KADİR HAS UNIVERSITY
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HYDROPOLITICS AND WATER GEOGRAPHIES OF ISTANBUL

ASYA ECE UZMAY

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MASTER THESIS

Submitted to the Graduate School of Kadir Has University in partial fulfillments or the requirements for the degree of Master of Science in Architecture and Urban Studies Master Program.

Istanbul, July 2019

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ABBREVIATONS

DAMOC: DANIEL, MANN, JOHNSON, & MENDENHALL/ ALVORD, BURDICK & HOWSON/ MOTOR-COLUMBUS/ CHECCHI AND COMPANY

ISI: Istanbul Sular İdaresi

DSI: Devlet Su İşleri

İSKİ: Istanbul Su ve Kanalizasyon İdaresi

WWII: World War II

İETT: Istanbul Elektrik Tramvay Tünel

USAID: United States Agency for International Development:

WHO: World Health Organization

1. INTRODUCTION

"It's five to twelve o'clock" said Dr. Kehr, regarding to existing hygiene crisis in Istanbul (cited in Sungur, 1970). Dr. Kehr was an expert on urban sewage design and came to Istanbul to make a master plan of sewage system in 1959[1]. He was invited to design a centralised sewage system because rising population and lack of sanitized housing were about to become serious issue for urban areas. The city was already alarming when he warned the officials about the urgency of the situation (Sungur, 1970). 10 years after his visit, Dr.Kehr's prophecy came true: a cholera outbreak occurred in Sağmalcılar village.[2] Due to the insufficient infrastructure in the area, *Vibrio cholera* has infected the water sources in the region and caused a "national disaster", as Türkan Akyol, Minister of Health, named in the Senate. (*Cumhuriyet senatosu tutanak dergisi 67*, 1971, p. 102).

It was neither "destiny" as the Prime Minister Süleyman Demirel claimed after the disease (cited in Bakar 2017 p. 25) nor a prophecy, apparently. Rather, it was a well-known fact, both by the professionals and the officials, that the living conditions in Sağmalcılar was unhygienic. People that were living in Sağmalcılar and in adjacent villages were hardly benefiting the rights of Istanbulites. There was a visible inequality in terms of water distribution and waste management in the city. Sağmalcılar was not a planned settlement, like many other *gecekondu* areas. These areas have been built by their inhabitants in order to meet the immediate housing needs mostly in state owned

1 First attempt to make a central master plan was in 1930 with the invitation of Dr. Wild. Later Prof. Högg proposed to equip below the streets with sewage canals (Tekeli, 2013, p. 180) and later Dr. Kehr was invited in 1959 to make a survey on sewage planning of Istanbul. Dr. Kehr's plans will later serve as a base plate for sewage and water master plan of Istanbul, the DAMOC (initials of the engineering firms in the project: DANIEL, MANN, JOHNSON, & MENDENHALL/ ALVORD, BURDICK & HOWSON/ MOTOR-COLUMBUS/ CHECCHI AND COMPANY) project. This project will be held in Chapter 3.4. For more on the sewage history of Istanbul after the Republic see Dinçkal, N. (2004) Istanbul und das Wasser: Zur Geshichte der Wasserversorgung und Abwasserentsorgung von der Mitte des 19. Jahrhunderts bis 1966 and for the sewage system of late Ottoman, especially in Pera and adjacent neighbourhoods see Kentel, K. M. (2018) Assembling ' Cosmopolitan ' Pera : An Infrastructural History of Late Ottoman Istanbul. University of Washington.

2 The last cholera epidemic in Istanbul was in 1910-1913, see Unat, E. K. (1995) 'Cholera epidemics in the Ottoman Empire during 1910-1913 and relevant events', Yeni Tıp Tarihi Araştırmaları, 1, pp. 55–65.

lands. In result of that, *gecekondu* settlements were lack of proper infrastructure systems like sewage, water, electricity or road. Among them, especially sewage systems have been neglected mostly. First, because of the entire system was buried under the ground and could be ignored easily. Second, the cost of these systems were expensive and they were financially self-sustaining in the long term.

Prior the modernized water distribution systems, infrastructure systems were much more variable in terms of scale. The city was equipped with wells, cisterns and fountains and these elements were connected to bigger infrastructures like aqueducts, water tunnels and water ways. On the contrary, modern water infrastructure system is less gradual in terms of scale: one big water dam or water reservoir (sometimes a water tower along the way) on the one hand, and a small faucet in on the other. The water infrastructure is trans-scaler in terms of form. Yet, in transition to modern water system it became more invisible and was placed under ground. Spatially, cables, pipes, tanks are preferred and designed to be invisible, hidden or underground.[3] The whole transportation system of water (pipes) is buried under the ground which makes it accustomed and forgettable: if everything goes by the book. In the case of Istanbul, "normalization" of water infrastructure needed a lot of time, as the transition from old infrastructure systems to modernized ones are haphazard and impermeant.

In the beginning of this research I focused on 90s water scarcity in Istanbul that affected the everyday life of Istanbulites. 90s water scarcity topic then, expanded in both ways. One path reached to Greater Istanbul Water Project which "brought water by excavating the mountains" (Anadolu Ajansı, 2019) including Melen and Istranca Water Projects that has started in 90s and still going on. The other part reached to historical part in order to reveal the palimpsest structure that lays behind 90s water scarcity. For this

3 It is similar in building making. In architectural culture the most important theorization of such invisible infrastructural systems. See Banham, R. (1969) The Architecture of The Well-Tempered Environment. London: The Architectural Press. Another book is "A Burglar's Guide to City" which talks about strolling in these unwanted structures in the buildings and the city. See Manaugh, G. (2016) A Burglar's Guide to the City. FSG Originals.

thesis I have chosen the latter path in order to entangle the present and past water geographies and infrastructure system of Istanbul.[4]

My initial aim was to re-assemble the water histories of Istanbul. Then a side project has evolved: mapping the water history of Istanbul. Methodologically, for the historical excavation, I benefited from the reports that were published by Istanbul Water Administration (Istanbul Sular İdaresi, ISI)[5] and State Hydraulic Works (Devlet Su İşleri, DSİ)[6] together with newspapers[7]. My second and most important source was the water distribution maps. I largely used the maps in the DAMOC (DANIEL, MANN, JOHNSON, & MENDENHALL/ ALVORD, BURDICK & HOWSON/ MOTOR-COLUMBUS/ CHECCHI AND COMPANY) reports, which is the reports of first master plan of sewage and water network of Istanbul, made in 1970. They represent the existing situation in 1970, and the projected lines for forthcoming years (1985 and 2020). In the end I have crosschecked my existing maps with water distribution map of İSKİ (Istanbul Su ve Kanalizasyon İdaresi, Istanbul Water and Sewage Adminstration) that shows the current situation by 2014. For the historical water maps, I referred to maps made by Çeçen and Crow (Çeçen, 1988, 1991, 1996, 2000; Crow, 2015)[8]. For Kırkçeşme and Taksim water ways, I also referred to İSKİ 2014 map because those lines are still in use as in they were depicted in the İSKİ 2014-latest water distribution map.

Revealing the water geographies of Istanbul in history has helped me to formulate two main questions: How did the transition from fragmented historical water networks to

[4] There are numerous research on this issue. Kazım Çeçen's writings basically cover the water history of Ottoman period.

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[5] There are reports between 1933 to 1947 (in SALT Archive), and they were collected by Ziya Erdem in Erdem, B. Z. (1948) Istanbul Sular İdaresinin 1933-1947 Yıllarındaki Çalışması. Istanbul Halk Basımevi. For later periods as a summary of İSKİ (Istanbul Su ve Kanalizasyon İdaresi, Istanbul Water and Sewage Adminstration) and before, I have used Esmer, K. (1983) 'Tarih Boyunca Istanbul'un Suları ve Istanbul Su ve Kanalizasyon Sorunu'. İSKİ Genel Müdürlüğü.

[6] What I can find was partial reports or booklets made by the professionals in DSİ. My most important archival sources was from the Archives of General Directorate of State Hydraulic Works, Drinking Water Department, Planning Section, Ankara.

[7] Milliyet and Cumhuriyet

[8] One should mention that Çeçen's maps are not precise maps. In some, they are drawn exactly over street maps, and in some cases they were left as krokis and once georeferenced they bozulmak higly.

centralized modern network take place in Istanbul? Secondly, considering the dual infrastructural system of Istanbul, how did the solutions were devised during this transition and interacted with the existing inequalities?

In order to formulate my findings, I have largely benefited from the fields of urban geography, urban political ecology and Science and Technology Studies. Conceptualization of infrastructure systems throughout time and how they shaped the cities were my initial research questions. While doing that, I referred to the writings of Willian Cronon, David Nye and Matthew Gandy. I also applied to writings of Bruno Latour in order to unleash the constructed boundary between nature and city as well as the dynamics between human and non-human. To understand the urban inequality in the cities and the changing meanings of nature I referred to writings of Maria Kaika, Eric Swyngedouw and Nikhil Anand as they all focused this issue through inequality in water distribution.

Water histories of the cities and how the cities have been shaped with water have been discussed widely in the urban geography literature.[9] Historically, there had been a great shift in need of water after the industrial age and construction of modern cities. Control of water is a crucial aspect in construction of modern cities. The city gets its water usually from distant sources with an infrastructure system -except subterranean water sources. The path, the source and the final destination are crucial notions in order to understand dynamics of water. Swyngedouw says "Like the individual body and bourgeois society, the city was now also described as a network of pipes and conduits." (2004b, p. 32). Yet those "pipes and conduits" were unseen and hidden, in terms of what they carry or the carrier itself (Swyngedouw and Kaika, 2000). As Larkin defines infrastructure is the "matter" that empower "other matter" to act which is not only the objects but they the system that enable the flow of actions in a row (Larkin, 2013). Pipes and conduits are part of a massive system. On the one hand their visibility

[9] See Gandy, M. (2002) 'Concrete and Clay: Reworking nature in New York City'.
Heynen, N., Kaika, M. and Swyngedouw, E. (2014) In the Nature of Cities, In the Nature of Cities.,
Swyngedouw, E. (2004) Social Power and the Urbanization of Water: Flows of Power. New York: Oxford University Press.

represent state power as gargantuan structures (Larkin, 2013) and on the other hand, in the bathroom, they perform privacy (Penner, 2013).

In order to understand infrastructure making processes and aftermath, in scope of Istanbul from late Ottoman Era to 1970s, the outline of this thesis is as follows. Chapter 2 briefly explains the historical and theoretical background of infrastructuring the cities and the role of disease in designing the city according to the modern ideal. The following chapter, Chapter 3, is constructed to give a brief information on the water supply system of Istanbul. It starts with revealing the existing or lost infrastructure of pre-industrial city, starting from Roman period and expanding through Istranca mountains, continue with Halkalı and Kırkçeşme Water ways in Ottoman period. With Hamidiye waters, we started to see the usage of water pumps in Ottoman Istanbul as a first sign of the changing the technology of water distribution in the city: from gravity force (*cazibe*) to pump force, which would have changed the history of cities entirely. Yet the most important attempt for modernizing the water system of Istanbul was commissioning a French company named: *Compagnie des Eaux de Constantinople* in the European side and *Compagnie des Eaux de Scutari et Kadikeui* later in 1890 in the Asian side (Kazgan and Önal, 1999). Yet, the focus of these companies was not building a total networked city, which is a necessity in the construction of the modern cities, rather, they developed partial systems. Nationalization of water distribution system of the city also based upon this ideal. However, through the years, as Istanbul's population was increasing due to the economic growth of the city after World War II (WWII), existing infrastructure, budget and expertise fell short. Furnishing infrastructure is expensive, requires a master plan that can cover the city and its hinterland and the predictions of forthcoming growth. However, Istanbul's growth was far from being predictable. Especially after 1950s, augmented *gecekondu* settlements skyrocketed and resulted an unplanned growth. Thus, the city's already insufficient infrastructure was extended to these unplanned areas, impermanently. As a result of this rapid urbanization, fragmented infrastructure became the pattern of subterranean of Istanbul. Central Terkos water system was used with wells and fountains, concurrently.

Chapter 3 covers the historical processes of incomplete modernization and ends up with future water distribution projections for Istanbul. These projects foresaw a centrally managed and regionally expanded water infrastructure system. Following Chapter 3, Chapter 4 focuses on the urban inequalities in Istanbul by revealing the 1970 cholera outbreak in Sağmalcılar and the adjacent villages. Sağmalcılar was one of the *gecekondu* villages nearby Haliç, one of the oldest industrial area of Istanbul. People in Sağmalcılar were obliged to build their own houses which had to be infrastructurally insufficient. Instead they were using subsidized elements like cesspools or fountains. Indeed, indications of cholera popped up one by one in the cholera geography. Sağmalcılar, Gaziomanpaşa Esenler, Taşlıtarla were settled over existing yet neglected Ottoman Halkalı waterways which would later turned into sewage and drinking water canal simultaneously. Moreover, the rivers that were flooding over through these mentioned places turned into contaminated cholera rivers which were effecting all over the landscape they penetrated. Last but not least, artesian well sources, which were the most dominant water sources in the area, were infected by leaking sewages in the area. In short, Chapter 4 summarizes the outcasted agents in 1970 Istanbul, from *Vibrio cholera* to a dumpsite, infected people to neglected water canals. Finally, Chapter 5 concludes the abovementioned incomplete modernization and cholera epidemic in 1970 Istanbul and suggests further research and possible focal points for future.

2. THEORATICAL FRAMEWORK AND LITERATURE REVIEW

"Did God make Paris, or did man?
Did God make cholera, or did man?"
(Vidler, 2011, p. 71)

"The environment of the city is the result of a historical-geographical process of the urbanization of nature."
(Swyngedouw and Kaika, 2000, p. 573)

2.1 **Making of the Modern City Through Water Infrastructure and Disease**

Idea of the modernization is based on the control circulation of goods. Modern agriculture, modern foresting, control of water or control of mobility can be the examples of this notion. City is the unit to understand these cycles. Creating a space for free circulation of goods and people such as water, traffic, people and waste and managing it are the responsibilities of local governments (Penner, 2013, p. 13). "The first conceptualisation of what we understand as the 'modern' city" as Spiro Kostof mentioned, was Hausmann's rationally designed Paris (Graham and Marvin, 2007, p. 53). Street is the primary element in the plan as it constitutes a ground for circulation. Below the street, the "invisible city" in Lewis Mumford's terms (cited in Graham and Marvin, 2007, p. 39), is also important for the construction of modern city since they are home to vital, yet unseen elements: water and sewage (Figure 2.1).

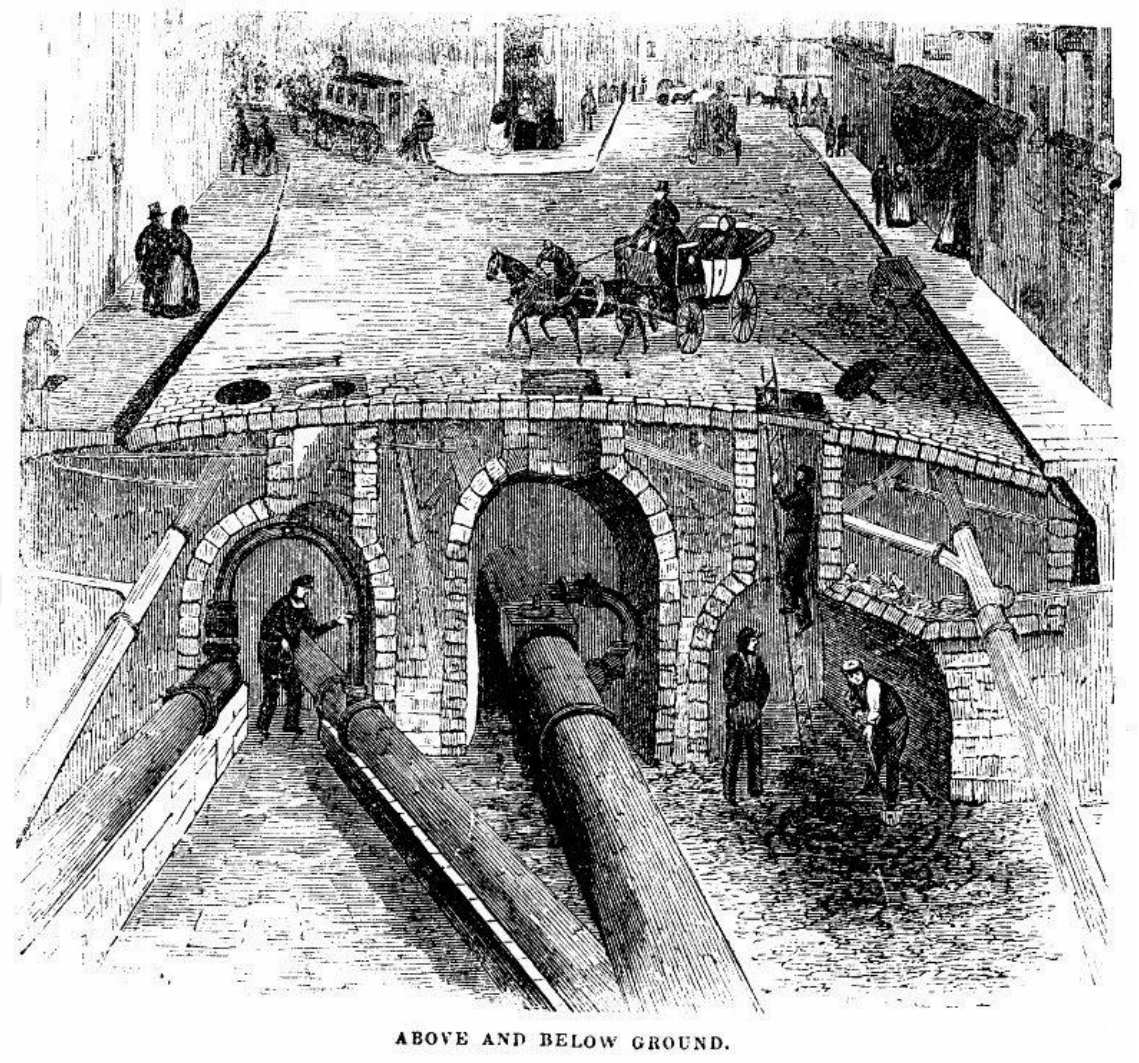


Figure. 2.1: The visible and the "invisible city" of Paris (Vidler, 2011, p. 101)

Baron Hausmann's intervention in Paris was an early image of how a modern city should be.[10] Infrastructure constitute the backbone of the modern city since all sorts of flows and movement in the city happen with infrastructures.[11] Water and sewage systems became the pathways of such controlled flows in the infrastructure in the underground and on the streets of Paris. Streets were covered up with the technology via standardization of pavements, lighting, urban furnitures and trees within a united and

[10] In "The Paris sewers and the rationalization of urban space", Gandy discusses the idealization of Hausmann's Paris and argues the impermanent factors of the city. See Gandy, M. (1999) 'The Paris sewers and the rationalization of urban space', Transactions of the Institute of British Geographers, 24(1), pp. 23–44.

