsistent maintenance of water projects.

The flood was caused by the sudden downpours in the Taihang Mountainous area brought by the southern typhoon. During May and June of 1939, the output of tributaries remained small as droughts hit the Hai River drainage basin. But the situation reverted after June. The major contributors to the Hai River currents -- the Yonding River, the Ziya River, the Sothern Canal -- had quick rises in water level. The Northern Canal began rising from 6 cbm/sec. on June 23 to 49 cbm/sec. on June 28. As the water kept rising, dyke-breaks occurred along the major tributaries of the Northern Canal – the Choabai River. This prevented the Northern Canal from reverting to the Hai River since the regulating works at Su Chuang had been
damaged by the flood in mid-July.\textsuperscript{43} Currents of the Northern Canal flowed into the Qigan River and found Beitang other than Dagu as its outlet to the sea. Consequently, the amount of clear water injected into the Hai River functioning as the balance of the silt-laden water from the Yongding River was reduced. Yet the Hai River remained navigable because the northern Settling Basin was in use to deposit silt of the Yongding River until July. The current of the Yongding River rose from 6 cbm/sec. on July 3 to 72 cbm/sec. on July 7. Torrential floods rushed from the mountains in Shanxi Province. Dilapidated dykes in the region failed to contain the pressure from the rising amount of water. On the Yongding River, the flood reached the rails on the Peking-Hankow Railway Bridge, followed by three dyke-breaks on the north bank of the river.\textsuperscript{44} Frequent reports on dyke breaks on other tributaries threatened the HHCC and Tianjin Works Bureau, which was responsible for the flood control.

On the southern side of the city, several dykes broke on the Ziya River and the Daqing River. The situation was more severe than that on the northern rivers as the north-south construction of the Southern Canal and Tientsin-Pukow Railway barred the natural tendency of the floods eastwards towards the sea. Until the beginning of August, cultivated land and villages in Hebei Province were overwhelmed by floods. With the GMD river conservancy commissions of the Hair River tributaries defunct, local rescue and relief teams were dispatched to block the burst. However, their work was hampered by Japan's clear-out military campaign. The water level on each tributary kept rising and finally the dyke of Northern Settling Basin burst. Tianjin was under threat when the rainfall spread into the suburbs. To save the city, a breach was deliberately made on the dykes of the Southern Canal in order to divert the flood westwards and inundated the areas in the south side of the city.\textsuperscript{45}
Ninety-four of Hebei Province's 108 counties were flooded, and the harvest was only $2/3$ of what it had been in previous years.\(^{46}\) Food prices soared as floods buried arable land in Hebei province.\(^{47}\)

The situation in Tianjin was aggravated by the loss of farmland. In July and August, the city was hit by both heat and rainfall. The Japanese tightened control over the British and French concessions. Food supply was strictly monitored and the Chinese vendors were barred from the foreign concessions. The HHCC and municipal agencies organized the rescue work on building and repairing dykes.\(^{48}\) Foreign municipal consuls command heightening dykes and piling sand bags to prevent inundation.\(^{49}\) The water level of the Hai River and its tributaries rose regardless. As the major outlet to the sea, the main branch of the Hai River and its complex diversions, including the Jinzhong River, the Xinkai River took the burden of discharging the overflow. Until August 12, the torrent of the Daqing River headed into Xigu and on the 15\(^{\text{th}}\), flood burst the barriers along the river banks and flowed into the streets in the foreign concessions. The major streets in British Concession and the 3rd special area were inundated.\(^{50}\) On August 19, the city absorbed the torrents.

The streets of the French concession were “transformed into canals.”\(^{51}\) Poets described the flood as “water sparkling downstairs, fish swam across the windows”, and “[the citizens] have to take boats out to purchase everyday necessities and the price is shockingly expensive.” Some climbed on top of the roof and saw the balcony as “new land”. Electricity was cut off and the entire city was lit only by candles after dark.\(^{52}\) The flood of 1939 was catastrophic.

The concessions were underwater until August 21. The foreign communities felt
anxious with cut off of the supply electricity and drinking water, along with the encirclement by the Japanese military. The water levels in the city, from the Chinese city to the concessions, ranged from three to nine inches.\textsuperscript{53} The British Municipal Consul required relief work from the British authorities.

Located in the low-lying region, the Japanese concession suffered from the flood. Military operations were hindered by the loss of railway, roads, telegraph, and telephone communications. Stores of cotton, metal, sugar, chemical, fertilizer were ruined. The winter fur coats stored in the Hai-guang-si Temple were soaked and the total loss reached nearly 50 million Yuan. In addition, the Communists attacked the railways, airports, barricades and storage, cutting the Japanese off from their supplies.\textsuperscript{54}

The Chinese suffered from the war and the flood. In Hebei province, the flood damaged cotton fields and cultivated land. Starving people ate roots and branches. A total of 153,852 qing land was ruined, 6,752 village damaged, 168,904 houses collapsed, the total loss reached 1.6 billion Yuan.\textsuperscript{55} Rural lands were underwater; refugees flocked into the city. In early September, the city had an estimated two million casualties and refugees, threatened by starvation, disease, and exposure.\textsuperscript{56} On August 20 the inner dykes broke and the low-lying areas outside the city were flooded. The flood created conditions for the spread of infectious disease.\textsuperscript{57}

The relief work inside the city was organized by the Tianjin special municipal administration in partnership with the Japanese army. A special flood relief committee was organized to collect donations. Subordinate institutions were departments for lifesaving, hygiene, safety, censorship, and propaganda. The pro-Japan Tianjin Special Municipal

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Administration organized shelters and used the flood relief to consolidate control on the society and justify the Japanese occupation. The propaganda pamphlet showed that this government, denounced as a puppet regime by the Nanjing government, cared about the sufferings of the people of Tianjin. It also had the “heavy responsibility to protect the nation and people.” People who hesitated to join the shelters were reminded “the winter is coming . . . staying on the rooftop can never be a long-lasting solution.” Lifeboats picked up those who refused to live outside of shelters. The municipal government arranged presentations to emphasize co-operation between the Chinese and Japanese authorities. The presentations described the damage caused by the flood and urged people to obey the authorities, calling the flood a “natural disaster,” and defining the shelters as the “exclusive fortune” for the ones who joined.

The Tianjin agency of the North China relief committee worked with the Tianjin special municipal government. These relief organizations were responsible for checking humans and livestock for disease, securing the water and food supply, building shelters for the homeless, and transporting and burying corpses. Fifty-nine cinemas, schools, temples were converted into shelters. The shelters had strict rules and regulations on daily life, hygiene, and work. Working for the Japanese military, some shelters transferred refugees to Tangshan and Beijing to free up food and water in Tianjin. Young women were sent to work in textile factories and young men to coal mines, factories, and on construction sites in Beijing, Tangshan, Shan-hai-guan and Manchuria.

The banks and dykes became the safety protections of the city under the care of municipal security guards and Japanese army. Police, guards, soldiers, and employees of
Public Works Ministry patrolled along the dykes in the assigned and designed flood prevention zones, keeping dykes, bridge and flood prevention properties intact without any intervention of the intended sabotage and farmers.61

The flood caused huge damage to the city and challenged the credibility of the HHCC. The Dagu bar was silted up by the Hai tributaries. The downward flow minimized the effects of the tidal waves over the river and dumped silt at the Dagu bar. The depth of the Bar Channel was reduced from six and a half feet on July 29 to five feet on August 17 and to four feet on the 21st and to two and a half feet on August 23. In September, even more silt was deposited as rainfall in the Hebei Province ceased. The depth remained at two feet on September 4 and only one on the 13th, which was unseen since 1912.62

The only effective way to minimize silting was dredging. The dredger Ku’ai Li operated day and night but its operation was limited since the dredge needed at least nine feet of water. It only worked when High water brought at least eight feet above T.D. and the channel had only one foot below the T.D. Datum.63 The situation did not improve until the end of the rainy season.

**The Rectification of the Harbor River**

From 1937 to 1942, the Haiho Conservancy Commission felt harder to challenge the will of the Japanese in engineering the Hai River and the city. The encirclement of the Japanese in the concessions and rivers, wars and hostilities on the waterfront, and the silting up of the river led to a decreasing number of foreign ships navigating on the river. This resulted in a huge cut in the river dues and taxes that sustained the operation of water conservancy projects.
It is impossible to overstate the effect of the Japanese military presence on the river from 1937 to 1942. The HHCC's plans to make the navigation over the Hai River essential in the conservancy program remained firm before the completion of the port of Tanggu. The military supplies from Japan were shipped up to the Japanese concession bund by warships, steamers, lighters and barges. In addition, the inclusion of the Haiho Improvement surtax inherited from the North China Water Conservancy Commission enriched the financial reserve and increased the funds that could be used for additional improvements. Therefore, during the Japanese occupation, the HHCC engaged in producing and implementing huge construction plans.

The HHCC made changes to the river and the Dagu Bar. The year 1939 was a nightmare for the HHCC. It showed the weaknesses of flood prevention along the river, the capacity of the river to discharge floods, produced large amounts of silt and made it impossible to maintain the channel at its minimum depth. The HHCC moved the channel 75 feet to the south since the southern portion of the channel was deeper than the North Line. This meant changes to three sets of transit beacons, lights and marks of the channel. After the flood, the HHCC engineers moved the channel another 75 feet to the south to follow the natural tendency of silt piling in the northern portion.