[11] They are resembled to veins in human body, as veins are responsible from transportation of blood (Penner, 2013).

monumental image of Paris (Vidler, 2011, p. 100). Below the street paths, on the other hand, there were pipes in different scale to control the flow of water, sewage and gas of Paris. Furthermore, the forests, the Bois de Boulogne and the Bois de Vincennes were tamed to perform a picturesque landscape for the new middle class of Paris and became the transition element between the constructed boundaries of city and nature (Vidler, 2011, p. 103). The relationship with nature was redefined.

The aim of equipping the city with latest infrastructure technologies was to construct a suitable ground for the needs of modern civilization. By the Promethean idea of modernism[12] and domination of nature via technology "no longer does the world weigh upon a man's shoulders, it is held in the palm of his hand." (Cosgrove, 1990, p. 8). Man becomes the creator and with his tools, technology and rational mind, he can dominate and redesign the existing cycles. Controlling the flows of materials like water, energy, information or people is the prerequisite of being a modern city as a result of heritage of the Enlightenment ideal on the control of nature by using technology and science (Kaika, 2004).

Use of technologies to tame water is a milestone in the history of cities. Water that city consumes usually comes from countryside therefore the system of water transportation connects rurally and urban physically . In other words, in the construction of cities, water is the most crucial "Natural element" to tame and stands for the intersection of rural and urban. First, in order to supply water for an increasing population[13] of the industrial age and secondly to keep the city sanitized and clean to hinder the spread of disease. As a consequence, water management informs social relations and is intimately connected to power and inequality (Cronon, 1991; Swyngedouw, 2004b; Gandy, 2005). In today's world most of the water system in the Earth has been tamed, dammed over, used for electricity or bottled and purchased. In this scenario, where water is equal to money, the deficiency of water is connected to inequality. Drought, flood, river, bottled

[12] In Greek Mythology Prometheus has stolen the fire from the Gods and served it to the humankind; here the scientists and the engineers are the savers of the humankind against the threats of nature. Therefore it justifies the idea of doing everything for the sake of humankind and didn't think about the consequences..
[13] More than %50 of people now live in the cities. It means the transition of enormous need of supply to a one location which have limited source. Water need of populations is inalienable Especially water as a natural source is limited for a region so that supplying water to a city is an important engineering problem

water and contamination reveal different forms of water inequalities. Nikhil Anand (2017) explains the inequalities of water distribution in Mumbai while connecting different agents from engineers as decision makers to water pipes, in which pressure and where they distribute. Lisa Björkman (2013) tells the story the emergence of a slum from a planned neighbourhood and the re-appropriation of existing water infrastructure in the neighbourhood of Mumbai. Eda Acara (2018), with an example from Ergene Basin in Turkey, explains the contamination story of Ergene River through mixing of the uncontrolled industrial waste to the river. The river has been affecting the areas it has touched during its journey: lands, animals, people, plants get polluted on its way through. The river has turned into symbol of pollution and like the river itself, the affected became the subject of outcast (Acara, 2018).

2.1.1. The Disease

Before 1854, there was no proof of the relationship of water and cholera till John Snow's, a physician lived in London, map of urban poor which was displayed the relationship between unequal living conditions and waterborne disease (Figure 2.2). The disease was affecting the streets of London and the possible agent was declared as miasma (Goubert, 1989, p. 45). Snow gathered the demographic and sociological data and mapped them over the streets of London. Later he transposed his data with the locations of deaths. The map has directed a water pump as the source of the disease. Cholera was seen in houses that was using water from that water pump. The hand-pump well was infected by the open cesspools nearby and became a suitable habitat for bacteria to settle and spread from. Moreover, other two spots on the map were pointed: a beer room and a working house. Although they were so close to the contiguous water pump they were not effected by the disease. The people who worked in the beer house consumed beer and the worker house had a secluded water well. By isolating their water source from the contagious one unconsciously, they have strengthened John Snow's claim.

The atmosphere of the pre-industrial city with the lack of organized sanitary and excretion facilities resulted in very different atmosphere of smell from today's cities

(Figure 2.3). Faeces, slaughterhouses and garbage were the dominant smells in the streets (Corbin, 1986). Pre-modern city was subjected to diseases like tuberculosis, plague and cholera whilst they caused massive deaths among the citizens and smell was associated with the diseases. Once the contamination and the smell in the streets were associated with the diseases, urgent acts have emerged. "Anything that caused stench was considered as a source of filth and thus required cleaning such as garbage on the streets" (Varlik, 2015, p. 279). The hygienist; the engineers and the doctors were arguing about contamination and water borne diseases and their effect on society in hygiene conferences[14] (Goubert, 1989, p. 109).

Figure. 2.2: John Snow's map of 1854 cholera outbreak in Soho, London ((*john-snow-s-cholera-map*, no date)

[14] One of these hygiene conferences took place in Istanbul. See Ersoy, N., Gungor, Y. and Akpinar, A. (2011) 'International sanitary conferences from the Ottoman perspective (1851-1938)', Hygiea Internationalis, 10(1), pp. 53–79.

“If the nation state wanted to protect their children, it was their duty to make population healthy and strong” says Goubert as the states praise for cleanness and germ-free societies (1989, p. 109). Keeping the nation clean is highly related to control over the body in street-scape which works as a walking, working, socializing space for the body. There were early regulations in Ottoman Istanbul in terms of organizing streets, in order to avoid diseases. Nükhet Varlık discusses that, according to *mühimme* orders regarding the regulations of street-scape with concerns of hygiene; slaughterhouses should be moved to peripheries, roads should be paved to restrict the movement of rats or disposal of excrement and garbage should be controlled (2015, p. 279). In late 16th century, new regulations were enacted in order to discipline the construction of new houses in terms of controlling the measurements of height and distance among them. These regulations are not only related to fire threat in Ottoman Istanbul, but related to hygiene concerns and epidemics to a certain point (Varlik, 2015, p. 279).

Figure 2.3: The atmosphere of pre-modern London was depicted in the engravings of Gustave Dore (Jerrold, 1872).

2.1.2. Water Infrastructure

Water infrastructures are the technological tools that allow us to shape the cycles in the city, which brings water from a distant source to a faucet in a bathroom. They not only provide a hygienic and germ-free city but feed the hygienic nations with the most vital element for survival: water.

The word infrastructure is etymologically combination of *infra* and *structure*. Infra means "under, below, beneath" (*infra-*, 2019) while structure stands for "that which is constructed, a building or edifice" (*structure*, 2019) according to Online Etymology Dictionary. "Infrastructure" means "the installation that form the basis for any operation or system." and adds that it is mostly used by military purposes (*infrastructure*, 2019). Before that meaning, as Carse (2017) explains, the word "infrastructure" was a "humble French engineering term" and used in transnational engineering community mostly for railroad constructions and for the larger projects they preferred "systems, networks or internal improvements" instead of infrastructure (2017, p. 30). At that time, in engineering terms, infrastructure meant a hierarchical relationship for arranging the responsibility of the contractors rather than "system or network" (2017, p. 30). After post-war era, the word has adopted a military meaning which referred to the networks of modern military institutions. Like the military programs "economic theories were enacted through the coordination of physical installations shaped by specific visions and theories of political and socioeconomic organization" (2017, p. 31). Search for a unified and coordinated military infrastructure also coincides with the need for organized developmental ideas especially for the importing modernization ideal of "Us scientific and technical expertise to raise standards of living overseas" (2017, p. 32). In McNeil's term 1960s was a "developmental decade" as a Cold War policy building of large infrastructure systems like roads, railways or dams have served as a path to modernism, and the organizations like World Bank or United Nations were supplying money for that (cited in Carse, 2017, p. 33). By applying a loan for planning water and sewage infrastructure network by 1964, Istanbul also benefited from the loan of United Nations[15] (Enerji ve Tabii Kaynaklar Bakanlığı, 1964).

[15] See Chapter 3.4

According to Hughes infrastructures are “Large Technical Systems” which involve complex economic, political and social relationships. As they grow in sclae, they are more likely to taken for granted and be normalised (1989, p. 180). *Homo civitas*[16], the people who lives in the city, are bounded to organized networks; water is always available from tap, electricity is always there in need of power and roads are connecting all over the city (Amin and Thrift, 2017, p. 109). They are the accustomed part of the everyday life practices and they are too normalized that only in the absence of these systems they start to be questioned. Namely, they are the invisible sources of modern urban life. With the excessive demographical change into urban areas means that every human is getting more “connected” into infrastructure spaces and the demand for being connected is one of the main reasons of this demographic change.

Swyngedouw mentions the “fixed and embedded” positions of infrastructures in “produced space” (1993), as they free the movement in space with their existence. These new spaces involve new dynamics, relations and connections with other places that comes from compositions of inclusions and exclusions that empower them. As being connected to a network is normalised for the *Homo civitas*, being out of the network emphasises the exclusion. For instance, cholera epidemic in Istanbul emerged and spread from the places which had no proper water distribution system whereas the well-equipped settlements that “normalized” the tap water, were free from the disease in 1970s [17] Another issue is the geographic unevenness between the ends of the pipes. Making a water station in Terkos affected the Lake Terkos and its environment, on the one end, and affected Pera and its environment, on the other end of the pipe. After Lake Terkos’ connection with the Black Sea has been cut in order to collect water in the lake, there have been floods in villages by the lake. At the other end of the pipe, in Pera, the neighbourhood was networked with water from Lake Terkos during late 19th century as part of the modernization project. What is astonishingly interesting here that the excrement of Pera was streaming into the adjacent and topographically lower Kasımpaşa and affecting the neighbourhood badly as folding the existing inequality

[16] “Man of the city”. Aaron X. Fellmeth and Maurice Horwitz, Guide to Latin in International Law, 2011, Oxford University Press.
[17] This topic will be discussed in next chapters.

between the neighbourhoods (Kentel, 2018). In other words, equipping Pera with water infrastructure affected both the immediate surrounding in Lake Terkos and and the immediate surrounding of Pera in an inequal way.

In the pre-modern city, with few exceptions, flow of water ended up in the street, not in private space. On the contrary, in the modern city, the journey of water ends in the most private space of the house, the bathroom. "The industrial architecture of the system" invisibly lays in the background just as the invisibility of pipes and conduits in the city.[18] Penner links the two reciprocal worlds, as depicting one as a finely decorated room which is the smallest and safest part of the house and the as an gigantic open space which is a dam or a reservoir (2013, p. 10).

Historian Paul Edwards defines technological systems as the "circulatory systems of modernity" (2002, p. 185). Citing Bruno Latour, Edwards points out that the empirical studies of infrastructures serves what Latour structures as the understanding nature and culture as two separated notions. "Close study of these multi-scalar linkages reveals not only co-construction, but also co-deconstruction of supposedly dominant modernist ideologies." (Edwards, 2002, p. 186). Modernism studies mostly tackle projects on macro level while technology studies focuses on micro or meso level research. According to Edwards, infrastructure studies has the capability of engaging this bi polar understanding of the world and ability to construct a more multi-scaler aspect into research (Edwards, 2002, p. 186).

2.2. Urbanization of Nature

Changing the course of the river to ameliorate (*ihya*), flattening a hill in the name of construction or damming a river in order to collect water are common practices of controlling nature in the modern era. This may also be seen in the displacement of "unwanted" populations or control of flora and fauna according to needs of the state

[18] Yet it must be very hard to hide this huge monster which spreads its extensions (scapes) all over the networked city.

(Scott, 1988). We have been discussing the ways in which water has been repurposed in the process of constructing modern cities. If we step back to see the water in bigger scale, we can see its transitional, conductive and therefore blurry position between countryside and cities.

Infrastructure stands as a negotiator/mediator between the urban and the nature. Even the nature itself can be an infrastructure. Architecture historian Antoine Picon (2018) gives the example of networks of flora in the Hausmannized Paris as the early example of infrastructured city.[19] He shows a hierarchical order in the flora of Paris from the roots of the newly planted trees to squares, parks to city forests like Bois de Boulogne. "Within this network" Picon says "the boundary between nature and artifice is blurred. The trees along the boulevards can be likened to street furniture, while the squares and parks act as nodes of the network" (2018, p. 269).

Cities involve complex systems and they are themselves also part of a larger system. The hinterland of the city is connected with the city, either it is large or small, they reciprocally feed each other in the flow of goods like energy water, food and people (Cronon, 1991, p. 384). Mango and his friends' (1995) research on Istanbul and its hinterland covers this connections between the city and the nature, rural and urban and the dependency on each other, in the Roman Era. Independent from time, these relations have existed in different scales.

The western Enlightenment doctrine was constructed on dichotomies like nature and culture, yet they were not defined as completely dialectical concepts. Instead, one is not prior to the other or does not need to dominate one another, instead, now we know that, one's presence is highly relational to the other. They enhance each other in an intertwined existence. French philosopher Bruno Latour identifies this transition process as "cutting of the Gordian Knot" (Latour, 1993). The Gordian Knot stands for the Earth

[19] There is a huge literature on the creation of urban parks and its role on controlling the urban life. For some, see Brantz, D. and Dumpelmann, S. (eds) (2011) Greening the City: Urban Landscapes in the 20th Century. Charlottesville and London: University of Virginia Press., Dümpelmann, S. (2019) Seeing Trees: A History of Streets Trees in New York City and Berlin. New Haven and London: Yale University Press New., Gandy, M. (2002) Concrete and Clay: Reworking nature in New York City. MIT Press.

that once have been cut by the scientists who wanted to understand it better, but in the process of understanding they have lost the entangled relationships that exist on the Earth. Yet the desire to perceive the world in dichotomies like nature in one side and the culture on the other, needs to be considered again since the boundary is getting blurry. For example, The Central Park in New York is a recreated and artificial terrain in the city (Gandy, 2002). Nature can be accepted in the city to a certain degree. Green spaces, like Central Park in New York, can only be a part of the city life for a limited time[20] whereas "some forms of nature", like excrements, were eliminated and exiled into underground or out of city (Swyngedouw and Kaika, 2000, p. 573).

The city is not separate from its human and non-human occupants and it is crucial to see the entangled histories to understand the dynamics of it. As in David Harvey's terms "There is nothing unnatural about New York City" (Harvey, 1996). Instead of bipolar vision of urban and nature one can comprehend the concepts in relation. Geographer Maria Kaika embraces this relation through water infrastructure network, "barring the flow of water between the natural, the urban, and the domestic sphere reveals that nature and the city are not separate entities or autonomous 'space envelopes,' but hybrids, neither purely human-made nor purely natural; outcomes of the same socio-spatial process of the urbanization of nature." (Kaika, 2004, p. 6). Another issue that may be held here is the question of who shapes whom? Rather, we should see the actors in network in order to unleash the complexity of infrastructure systems and the system's relation to nature and city (Latour, 2005).

David Nye (2006) talks about the relationship between users and the technology by giving the example of electricity. Once users, suppliers and mediators invent on this technology, the technology spreads and creates its own agencies like educational institutions, utility companies and the machinery itself, later became "social technical systems" in Hughes terms (2006, p. 56). As people habituated this new technology and demanded it, technology became "less shaped by and more the shaper of its environment" (Nye, 2006, p. 56).

[20] Entering to Central Park is not allowed between 1.00 am to 6.00 am

Historian William Cronon's work Nature's Metropolis: Chicago is very influential in terms of his approach into urban and nature. In Nature's Metropolis, William Cronon defines a "second nature" which is the result of capitalist interventions on environment that he calls the "first nature". The second nature is designed as the "original one" that users don't need to question the "naturalness" of it (Cronon, 1991, p. 56). Cronon narrates the urban history of Chicago with the reciprocal relations of elements like grain, water, hills, mud as well as humans and animals. Thinking with a larger toolset also allows him to reconstruct the boundaries of city and expands his perspective into a larger scale: the city and its hinterland.

Like Cronon's denial of the first nature and his thought on the second nature, also Giddens mentions that the idea of "nature out there" has been attacked by the transformation power of modernity and now we have a new definition of nature [as Ulrich Beck describes] which ranges from nuclear installations to dams as this new nature is pregnant to "unexpected and unknowable implications" (cited in Swyngedouw, 2004a, p. 17). Swyngedouw identifies the notion of "nature" as a historical and social process and water plays a crucial role in order to unleash the changing definitions of nature within the intertwined relations of nature and city. In the case of Sağmalcılar, water contains the relationship of the city and its hinterland, redefines the planned and unplanned urban areas and the hierarchies of hygiene.

With a closer look to Istanbul, in order to overlap the abovementioned theoretical background of water and infrastructure systems, the historical process of controlling the flows should be unleashed. In order to prepare us for the forthcoming story of 1970 cholera geography in Istanbul, Chapter 2, focuses on the historical background of water infrastructure in Istanbul.

3. STEP BY STEP: MODERNIZING THE INFRASTRUCTURE AND CHANGING WATER GEOGRAPHIES OF ISTANBUL

This chapter illustrates a project that remained incomplete: transition from historical water distribution systems to modern water distribution systems became haphazard and hybrid. On the one hand there was the historical water infrastructure, which dates back to Byzantine Era, on the other, modern water infrastructure system were put in use simultaneously. Establishment of *Compagnie des Eaux de Constantinople* was the initial modernization act yet it was unevenly equipped in Istanbul. After Republican Era, there was a transition phase to achieve the modern ideal of infrastructure: governing all the water elements to construct an equally distributed water network system. This aim was interrupted by the lack of technical and economical reservoir. Initially, water infrastructure of Istanbul became fragmented and dual: wells on the one hand and Terkos water on the other till the water projects of 1960s.

3.1. Historical Water Distribution Systems in Istanbul

During the Roman Era, from Belgrade Forest[21] on the north and Istranca Mountains on the northwest, water flowed to intramural Istanbul (Figure 3.1). The water was running by gravity (*cazibe*), through channels, crossing valleys over aqueducts and collected in the cisterns inside the city walls. In the period of Hadrian (117-138) the city got its first flowing water system. Although the exact location of this system is not accurate there is a possibility of it coordinates with late Ottoman Kırkçeşme water supply system from Cebeciköy and Belgrade Forest (Crow, 2015, p. 117) (Figure 3.2). In other words, late Ottoman water ways were constructed and stratified over previous Roman water way. [22]

[21] Waters from Belgrade Forest could only supply water till the height of 34 meters (Çeçen, 1996, p. 21)

[22] This previous Roman water was available for 6 public paths (*thermae*) in 9, one cistern, two *nymphea* from a total of 3, 98 private baths (*balnea*) out of 153 for the city and the Great Palace (Crow, 2015, p. 119).

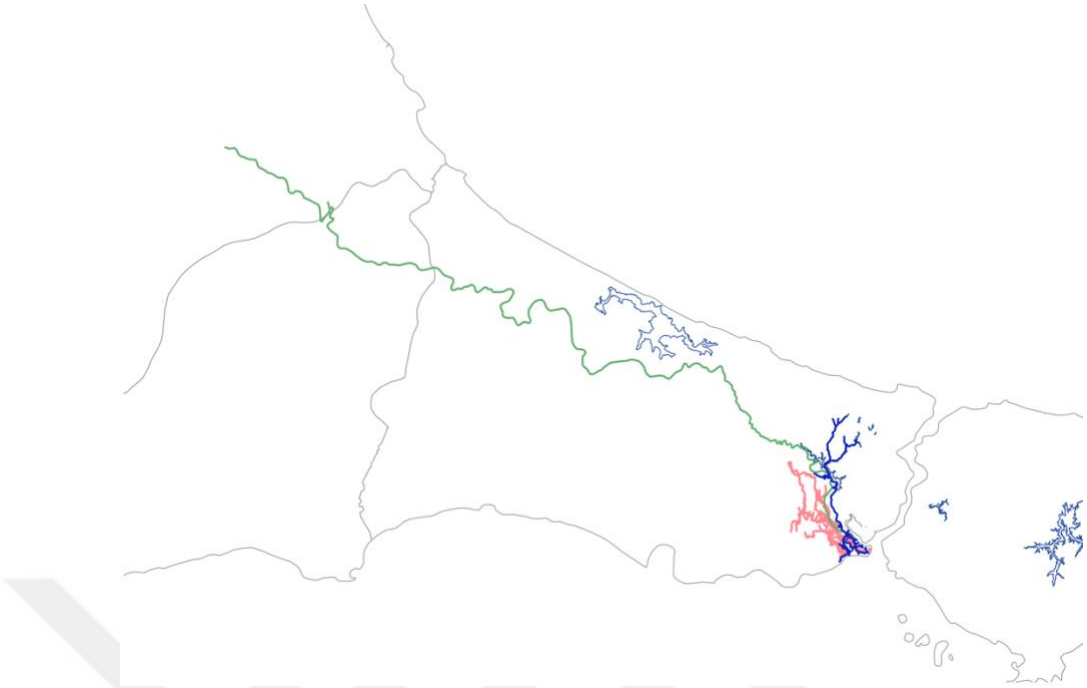


Figure 3.1. Green way indicates the oldest Roman Water Way, coming from Istranca Mountains (Uzmay, 2019).

By the time of Valens (364-378)[23], as the urban area of the city was expanding through higher west of the Forum of Constantine towards the site of Constantine's mausoleum at the Church of the Holy Apostles (from Çemberlitaş towards the Fatih Mosque), the first phase of collecting Thrace water project was finished. Water of Thrace region entered Istanbul through new channels, which were 56-57 m above sea level. According to Byzantine archaeologist James Crow, major springs were Damandıra and Pınarca which lengths 268 km in total and pass 130 bridges along the way, including the still standing Bozdoğankemer[24] in the city (2015, p. 119). By that, water could be circulated in relatively higher regions of Istanbul, around Fatih to the Forum of Constantinople (Çemberlitaş) (Figure 3.3). Around AD 400, water system was enhanced through Binkılıç, Ergene and Vize to cover more springs. After the establishment of the second phase, total length of the aqueduct channels became 494 km (Figure 3.1) (Crow, 2015, p. 120). Yet the water from the Aqueduct of Hadrian was only used in public baths and

[23] According to Çeçen (1996), it was built by Theodosius I (379-395).
[24] Çeçen (1996) argues that Valens (Bozdoğan) Aqueduct and Hadrianus Aqueducts might be the same and it needs further research. Whereas, Crow (2015) argues that, water of Hadrianus Aqueduct was reaching into lower topographies therefore they are different aqueducts.

the imperial palace as opposed to domestic or irrigation usage (Crow, 2015, p. 121).[25] Hadrianic, earlier and lower line, was entering the city through 35 m (Belgrade), from Eğrikapı, whereas the higher one (in Valens time) was entering the city from 59 m (Istrance), from Edirnekapı (Figure 3.3) (Crow, 2015, p. 121). This is important in terms of building activities and its relation with the topography. As Byzantines were able to bring water in higher levels, settlements could be able to expand in higher topographies.

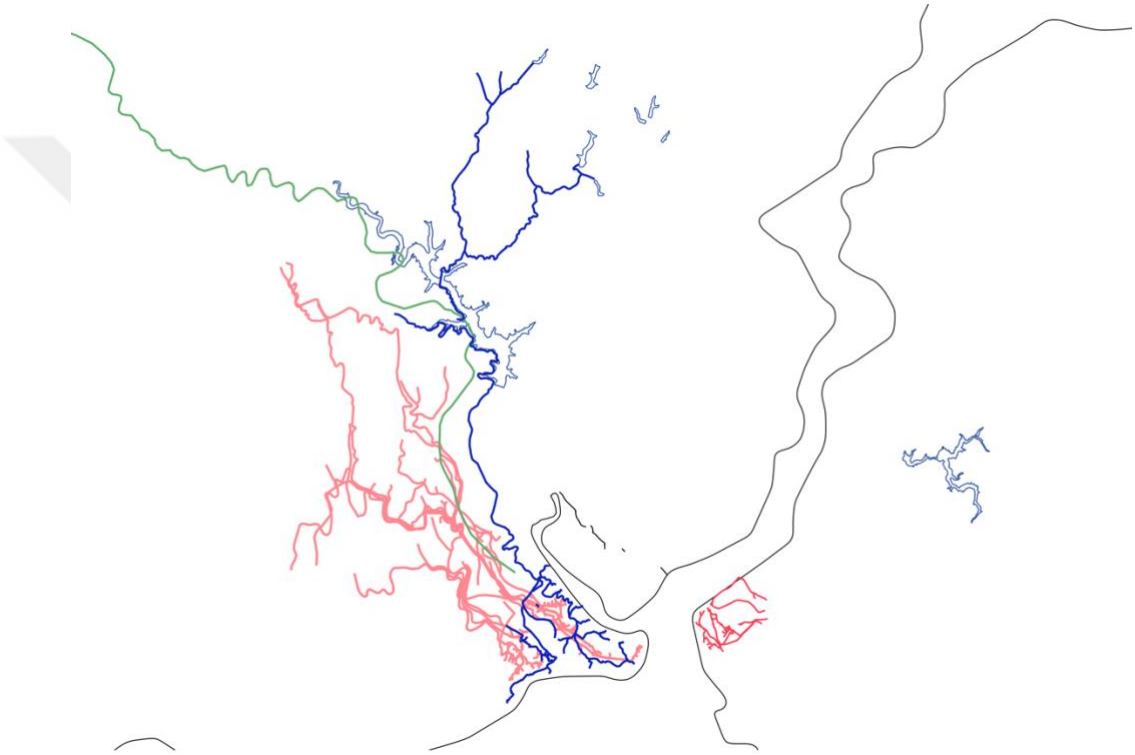


Figure 3.2. Pink way indicates Halkalı Water Ways and the blue one is Kırkçeşme Water Ways (Uzmay, 2019).

Crow mentions that cisterns, which had an important role in the water system of Istanbul, were constructed throughout Byzantine and Ottoman times[26]. Basically, cisterns were used both for public and private manners. For the smaller ones in size, it is not accurate if they were part of the larger supply system or just private scaled water

[25] There is also third phase of collecting the water to the city around 6th century. According to Crow, as result of an earthquake it may cause to change the 4th century structure and some of the aqueducts might have been replaced in 6th century (Crow, 2015, p. 121).
[26] In 2008 study they have found 150 cisterns in the city (Crow, 2015, p. 122).

storage system (2015, p. 122). After 1204 Latin invasion, water distribution system of the city was destroyed. As a result of this, most of the houses created their local cisterns to become independent from central water system.

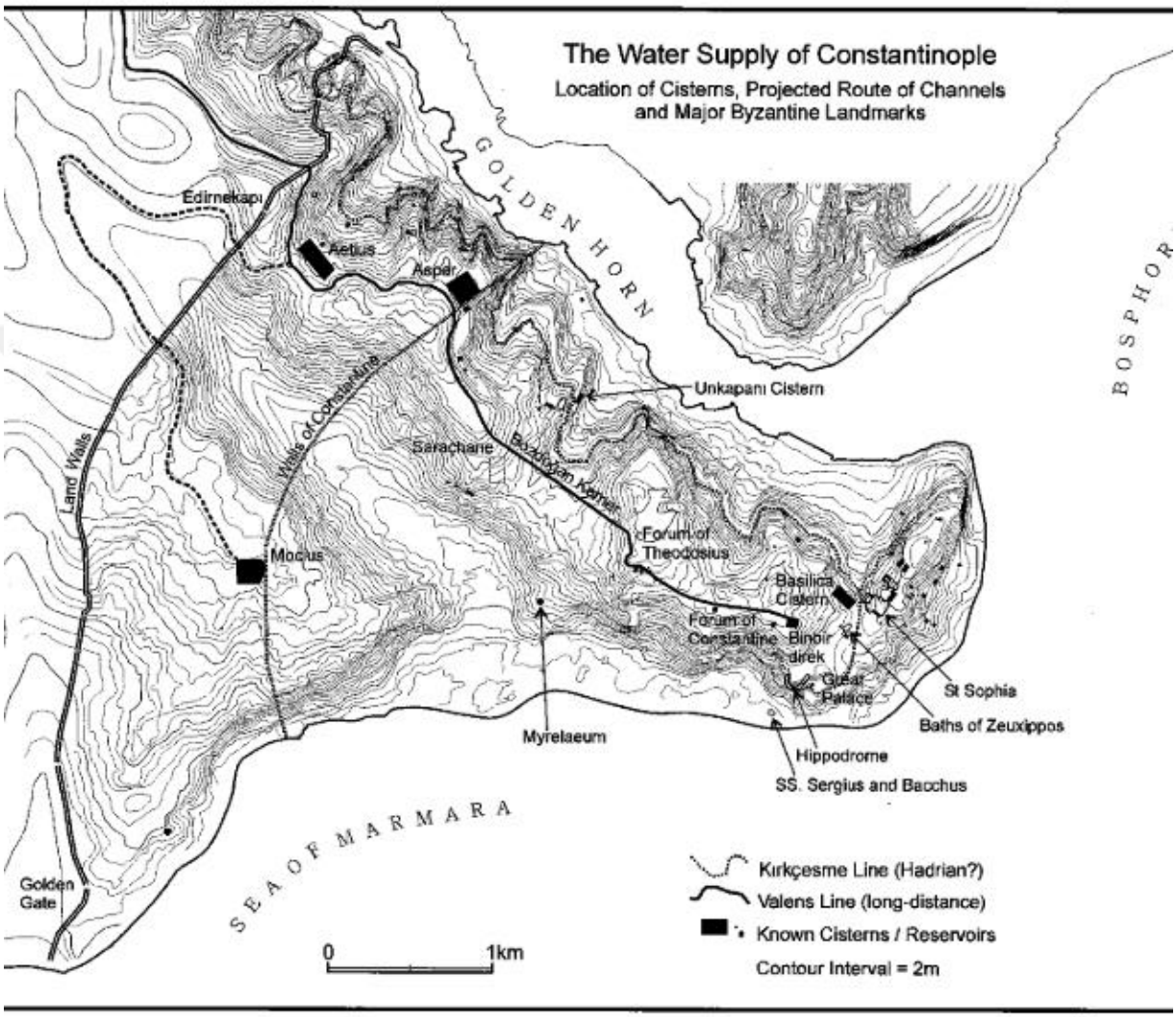


Fig. 1. Map showing the distribution of water within Byzantine Constantinople. Source: Drawing by R. Bayliss.

Figure 3.3. A closer look to Byzantine water distribution system (Crow, 2015)

Ottoman water distribution system followed the remains of Byzantine water distribution system. After Istanbul was taken by Ottomans, broken parts of Byzantine water line were repaired and became the base of Halkalı Water System. Halkalı water way was covering the area between Cebeciköy and Halkalı (Figure 3.4). There were 16 separate

distribution lines[27] that feed the city (Figure 3.5). Moreover, there were two other spring water lines for Rami and Davutpaşa Barracks which located out of the city walls, one line for Bakırköy and one line for Topkapı *meydan* fountain. Namely, they were more protected for contamination in comparison to water sources in reservoirs (i.e. Kırkçeşme Waters) and low in flow rate. Different water sources resulted in different designs in the transportation of water. There were three main drinking water collection types according to their sources: Collecting water from springs out of the city (Halkalı), collecting water from Belgrade Forest through galleries (Kırkçeşme) and the local subterranean water sources (wells) (*Tarih Boyunca Istanbul'un Su Davası*, 1950, p. 7).[28] Galleries are small dams, which collect waters than distribute it through pipes. Like Halkalı water system, the beginning of Kırkçeşme water main was based on former Byzantine supply system and it was built between 1554 to 1563[29] (Çeçen, 2000, p. 117) (Figure 3.5). The water flowed in closed *künk*[30] or lead pipes which protected the water along the way. Another element of Ottoman water system were water gauges. They situate along *künk* pipes in order to reduce the pressure in the pipes by avoiding accumulation of air. While Halkalı system had gauges over the main, Kırkçeşme had gauges only in the *künk* pipes -where it used- and did not have it on the main gallery (Çeçen, 2000, p. 122).

The water line was open for further extensions, so in demand, new branches could be added either by a *vakıf* or a donor. In order to do that they had to add a new water source to the main system. Adding new water sources to the increased the flow rate, s that they have also provided more water to the citizens (Çeçen, 2000, p. 68). This system was called "Katma" and Kırkçeşme system had 570 *katma*s. Thanks to this system, even in drought times, the whole system have carried more water in total. In order to collect water for dry seasons (especially August and September) Ottomans have

[27] Fatih, Turunçluk, Bayezid, Mahmutpaşa and Sultan the 3rd Mustafa, Süleymaniye, Mihrimah, Ebusuud, Köprülü, Cerrah Paşa, Sultan Ahmet, Saray Fountains, Beylik, Hekimoğlu Ali Paşa, Kasım Ağa, Nurosmaniye (Ayvalı River).
[28] I may add here cisterns as well yet they are not used as drinking water source in Ottoman Era. They were used mostly for irrigation.
[29] In 1554, only the ruins of the structures were standing The construction of Kırkçeşme Waterways was started at 1554 and lasted for 10 years because of a flood happened in 1563 and damaged some of the aqueducts including Mağlova, Uzunkemer, Ayvad (Kurt), Kovukkemer and Güzelcekemer (Çeçen, 2000, pp. 37, 46)
[30] Clay pipes, cement pipes

built 4 dams (bend) to collect water (Çeçen, 2000, p. 70). Former cisterns which were constructed mostly in Byzantine Era to collect water inside of the city for the drought times, were replaced by dams in Ottoman Era as they were getting bigger in scale, in order to collect water from outside of the city.

Figure 3.4. Halkalı Water Distribution System (Uzmay, 2019)

On the other hand, Galata was a relatively smaller settlement, located on the opposite shores of Golden Horn. Water collected from nearby hills and collected in small galleries in the area. After the conquest of Istanbul by Ottomans, an outstanding water need have occurred because of the rising population in Galata. In order to supply the need, new distribution lines have been built (Çeçen, 2000, p. 251). The ones from Leventçiftlik were flowing through Galatasaray, while the ones from Kasımpaşa and Kağıthane were flowing through the coast of Haliç.

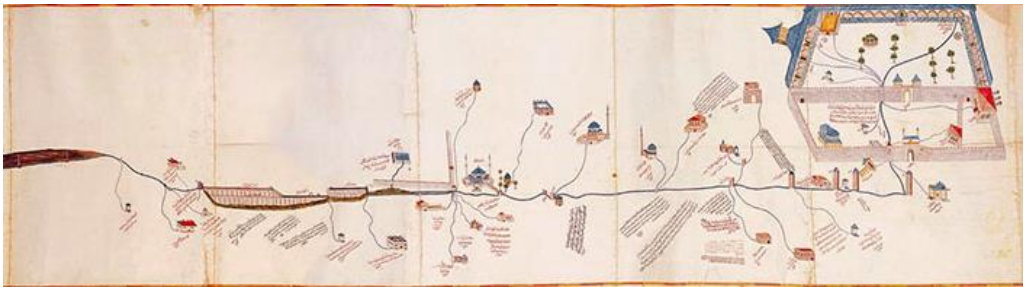


Figure 3.5: The last plate of Beylik Water Supply System, dimensions of the original work is 75x1098 cm. (Çeçen, 1991)

In 1731[31], I. Mahmut provided water to Bosporus shoreline as water scarcity was increasing. This line is known as Taksim waters (Çeçen, 2000, p. 252). To avoid water scarcity in the city, three dams have been built in order to collect water. In 1750 Topuzlu Bend, in 1797 Valide Bendi and in 1839 Sultan Mahmut Bendi was constructed.

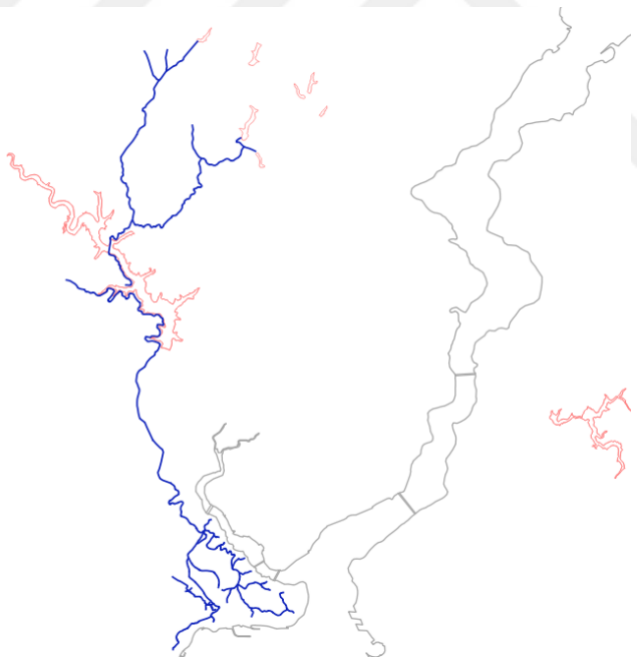


Figure 3.6. Kırkçeşme Water Distribution System (Uzmay, 2019)

[31] The system took its final shape in 1839 (Çeçen, 2000).