With constant dredging operations, the depth of the Dagu bar recovered after 1939. The Yonding stopped depositing silt after the southern dykes broke. In 1940, the Hai River began discharging the flood water into the sea. Dredging work on the main reaches and the Dagu Bar showed positive results. During June, silt excavated from the channel reached 59,000 square km², offering water depth of -7’6” T.D., as compared to only -5’ T.D. when the
channel was opened earlier that year.\textsuperscript{66} The channel was deepened by dredgers from the beginning of 1941, to a maximum depth of -8’6” T.D. on July 1.\textsuperscript{67}

Japanese water conservancy agencies in Tianjin also joined the dredging of Dagu Bar. As a result, Japanese shipping companies benefited from the mild change of the river. The Taku Pilot Co. was annexed by the Japanese in 1938 Japanese workers were employed in Tianjin Customs.\textsuperscript{68} Before Tanggu harbor project was completed, the Japanese had to cooperate with the HHCC and dredged the Dagu Bar in order to keep the channel navigable. In 1938, two Japanese bucket-dredgers worked with \textit{Kuai’Li} and \textit{Chung Hua} at the deep hole. In 1943, a similar suction-dredger similar to \textit{Kuai’Li} was brought to the site.\textsuperscript{69} In the meanwhile, the HHCC sold old steam-engines and pumping plants and purchased new models to increase efficiency and reduce dredging cost.\textsuperscript{70} These machines increased human involvement on the Dagu flat bar. The amelioration of the river and the bar was also the major repercussion of a complete discharge of energy and power by the Hai River tributaries, especially the Yonding River after the flood of 1939. In fact, the condition of the Hai River and the bar after 1939 was so satisfactory that only regular dredging were need to make obvious improvement of deepening the Dagu Bar, especially in May and June when the warm weather and mild gale allowed such operations.

The depth of the Tianjin Harbor recovered after the flood. The mean annual low water level dropped from 10.73 feet in 1902, to 6.19 feet in 1910, rose again to 6.50 feet in 1934. The figure went down to 4.63 feet in 1940 and to 3.33 feet in 1941. Another sign for the improvement of the river was the tidal-range at Tianjin harbor. As it was observed, the mean annual tidal range rose from 0.60 feet in 1902 to 2.70 feet in 1910, 5.66 feet in 1920, sharply
declined to 3.35 feet in 1934 and rose back to 5.62 feet in 1940 and 6.52 feet in 1941.\textsuperscript{71}

Besides dredging operations, the HHCC had enough funds for non-stop surveys along the course and at the bar. The surveyors read and reported data from the tide gauge station. Eight benchmarks were established along these tide gauge stations to broaden knowledge of the sea wave and river water. These methods turned the river into a modern navigational system to be manipulated by scientific observation and computation.

The Haiho Conservancy Commission concentrated on repairing and enhancing swinging berths, shipyards and groynes. Plants were widely applied in order to strengthen banks and dykes. The workshop at Xiao-sun-zhuang was enhanced by wooden and concrete structures, modeled by stones and cement grout. The old steam engine was replaced with a more powerful one. The HHCC purchased electric motor and pneumatic rivet-hammers.\textsuperscript{72}

The year-by-year mechanical and technological construction renovation and maintenance kept the Tianjin harbor open.

The conservancy work conducted by the board during the Japanese occupation era was more effective and efficient than its pre-occupation counterpart. Yet natural elements still determined the outcomes of the conservancy works. Ice-breaking, for instance, was affected by fog, wind, current, and temperature. Fogs hit the Dagu bar in the winter of 1939 and caused loss of visibility and delayed shipments. Strong winds hit the gulf seasonally and caused temperature drop on the rugged sea surface. Northeastern winds moved the ice chunks from Beitang to the Dagu flat and the eastern wind blew the ice to the river mouth and impeded the movement of crafts.\textsuperscript{73} It could also cause damage by reducing the depth of the channel and producing temperature drops. Tugs and barges were dislocated by the flooring ice
chunks, even when the ice breakers worked day and night from December to February. The fluctuating conditions of the bar and ice masses were broadcasted through wireless signals by the HHCC to the approaching crafts. Regular inspection was conducted by technicians on the hull of Ching Ling and Mei Ling. Parts would be replaced or repaired if the hull showed any sign of wear or break. The HHCC had to pay maintenance fee to check the conditions on the docks, wharves, and shipping facilities after winter passed.

During the Japanese occupation, the HHCC had the money for a large construction campaign: the Gegu cutting to deepen the river. Gegu village was economically, socially and culturally important in Tianjin under the Qing Dynasty. Gegu benefited from its close access to the river. The bend was a natural mooring place for the shallow wooden vessels. The bend was also a social center for the Qing governments to announce its Shui-li-ying-tian projects. Moreover, Gegu was another riverfront site for the worship of Tianhou (the Heavenly Empress). Like the Huanghui held in Tianjin, this ceremony of parading the imperial sedan chair of the sea goddess was held in the Spring Festival to strengthen the cultural tie of the villagers to the sea.

The possession of a sharp bend of the river by the Gegu village was seen by the HHCC another challenge to making Tianjin into a modern harbor and the river navigable. Early in the 1920s, Pincione mentioned a cutting at Jun-liang-chen to make the river course smoother but French river conservancy expert Perrier claimed that the radius should be much longer, not only to cover Jun-liang-chen bend but also to include Gegu bend. Hardel improved Pincione’s suggestions and promoted the Gegu bend cutting as a way to eliminate the shallowest points above and below Gegu and in Stone Reach.
As long as river dues, and the bridge and improvement surtax could fund this costly cutting, A. Tritthart was eager to carry the torch of river improvement by suggesting the completion of the Gegu cutting when he was in charge of designing the project in 1939. The proposal was submitted to the Central Rehabilitation Bureau (Jianshe zongshu) at Beijing. The Chinese and Japanese authorities agreed to the completion of the project. The elimination of the Gegu bend would not only benefit the Hai river navigation but scour sand away from the Dagu bar and Tanggu harbor. The standing committee incorporated the proposal into the plan for the development of Greater Tianjin and Tanggu. Tritthart estimated the project would take six years and cost $3,500,000. The conservancy board members agreed that the Gegu cutting should go forward and that other cuttings would be carried out in the future.

The HHCC cooperated with the Tianjin Works Bureau in expropriation of land. The HHCC engineers believed that the rights of villagers would be preserved because villagers still had access to the new river course after the location of the village and river had been completely altered by the cutting. The secretary of the board insisted that the severance of the Gegu bend would eliminate bank erosion of the cut arms which benefited the navigation of villagers. Yet, opposition to the projects arose not only in Gegu but also in adjacent villages with their cultivated land, graves, or houses that were in the way. The HHCC expected the project to begin April 1941, two months after the field survey was finished, but the resistance from the villagers postponed the starting date. The HHCC requested assistance from local officials, the North China government and Japanese authorities. In August, 50 laborers finally started to build dykes on the limited construction stripes. As soon as the opposing villagers had been suppressed or compensated, the commission began excavating a starting basin for
dredging facilities. The construction moved into full development in November of 1941 when the bucket dredger *Hsin Ho*, the pipe conveyor, floating pipes, and other auxiliary craft worked in the starting basin.\(^{79}\)

The project was slowly carried out in 1943 and 1944, but halted by the escalating war. The cut about 1,898 meters was made, leaving more than 6,500 meters unfinished.\(^{80}\) It was restored by the Guomindang after 1945. Newly established HHCC engineers in the GMD era proposed to continue the cutting, but was prohibitively expensive. The Gegu cutting was estimated to cost an astonishing 50.9 billion Yuan.\(^{81}\) The central government asked financial help from the United States but it was impossible to announce the opening of the project. The unfinished project was left for the Communist Party to complete after 1949.

**Military and Industrial Construction on Hai River Tributaries**

In the meanwhile of making change of the Hai River mainstream by the HHCC, the Japanese occupation was characterized by a frenzied scheme for improvement of railway and river transportation and communication on the Hai River tributaries. The whole North China experienced drastic environmental change during and after the Japanese Occupation. Every spot on the blueprint was based on modernist, imperative, and extensive construction designs, scientific evaluation and statistics. These schemes to broadened the capacity of road transportation and river navigation, transforming both urban settings and natural environment following the planned scheme moving tons of resources needed for the expanding war in China and the Pacific.

The Japanese military launched a series of campaigns to extract natural resources for military and industrial development after 1937. The Japanese occupation of the Manchuria
and North China, and collaboration with the Mongolian autonomous government created a short-lived unification of the North Plain. The unification buttressed Japan’s scheme to take use of natural environment and resources – the dream that had been fulfilled neither by the Beiyang government nor by the Guomindang until 1937. The construction of the Shijiazhuang-Tianjin Canal showed how Japanese colonialism and economic exploitation plan influenced natural surroundings. The plan was mentioned as one of the shiye plans of 1936 proposed by the North China Conservancy Commission to make the nature one part of the national economic development and enhance the communication of Tanggu (Tianjin) and the Hebei province, with purposes to benefit irrigation among the agrarian communities along the canal. The canal was designed as long as 300 kilometers and used the Ziya and Fuyang Rivers as its main water resource. Similar to the construction of the Great Northern harbor, the nationalist scheme could not be put into practice before 1937 due to political chaos and lack of financial support.

After the Japanese military controlled North China, the Japanese plan emphasized the utility of the same canal to create a river way in use of transporting coal from Hebei Province to Tanggu. It aimed at opening a new passage from coastal cities towards Northwest to meet the minimal requirement of coal supply. In early 1939, Kusuo Aoki who was a respected engineering and bridge expert in Japan was invited to make a general survey on the river systems in North China. The team spent three months examining the Hutuo River and eastward towns and villages. The portion of Tianjin was surveyed as well. It took another two years to acquire the detailed information and field investigation. The project, including water conservancy projects consisting of a dam as electricity generator, irrigation zones to
enhance cotton cultivation, tunnels, sluices and numerous river channels, began since 1942 and was to be finished in five years. This million-yuan project involved the mobilization of hundreds of field studies of the Japanese engineers and technicians from Beijing, Tianjin, Jinan, Tiayuan, and Japan. Japanese technicians conducted experiments and built models to test pressure, flow, electricity, and tenacity of building materials. The project contained heavy labor and extensive land reclamation, agricultural land expropriation, and large-scale resettlement. Farmers were mobilized by the North China Labor Union and sent by Japanese transportation companies to the construction sites. As these sites were targets for anti-Japanese forces, Japan sent security guards to protect the workers. As with the Tanggu Harbor project, the hastily constructed project experienced several modifications while Japan was fighting the Pacific War. Until July 1945, only the basic outlay of the project had been completed.