Taksim Maksem distributes the line through Kasımpaşa, İstiklal Street, Galata, Sıraselviler, Tophane (including the Tophane Fountain), Kazancı Yokuşu, Gümüşsuyu. Before Taksim Maksem, the line separates into Pangaltı, Kurtuluş, Teşvikiye and Maçka. Beşiktaş, Ortaköy, Yıldız, Kuruçeşme, Boyacıköy-Emirgan, Yeniköy (Figure 3.7).

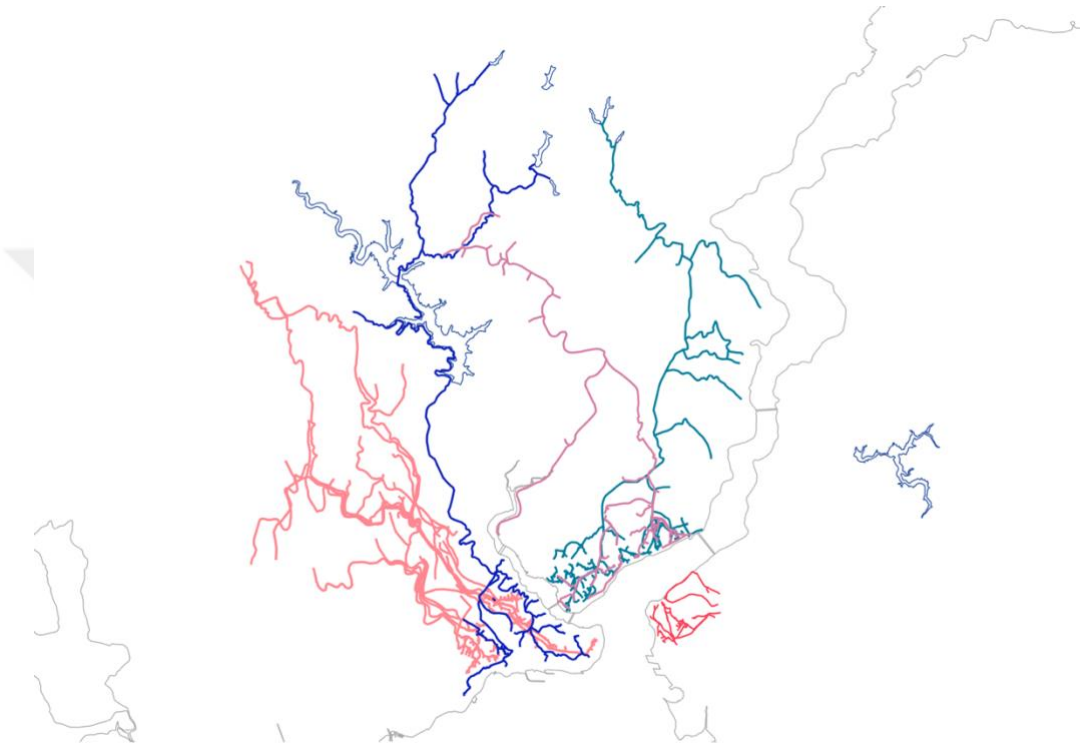


Figure 3.7. Taksim Water Distribution System is the green line. Whereas Halkalı and Üsküdar are red, Hamidiye is pink and Kırkçeşme water line is blue (Uzmay, 2019)

By late 18th century intramural Istanbul was supplied by Kırkçeşme and Halkalı mains, Galata was mainly networked by Taksim waterways and coasts of Bosporus was covered by Hamidiye waterways besides local wells (Figure 3.7). In the meantime, population of Istanbul was almost doubled (Dinçkal, 2008b, p. 683). Pera and Besiktas were mainly settled by new coming Europeans[32]. Existing water system was inadequate not only for supplying the needs of new settlers but also far from answering the

[32] For further reading on this issue see, Çelik, Z. (1993) The Remaking of Istanbul: Portrait of an Ottoman City in the Nineteenth Century. University of California Press, Akın, N. (2002) 19.Yüzyılın İkinci Yarısında Galata ve Pera. Literatür Yayıncılık.

requirements of modernity: hygienic and deodorized streets and clean water that accessible from taps in bathrooms. Modernization process, fire thread and public demand have resulted to construction of a modern water distribution network for the city (Dinçkal, 2008b, p. 684). In the transition to modernist water distribution technologies, the things that have associated with water have also changed. Once it was part of a public view, a reason (an instrument for) to gather and socialize[33], it became an agent of private space, starting its path from huge reservoirs, secretly running underground and finishes its path in the taps of the most private room in our houses. Together with its multi-scaled elements which help them to move in space, aqueducts, water gauges and fountains, water has buried underground, became hidden from the public eye. The water was limited from one big dam in one hand to a small tap on the other. Moreover, according to Matthew Gandy, they have created a "subterranean counterpart" of what was visible on the streets, therefore they have buried the circulation systems and eliminate the transparency of pre-modern city (1999, p. 26).

In order to keep pace with the rapid change in the city, in 1874, distribution of water in modern ways was commissioned to French campaign, *Compagnie des Eaux de Constantinople*.[34] The company was responsible for distributing water to military barracks, hospitals, schools free of charge as well as constructing 12 fountains for public. The company was also claiming that their charge would not be effected by seasonal changes in water as they were become rival *saka*s who were manipulating water price freely (Yurdakul, 2010, p. 36). In 1885 Lake Terkos was harnessed in order to supply water to the hills of Pera (Kentel, 2018, p. 43). In 1890 *Compagnie des Eaux de Scutari et Kadikeui* was established and Elmalı Dam was constructed between in 1893 in order to fulfil increasing needs of residents in Asian Side (Kazgan and Önal, 1999, p. 104).

[33] For role of water in Ottoman public space see, see Sahin, S., Sonmezer, S. and Kolay, I. (2015) 'Open space use in Ottoman daily life: Landscape of historical dams in Istanbul', Studies in the History of Gardens and Designed Landscapes, 35(4), pp. 279–289., Hamadeh, S. (2007) The City's Pleasures: Istanbul in the Eighteenth Century. University of Washington Press.
[34] The same French company was also operating in Venice, Naples, Trieste and Porto (Dinçkal, 2008a, p. 65)

Historical water ways were gradually abandoned through the modernization process of waterways in Istanbul. Especially after the establishment of the Republic and the nationalisation of foreign water companies accelerated the demise of abovementioned historical ways as the priority of the government was to strengthen the central and modern water distribution system.

3.2. Nationalization of Water Distribution System

After Ankara became the capital of the Turkish Republic, Istanbul was abandoned and the governmental branches were transferred to Ankara. In 1930 and the following years, Ottoman law system which were related to governance and the development of the city, was completely abandoned in order to prepare the city for its modern look. In 1930 the administrative forces have been gathered under a "common administration (*müşterek idare*)" and the governor of the city became responsible for both municipality and provinces alongside with "City Council (*Umumi Meclis*)" (Tekeli, 2013, p. 129)[35]. In 1923, with the establishment of Turkish Republic, *Compagnie des Eaux de Constantinople* has already changed its name as "Istanbul Turkish Anonymous Water Company (*Istanbul Türk Anonim Su Şirketi*)" and the pressure about nationalization of the foreign corporations has started (Figure 3.8). Water, electricity, gas and transportation were all being managed by foreign companies.

In 1930, with the Public Health Law, Istanbul Municipality was commissioned to furnish Istanbul with infrastructure network. In addition later with the law number 1580, "Municipalities Law", purview of the municipalities have been broadened and all of the infrastructural investments were assigned to the municipality which transects with the republican move towards nationalization of foreign infrastructural companies in Istanbul (Tekeli, 2013, p. 129). However, lack of financial resource was always an obstacle for the municipality Istanbul was left with questions about its future life. Question of what the foundations of Istanbul's economy would be was obscured

[35] Municipality was consisting of 10 branchs, including Eminönü, Fatih, Bakırköy, Beyoğlu, Beşiktaş, Sarıyer, Beykoz, Üsküdar, Kadıköy and Prince Islands. (Tekeli, 2013, p. 129)

because of 1929 World Economic Crisis and Statism policy of Turkish Republic (Tekeli, 2013, p. 127).

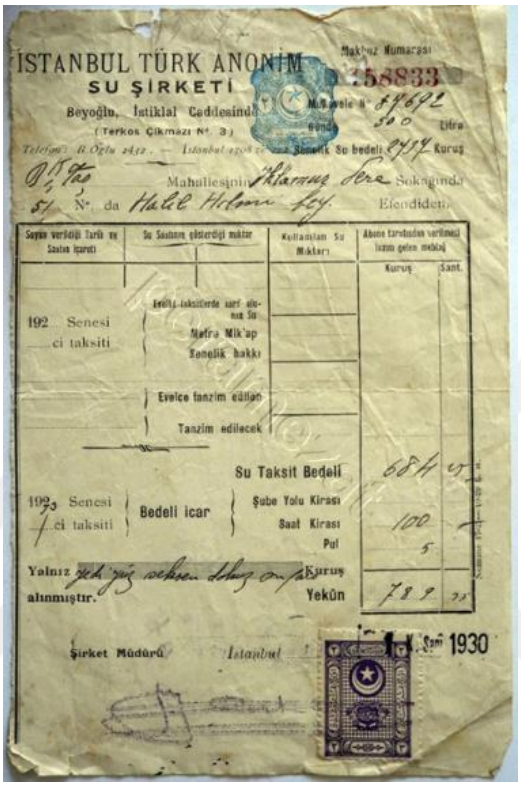


Figure. 3.8: Invoice of *Istanbul Türk Anonim Şirketi,* 1930 (*Istanbul Türk Anonim Su Şirketi*, 2018)

There were complaints on the inefficiency of Terkos water company for a long time. During 1908 Second Constitution they put pressure on the company since it couldn't provide the need of the citizens whereas it didn't work (Erdem, 1948, p. 6). In the meantime, Cemil Paşa, the mayor of Istanbul in 1912 , claimed that future of water is too important to be handed in to a foreign company, it should be given to Istanbulites (Ergin, 1996, p. 501). After the foundation of the Republic, in order to manage the newly nationalized companies, with two separate laws, 2226 in 1933 and 3645 in 1939 Istanbul Sular İdaresi and İETT (*Istanbul Elektrik Tramvay Tünel*, Istanbul Electricity, Tram Tunnel) , were established to accomplish "municipalization" process of Istanbul (Tekeli, 2013, p. 129).

Existing literature pictures a badly maintained company with a hardly working supply system (Figure 3.9). In 1908 the company could provide 45.000 m3 water for the city, whereas the city was in need of 200.000 m3 of water per day (Erdem, 1948, p. 6) and most of the pipes were filled with dirt and it resulted to reduce their capacity during transportation and the pumping equipment was in bad shape. Nearly %45 of water was wasted along the way due to the poor maintenance of pipes (Erdem, 1948, p. 7). Water was not chlorinated enough and without any or less treatment, it was given to the city. In most of the neighbourhoods water pressure was so low that the higher levels of the apartments couldn't have water from their tap although they have enough equipment (Erdem, 1948, pp. 6–7). After this nationalization move, the maintenance had needed to be repaired or be changed since it hasn't been taken care for a long time. The first concern was to reform what was in hand.

First reform (*ıslahat*) plan after nationalization was performed by Burhanettin Berken, professor on hydrology in Technical University (Erdem, 1948, p. 8). His plan was to rebuild the delayed infrastructure in three stages: increasing the amount of water per day to 45000 m3, than 65000 m3 and gradually making it 165000 m3, gradually. In addition to main Terkos water, they have planned to open a well in Çırpıcı, to supply the water need of Bakırköy area with the capacity of 25000 m3 (Erdem, 1948, p. 9) [36]. Berken's plan was started in 1933, which was interrupted by WWII, and applied till 1947 (Erdem, 1948, p. 13).

In the first stage, after buying the water company, ISI had increased the capacity of Terkos pumping station by repairing and transferring unemployed pumps in Hamidiye waters and controlled leakages on the water network. By using the idle pipes, they have doubled Kağıthane main with 600 mm pipes and increased the distribution capacity (Erdem, 1948, pp. 8–10). Kağıthane facility was built in 1926 as one of the last improvements of the water company in order to filter the water that was coming from Terkos Lake (Erdem, 1948, p. 6). As the amount of water was increasing, new pools

36 The beginning date of Burhanettin Berken's plan is not mentioned specifically in the report of "Istanbul Sular İdaresinin 1933-1947 Yıllarındaki Çalışması". Yet the report approaches the operations of the abovementioned period with three stages: 1933-1939 before the war, 1939-1945 war period and 1945-1947 after the war (Erdem, 1948, p. 13).

have been added to Kağıthane facility in late 1930s (Erdem, 1948, p. 14). Kağıthane Supply Station became the first stop of flowing water of Terkos till 1950s. From Kağıthane, water was distributing through Feriköy facility in order to flow into Beyoğlu and Boğaziçi and to Eyüp and Edirnekapı in order to supply Topkapı and Fatih (Figure 3.9). [37]

[37] In the meantime Üsküdar-Kadıköy Company was bought by the government and in 1937 and the management of water supply in Istanbul was centralized under ISI. In 1937 Erenköy, Haydarpaşa and Üsküdar was networked with new pipes (Erdem, 1948, p. 29). There were two lines were covering Asian Side, rooted in Elmalı Dam yet the amount was not enough (Erdem, 1948, p. 29). Especially in summer time as population of Marmara shores was increasing, places like Suadiye, Göztepe, Ereknöy and Kalamış were obliged to night time water for a short amount of time (Erdem, 1948, p. 29). After construction of a water supply station in Kuzguncuk together with new conduit, İcadiye, Kızıltoprak, Kalamış, Çiftehavuzlar and Kadırga Street has received water for all day (Erdem, 1948, p. 29). Line has been expanded from Bağlarbaşı Reservoir to İçerenköy with 300 mm pipes (Erdem, 1948, p. 30). By 1939, another line has been installed from Bağlarbaşı Reservoir to Üsküdar Pier which was responsible for carry water to Büyükada (Erdem, 1948, p. 30). Transferring water from Üsküdar to Büyükada with lush ships has started in 19th of August, 1939 (Erdem, 1948, p. 30). Because there was no sewage system in the island, ISI was providing additional water for them to fill their cisterns in spring yet the projects in Büyükada was interrupted by WWII (Erdem, 1948, p. 31).

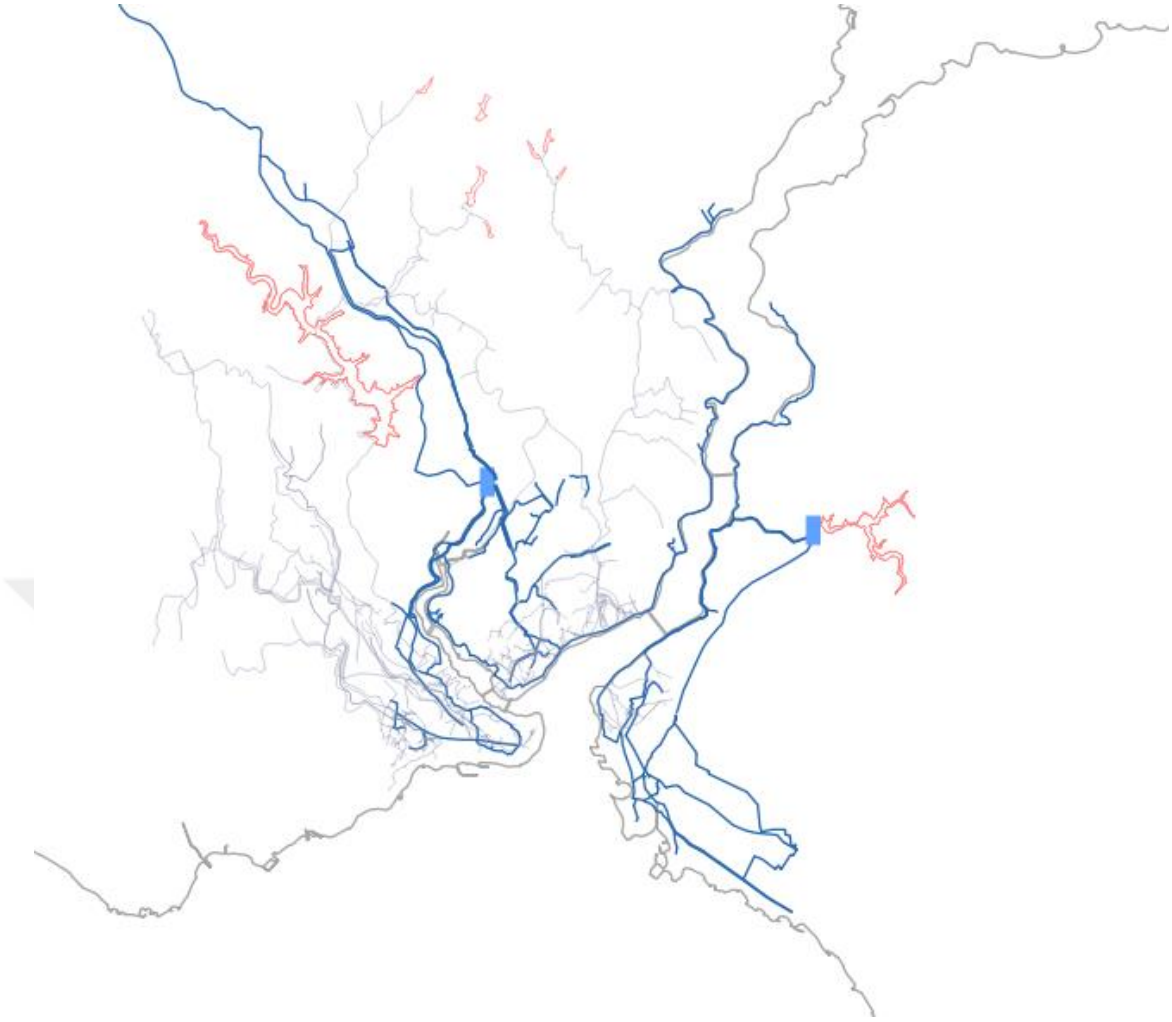


Figure 3.9. The bold line indicates the Terkos water system. The thin line in the background represents the historic water ways which were still in use at that time. Terkos and Elmalı Water Distribution System before nationalization of the system (Uzmay, 2019)

Another problem was application of inappropriate sizes in site. This resulted a hierarchy in water access, both in nearby geographies and in the same apartments. Especially in Beyoğlu only ground levels could have tap water while others were using water pumps in order to collect water in water tanks on rooftops. Places like Ayaspaşa, Cihangir and Tepebaşı were suffering from the same issue (Erdem, 1948, p. 10). Burhanettin Berken's "modern attitude" have solved this "misery" via increasing the amount of water supply of the city by %25 (Erdem, 1948, p. 11).

In 1937, there were different water sources in use, simultaneously. Former waterways from Ottoman Empire was still in use in the older parts of the city. Terkos water was another option and it was promoted by the government covering a geography from Topkapı to Bosporus in Europe, together with private wells[38]. Yet using the "old fountains" were always the topic of discussions and seen as contrary to modernist approach. In the Asian side, there was still *Compagnie des Eaux de Scutari et Kadikeui* (till 1939). The name of modern water distribution system in the city became "Terkos water *(Terkos suyu)"* for both sides of the city for a long time.

Water borne diseases were long term problem in Istanbul[39] . Typhoid was the last straw and after that usage of old water ways were cut, gradually. In 1937, typhoid was first seen in Fatih, where water was flowing through Kırkçeşme Waterways (Figure 3.6). Water of existing Kırkçeşme fountains had been cut right after by the prohibition of the Municipality of Health. ISI had built 92 new Terkos fountains in the area in order to compensate the idle ones (*Cumhuriyet*, 1937).

38 It is important to mention here that there are two types of "well systems" that I have been mentioning in the thesis. First there are wells that dates back to Byzantine era, used both in Ottoman and today's Istanbul. They mostly used for irrigation. For more information see Shopov, A., & Han, A. (2013). Osmanlı Istanbul'unda kent içi tarımsal toprak kullanımı ve dönüşümleri: Yedikule Bostanları. *Toplumsal Tarih*, *236*, 34-38.
and Ayhan, H. A. N. ISTANBUL VE GALATA HENDEKLERİNDE KENTSEL TOPRAK KULLANIMI. *Tarih Dergisi/Turkish Journal of History*, (64), 27-71.

39 See Kurt, B. and Yaşayanlar, İ. (eds) (2017) Osmanlı'dan Cumhuriyet'e Salgın Hastalıklar ve Kamu Sağlığı. Tarih Vakfi Yurt Yayinlari., Doğan, C. (2018) 'Fareler ve İnsanlar: 20. Yüzyılın Başında Galata'da Hijyen, Veba ve Farelerle Mücadele', Kebikeç, 43, pp. 329–345.

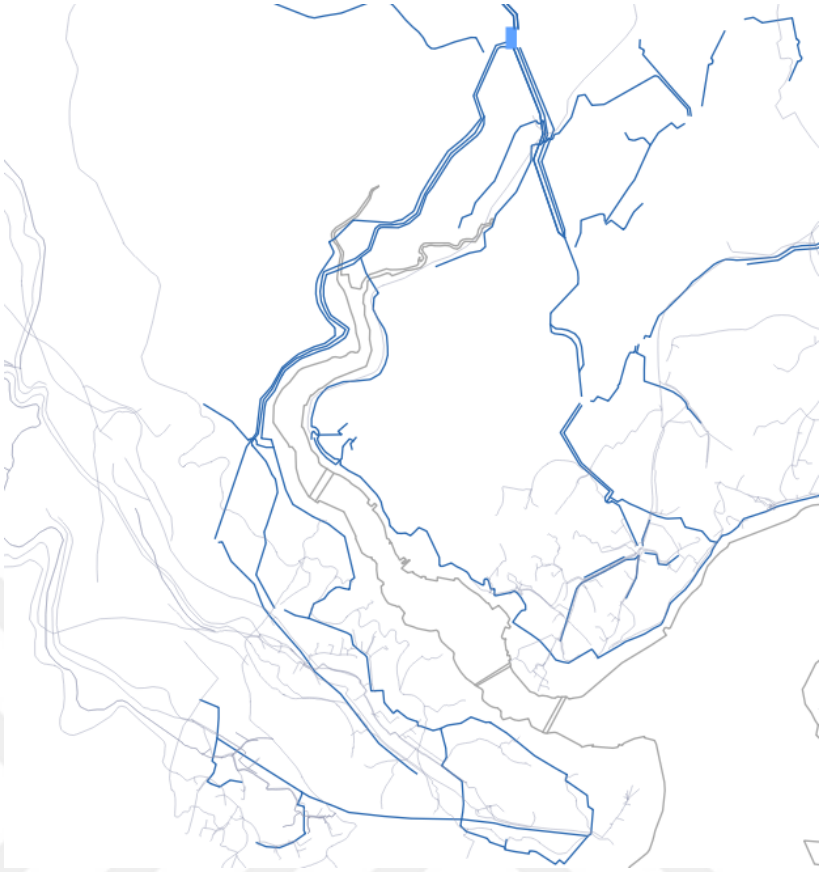


Figure 3.10: The bold line indicates the Terkos water system. The thin line in the background represents the historic water ways which were still in use at that time. From Kağıthane, water was distributing through Feriköy facility in order to flow into Beyoğlu and Boğaziçi and to Eyüp and Edirnekapı in order to supply Topkapı and Fatih, a closer look to 1930s water distribution system, just before nationalization (Uzmay, 2019)

Ziya Erdem states in his 1933-1947 ISI Report that "It is possible to measure the level of civilization via water consumption of our people." and points out that the water consumption of people has been doubled since 1932 in comparison to mid 1940s (1948, p. 38). "It is also the necessity of civilization" he continues, "to furnish public fountains to supply the water needs of citizens. Water was coming clean until the fountain and in the way home -as especially it was carried by *saka*s it became contaminated. Instead of building more fountains, removal of them was necessary as Erdem claimed (1948, p. 39). Instead, in 1938, right after typhoid outbreak in Fatih, the number of fountains was 196, it increased to 226 in the European side, 43 in the Asian side by the end of 1946

(Erdem, 1948, pp. 24–36). The symbol of modernism was to furnish every single house with tap water in order to avoid extra contacts during the journey of water. However the plan was too expensive and couldn't be able to catch the rapid industrialization that happening in Istanbul. Moreover, it was war time for Europe, and Turkey was dependent on imported technical materials for building its water infrastructure (Figure 3.11).

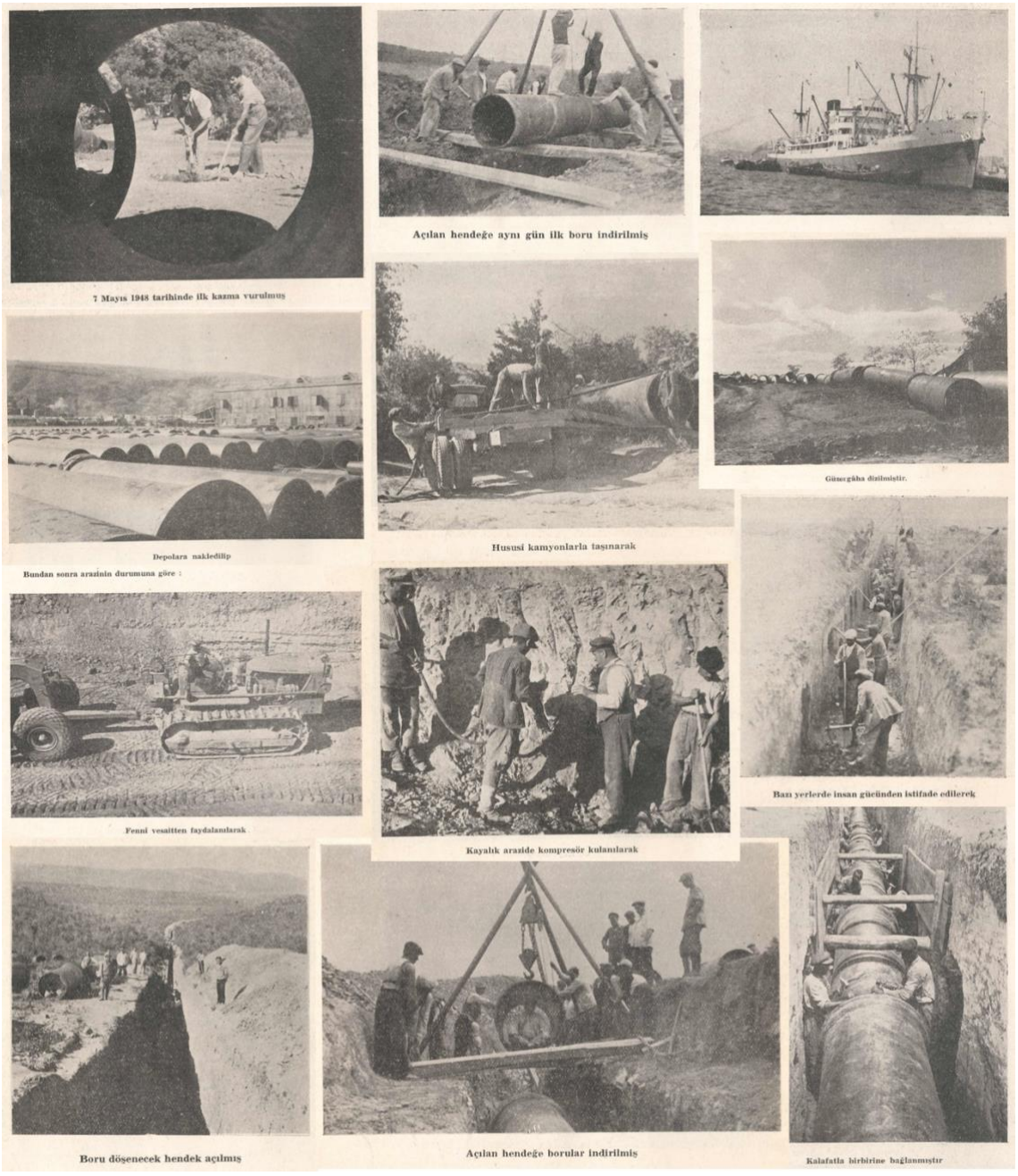
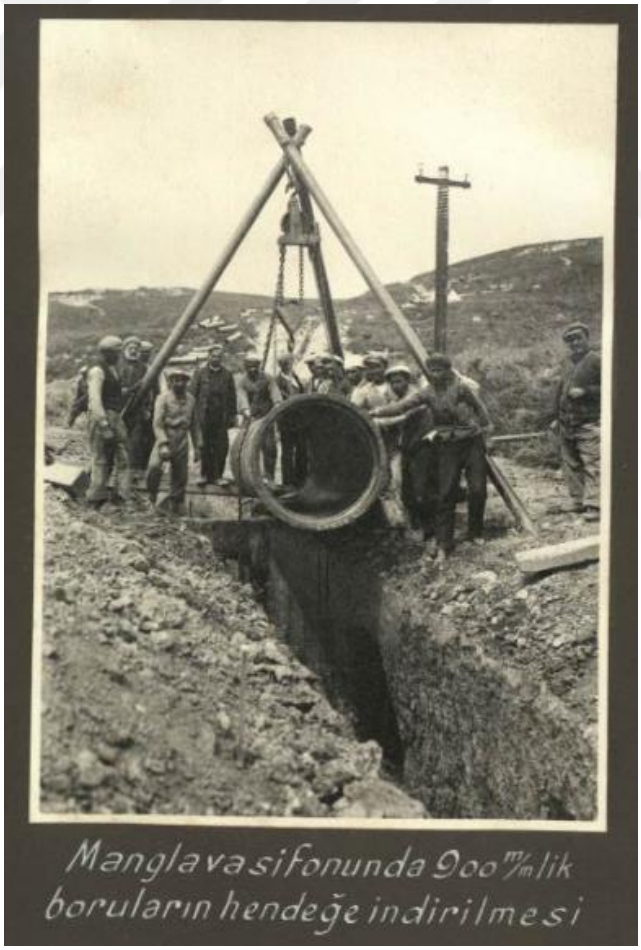


Figure 3.11: After the war and material scarcity ended, Berken's plan were put into action (*Tarih Boyunca Istanbul'un Su Davası*, 1950).

In 1941, Lütfi Kırdar, the mayor of Istanbul, claimed that, just by using and investing on Terkos water system, Istanbul gained seven times of water in comparison to previous conditions. “It was impossible to invest on their restoration in the given circumstances”, he added. “Our goal is to remove all public fountains. Water should be at our service in houses, for each storey. The water that was carried via dirty plastic containers and dirty hands should be part of the past.” (‘Istanbul Belediye Mecmuası’, 1941). But that wish will later be interrupted by *gecekondu* crisis and the following water scarcity. According to ISI report, there were 802 fountains in 1957 (1958, p. 10). Yet, public fountains and lack of infrastructure were not only associated with rapidly increasing *gecekondu* settlements but new housing projects also lack of proper water infrastructure in general[40].



[40] For more on this issue see Chapter 3.3.

Figure 3.12: "Installation of 900 mm pipes in Mağlova (Manglava)" (*Terkos fabrikası inşaatı ile bazı yerlere yapılan terfi istasyonları inşaatı albümü*, no date)[41]

In 1938 Cumhuriyet, it was reported that, using of Kırkçeşme water source would continue according to the projects of ISI by transferring Kırkçeşme waters to Terkos main (*Cumhuriyet*, 1938). In 1939 they changed one of the 600 mm pipes in Mağlova with 900 mm ones (Figure 3.12) (Erdem, 1948, p. 19). After construction of water supply station in Mağlova[42], Kırkçeşme waters have transferred into Terkos Kağıthane Gallery and then serviced into city network (Esmer, 1983, p. 55) (Figure 3.9). Rest of Kırkçeşme waters, later in 1967, transferred into newly built Keçesuyu Treatment Facility[43]. After the amount of Terkos water was increased, all Kırkçeşme water was assigned into Keçesuyu station to and then to Gaziosmanpaşa Station (Esmer, 1983, p. 40) together with newly constructed water tanks in Osmaniye (Esmer, 1983, p. 83). By 1950s, using Kırkçeşme, Halkalı and Taksim waters were prohibited by the health authorities (Dinçkal, 2008b, p. 697). Taksim waters was transferred into Hacıosman Treatment Facility which was built in 1950, through Kefeliköy and mixed into Terkos conduit (Figure 3.13) (Esmer, 1983, p. 40). However, we know that, Halkalı waters were continued to be consumed in 1970s. Both for irrigation as intended and unfortunately, as a drinking source which resulted in the cholera epidemic in Sağmalcılar. Halkalı waters had a more suitable hardness as a drinking water rather than well waters.[44]

[41] I am thankful to Göktuğ İpek for introducing me this photo album.
[42] It was electrified in 1951. (Esmer, 1983, p. 55)
[43] This facility is renovated and turned into "Gaziosmanpaşa Belediyesi Çocuk ve Kadın Korrdinasyon Birimi" in Bağlar, Gaziosmanpaşa.
[44] For more on this issue see Chapter 4.

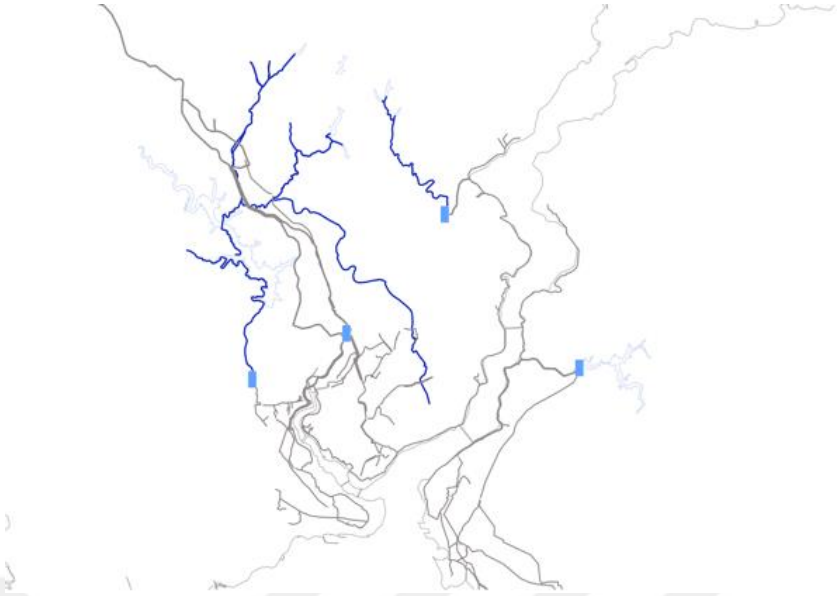


Figure 3.13: Connecting Kırkçeşme and Taksim to the centralized network (Uzmay, 2019)

3.3. Wells vs Terkos Water: Fragmentation from 1952 to 1963

Terkos water main was covering a small portion of Istanbul. Especially places like Bakırköy, Beykoz, Kartal and Tarabya were located outside of this network because of their geolocations. By Burhanettin Berken's plan, local sources like artesian water sources in Çırpıcı, which could supply relatively wider areas, would be in use. According to the plan, water from Çırpıcı wells would be distributed through Bakırköy and Yeşilköy, while excess water would be transferred to Terkos system (Erdem, 1948, p. 32). Although the survey of the artesian water was completed in 1939, it was the time of WWII and the plan was interrupted since both the machinery and the pipes were imported from Europe. Finally in 1946, by the end of war, with the imported machinery from Europe the wells could be opened (Erdem, 1948, p. 33). In 1947 Çırpıcı waters was connected into Edirnekapı Water Reservoir as planned, in order to transfer the excess of Çırpıcı waters (Esmer, 1983, p. 58). By that, for the first time, western side of the city, which were fragmentally constructed, was connected into central water network in the European side.

In 1960 by law number 167, usage, investigation, protection and legislation of underground water was controlled by the state, under the governance of State Hydraulic

Works (DSİ). DSİ was established in 1954, by law number 6200. According to the modernist discourse, taming nature by constructing huge dams is the celebration of man over nature.[45] "The dialect between the production of nature and the production of cities is paradigmatically manifested in dam projects: transmuting 'natural' landscapes in their making, while making the production and expansion of urban landscapes possible, these technological shrines exemplify the messy dialects between creation and destruction inherent in Modernity's promethean Project" (Kaika, 2006, p. 77). Tenessea Valley Authority in USA, Dnieperostroi in Soviet Russia, Aswan Dam in Egypt and Keban in Turkey were all demonstrations of triumphs and different versions of spectacle (Bozdoğan, no date). The aim of the institution was to govern, plan, improve and manage all kind of water sources; underground, surface or flowing, by state.