Water and water conservancy played a core role in stimulating agricultural production, guided by the plans of agricultural production development. In addition to campaigns to put forwards the introduction in the form of cooperatives promoted and financed by Shinminkai (New People’s Society), Kahoku kotsu kabushiki kaisha (North China Communication Co.), or Kahoku Mensan Kaishinkai Chōsaka (North China Cotton Production Improvement Society), the Japanese founded several agricultural experimental institutions in the cities of North China. The institutions experimented with planting periods, types, irrigation, preservation and the use of fertilizer of cotton, wheat, rice, and sorghum. One of the experimental sites was in Jun-liang-cheng, the traditional site of rice cultivation site in Tianjin. The agricultural site was equipped with facilities to screen and select rice seeds,
soil and water testing and the effect of salts and alkali on rice growth. The Japanese agency launched an extensive survey of water resources from mountains to the underground. In North China, a campaign to increase cotton output was put forward. Local communities were encouraged to engage in land reclamation and water conservancy improvement. Drilling was the method of testing the underground water and its relations with surface water resources. By 1940, 200,000 wells had been drilled to expand cotton cultivation in Hebei Province.

Besides water conservancy to promote irrigation, water conservancy in North China offered flood prevention. The pre-occupation railway network was vulnerable to flood; the 1939 flood had cut off the Beijing-Hankou and Tianjin-Pukou railway. Since 1939, construction scheme were designed to prevent natural damage to these transportation lines. The Japanese re-evaluated the conservancy proposals mentioned by the CIRC and NCRC of the Hai River tributaries.

The Japanese highlighted a diversion canal from the Daqing River to the Machang Canal. The original design was proposed by the CIRC after dykes on the Daqing River of 1924 broke, flooding the southern provinces outside Tianjin. In 1934, engineers on North China River Commission mentioned wanting to cure the “illness of the Daqing River” and end the potential threat of inundations from the Ziya River. The proposed canal began from Di-liu-pu (the sixth fortress) of the Duliu Town, moved southeastwards, passed across the Southern Canal and Tianjin-Pukou Railroad, and found a new outlet in the mid-reach of the Hai River near Nigu to the sea. This scheme would divert clear water from the Daqing River, “safest of the tributaries,” and take it away from the upper Hai River, where the swinging berths and wharves were located. The HHCC engineer Pincione once mentioned
that the Daqing River “should be the only direct tributary” of the Hai River in order to raise the depth and rush silt.\textsuperscript{93} None of these proposed diversion channels would be completed without resistance from the HHCC engineers. To appease the foreign interests in Tianjin, the French, British and German engineers and experts invited by the Guomindang proposed their own plans based on the original scheme. Instead of finding another outlet to the sea, the lower reach of the Duliu Diversion Canal could be converged with the Hai River, through which the design not only reduced the likelihood of silting up the new river mouth but also benefited the Hai River.\textsuperscript{94}

In the occupation era, the Japanese dominated Tianjin and disregarded foreign conservancy agencies such as the HHCC in the process of making decisions on water conservancy scheme of northern rivers. The Japanese scheme modified the NCRC plan. The 100-kilometer project was finalized and divided into three construction sections in 1942. Japanese mechanical shovels and human labor were used in the downstream section while human labor was still the main method in the upstream sections.\textsuperscript{95} Due to the difficulty of sticky soil and clay in the downstream, the machine needed more maintenance and investment. With the presence of other large-scale constructions were simultaneously launched, obtaining enough human labor was also another problem of wartime. Only a small section of the dyke and channel was finished in the spring of 1944.\textsuperscript{96}

The unfulfilled dream of large-scale construction of reservoirs and dams was handed to the Japanese authorities. The construction of the Yongding River, the Chaobai River haunted foreign and Chinese engineers. The plans were re-examined as part of the Japan’s water conservancy plan in North China. One project launched by the NRCR was the construction of
two dams and a culvert in a reservoir system in the hope of preventing flood and controlling sediment concentration in North China and Mongolia. The plan involved careful examination and a heavier investment than other water projects. Considerations of the resettlement of farmers, and the possibility of silting up the reservoir were bases of opposition. The Central Rehabilitation Bureau of the pro-Japan Chinese government dispatched Japanese investigators to Guanting site and imported drillers to test terrene composition and the possibility of construction. Mitsubishi was contracted for transporting and constructing materials, and installed machines on the site. Beijing and Tianjin areas provided wood due to the lack of trees in Guanting. The North China government forged collaboration with the Mongolian autonomous government to govern the upstream rivers. Pacts covering investigation and investment were discussed and signed by both sides. However, the drilling test faced difficulties. The remoteness of Guanting generated problems of transportation of construction supplies. Guerillas also sabotaged the site. The main challenge, however, was the natural environment. Spring and summer freshets of the Yonding River created danger in the construction sites and slowed the drilling.

The Japanese conservancy also mentioned the campaign for foresting the upper reaches of the Yongding River and the Zhang River, a greater project involving long-term investment besides the Guanting Reservoir to solve the problem of the Hai drainage basin. This project was divided into three sections. The first section needed 5-7 years and entailed a full-scale investigation of rivers, terrace, geology, hydraulic observation and calculation, precipitation, flow, sediment concentration, and the possible use of groundwater. The second and third sections involved seven and 11 years respectively and focused on the sediment reduction,
flood control and alluviation prevention. Gradual forestation was put forward as scheduled. This slow project was intended to revive forestry as announced by the Mongolian autonomous governments under the supervision of Japanese military. The main purpose was not to enhance soil and water conservancy but to present economic rehabilitation projects by integrating Japan, Manchuria, Mongolia, and China into an East Asian economic sphere and to produce enough timber for communication infrastructure and military use. Japanese railway industries, the Kochu Koshi and its subsidiaries funded the projects. Areas along the riverside, valleys, mountainside, lakes, railways, homes and cultivated land were demarcated as the designated planation zones. The government provided free seeds produced from experimental laboratories.

In occupied Tianjin, the transformation of nature was the responsibility of the Tianjin Works Bureau (Tianjin gongcheng ju). In 1938, the Tianjin works bureau was established by the Tianjin Special municipal administration. The bureau took over the authority from the NCRC of designing engineering work and allocating funds. The Tianjin Works Bureau improved transportation and navigation in North China by improving water conservancy on the Hai River tributaries, and the Yellow River water systems, and by constructing comprehensive network of railway and road to link the hinterlands of resources and cities and ports of processing them into industrial products. The North China transportation net was designed to connect Beijing, Tianjin, Shijiazhuang, and Jinan. Constructing roads and railways was no less important than making improvements to navigation.

The Tianjin Works Bureau inevitably made contact with the HHCC and negotiated conservancy methods and projects on the Hai River and its tributaries. Conflicts persisted
over the conservancy plan of the Yongding River. The Tianjin Works Bureau wanted massive settling basin projects in order to limit the influence of other foreign powers on the water system. Inside the HHCC, the Japanese military used its representative on the Consular Body as its mouthpiece inside the Commission Board and intervened in the decision-making process on promotions of employees, budgets, and projects. The Japanese representatives insisted on making joint decisions with Chinese and western powers for future conservancy work concerning the diversion of the Yongding River.

Difficulties arose when the farmers in the settling basins were influenced by Communist and anti-imperialist sentiment. The Japanese military hesitated to suppress the resistance of the villagers because they saw the projects as less urgent. The project was delayed and the Tianjin Conservancy Bureau placed the HHCC into a dilemma in face of the imminent silting up. The HHCC engineers contacted Japanese authorities to mediate and avoid potential threat to Hai River navigation and the prosperity of the city.

Disputes over water conservancy plans remained strong after the flood of 1939. The Yongding River rushed southwards into Daqing River and deposited silt in Xidian (West Lake). The northern settling basin projects were useless because the old river course of the Northern Canal failed to catch silt-laden water. However, in the eyes of the HHCC engineers, the diversion project of the Yongding River was still one of its most important and the acknowledgement of the Japanese authority over complete control of sluices and gates of the Yongding River, Northern River and the settling basins was equally important. The chief engineer wanted to repair the canal and partition dykes in order to continue the Yongding River diversion project. The Japanese authority questioned the plan since the project was
aimed neither at flood prevention nor at agricultural production, so had no value to Japan’s economic construction scheme.

The Yongding River diversion project was therefore postponed. The construction of channels, sluices, gates and gadgets remained idle after the Yongding River changed its course. The Tianjin Works Bureau repaired broken dykes and settling basin which prevented the cultivation of flooded land. In order to strengthen flood prevention of the Yongding River along the new course, dyke consolidation was ordered in Dongdian and Xidian where any dyke-breaks would lead to floods in Hebei Province. Diverting the Yongding River to its former course was slowly prosecuted as major dyke-breaks had been repaired. Until July 1942, the Yongding River returned to its former course but it was against the natural tendency of the river of constant southward flow. The summer freshet caused another dyke-break and the flow deposited a great deal of silt at the Yongding River Delta.¹⁰⁴

The Japanese invasion of North China negated the priority of the water conservancy for assisting the Hai River for navigation. Japan stick at developing infrastructure for a systematic control of the water system for irrigation and flood prevention in North China plain. In Tianjin, the priority for water conservancy investment had paid to the Tanggu Harbor. Along with the Tanggu Harbor, the Tianjin Works Bureau constructed a network of railways and roads to connect Tanggu with Tianjin, Beijing and Shi-jia-zhuang. The Japanese authorities preferred overland transport to move troops and logistics, because it was faster than river navigation. The Hai River, despite the improvements made by the HHCC, was neglected in the scheme of the water conservancy of North China by the Japanese.