Underground water was an important source especially to supply water for the outside of the municipal borders of Istanbul. *Gecekondu* settlements were fed by local water sources but also places like Ataköy, Florya used underground waters. In 1965 four wells were drilled to supply water for Ataköy residential and recreational area (DAMOC, 1971a, p. I-46).[46] For "summer holiday houses, tourist camps and other recreational facilities" at Florya, Istanbul Municipality have opened wells in 1952 (DAMOC, 1971a, p. I-46). From far north of Istanbul, Tarabya Hotel in Tarabya, factories in Beykoz to southeast of Istanbul, industrial areas in Kartal, were dependent on well water and the "impermanent infrastructure islands" were proliferating.

After WWII, demography of Istanbul has changed tremendously. To answer water needs of the increasing population, another plan was prepared by ISI in 1952. According to the plan, Istanbul has needed 250 m3 additional water source and it was decided to sustain the city with three main water sources; 200.000 m3 from Terkos,

[45] See Kaika, M. (2006) 'Dams as symbols of modernization: The urbanization of nature between geographical imagination and materiality', Annals of the Association of American Geographers, 96(2), pp. 276–301., Demirtaş, A. (2013) 'Rowing Boats in the Reservoir: Infrastructure as Transplanted Seascape', in Pyla, P. (ed.) Landscapes of Development: The Impact of Modernization Discourses on the Physical Environment of the Eastern Mediterranean. Harvard University Press.
[46] Emlak Bankası was established in 1957.

10.000 m3 from Çırpıcı and for Asian side 40.000 m3 from Elmalı (Esmer, 1983, p. 62).[47] This program was applied between 1953 and 1962.[48]

In 1888 Terkos connection with Karadeniz had been cut to hold water in the lake. Although water floods were typical in the area especially around 1880s, particularly after this event, floods became the subject of complains (Yurdakul, 2010). The older water blockage was changed with a new one to hold more water in the lake (Esmer, 1983, p. 65). As water was increasing in Terkos the third line between Kağıthane and Terkos has been projected by ISI which could have guaranteed the water of the European side for a long time. The project was too expensive to be realized and instead of the third line, Alibey Dam project has been erected (Esmer, 1983, p. 71).

After second water main was finished another water supply station had been built on the line in Kemerburgaz, in 1959 and 1961 gradually (Esmer, 1983, p. 67). Between Feriköy and Kasımpaşa another line was constructed together with Feriköy-Bomonti line (Istanbul Sular İdaresi, 1958, p. 6). A new line has been built between Kağıthane and Baltalimanı in order to connect Bosporus shores and northern part or the city with central Terkos water (Esmer, 1983, p. 64) Ten new water tanks have been built as two in Feriköy, 2 in Baltalimanı, 4 in Edirnekapı, 2 in Altunizade and total storage capacity was increased into 115.000 m3 (Esmer, 1983, p. 65).[49] A new artesian water well has been drilled for Şenlikköy village as 10 other wells dated back to 1952, were taken over by ISI (Esmer, 1983, p. 66). Another artesian well source had been drilled in Zeytinburnu (Esmer, 1983, p. 65) (Figure 3.14).

[47] For the first phase of the plan, amount of water per person was 200 per day while for the second phase they have calculated as 250 m3 per person per day (Esmer, 1983, p. 62). Projected amount of water per day is relatively exaggerated per person. In 1980s it was projecting as 150 m3 per person per day and now it is 190 m_3 per person. Yet, today with the discussions on "Day Zero", it is claiming that we are using so much amount of water that it may have to decrease the amount to 25 m_3 per person per day if we go continue to consume that much.

[48] The loan for the first phase was provided by Emlak Kredi Bank, and it lasted for 1957 (Esmer, 1983, p. 63). There was also a 2nd phase of the plan yet before the application of the plan, new plans have been released.

[49] These tanks collect water during daytime in water consumption hours. Later, they distribute the collected water depending on the availability of network's status, especially in conditions of malfunctions in any distribution lines and pump stations. (Istanbul Sular İdaresi, 1958, p. 6).

The central water distribution system was fragmented and constituted by water pumping stations, treatment facilities, water tanks, distribution pipes, and wells. While distribution pipes were covering the Istanbul Municipal border area (Figure 3.15) outside of this area were supported by local sources, wells, as it was too difficult to connect them with the existing lines (Figure 3.14). Existing water distribution system was networking the municipal borders to supply water in these areas. By 1958, although we started to see a "networked city" it was far from distributing water equally. Şişli, Nişantaşı, Maçka, Talimhane and Kurtuluş cannot take water at night by 10 hours whereas in Beyoğlu, Cihangir and Ayazpaşa neighbourhoods can receive water nearly all day but limited to lower levels like Galata, Hasköy and Sütlüce (Istanbul Sular İdaresi, 1958, p. 13). While Beşiktaş had no problem in receiving 24 hours water rest of Bosporus shores had water scarcity due to the drought in Büyükdere dams (Istanbul Sular İdaresi, 1958, p. 13). It was solved by carrying water via ships to Tarabya pump station (Istanbul Sular İdaresi, 1958, p. 13). Levent receieved 9 hours water in a day (Istanbul Sular İdaresi, 1958, p. 13). Amount of water with the existing pipelines was not enough to fulfil even the needs of equipped neighbourhoods.

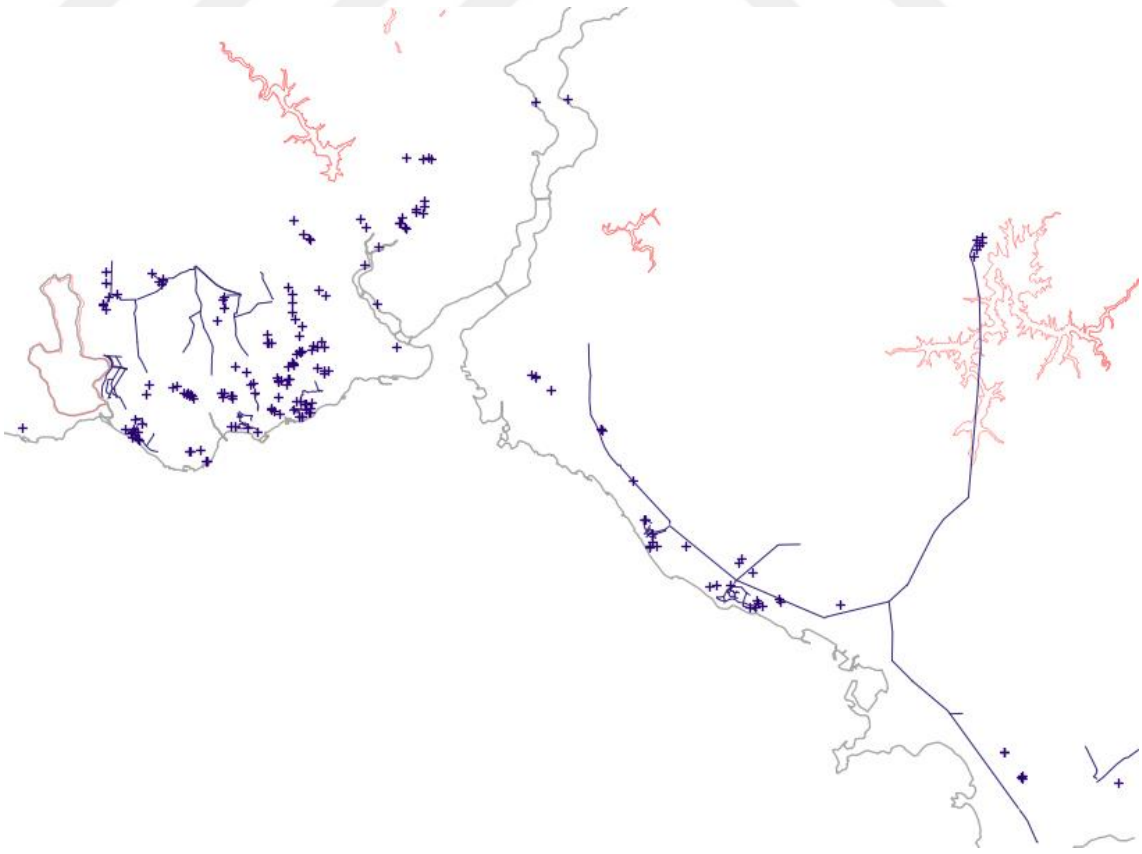


Figure 3.14. Network of wells 1970 (The wells that are indicated here have the average yield of 2lt/second) (Uzmay, 2019)

Urban planner and sociologist İlhan Tekeli defines two types of infrastructures: those that pay for themselves and those that do not (*karşılıklı* and *karşılıksız*). On the one hand, infrastructures like electricity, water and transportation reciprocally pay their cost of application since the user constantly pay the service cost of water or electricity. On the other hand, for the infrastructures like sewage systems, service cost should be paid at first, and they do not pay for themselves because their services are not charged (2009, p. 125)[50]. Because of this, it was used to be hard to fulfil the application cost of infrastructures like sewage systems until pricing of sewages started. The solution for it was to charge sewage systems together with water supply systems and calculate the waste water and consumed water together (Tekeli, 2009, p. 126).

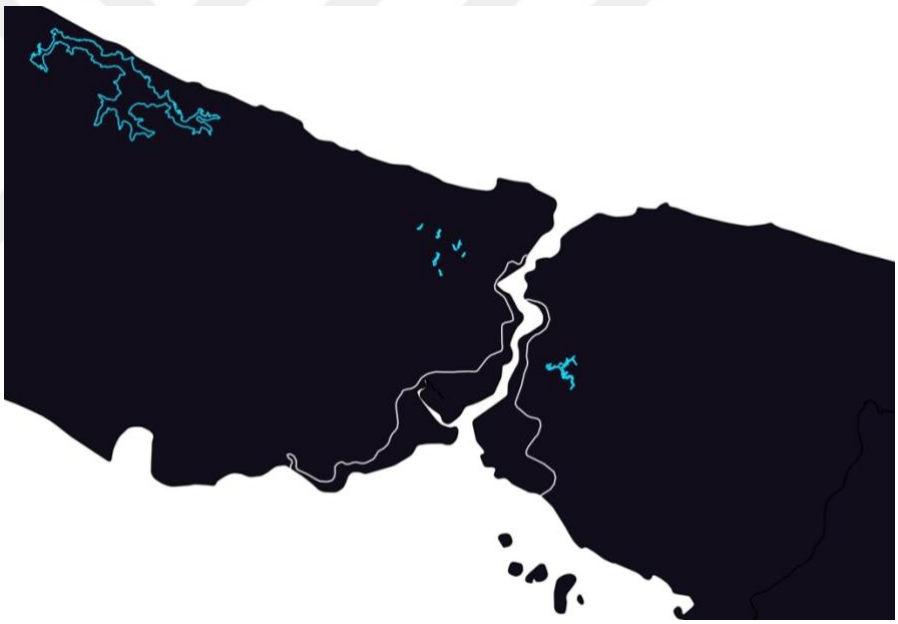


Figure 3.15: Boundaries of Istanbul Metropolitan Area (Uzmay 2019)

In newly built areas (even in non *gecekondu* areas), the residents were dependent on public fountains, which were carried by related municipalities, and exposed to unequipped houses (Enerji ve Tabii Kaynaklar Bakanlığı, 1964, p. 18). " These newly constructed expensive houses, cannot fulfill the hygiene standards of the owners. Moreover they will be home to 60.000 people after the construction is over. This

[50] Tekeli's talk took place at Revolutionary Municipalities Association (*Devrimci Belediyeler Derneği*) in 18th and 19th of June, 1976.

problem shouldn't be underrated" (Enerji ve Tabii Kaynaklar Bakanlığı, 1964, p. 18). It was also mentioned in the report that a newly built hotel was not connected to the city network (Enerji ve Tabii Kaynaklar Bakanlığı, 1964, p. 17).

Moreover in Istanbul, there are only few examples of housing projects that was ready in infrastructure, i.e. Levent neighbourhood. "Levent farm area was raw when it was bought from the municipality. Subdivided according to fundamentals of urbanism and construction has started after completion of civilised facilities like road, water, sewage and electric." (Aru and Gorbon, 1957, p. 174). Levent Neighbourhood was exceptional in Istanbul. Even some of the cooperatives or hotels couldn't follow up with Levent[51] (Figure 3.16).

Figure 3.16: Levent Neighbourhood, with the shadow of its water tower (Aru and Gorbon, 1957).

51 "Beşiktaş Balmumcu semti Jandar Yapı Koop, Bakırköy Sümer Teknik İşçileri Yapı Koop or Emekli Sandığı Tarabya Hotel couldn't be connected to central water network because of insufficient water in main Terkos Reservoir in 1961 (Istanbul Sular İdaresi, 1961).

In *gecekondu* neighbourhoods, the relations over the ground -therefore visible- have been strengthen before the engagement of underground elements. Yet, in modernist plans like Hobrecht's Berlin, these relations were already planned and there was no chance for coincidence as the subterranean connection were furnished before.

3.4. Broaden Istanbul's Horizon to A Regional Scale

According to 1958 ISI report, construction of third water main between Terkos and Kağıthane should be started immediately. (1958, p. 11). Both the Asian side and the European side of the city, including villages and industrial areas, faced to a major water scarcity. Therefore "in our times, before considering the water problem of a village or a city, water problem of the whole region should be considered. It was declared in 1958 ISI report that the water problem of the area from Istanbul to İzmit should be the first interest of the Turkish Government" (Istanbul Sular İdaresi, 1958, p. 12). This is a reminder of Wagner's regional plan of Marmara. His plan was focusing on the hinterlands of the city in order to emphasize the image of networked city. Industry, water need, road network and food supply were planned according to covering the needs of the whole region (Wagner, 1935). His plan couldn't be applied when he proposed. As Tekeli argues, it was way beyond its time as the plan tackled economical possibilities of the country in relation to urban planning (2013, p. 134).

By 1960, the population of Istanbul was almost doubled after 30 years (Table 3.1). Moreover, "Greater Istanbul" was 1.680.000 whit total of municipal adjacent areas (Enerji ve Tabii Kaynaklar Bakanlığı, 1964, p. 8). According to the Report in 1964, Istanbul Sular Idaresi was able to afford %80 of the population (within the municipal borders). It includes industrial areas (by %7), housing areas, public buildings (by %88) and public fountains (by %5) (1964, p. 13). Contrary to Terkos Company, all water was charged by the administration and the cost of public fountains were in the responsibility of municipalities[52] (Enerji ve Tabii Kaynaklar Bakanlığı, 1964, p. 13).

[52] It was a burden for municipalities since they need to pay for fountain water.

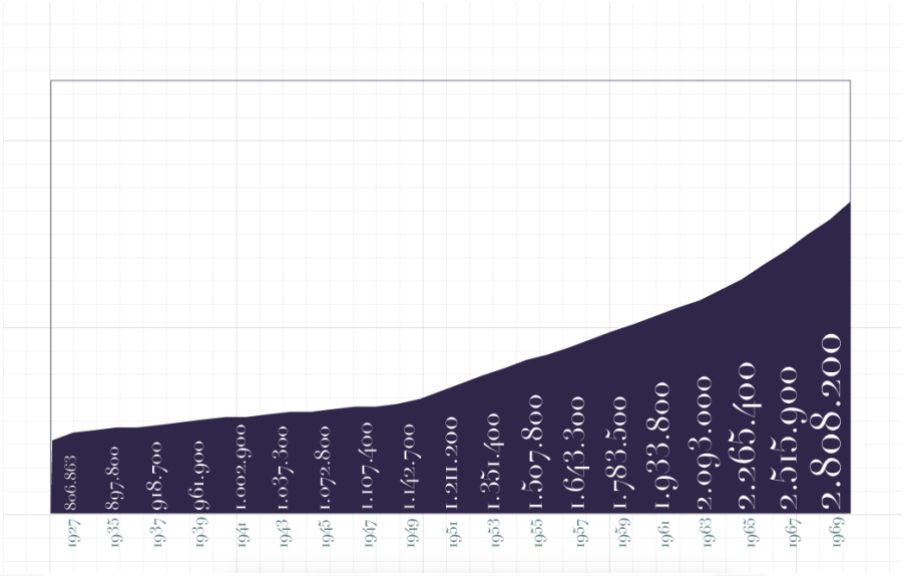


Table 3.1: Population change of Istanbul (data from *Sayılarla Istanbul*, 2001)

By 1960 there was a dual scene in terms of water networks (Figure 3.17). On the one hand there was the network of wells[53] and on the other the network of central water[54]. While network of wells were serving mostly for immediately urbanized areas, the old settlements of the city were connected to networks of central water. This duality between two systems demonstrated the image of incomplete modernization. Wells were answering the immediate needs of settlers whereas their limit was restrained with subterranean sources. The subterranean source in Çırpıcı for example, was threatened by decrease in water level and salinization by sea water. Another threat was contamination of underground water since there was an insufficient sewer system in the city. It was dangerous both for the consumers of that source and factories which gather water from those wells, especially the ones who use that water in food production (Enerji ve Tabii Kaynaklar Bakanlığı, 1964, p. 17).

[53] They have existed as network islands, in some places completely separate from each other, in some places occurred as small network of wells.

[54] Terkos on the European side, connected with Kırkçeşme and Taksim waterways, Elmalı on the Asian side. Namely there are two main water reservoirs in each sides. There were relatively small and poor spring water sources like Kayışdağı which were not connected to the main lines thus continue their old route as in Ottoman Era. For more information on spring waters in Istanbul see Çeçen, K. (2000) Istanbul'un Osmanlı Dönemi Su Yolları. Edited by C. Kolay. Istanbul: İSKİ. There is also a map of spring waters in Esmer, K. (1983) 'Tarih Boyunca Istanbul'un Suları ve Istanbul Su ve Kanalizasyon Sorunu'. İSKİ Genel Müdürlüğü.

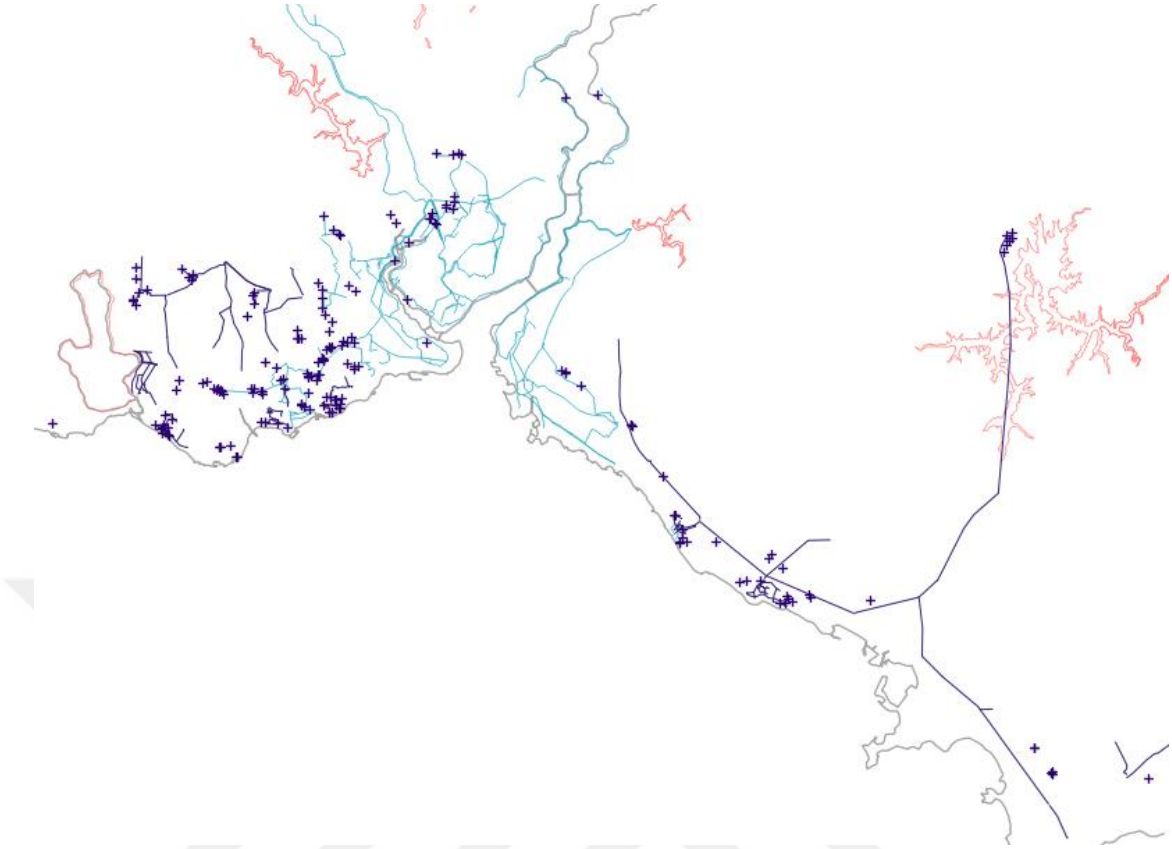


Figure 3.17: By 1960 there was a dual scene in terms of water networks: wells and Terkos Water (Uzmay, 2019)

Keeping that image of Istanbul in mind, Istanbul had three master plan projects that tackle water distribution: Water Project for 10 Years in 1961, TAMS (Tippet-Abet-McCarthy-Statton) Report in 1965 and as a more inclusive one, DAMOC project in 1970 which constitute today's water network. What they have in common was, first they were planning to get rid of well establishments and replacing them with the main line system.[55] Abandoning the historical water and partial system and building a fully connected infrastructure system were the key issues in these plans. Second, they all envisioned a regional perspective which was mentioned by Wagner in 1930s. Later, with the application of East Marmara Development Plan, Istanbul imagined together with adjacent industrial areas, with its hinterland.

[55] Groundwater reserves in Istanbul have limited capacity and most of them was already in use when the plans were making. It resulted that groundwater sources were not consiedered as possible sources for future demand (*Drinking, Utility and Industrial Water Supply Project of Istanbul Fisibility Report Summary*, 1987, p. 4.1)

In 1961 ISI and DSI have developed another plan for Istanbul called “Water Project for 10 Years”. According to the program, Alibey, Kağıthane, Yarımburgaz, Baruthane, Büyükçekmece and Küçükçemece Rivers in European side and Lake Sapanca, Riva[56], Şile[57], Göksu, Çanak and Tavşanlı Rivers in Asian Side were studied as possible water sources for the city (1961, p. 4) (Figure 3.18). The program starts with three main goals: construction of the third water main from Terkos, construction of Alibey and Ömerli Dams and an underground Bosporus line with an additional network. Although in the Asian side they have proposed Ömerli Dam to be realized in the second phase of the project. Bosporus underground water line was proposed before the Report in 1964 (Enerji ve Tabii Kaynaklar Bakanlığı, 1964), yet the feasibility report was left to actual master plan studies. In times of scarcity, European water sources could have supply water for Asian side whereas after construction of Sapanca Dam, Asian waters could pay back after the construction of the Bosporus line (Enerji ve Tabii Kaynaklar Bakanlığı, 1964, p. 30). Especially during summer time in the Asian side, water scarcities were happening because of intense droughts and rising population as a result of habitation of summerhouses. Whereas the European side had more water than the Asian side had and it could have had even more after the construction of Alibeyköy Dam. In the plan, there were also two lines that planned to be constructed for the European side. One is the third distribution line from Lake Terkos after expanding the capacity of lake[58] and the other one is Alibeyköy Dam. Baltalimanı-Kanlıca line was projected for this Bosporus line first (Istanbul Sular İdaresi, 1961, p. 8). After water was collected in Elmalı, the plan was to transfer it to Altunizade and Beykoz with additional conduits (3rd line for Altunizade, 2nd line for Beykoz), while transferring the excess water of Altunizade to Bostancı line according to the “1960 10 Years Plan” (1961, p. 13) (Figure 3.18).

[56] Muratlı, Bakacak, Arnavutköy (Istanbul Sular İdaresi, 1961, p. 17)
[57] Darlık, Hiciz (Istanbul Sular İdaresi, 1961, p. 17)
[58] Instead, a line between Terkos and Alibey has been built.

Figure.3.18: According to the program, Alibey, Kağıthane, Yarımburgaz, Baruthane, Büyükçekmece and Küçükçemece Rivers in European side and Lake Sapanca, Riva[59], Şile[60], Göksu, Çanak and Tavşanlı Rivers in Asian Side have been studied as possible water sources for the city (Uzmay, 2019).

However, the application cost of the projecting facilities was a burden for ISI. Law number 1053 was proposed to the government in order to avert the economical impediments of constructing the water network of three cities: Istanbul, Ankara and İzmir. The military coup in 1960 have postponed the enactment of the law till 1968. In the meantime, again after 1958 ISI Report, in1964, it was claimed that Istanbul would be facing a serious water scarcity if ministries wouldn't take any responsibility (Esmer, 1983, p. 72).

[59] Muratlı, Bakacak, Arnavutköy (Istanbul Sular İdaresi, 1961, p. 17)
[60] Darlık, Hiciz (Istanbul Sular İdaresi, 1961, p. 17)

Figure 3.19: It was the start signal of DAMOC Master Plan which covers Metropolitan Istanbul (*Büyük Istanbul*) with its water and sewage network

It was the start signal of DAMOC Master Plan which covers Metropolitan Istanbul (*Büyük Istanbul*) with its water and sewage network (Figure 3.19). In the meantime, by DSI, with a loan from USAID (United States Agency for International Development), an engineering firm called TAMS was commissioned in order to develop a master plan for Istanbul-İzmit area, both for domestic and industrial purposes in 1965 (Esmer, 1983, p. 73). The plan was proposing to harness Terkos, Alibey, Ömerli, Kirazdere and Sapanca as possible water sources (Figure 3.20). Their suggestions coincides with "Water Project for 10 Years in 1961" and reflects the expansion of Istanbul water geography from Terkos Lake in the west and Sapanca Lake in the east. Instead of building the third line between Terkos and Kağıthane, Alibey Dam would have taken the excess water from Terkos Lake according to the plan. Construction of Alibey Cofferdam, a type of enclosure to hold water during construction phase of dams, was started in 1966 and it took a year to finish. Through a 1000 mm conduit, water was transferred into Kağıthane Pumping Station, starting from 1968 by ISI (Esmer, 1983, p. 80). Alibeyköy-Terkos water line was finished in 1972 by DSİ (Esmer, 1983, p. 80).

Figure 3.20: After water was collected in Elmalı, plan was to transfer it to Altunizade and Beykoz with additional conduits (3rd for Altunizade, 2nd for Beykoz), while transferring excess water of Altunizade to Bostancı line according to the "1960 10 Years Plan" (Uzmay, 2019)

In 1964 State Hydraulic Works and Municipality of Istanbul together with two professionals from World Health Organization (WHO) had prepared a detailed report on water of Istanbul. By Ministry of Energy and Natural Sources and the Ministry of Foreign Affairs it was accepted and sent to United Nations for a loan.[61] A working group has been developed from DSİ, İSİ, Istanbul Sewage Office and WHO started working on 1966 (Esmer, 1983, p. 74).

The city was under pressure, in terms of tourism, industry and their effect on the rising population. In East Marmara Development Plan, Istanbul was projected as one of the major industrial regions in Turkey. Yet Istanbul was infrastructurally way too behind to deal with the needs of the projecting population. %40 of the population were depended on public fountains, which means 1750 public water taps in the year of 1971 (WHO/UNDP Advisory Team, 1971, p. 3). Other water source was private wells but they were too vulnerable to contamination (1964, p. 2).

[61] Later the name of this loan will be UN Developmental Program

In 1972, another loan from World Bank was given for the construction fees of water projects in Istanbul for the first phase (till 1982) by government's application to the United Nations and World Health Organization (Esmer, 1983, p. 83).

Changing the water geographies of Istanbul have changed its relation to its hinterland (Figure 3.18, 3.19, 3.20,). Back in 1885, when Terkos Lake was harnessed to collect water for Istanbul and right after its connection with Black Sea was stonewalled, the immediate environment was affected as well as Pera, where the lake was flowing into the villages nearby (Kentel, 2018). As the new sources were added to the system, the affect of this change on geographies were incrasing.

4. SAĞMALCILAR: CHOLERA, URBAN INEQUALITY AND HYDROPOLITICS IN ISTANBUL

"Disasters like fire, flood and epidemic illnesses are volition of God. There is nothing to be said… It is pleasing to hear that the disease will end soon. İnşallah it will disappear from our conversations as well… Death doesn't care about if you are poor or rich, when it comes, takes whoever you are"

Süleyman Demirel,
minister of Turkish Republic at that time,
during his visit to Sağmalcılar
(cited in Bakar 2017 p. 25).

I can now return to Sağmalcılar cholera outbreak in 1970 which I mentioned in the opening of this study. In order to understand the stratified characteristic of this contagious cholera geography, I explained the water history of Istanbul in previous chapter. The geography of the disease was not a coincidence, it was the outcome of series of incidents and multiple agents. It displays the story of old settlements in intramural Istanbul, industrial areas, migration, unplanned urbanization, gardens and inequalities.

4.1. Sağmalcılar as a suitable habitat for *Vibrio cholera*

"Sağmalcılar, Esenler, Gaziosmanpaşa and Zeytinburnu districts have something in common. These are the districts of people who has come from different cities in Turkey, because of the living and economic conditions, to earn their life with a great effort. Most of the people here are workers and %80 of the population has come from all other parts of Turkey." These words were claimed by Şevket Köksal, deputy of Ordu, during a discussion in Republic Senate, seven months after the cholera epidemic in Istanbul (*Cumhuriyet senatosu tutanak dergisi 67*, 1971, p. 84). According to him, their mobility in the country effected the spread of the disease. He described the physical conditions of

the districts as, “most of the houses in Sağmalcılar and Esenler don’t have hygienic living standards or proper sewage system, and even they have, the sewage system isn’t constructed for a progressive urban attitude which should consider the standards of public hygiene.” He describes the existing infrastructure as accumulation of makeshift solutions in order to save the day in the eyes of the local population just like giving property deeds in election times. “Cesspits are generally open.” He continues, “overflowed cesspits make it impossible to cross the streets when it rains.” (*Cumhuriyet senatosu tutanak dergisi*, 1971, p. 85). Köksal also emphasizes an ignored fact on water sources of these neighbourhoods: “Cesspool and streets waters were leaking into the well sources that have been used by most of the families.” (*Cumhuriyet senatosu tutanak dergisi*, 1971, p. 85).

Köksal’s speech in the senate, more or less explains the situation in Sağmalcılar and the reasons behind the epidemic. Except one thing, which was probably the most important reason of why all it happened in these districts: derelict Ottoman Halkalı waterways, which stand beneath the abovementioned geography, transport water and *Vibrio cholera* from higher topographies to sea level while crossing over Sağmalcılar, Esenler and Gaziosmanpaşa (Figure 4.1, 4.2).

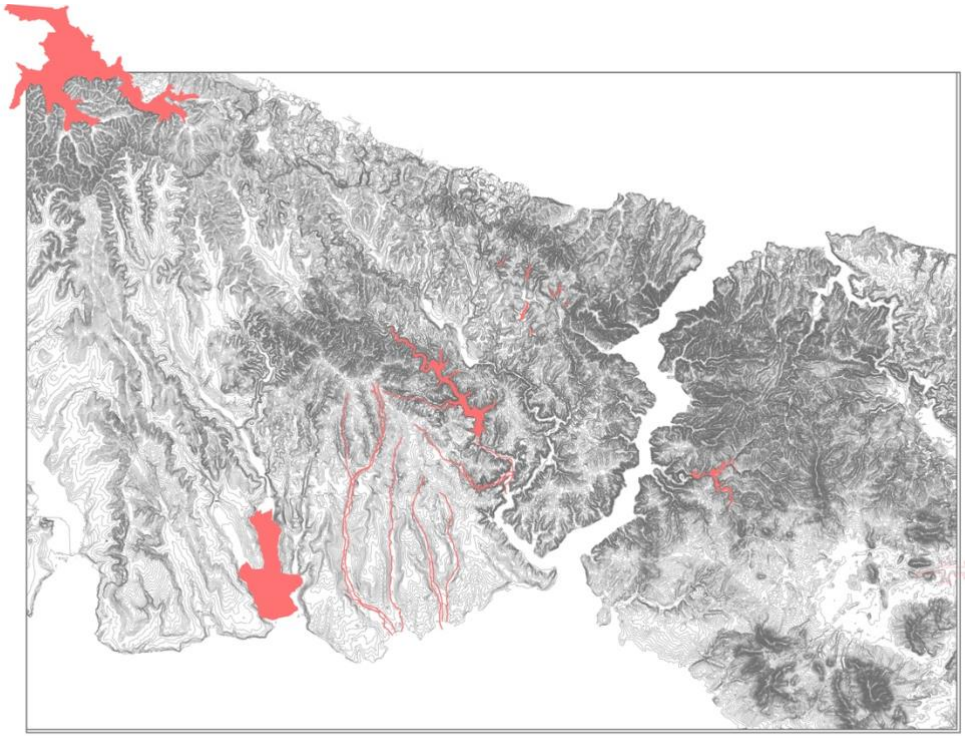


Figure.4.1: Rivers (Uzmay, 2019)

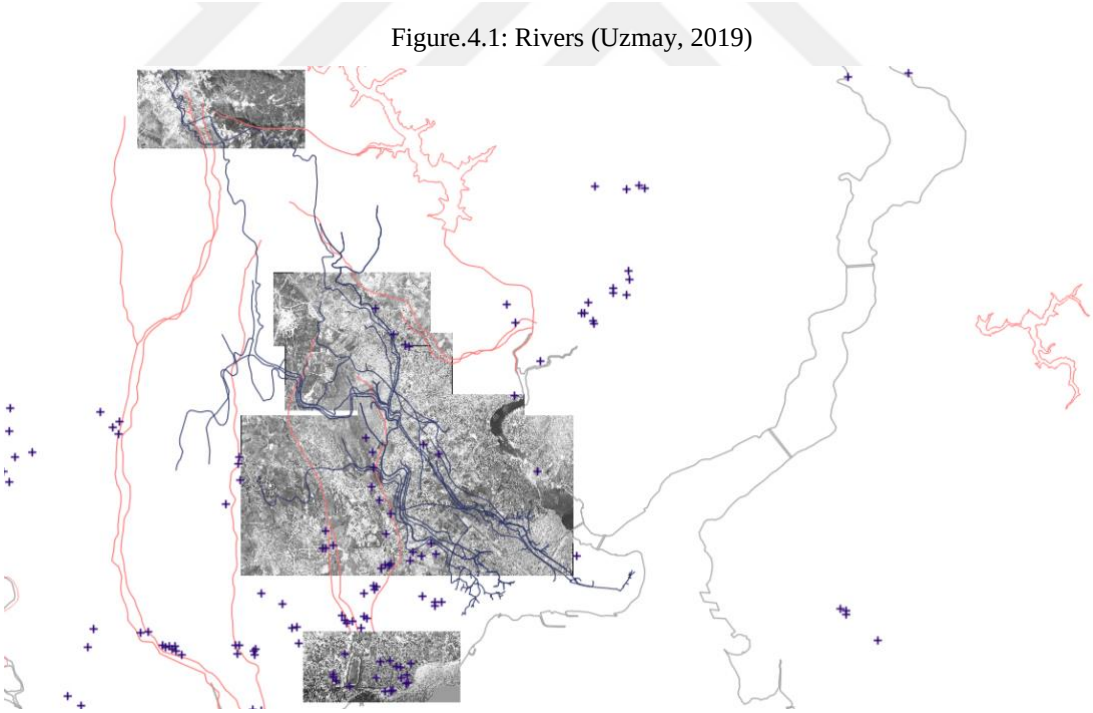


Figure 4.2: Cholera geography (Uzmay, 2019)

Sağmalcılar, Esenler and Gaziosmanpaşa were close to industrial areas in Haliç, and home to industrial facilities which have attracted rapid migration to the area. They were only one of the villages, which had witnessed relentless urbanization after 1950s. The

city was not ready to tolerate this rapid urban growth. Following 1950, the population of Istanbul has increased from 983.000 to 3.019.032 in 1972 as a tremendous jump for Istanbul (Table 3.1, 4.1, 4.2). After Ankara has become the capital of Turkish Republic, neglection of Istanbul, on the other hand, resulted the regression of the quality of urban life. Roads, transportation systems, water distribution, electricity, hygiene conditions were not enough and improved. In addition to that, the infrastructural systems were all owned by the foreign companies. However, water, electricity and sewage networks are too vital for the modern city that, “lifelines of the city” (Graham and Marvin, 2007, p. 56) “cannot be handed to foreign companies” (Ergin, 1996, p. 501). A fully networked infrastructural systems in order to manage all the cycles in the city was an essential aspect of the modern city. However, foreign companies were focusing on most profitable locations to invest on. A fully networked city ideal was hard to achieve with this fragmented infrastructure developments, therefore it led to the nationalization of these foreign companies.