The blockade in the French and British concessions was highlighted by the Japanese
capture of western properties and facilities in the city with the outbreak of the Pacific War. In 1943, the Japanese military renamed foreign concessions into “zones of Asian prosperity” and returned them to the Tianjin Special Municipal Administration. The escalation of war exhausted any attempts by the HHCC to improve the river. The eagerness of the Japanese military to secure supply of natural resources became desperate in the final stages of the war. The defeat of the Japanese offered the Guomindang at least a nominal opportunity to control Tianjin and the majority of cities in North China.

The Guomindang continued the water conservancy programs designed by the Japanese military. The Japanese and the GMD saw the North China as a unified macro-region that with potential for economic development. Both saw river conservancy as necessary to improve agricultural output and navigation. Agriculture played a key role in the Japanese and GMD water management. Compared with construction schemes of the North China Water Conservancy, the Japanese scheme was dominated by the need to transform North China within a short period. Japanese construction also focused on the military and colonial benefit of the North China in its Asian construction schemes. The ill-planned construction schemes lacked field observation, tests, calculation and estimation.

The completion of the Tanggu harbor was a symbol of GMD power. The tides in the river were connected with the fate of the region after the war. The Tanggu Harbor was depicted as starving. A commentator from Yishibao wrote: “with the unstable social order, the unstable sea surface has been encroached the ruined long dykes day and night. Who can make the sea calm down?” The harbor project was equated with theft; “if we [the Guomindang] took money from the people and could not finish the project, it was unreasonable.”
Whether the Guomintang was capable to finish this patriotic construction or not made it a symbol of legitimacy to rule North China. The Nanjing government invited American engineers to take over the partially finished project. It was estimated that the new harbor had eight million tonnage capacities, added by the six million capacity of the Tianjin Harbor; it exceeded the total capacity of Shanghai.\(^{107}\)

The Tanggu Harbor Technical Bureau was organized in 1946 by a series of field visits by Guomindang officials. The Tanggu Harbor project was “a complete therapy to cure the throat disease.” The GMD believed the construction of Tanggu harbor was related to “the entire trade and transportation system of North China.”\(^{108}\) In April, a special Tanggu Harbor Construction Commission was formed under the Ministry of Communication. The commission organized the investigation of the harbor and proposed construction.

But the Chinese and American engineers seemed incapable of completing the project. Construction materials and technical details were destroyed by the Japanese before their surrender. The artificial harbor was very difficult to construct given its geographical location and geological foundations. Dredgers were left in disrepair and even the finished construction and structure were ruined by the war. The channel dredged to more than four meters was re-silted by 1.5 meters or more.\(^{109}\) The new three-year plan was an obvious modification of the original Japanese plan, including the completion of the southern breakwater 16.8 kilometers, and northern breakwater 13.8 kilometers.\(^{110}\) Iron structures used for dams and reservoirs in the United States were suggested by American engineers. The GMD engineer took the advice, hoping this would contain costs and simplify construction. Dredging played a huge role in the three year plan so that the channel would accommodate mooring of
ocean-going steamers of 30,000 tons. The construction of ship locks, wharves, oil wharves, godowns, shipyards, and railways was modified from the original plan.

The Tanggu harbor would realize the Guomindang dream of shiye and triumph over the imperialist powers. It was said that “even the site was not ideal; it is still possible to be constructed in to a good harbor with human assistance.” The modified plan cost less than the Japanese design and extended the Japanese vision of establishing a mature communication system to sustain economic development and production in North China. The Tanggu Harbor, according to the Guomindang controlled pressedia, was the new scope of the Guomindang took account of the reality and comprehension of economic situation in China. This would mark a clear watershed with the imperialist plan of the Japanese to monopolize the harbor to exploit natural resources and dump industrial products.

A. Tritthart compared the construction of the New Tangku Harbor and maintenance of the Dagu channel. He indicated the maintenance fee of the Tanggu harbor would be greatly increased by the intrusion of ice during winter and the possibility of silting up as the harbor had been separated from the Hai River and the Dagu bar. Since the silt delivery by the Hai River tributaries caused less burden in the 1930s, dredging would be eased by rushing silt towards the sea. Tritthart hoped to continue dredging and dyking the Dagu bar. He contrasted the Dagu bar with the successful Weser River, Clyde River and Seine projects, where money was paid to develop inland ports and channels at the river mouth, and agreed that with the Dagu Bar “preference should be given to the development of the Hai Ho and [Tianjin], and not the development of harbor for shallow draught vessels at [Tanggu].”

Industrialization was the major agenda of GMD engineering projects in North China.
Natural resources and water conservancy programs were to increase national power. The Guomindang retrieved the Haiho Conservancy Board from the hands of American air force, ending foreign domination of the urban river. In 1947, the NCRC exerted its influence through the newly founded North China Conservancy Technical Bureau. Engineering agendas concentrated on water conservancy and management of the Hai River tributaries and the Yellow River, with attention to improving agricultural production and irrigation. It was also hoped to benefit the people in North China.\textsuperscript{115}

The Guanting Reservoir, which the Guomindang saw as the means of harnessing the Yongding River, was the top priority. Nationalist experts boasted that they would finish the hydroelectric reservoir in only three years. The construction of roads, sluices, channels, and sand detention dams was planned to be finished in one to five years with a total budget about 300 billion Yuan of the depreciated GMD currency.\textsuperscript{116} American experts compared the plan with Madden Dam over the Panama Canal and Morris Dam of Tennessee. The Guomindang, however, was losing credibility, political legitimacy and military strength in North China. Even the construction of the Guanting Reservoir involved contacts and negotiations with the anti-GMD Communist leaders since the GMD was too weak protect the construction sites.\textsuperscript{117} The schedule was modified because of financial and political constraints. In September 1947, the Guomindang began building roads to transport construction materials and the slow pace of construction was not well financed as the Guomindang government was on the edge of bankruptcy.\textsuperscript{118} Until the Communist Party took over the site, the project was amounted only to a few finished roads and piles of construction materials.

\textbf{An Industrial City of the River}
The relationship between the river and the city was shaped by the Sino-Japanese War. River navigation reached its zenith in 1938 when 2,962 steamers including warships passed through the Dagu Sand bar and reached the inner Tianjin Harbor. The deepest draft was about 16 feet, which was what it had been in the 1920s. In 1938, Japanese tonnage surpassed the British and dominated navigation on the river. The harbor ceased to be a commercial port dependent on global businesses. The city was vulnerable to Japan’s radical plan to turn it into a military harbor for transporting industrial products and resources for wartime expansion. In 1938, the total tonnage of Japanese steamers reached 2,292,607; it had been 2,465,572 in 1939, 2,588,875 in 1940, 2,263,513 in 1941. The majority of steamers passed the Dagu Bar and reached Tianjin inner harbor. In 1941, 1592 out of 2406 (66.2%) steamers reached Tianjin; the figure was still higher than it had been ten years earlier when only 802 out of 1835 (43.7%) steamers made their way up to the bund.

During the war, major imports through the Tianjin Custom were limited to grain, flour, millet, sugar, fuel, kerosene, and gas. Japanese steamers dumped Japanese agricultural and manufacturing products because the production of these items was vulnerable to natural calamities in China. Since 1938, the need for food grew intense because of crop failures in Manchukuo and North China. The hostility between Japan and the west increased China's dependence on food from Japan.

But the relation of the city and the river changed. The city evolved from the domination of trade to a city with a modern industrial and manufacturing base, a process initiated by the Chinese shiyue entrepreneurs, promoted by the Guomindang and accelerated by the Japanese. To meet military needs, large amounts of money were invested in the wartime industries in
In Tianjin, Japan invested in the local banking and financial system in order to control the flow of funds and the influence of the Japanese currency in China. Electricity, transportation and navigation companies consumed funds from the banks that the Japanese invested in. The Japanese investment nearly covered every economic sector in North China from chemicals to canary. In the realm of industry, the investment of Japan concentrated on the factories related to wartime products including mining, metal, textile and knitting, chemicals, salt, fishery, dying, machinery, paper-making, and rubber manufacturing.124

The investment in industries in Tianjin outpaced industrial investment in other North Chinese cities. In 1936, the investment on industries in Tianjin was 9.8% of the national investment on industries and 24.4% of that in North China; in 1938 the proportion of industries in Tianjin took 21.7% of that in China and 43.1% in North China.125 The metal industry absorbed great proportion of funds. Thirty-two new Japan-invested factories producing lead sheets, iron plates, steel wire, bicycles and machinery were founded during occupation, making a total number of 42 metal factories in the city. More than 10 electric companies were established to produce light bulbs, transmitters, batteries, and electric machines for industrial production.126

One Tianjin industry that Japan invested heavily in was textiles and yarns. The annexation of Chinese textile factories began before 1937. Among seven Chinese factories that were built pre-1937, three were purchased by the Japanese. The Yutai Mill, capitalized at $3,000,000, with 39,747 yarn spindles and 2,380 thread spindles sold the entire stock to Dai Nippon Textiles Manufacturing Co.127 The Japanese Toyo Textile Mill, the Osaka Textile
Plant, the Kanegafuchi, opened new factories, monopolizing textile industry at the expense of Chinese and foreign companies. By 1943, more than one half of all spindles in North China were in Tianjin, with capital investment in excess of 200 million Japanese Yen.\textsuperscript{128}

Tianjin's transformation into an integral component of an economically self-sufficient North China changed the city and its river. The trajectory of urban development resulted from the previous era of separation when the foreign investors or businessmen saw the city as an independent commercial harbor. The urban and industrial planning of Tianjin could not be separated from the urban construction plans for other cities and the sites of natural resources in North China. To the Japanese, Tianjin was an integral part of North China. Therefore, Japan assisted the Chinese government and retrieved foreign concessions and in 1942, the HHCC ended Tianjin's longstanding separation from other inland cities under foreign powers. The transformation of the city into the industrial base for Japanese military, as well as the sophisticated traffic network of railways, river channels and roads, weakened the city's dependence on commerce and international trade along the Hai River. With the construction of the Tanggu harbor, the importance of the river and the city continued to decline.

Japanese industrialization of the city also affected the salt industry and fishing commissions. Fish and salt were changed by the Japanese and the Nationalists. Salt had a role in industrial and chemical production. Japan had long history of intervention in Chinese production, transactions, and transportation of sea salt. Renowned for its Changlu sea salt, the Hai River region drew the attention of the Japanese military after 1937. Changlu salt exploration was related to the Kochu Koshi. In 1936, the company decided to invest in salt industries in Tianjin. Since salt was indispensable in the chemical industry, salt-producing
regions like Tanggu and Hanggu were occupied by the Japanese. In 1938, the Kochu Koshi established agencies in Tanggu, Hanggu and Dagu and appointed Japanese to manage the salt fields. The company invested in expanding salt production, restore the desolate salt fields and explore new salt fields to transport 600,000 tons of salt to Japan in 1941. In 1939, the North China Salt Co. was founded with the joint investment of $20,000,000 to $25,000,000 by the provisional government and HokuShi Kaihatsu Kaisha (North China Development Company). The North China Salt Co. had agents in Tanggu and took control of the factories owned by the Jiuda Salt Co. and the Pacific Alkali Co. It also annexed the property and industries owned by the Bohai Salt Co. in 1940.

The plan to use Changlu salt to stimulate the industrial progress in Japan was ambitious. Only in 1939, the batch transported from Tianjin to Japan increased from 70,000 tons to 450,000 tons. The fast development of the chemical companies and the increased military demands made Japan explore the salt fields near Tianjin. In 1940, Japanese authorities designed another six-year plan to transport 500,000 tons in 1940, 550,000 tons in 1941, 70,000 tons in 1942, 850,000 tons in 1943, 950,000 tons in 1944, and 100,000 tons in 1945.

The enormous interest in Chinese salt production and chemical industries stimulated Japanese capital investment and technological renovation, bringing the large-scale industrialization of the salt industry. The crude salt produced in Tanggu could not be used in chemical factories because “the salt was melted with dirt.” The North China Salt Co. imported technologies for smashing and refining crude salt from Japan. New factories were built in Tanggu and Hanggu to improve the techniques for electrolysis and brine wash. Japan also brought the technology of transporting and restoring salt. Japanese chemical laboratories
assisted factories in producing sodium sulphide, sodium sulphate anhydrous, sulfuric acid, and magnesium chloride,

The transformation of the Dagu and Tanggu region coincided with the construction of the new harbor. Steamers, tugs, and barges navigated along the coast, bringing salt from Tianjin to Japan. The sea and the river not only provided natural resources but also a profitable system of production and transportation. New salt fields were equipped with mechanical and industrial systems. Seawater diversion was mechanized by pumping machines and pipes. Japan also designed and developed sluices and river channels to fulfill the colonial plan for massive salt production. The construction of salt fields in Hangu developed five field sections with ponds for salt storage, adjustment and evaporation.

The North China Salt Co. also invested in river navigation on the Hai River tributary and the Hai River. The company owned a subsidiary agency with six tugs and more than two thousand lighters and barges dedicated to salt transportation. New barges, lights, and steamers were constructed for loading, restoring and transporting salt from the Daqing River. The Xinhe Wharf and Nankai Wharf were under construction for expanding and facilitating the growing volume of salt for transport.

The restricted control and management of salt fields in Tianjin by the military resulted in social tension. Compulsory purchases of salt fields from farmers were occasionally accompanied by violence. The urgency of meeting the goals for salt production and opening new salt fields led to the appropriation of wasteland which was used by villagers for burning wood fire. This led to deadly conflicts between farmers and the Japanese military. Rich merchants collaborated with the Japanese military and continued exploiting the lower-class
salt makers, making their lives even more miserable.

A similar pattern of industrial change was found in agricultural sector. Japanese interest in changing North China's landscape was not separated from its ambition to construct the agrarian North Chinese society. Like the imperial rulers, the Japanese military understood the importance of grain and the problems caused by natural calamities.

Serving as century-old resources to assist and improve agricultural production, the rivers in North China was seen by the Japanese the natural landscape to promote agricultural output. The establishment of the North China Reclamation Co. enhanced the control of local agrarians and expanded cultivated land in North China. After 1939, the company managed the expansion and change of cultivated land, investment and finance on land reclamation. In 1941, the company introduced an agricultural improvement program in the Hai River region, including the Luan River and Jiyun Canal, areas along the Yongding River, Jiedi Canal, and the Xiao-qing-he Region. The Machang Canal where the Xiaozhan was located was also a site for agricultural promotion. The plan involved improvement on water conservancy methods to divert clear water from the Machang Canal.141

Last, the fishing industry in Tianjin was influenced by the Japanese fisheries. Japanese involvement stimulated industrialization on promoting and expanding industrial production and process of sea products. A new fishery company was jointly organized by a Japan-invested Manchurian fishery Company, the Tanggu cold storage plant and Hebei provincial fisheries association. The newly-founded companies like this one in Tanggu introduced machines for storing, processing and transporting fish and fishery products from Japan. Larger steam-powered steamers were brought into the Bohai Region to work shoulder
to shoulder with Chinese fisherman who used shallow wooden fishing boats at Dagu and Beitang. The company made plans to grant low-interest loans to poor fisherman but in general, fishermen did not benefit from these improvements. Instead, they were monitored by the Japanese police. Certificates of good citizenship had to be obtained and registered before they sailed out. Wars, blockades, and even the construction of the salt fields and Tanggu harbor affected their livelihood.

All of these changes in the traditional economic sectors of salt making, agriculture, and fishery fit into the Japanese colonial plan in North China. It also shows the magnitude of the transformation of state, society and natural surroundings to make North China a self-sufficient economic region and a place to store the natural resources for Japan's military agenda. These changes were included in the process of making the city into an industrial base. It also showed a different way of seeing the river, not only terms of the usage and function of water resources but also the future plan to change the river into the engineering system to bring about these changes.

Uses of the River in the New Urban Planning

Japan remade the city during the occupation. The military occupation of the native city, suburb and rural regions and foreign concessions ended the privilege enjoyed by western powers. The Japanese occupation was a chance to remake a Chinese city and foreign concessions as an integral urban space. In the new scheme of urban planning, Tanggu was ruled by the municipal administration of Tianjin. The municipal scope and space of Tianjin extended from the city to the sea, showing Japan’s monolithic view of the city and its ambition to develop a communication network for transportation and navigation.
The inclusion of larger space along the Hai River into the city planning aimed at turning Tianjin into an industrial city that supported industrial and economic development for Japan’s self-sustaining economic cycle of North China. Placing Tianjin as the economic and trade center within a mature transportation net, the Japanese authority turned the natural surroundings of land and rivers to their economic advantage.\textsuperscript{143}

The Hai River and its tributaries were important components of colonial city planning. In 1930 when the Nationalists published their city plan, the riverfront along the Hai drew special attention with efforts to mediate between Chinese and foreign municipal and executive powers.\textsuperscript{144} The Japanese plan kept the river as the urban center. Streets and markets would rearrange the space along the waterfront that had been occupied by foreign municipal councils or Chinese authorities. Plans for new markets were also placed on waterfront where the relationship between human and the river was economically, socially and culturally strengthened.\textsuperscript{145} The space along the tributaries was also designed since these places had long been economically prosperous.

The use of the river for navigation and drainage was well-planned. Sluices and wharves were encouraged within the network of rivers and channels linking Tianjin with its hinterland and the world. The river shaped urban space with the establishment of water-supply lines and underground sewage system.\textsuperscript{146} This construction enhanced the perception of modern hygiene and its influences on defining waterfront and the urban space inside the city. In the areas where no sewage system was built, the Chinese regulated and renovated gullies, ditches and silt wells in order to achieve same modern hygienic goals. In the Nanshi section (the south market) of the native city, the authority repaired or renovated ditches. The government
regulated the construction. Cement, lime, sand or stone were used to strengthen the bed of ditches. Chinese authority reinforced the drainage system with wells especially in populated areas, through which modern infrastructure linked the cities to the river.¹⁴⁷

During the Japanese occupation era, Tanggu was both the eastern end of the city of Tianjin and a potential urban zone. Since Japanese had long history of occupying Tanggu to construct shipping and dwelling facilities, the place gained top priority when Japan made future designs for the growth of the city. A General Plan for Tanggu Urban Development depicted Tanggu as another urban center on the other end of the river to assist the growth of Tianjin.¹⁴⁸

The rural and unclaimed land between Tianjin to Tanggu was designed as an industrial base along the Hai River. On one hand, this layout for promoting industries would not conflict with existing organized urban and commercial space inside the city. On the other hand, it took advantage of the water resources, river navigation or railway transportation to stimulate the efficiency in industrial production. This plan, unfulfilled by the Japanese, laid the foundation for postwar urban industrial development in the GMD and Communist eras.

As symbols of modern technological superiority, four iron bridges occupied by the Chinese were targeted for transformation. Beginning from the Nationalist era, the aesthetic value of the urban structures had been considered essential to convey a clean image of the Chinese city. The peeling paint on these bridges became “a hindrance for viewing” so the bridges were stripped and repainted.¹⁴⁹

The Japanese military authority did not control the Hai River; the shipping privileges and agencies were controlled by the western powers when the Tianjin Urban Planning
Outline was published in 1939. This outline did not pay attention to improving navigation, but rather on linking the river and the city by re-organizing drinking and sewage systems. The importance of the river in the business of shipping and navigation waned as comprehensive plans of massive infrastructure constructions of roads, railroads, and even airports. The risk of the river being abandoned could be seen in Japanese plan for the establishment of Tanggu as the new Tianjin harbor.

The HHCC strived to transform urban space by turning the lower-lying ponds into flat roads during the war. The dredging and filling which was opened as old as the beginning of the commission itself, continued as the effective methods to fill the ponds with silt and dirt dredged from the river reaches and the Dagu Bar. The HHCC maintained its autonomy in using dredging and filling to sustain the operation of the commission in the midst of war. Pumping machines and pipes delivered the silt from dredgers to the designated ponds ashore.

Table 5.1: Filling amount completed by the HHCC 1938-1942

<table>
<thead>
<tr>
<th>Year</th>
<th>1938</th>
<th>1939</th>
<th>1940</th>
<th>1941</th>
<th>1942</th>
</tr>
</thead>
<tbody>
<tr>
<td>Filling amount (in fang)</td>
<td>140,000</td>
<td>115,550</td>
<td>178,075</td>
<td>221,825</td>
<td>158,809</td>
</tr>
</tbody>
</table>

The incorporation of wasteland into urban space and the transformation of ponds, puddles, lakes into flat land was not confined to the efforts of the HHCC. The Japanese and Chinese authorities filled the low-lying areas and ponds with urban construction. The layout for urban markets and streets in Tianjin and Tanggu needed to be supported by massive filling projects. The Tianjin Works Bureau eliminated uneven land areas for the preparation for road and railways construction. As long as 12.087 kilometers lowland areas had been filled and
turned into flat roads only in 1942.\textsuperscript{152} In addition, the work on railroads and airports accelerated the preparation of firm and flat lands for urban expansion.

When the Nationalists regained control of the city they used their political influence to shape the river and the city through the campaign to overhaul the drinking and sewage system. The HHCC resumed its work under the Guomindang, with assistance of American water conservancy experts. These tasks were linked with modern understanding of hygiene and showed the Nationalist interest in building a modern metropolis. The establishment of a modern system of water usage and disposal continued after 1945. The government created a comprehensive drinking and discharging system. Such campaign was led by the special Sanitary Engineering Works Bureau of the Nationalists.

The urban drinking system was relevant to the modern hygienic concept. Until the 1940s, the drinking system in the city included the Tientsin Waterworks Co, and Tientsin Native City Waterworks Co. The latter gradually expanded business into foreign concessions and the Chinese native city, suppressing the British Waterworks Co. with five factories processing the purified water originating from the southern Canal and the Ziya River. Until 1947, both companies expanded their production scale and provided drinking water to sustain population growth and industrial expansion. The Jieyuan factory of the Jian Waterworks Co. owned five pumping machines, nine depositing tanks, two depositing ponds, 17 rapid filters, 38 slow filters, and four filtration ponds. The other factory located on the Ziya River had three pumping machines, two depositing ponds, two wells, and one filtration pond.\textsuperscript{153} The British company had eight wells with numerous pumps and purification tanks.\textsuperscript{154} The Sanitary Engineering Works Bureau enlarged the scale of construction of the underground pipes,
pumping machines and drinking facilities in order to provide purified water to half of the population that did not have access to these facilities.\textsuperscript{155}

The growth of Tianjin as an industrial city and a northern metropolis required increasing the supply of water. The average usage of purified water was five million gallon per day in 1937, the figure doubled by 1942.\textsuperscript{156} The expansion of the drinking system was also profitable; it increased the power of the state, promoted modern knowledge of sanitation by providing affordable drinking water. The GMD government continued to impose a modern social order through expansion of tap water system. The merging of the two waterworks ended the long-lasting separation of the concessions from the Chinese municipal administration. The government planned to connect two companies with underground pipes and unified urban water prices.

A larger reshaping of the connection between city and river had been created by ditches, trenches, and underground pipes that drained wastewater into the rivers. Under Japan and the GMD, a modern sewage system came to symbolize the modern metropolis and shaped the use of water resources. On the other side of the pipes, the Hai River became the dumping ground of wastewater. The Hai River was connected with the Qiangzi River which had traditionally been the major drainage channel for the British, French and Japanese concessions. The construction of a new sluice on the converging joint of the Qiangzi River and the Southern Canal was invested. It aimed at using the clear water from the southern Canal to rinse silt of the Qingzi River into the Hai River. In order to take water from the Qiangzi River for irrigation, other two irrigation sluices were constructed.\textsuperscript{157}

Other areas had different methods of producing drinking water. In the former Russian
concession, pumps were used to deliver and dump waste water into the Hai River. Other concessions built ditches. Water channels connected all water resources to divert floodwater and rain into the river. Since Tianjin had been occupied by different powers, each system had its own features and functions. In populated Chinese cities where the sanitary rules and regulations came late, the maintenance of drainage and sewage system became harder.158

The Nationalist government had plans to examine, unify and refine the sewage system. The difficulty of the mission was suggested by a high number of ruined pipes and missing well shutters.159 Even in the British, French and Japanese concession where the drainage facilities were in good condition, pipes were blocked by silt and dirt. The municipal authority appointed work teams to dig, dredge, and examine the underground pipes, wells, and channels in order to keep the system running.160 Designs of this new sewage construction obeyed the infrastructure layout and stretched following traffic flow on major roads and streets. The construction designs relied on scientific research of precipitation calculation, demographic figures, and waste projections.

The GMD municipal government included the pavement and maintenance of the underground sewage system in its agenda of reshaping social order.161 Most of the water works took the form of work-relief, supported by distribution of flour as labor fee and machinery. The unemployed needed to register with the relief and rehabilitation work bureau and wait for an assignment. Pensions and salaries were based on workers’ skills. The work outcome was investigated examined by supervisors.162 In Hedong region, the local autonomous committee mobilized local residents and funded the project.163 Residents of the designated area were under the influence of the campaign. Surtaxes and charges were
imposed on households and stores.

**Shuili (hydraulic power) and the beginning of the Hydroelectric Power Era**

From traditional economic activities such as agriculture, fishing and salt-making towards the new Japanese and Chinese factories producing chemicals and necessities, every corner of the city took part in the transformation. The transformation of the city from a treaty port dependent on international trade into a city of booming industries was accompanied by changes in the role of the river.

The uses of water and modern water management were developed to promote industrialization. The agricultural progress of cotton and grain plantation required water conservation. Japan military encouraged rural communities to construct channels, wells and diversion canals. The development of chemical factories required increasing volumes of salt and filtered water from the river. Underground tubes and ditches linked the river and to human settlements. The river was also seen as the destination of wastes to promote hygiene and cleanness.

The 1920s plan for the nationwide industrial development of dams and hydraulic power plants explained the evolving concepts on water management and conservancy. The term *shuili* (water power) linked water use to modern industrial development. Dams and hydraulic power plants were designed to accomplish flood prevention, electricity generation, navigation, and irrigation, not only consistent with the national drive for industrialization but also accelerating the industrialization of Chinese cities. The GMD government never ceased constructing dams and reservoirs across Chinese rivers. During the war against the Japanese, the central government planned to explore the power restored in the southern rivers.
Preparation teams investigated several sites in the Yangzi River region and consulted American engineers, such as John S. Cotton and John Lucian Sovage for a construction blueprint.¹⁶⁴

Like the Japanese, the Nationalists emphasized the development of a state supported by heavy industry, facilitated by hydropower to generate electricity. Engineers studied the secret of hydraulic power and the potential of mountains and rivers. Based on the data collected in the previous era, a national plan to dam rivers and promote industries was proposed. As Chinese engineer Zhang Guangdou wrote: “Dynamic force is the foundation for the development of industry and mining. Every industrially advanced country in the world pays attention on exploring dynamic force. Hydropower took use of natural resources and supply dynamic force.”¹⁶⁵ In the era of industry and electric power, the strength of rivers was explained in technological and physical terms. The era of damming rivers also pointed to a new way to harness the rivers in North China.

The medium-sized hydropower plants were the new goal of the Nationalists. These projects would supply 10,000 to 100,000 watts of electric power. The long-term goal, however, was to construct huge engineering projects that generated millions of watts of electric power.¹⁶⁶ Understanding hydroelectric power was necessary to meet the demands of mechanizing industry and agriculture.

Electricity and hydroelectric power were considered modern and advanced by the Nationalist engineers. Every hydropower plant and reservoir was the product of strict scientific calculation and experimental observations, data analysis, accurate design and constructions. Height, elevation, distance, water level of the natural areas was under the
control of engineering plans. The understanding of specific gravity, density, elasticity, viscosity, pressure and buoyancy marked a sharp departure from the understanding of water in terms of theory of qi and blood.

The description of a hydroelectric state was ambitious, and tied to national sovereignty. The postwar superpowers -- the United States and Soviet Union -- became the models for future engineering projects envisioned by Chinese engineers. However, the realization of a powerful state comprising a complete electric network to sustain the development of its industries was enormously expensive. The proposals made by the engineers from 1945 to 1948 were never realized. After 1949, the dream was taken over by the Communists who were even more eager to show the national power of their country: the People’s Republic of China.

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1 YSB, May 13, 1936, 5
2 YSB, June 3, 1936, 5.
3 DGB, May 1, 1937, 6.
5 Minami Manshū Tetsudō Kabushiki Kaisha, Kita Shina no nōgyō to keizai (Tōkyō : Nihon Hyōronsha, 1942), 1.
6 Uhei Isoko, Kishina no nōten shigen (Tōkyō : Gakugeisha, 1937), 5-7.
7 Kōhoku Kōgyō Sōkōkai, Kōhoku kōgyō sōran (China: Kōhoku Kōgyō Sōkōkai, 1942), 1.
9 Shi-jia-zhuang is the capital city of Hebei Province
10 The six northern ports were Tianjin, Qinhuangdao, Yantai, Qingdao, Longkou and Weihai
13 Kizokuin, Hokushi kaihatsu ni kansuru shinbun zasshi no ronchō (Tōkyō: Kizokuin Jimukyoku Chōsaka, 1938), 24-5.
14 “Tai hokushi kankei no shomondai,” Manshū Nichinichi, April 8, 1938, Kobe University Library Newspaper Clippings Collection(Kaitun 33-010), www.lib.kobe-u.ac.jp (accessed Feb 23, 2013)
16 Li, Tianjin de jingji diwei, 115.


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Da Qi, “Rijun Tanggu Dagou zhugang de yiyi,” 319.

Da Qi, “Rijun Tanggu Dagou zhugang de yiyi,” 318.

The commission was moved to Tanggu before the construction began. Xing, Tanggu xingang zhi guoqu yu xianzai, 10.

Xingzheng yuan xinwen ju, Tanggu xingang (Nanjing: Xingzheng yuan xinwen ju, 1947), 7-8.


Xing, Tanggu xingang zhi guoqu yu xianzai, 11.


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“Impressments or borrowing of dredge ship to build Tanggu new port,” Rikushimitsu Dainikki No. 8, 2/2, 1941 [Reference Code]C04122835200, Japan Center for Asian Historical Record (JACAR) http://www.jacar.go.jp/ (accessed June 21, 2014)

Xing, Tanggu xingang zhi guoqu yu xianzai, 11.

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Ibid, 5, 32.


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DBG (Hongkong), August 15, 1939, 2.

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“Tianjin da shuizai,” Liangyou, no. 147 (1939), 17.


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DBG (Hongkong), September 7, 1939, 4.
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A. Hardel, No. 3 River Correction Works, TMA 1:X-91-1.

P2 Minutes of the 427th meeting of the board, 24th January, 1939 at 2.30 PM

P3 Minutes of the 427th meeting of the board, 24th January, 1939 at 2.30 PM

P3 Minutes of the 427th meeting of the board, 24th January, 1939 at 2.30 PM

Report for 1941, 29-30, TMA 1:1-120.

The original scheme required 8,400 meters. See SB, February 23, 1.


YSB, June 25, 1937, 3.


IBRR, July 18, 1949, 5.

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“Ge di mian xun,” Huabei mianchan huibao 2, no. 10 (1940), 19.

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The Conservancy Problem in Hopei, 3, TMA 1:VI-320.

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SB, August 6, 1946, 9.

SB, December 16, 1946, 9.

SB, December 16, 1946, 9.

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Xingzheng yuan xinwen ju, Tanggu xingang, 13.

Xing, Tanggu xingang zhi guoqu yu xianzai, 24.

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One reason for the sudden increase of import value is the smuggling in North China was legalized by the Japanese after 1937. Details see Li, Tianjin de jingji diwei, 293.

Li, Tianjin de jingji diwei, 268.

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Tianjin riben gongye diaocha shang, Guomin xinwen zhoukan 19 (1942), 8-12.


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Cao, Huabei jingji lueduo, 698.


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Zhao Xingguo, “Changlu yantian zhi jinxu guan,” Hebei sheng yinhang jingji yuekan 1, no.7-8 (1946), 39.


Kamematsu Hirose and Wang Da-chuan, Jinmen qinhua rijun zai Tianjin shi de baoxing (Tianjin: Tianjin shi de baoxing, 1995), 153.


“Zhong ri hezu yuye gongsi,” Qiaosheng 1, no.12 (1939), 45.


Ai Poting et al., Chengshi Wenhua yu chengshi tese yanjiu yi Tianjin shi wei li (Beijing: Zhongguo jianzhu gongye chuban she, 2010), 51.
For instance, the pro-Japanese Tianjin Municipal administration chose areas in the 3rd Special Area (EX-Russian concession) as the spot for developing new markets and streets for businesses. Details see *Tianjin dushi jihua dagang*, 2.

Such constructions were launched in populated areas inside the city, such as Nanshi, Gulou, Hebei in 1942. Details see Liu Mengxun, *Tianjin tebie shi gongshu gongwu ju baogao* (Tianjin: n.p., 1942), 49-113.

Dangdai chengshi jianshe bianji shi, *Dangdai Tianjin chengshi jianshe* (Tianjin: Tianjin renmin chuban she, 1987), 36.


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http://www.cadal.zju.edu.cn/ (accessed February 27, 2014)

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Meng shao’e, “Tianjin shi xia shuidao xiufu yu yanghu,” *Weisheng gongcheng*, no.2 (1947), 42.

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DGB, May 20, 1947, 5.


Zhang Guangdou and Tan Xiudia, “Zhongguo zhi shuili fadian shiye shang,” *Dongli gongcheng* 1, no.2 (1947), 70.

Zhang Guangdou and Tan Xiudia, “Zhongguo zhi shuili fadian shiye xia,” *Dongli gongcheng* 1, no.3 (1948), 115.
CONCLUSION

Water conservancy engineer Zhang Hanying describes in his book *Hydraulics* that the quality of water in the universe is immense, and water has an intimate relationship with humans. This is especially true in the Chinese historical context. Tianjin and its people forged intimate relationships with the Hai River drainage system. Together, the river and the city experienced transformation throughout history.

**A river and its city**

The city was created by state officials who saw the geographical location as an advantageous site for a fortress. The early urban space was formed based on agricultural development and bustling commercial activities on the smooth Hai river tributaries and the Grand Canal. As larger mooring spaces were created autonomously on the riverfront of the East Gate, and over the reaches where sharp bends and larger villages like Gegu were located, the river connected with the city through its crucial position in sustaining the imperial lifeline of grain tribute.

Other than providing the necessary waterway for transport of goods, the river offered livelihoods of fishing and salt-making. It provided original resources for drinking water and a channel for draining waste. It also served as a site for worshipping Mazu and creating social spaces and asserting imperial rule. The river also shaped the city partly through its vicious repetitive flooding. In the imperial era, earthen dykes and levees delineated the landscape of the city.

After the collapse of the Qing government, the relationship between the river and city
strengthened economically despite declining religious representation. The river became part of world trade due to the coming and going of steamers and global shippers. The process shifted the internal connection between Tianjin and other spots via the north-south Grand Canal water system. Urban growth developed on the San-cha-he-kou, at the convergence of three rivers to the expanding areas along the Hai River. The extension of the foreign concessions eastward to the sea emphasized the dependence of the city on the Hai River – its sole passage toward the open ocean of trade and commerce.

The city grew into a treaty port. Its importance to the world became more obvious as nine countries established concession zones along the river after the Boxer Uprising ended. International communities settled in the city for better business opportunities. The engineering projects conducted by the Haiho Conservancy Commission (HHCC) freed the city from the state-governed Grand Canal system and expanded it into a navigation network offered by the ocean. The city was known eventually as the second-largest port in China. The name of Tianjin became a fixture for travellers’ brochures and tourist guides. Along with Beijing, the city was a center for global trade, politics and promotion of foreign cultures in Chinese coastal regions.

The HHCC’s dredging and reclamation projects contributed to the expansion of concessions. Low-lying ponds and marshes were filled with mud and silt dredged from the bottom of the river. These places were considered harmful to human health and contradictory to modern concepts of hygiene. In the early Twentieth Century came the trend to transform such wastelands into sites of smooth roads and modern buildings. The Chinese authority encouraged dingy ditches to be filled and built on. Along with the greater campaign of building settlement basins on the Hai tributaries to store the silt of the Yongding River, the edaphic and ecological conditions in North
China were also in the process of slow transformation due to the need to eradicate bodies of water.

The two waterworks companies in the Twentieth Century, i.e. the Tientsin Waterworks Co. and Tientsin Native City Waterworks Co., provided filtered water for the population growth in the expanding urban areas. They changed the traditional business of carrying drinking water from rivers with buckets into individual vendor houses. The system of depositing, filtering and restoring drinking water reflected modern hygiene and public infrastructure construction. As more households linked to drinking pipes and received regulated water prices, these factories and pipes altered the way that the river and the city interacted. It challenged the intimacy that people had in the old days with the river, when drinking water was explicitly fetched by buckets, carriers and carts. The modern underground water system estranged people from the system of water towers and filtration ponds.

The shiye and industrial development, promoted mainly by anti-imperialists, connected the river and the city through other ways. The industrialization of agriculture required the continuation of systematic water conservancy work. Balancing with the interests of using the river as a major navigation channel, it accelerated the pace of revival and renovation of the century-old agricultural sites along the river. Manufacturing and chemical factories consumed filtered water and used the underground channels to drain wastewater into the Hai River.

**The river transformed by water conservancy**

The Qing court, the foreign communities, the Beiyang government, the Guomindang government and the Beijing government under the rule of the Japanese had different understandings of the Hai River region. The differences lay in political agendas and resulted in a variety of water conservancy policies.
In the Qing dynasty, the Hai River was not the focus of water conservancy efforts. The Yongding River of the Hai River system gained top priority due to its geographical proximity to the capital. The city became economically prosperous not because of its dependence on the Hai River, but because of the Grand Canal — the imperial lifeline of grain tribute for the state. The land along the Hai River was occupied by villagers, fisherman, soldiers, merchants and salt-makers. Cultivated land, graveyards, salt piles, and wooden docks dotted the landscape. Geographical locations played a critical role in shaping the development of river villages. Villages such as Gegu and Xian-shui-gu, located along the sharp bends of the river, provided accommodation for junks and sampans and grew into larger agricultural communities.

As the imperial rulers dug diversion channels to solve the problem of the Yongding River, Tianjin also grabbed the attention of the ruler as a critical port city along the Grand Canal. Seeing the state in agrarian terms, the Qing water engineers chose Shuili-Yingtian and considered diversion of rivers to be the most effective and ideal way to solve the problem of inundation and irrigation, despite strong objections. Shuili-Yingtian served to explain the concept of shuili (“water benefit”) in the imperial era. It was, on one hand, an effective way to divert flood water into the cultivated fields; on the other hand, it helped to create an agrarian and stable society.

Thus several large-scale projects of Shuili-Yingtian programs were carried out in the Ming and Qing dynasties. The largest one was carried out by the Qing military. The local communities were mobilized through the water conservancy work. But this agrarian-based system was largely damaged when the Haiho Conservancy was established in 1897. Now the agenda of water conservancy favored an understanding of the river by foreign engineers. In the scope of creating a modern river, the only goal of the conservancy was to increase the water depth in order to enable
global navigation and trade.

The conflict of interests between foreign communities and the Qing government, the Beiyang government, the Guomindang and the Japanese lasted long throughout the Twentieth Century. The Chinese perspective on water conservancy focused on the North Plain as a whole, with much emphasis on preventing floods and securing water supply for irrigation during dry seasons. The conflicts over different water conservancy schemes proposed by the Chinese water conservancy commissions, the Commission for the Improvement of the River System of Chili (CIRC) and the North China River Commission (NCRC) became a challenging obstacle for HHCC engineers. Their quarrels and conflicting opinions on the issues of reverting the Northern Canal, the diversion of the Yongding River to the Daqing River, and numerous engineering works such as the construction of settling basins, revolved around whether minimum water depth could be maintained in the Hai River or not. This was also the first time the Hai River drew attention of engineers across the entire northern China plain.

With foreign interests surpassing those of the Chinese, the diversion network embedded in the Shuili-Yingtian projects were severely challenged by the change of water conservancy interests of the HHCC. The first project accomplished by the HHCC was the closure of three major sluices along the Hai River to prevent the stealing of water by these intertwined irrigation canals made by the Qing governors. The domination of the HHCC over the Hai River caused the silting over of these canals and river arms, some of which were filled with silt dredged from the Hai River and paved into flat roads. These changes marked the end of the massive agricultural expansion in the Hai River region. A number of agrarian households gave up on land cultivation and moved to other employment; the fast-growing city grew had a rising number of employment
opportunities in factories and commercial institutions.

The Xiaozhan Shuili-Yingtian site was influenced by the behavior of irrigation, especially during the dry season when it was dangerous to navigate the mainstream river. Other sites, like Jun-liang-cheng which used the water from the Hai River for irrigation, were crippled by the HHCC projects. However, it would be exaggerating to state that the agrarian system was eliminated by the intrusion of powerful foreign interests regarding river navigation, because the agricultural activities near the river had been entrenched with tradition and culture. Chinese rulers and entrepreneurs knew the importance of agriculture and invested in changing the system. Even the Jun-liang-cheng site was not entirely erased from the agricultural blueprint. New agricultural companies with modern tools for irrigation were founded on the site. Farmland was reorganized even though the acreage shrank. Agricultural laboratories also rooted in the Jun-liang-cheng site and survived until 1948. Moreover, the limited power of the HHCC failed to alter the existing irrigation system beyond the Hai River. The majority of the Xiaozhan Shuili-Yingtian site, for instance, relied on the injection of water from the Southern Canal through the Machang Canal, where the HHCC engineers could not infiltrate.

Other agricultural sites were not as fortunate as the Xiaozhan and Jun-liang-cheng – those small-scale sites managed by individual villagers disappeared were inundated with social changes. The six major alterations of the river’s course changed the total geographical layout of the river-born communities. These villages were transformed not only by the geographical change of moving closer or farther from the river, but also by social change with mass relocations. Conflicts became the main theme, because the riverfront was always a populated and economically prosperous place. The HHCC cooperated with the Chinese authorities to fulfill their
transformation of the natural river. Other conflicts included the difficulty to access drinking water, loss of agricultural land and graveyards. Both compromise and coercive methods were applied by the authorities to modernize the river.

Such was the change on the perspective of the river. The Qing government believed that in religious terms, the river was both a threat to the throne and a way to benefit and stabilize society and thus preserve the throne. Temples of sea goddesses and sea gods served to enhance state rule through the religious system. But now, foreign communities trusted that the river could be totally transformed into a path of trade for floating modern steamers. Modern water conservancy was designed to accompany the achievement of navigational technologies and innovations. Machines and technology helped to finish large-scale projects. The failures of past water conservancy efforts were replaced by new efforts in the Twentieth Century. Although helpful, the new perspective did not eliminate the major threat of flooding in North China. However, the river can never be separated from the entire Hai River drainage system.

Foreign experience on the Dagu Bar shows this problem. The condition of the bar was related not only to the Hai River, but to the Hai River tributaries. Without any legitimate power to change the North China water drainage system, the HHCC pushed the establishment of joint water conservancy agencies like the CIRC and the NCRC to broadcast their interests and force the Chinese government to change the river system following their will. But the creation of these joint commissions also gave the Chinese an outlet for their voices. As the resistance and anti-imperialist motivations reached high levels in the Guomindang era, the Chinese authorities even used the commission as a way to influence foreign communities shut down the HHCC, mostly failed in the early Twentieth Century.
The foreign engineers transformed the Dagu Bar and made the entrance cut deep enough to accommodate oceanic steamers. Dredging, raking, and dyking were proposed and implemented to control the natural tendency of the river’s soil and silt. Ice breaking costs were also put on the commission budget year after year to solve the problem of winter navigation. In terms of navigation, these projects were successful. It is difficult to say that a permanent channel could be achieved, as the channel was artificial and re-silted easily without continuous dredging. The attempt of the HHCC engineer Pincione to stabilize the entrance channel by dyking the Dagu Bar was a costly engineering failure. The demolishment of the dykes by his successor showed the uncertainty and limits of human knowledge regarding the natural system.

**Power, struggle and the evolution of waterfront and the Hai River**

The power of the state was the key for unnatural and social changes that affected the relationship between people and nature. In Tianjin, the imperial fair was one tradition that reflected the state-society construction over time. It was created by the religious beliefs of immigrants from the southern provinces and served as a connection with the royal family. The goddess herself was the representation of the natural power of the river and the sea. Through worshipping the goddess, the cultural connection between the masses and the river was preserved and strengthened.

The religious practice of the imperial fair, however, was criticized after the fall of the Qing Dynasty. A modern concept for a stronger nation of industrialization amid the world trade system led by the western powers motivated the state to focus on constructing industries and agriculture instead of constructing cultural ties with the river and the sea. However, the reinvigoration of the imperial fair in 1924 and 1936 showed the event was still effective and influential as a cultural and
Most importantly, the power that prevailed in the process of industrialization and urbanization could be seen through the changes to the waterfront. The change occurred through concepts embedded in the dualistic structure to differentiate superior modernity from inferior tradition.

Therefore the waterfront of the Hai River had been transformed into a modern bund. The bunds of foreign concessions witnessed and facilitated the growth of cargo volume brought by oceanic steamers. The bunds were occupied by profitable shipping and modern warehouse industries. Not only did the European-style architecture catch the eyes of travellers, but the orderliness and cleanliness of the bunds made them the new urban centers in the eyes of the foreigners. In fact, in the urban histories written by foreign writers in the 1920s and 1930s, the geographical location of the city was limited to the concessions. The Chinese city was barely mentioned in these books.

Tianjin transformed into a port and later, a harbor, due to improved shipping infrastructure envisioned by foreign engineers. The change was made by renovating, consolidating and expanding wharves, and building shipyards, swinging berths, and bridges capable of opening when steamers passed. The giant iron body of the International Bridge well illustrated the domination of foreign power on the river. Connecting foreign concessions along two banks, the international bridge was a sign that a seemingly balanced and economic global community had been established; the struggles and conflicts were concealed. It was also a sign of cooperative relationship between Chinese and foreign communities, belying the real world of power struggles and economic competition.
The business of piloting, tugging and lightering was tightly governed by the foreign shipping companies. Local Chinese junks or sampans were marginalized in the system, deprived of rights to navigate freely on the river alongside steamers. Regulations and rules for safe river navigation were announced as methods to accelerate the process of expelling these individual wooden crafts. Their numbers declined sharply.

The numbers of fishing boats was also declining due to the annexation of river space by the steamers and expansion of foreign bunds and modern bridges. It is difficult to track the exact number of these vanished boats, many of which were lifelong businesses for a whole family. Due to illiteracy and impoverishment, their voices failed to be heard. But many persisted in their way of living dependent on the river. These small floating boats could be seen during the Nationalist and Japanese eras in the upper reaches of the Hai River.

Concessions gradually returned to the Chinese after WWI. The Chinese government incorporated related projects into its political and social campaign for a better urban appearance (Shirong). The poor and homeless who lived along the riverfront were sent into refugee camps. Police or water conservancy employers patrolled the dykes in order to keep the city safe and clean.

Throughout the early Twentieth Century, the riverfront was a place for the rising of competitive shipping companies. At the center of the harbor, the British shipping companies occupied the riverfront and divided it into special areas with their wharves. The Japanese competitors were also influential at the riverfront and Tanggu.

It is recorded that when the news of the end of WWI reached Tianjin, the French and the British soldiers rushed into the German concessions area and smashed the Roland statue on Nov. 11, 1918. The incident reveals that peaceful and cooperative trade among foreign communities
was an illusion. The scramble for the river spaces was fueled by pure competition and wartime hatred. The competition for power escalated as Japan grew into a world power. Joining the concession scramble game in Tianjin, the Japanese strove for more profits that had been divided up among the powerful western countries. The Japanese wharves were located above the International Bridge, where the depth was shallower than the mooring space occupied by the British. Asking the HHCC to create a new swinging berth was a symbol of the rising power of Japan in the city and on the river. The establishment of Japanese influence in Tanggu indicated Japan’s goal of loosening the tight British grasp on shipping interests.

All of these power struggles divided the riverfront and created the visible landscape of a modern harbor. The natural course of the riverfront was estranging rather than reconciling, disintegrative rather than integrative. Each power attempted to exploit the dynamics and changing powers of this natural environment until the Japanese finally militarized and unified the river in its economic and military plan to colonize North China.

The river took critical part in shaping the city socially, economically and culturally. Impacted by different water conservancy concepts and by modern industrial and commercial production, the city stepped into the mid-twentieth Century as the largest industrial and commercial harbor in North China. When the Communist Party took control of the city, the relationship with the river would never be the same.

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