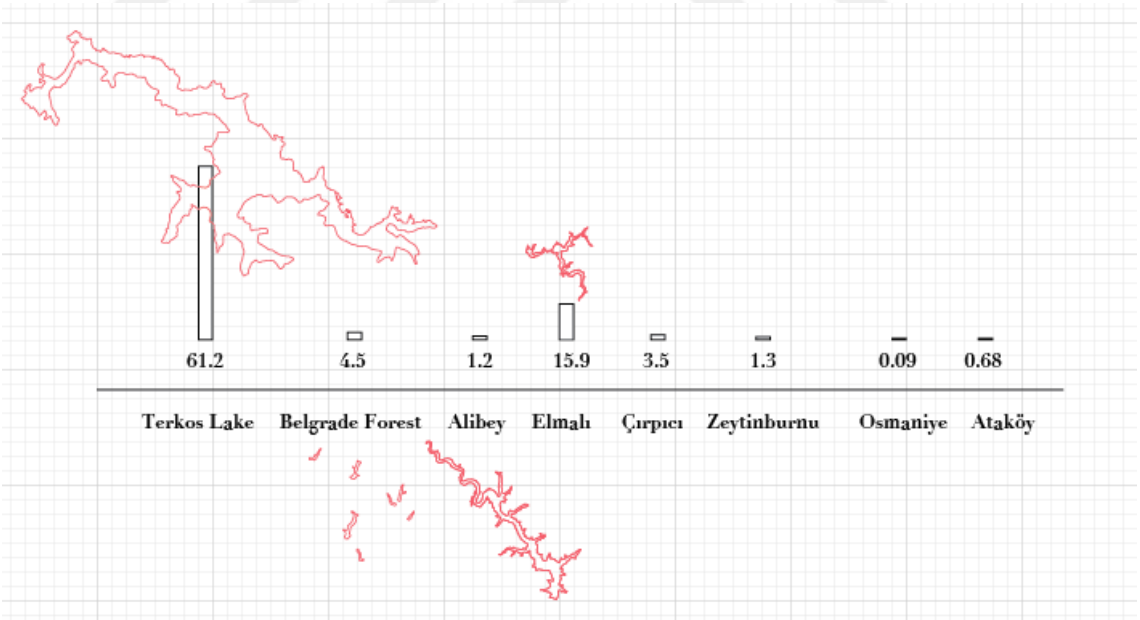


Table 4.1: Water capacities of Istanbul, 1970 (data from *Drinking, Utility and Industrial Water Supply Project of Istanbul Fisibility Report Summary*, 1987).

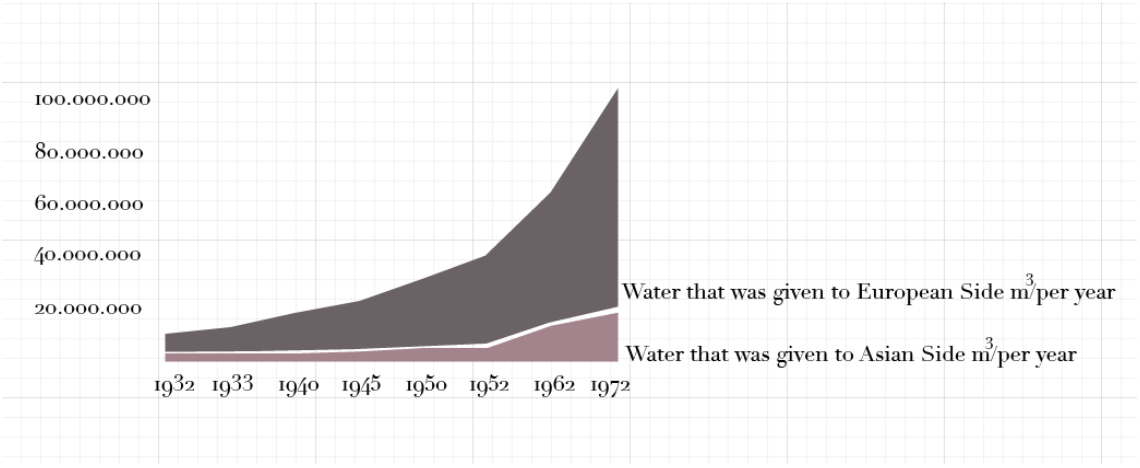


Table 4.2: Water that was given between 1932 to 1972 (data from Esmer, 1983)

Coupled with the population growth after 1950s, the lack of an organized water infrastructure system in Istanbul resulted in serious health problems. Existing building stock of the city was insufficient in responding to the mounting housing needs, therefore, it ended up that, the new-coming urbanites had to build their own dwellings (i.e. *gecekondu*s) on state-owned land in the absence of formal infrastructural systems. Infrastructures have not been part of a planned growth, contrary they became part of political debates and impositions (Tekeli, 2009, p. 118). For example, having more unconstrained law system in adjacent villages, in comparison to Metropolitan Municipalities, directed people to invest on these nearby villages both for housing and industry settlements (2009, p. 118). These emergent *gecekondu* areas were in close contact with the existing building stock which was equipped with formal infrastructural systems. Yet, the *gecekondu* areas showed up as "impermanent infrastructure islands" (Murray, 2013, p. 776), independent from existing building stock and its equipment, contrary to fully operational and ubiquitously modern infrastructural ideal.

Tekeli called this development strategy as development in "infrastructural scarcity (*altyapı darlığı*)"(2009, p. 127). *Gecekondu* settlements have created a political pressure over state, especially during election periods. It affected the decision processes of officials and resulted "impermanent infrastructure islands", established with immediate demands. On the other hand, land speculation in the cities was an important phenomena. In the neighbourhoods that was not designed for overpopulation, increase of the housing demand, resulted overpopulation which was followed by an infrastructure scarcity for

that neighbourhood. (Tekeli, 2009, p. 127). Over and above, even for newly planned and established neighbourhoods, it is argued that "development in the excess of infrastructure" is not possible (Tekeli, 2009, p. 128). Because of the financial incapability of municipalities, in most of the newly established neighbourhoods, subterranean infrastructure systems were built only after finishing the constructions on the surface (Tekeli, 2009, p. 128).[62]

Besides, as reported in Millet Meclisi Tutanak Dergisi, Sağmalcılar district had been seen as a laboratory for medical students to study infectious disease[63]. There were site specific articles, researches and case studies. These circumstances were familiar ('Millet meclisi tutanak dergisi 31', 1971, p. 612). Moreover, Sağmalcılar district has been warned repeatedly about the danger of this epidemic in 1966, 1967 and in 1969 by the General Directorate of Health ('Millet meclisi tutanak dergisi 31', 1971, p. 603).

In order to unleash the situation in Sağmalcılar, the geographical position and its relation to water sources should be revealed (Figure 4.3). Water was coming from four different artesian wells to Sağmalcılar. They were collected in a water tank for chlorination and then distributed to four different water tanks at four different locations (Tezok *et al.*, 1970, p. 3). One of those four was targeted and published as scapegoat in Hayat Magazine (Figure 4.4).

[62] More on this issue is in Chapter 3.3.
[63] According to Reşit Ülker, during cholera, there was also a typhoid epidemic in Sağmalcılar ('Millet meclisi tutanak dergisi 31', 1971, p. 612).

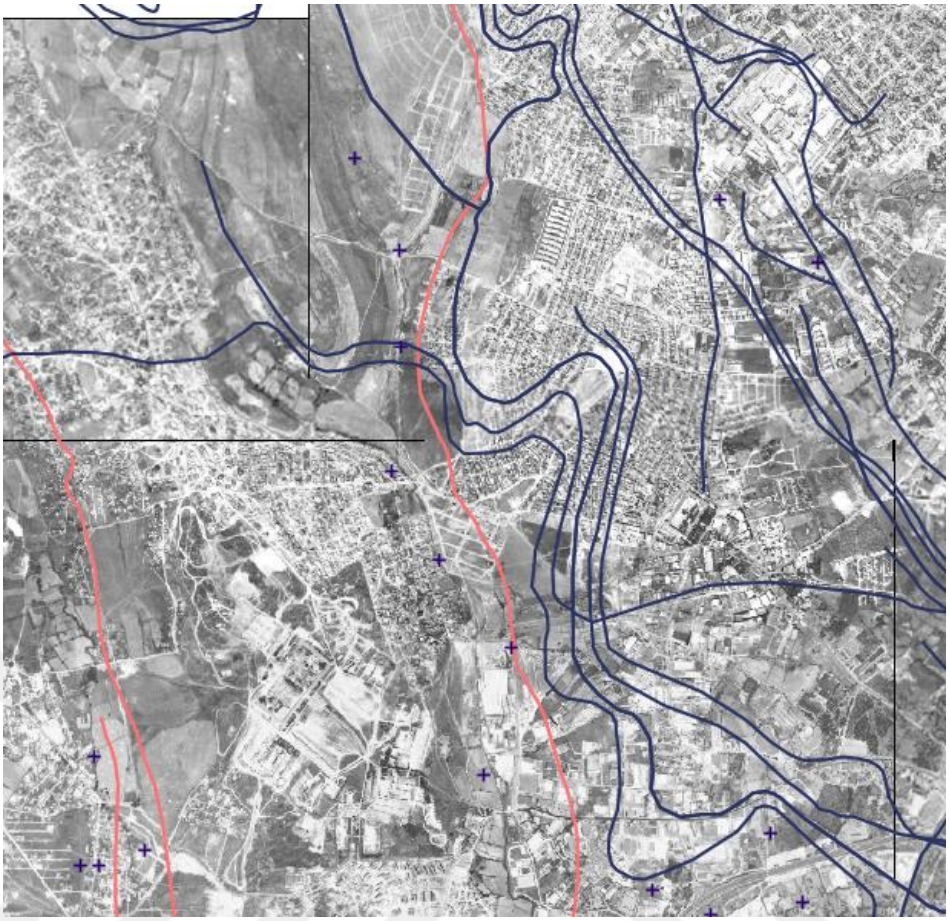


Figure 4.3: Sağmalcılar. Pink line indicates the open rivers and the blue line is Halkalı water way. (Uzmay, 2019)

Halkalı waterways, which were abandoned quite long ago, were crossing over the village.[64] There was a dump site called Habibler Çöplüğü, in the spring of the waterways. Now the area is covered with *gecekondu*s and it is part of Sultangazi Municipality. The exact location of the dump site can be understood by the local name of the street "Dump Way (Çöp Yolu)" although the official name of the street is now 2721st Street (Yüzak, 2011) (Figure 4.5). Another two rivers, which were starting nearby, also affected by this dump area and turned into an open sewage canal along its way to Esenler and Zeytinburnu (Figure 4.5). Moreover, in *gecekondu* settlements, there

64 Halkalı water ways consist of 14 different water ways located on the western part of old Istanbul (for more information about them see Chapter 3.1. History of Water Distribution Systems in Istanbul) There is no data that when these water ways were abandoned. But we understand that even in 1970, some of them were used by the local residents of the area. In 1930 Map of Halkalı waters by İsmail Remzi (Figure 4.7), we see the current day situation of these water ways.

was insufficient sewage system and most of the houses subsidize sewage network via using cesspools. From cesspools, sewage was leaking into underground water sources and to the wells in Sağmalcılar which inevitably caused contamination of drinking water sources. Yet, the mayor of Sağmalcılar was claiming the opposite and declared that he would resign if someone shows him a better sewage system rather than Sağmalcılar (cited in Bakar, 2017, p. 257).

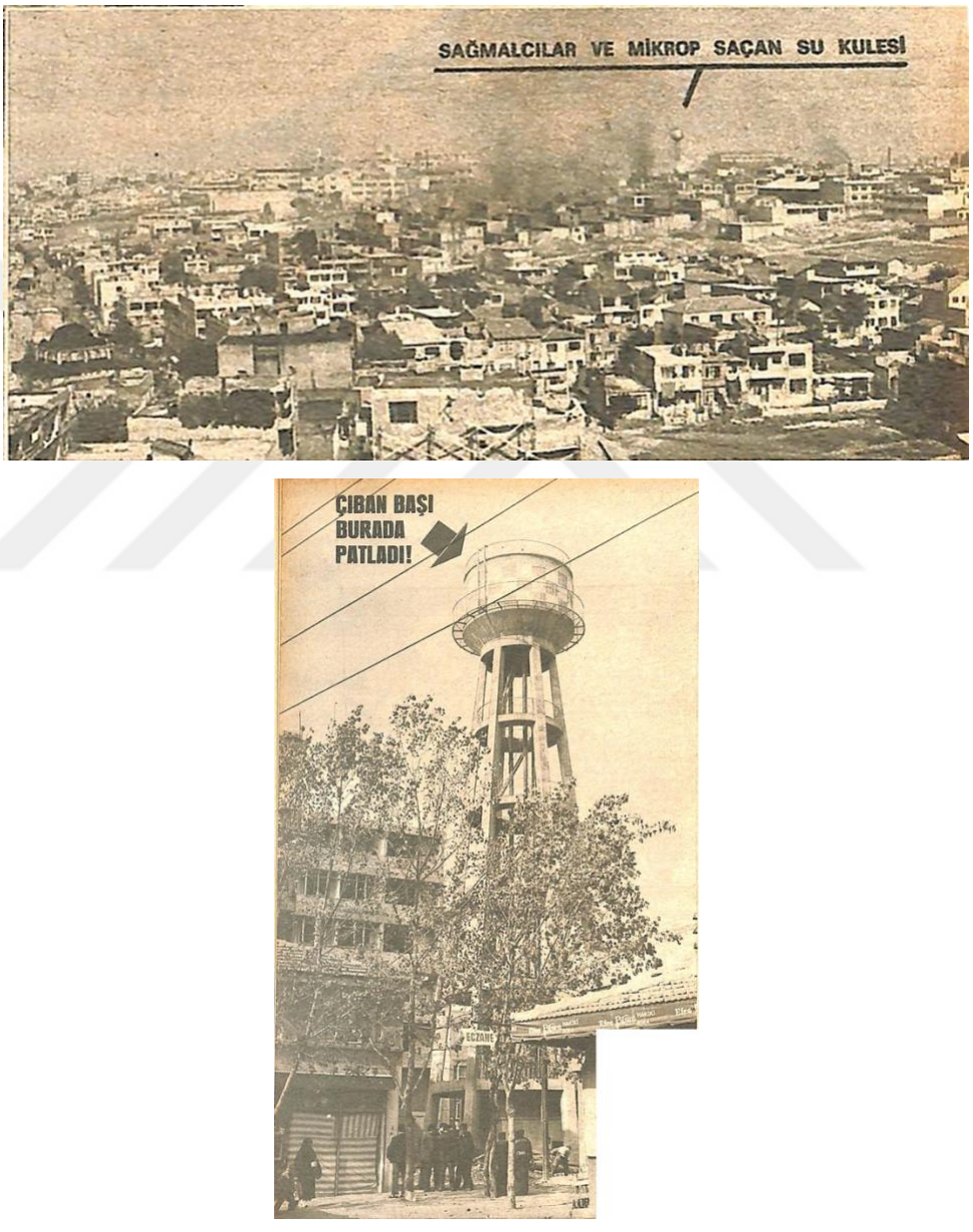


Figure 4.4: The scapegoat of the disease in Hayat Magazine (Yarbag and Koray, 1970)

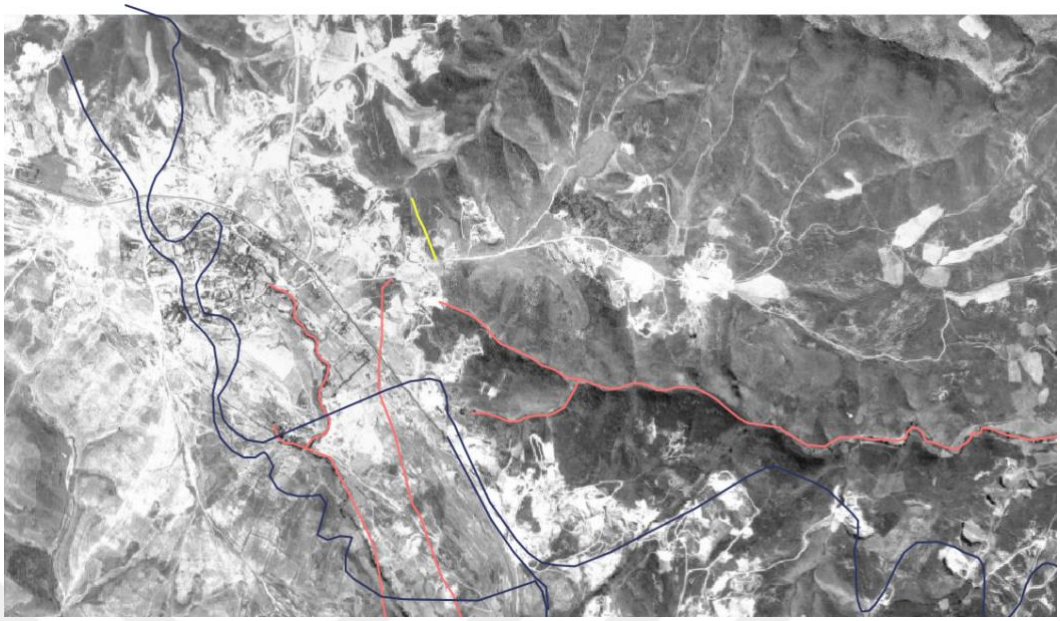


Figure 4.5: Habibler Village and adjacent Habibler Dump Site. Yellow line is "Çöp Yolu", 2127th Street. Pink line indicates the open rivers and the blue line is Halkalı water way. On the left there is Köprülü water line and on the right there is Süleymaniye water way. (Uzmay, 2019)

As a matter of fact, Sağmalcılar had a newly built sewerage system. However, according to civil engineer Ertan Sungur, who was specialized on sewage systems, Sağmalcılar had no proper sewage system, indeed, only %10 of Istanbul was equipped with legitimate sewage system by 1970 (Sungur, 1970). Municipality's cesspool in Güngören, adjacent to Sağmalcılar on western border, was located between two artesian wells that was dedicated to Sağmalcılar (Bakar, 2017, p. 254). The mayor of Sağmalcılar, Muzaffer Öztekin, claims that 34 public fountains were in use in the area before employing the artesian wells (cited in 1970, p. 7). However during the construction phase of the sewage system, they came across to the aborted waterways and used it as part of the sewage system (Tezok *et al.*, 1970, p. 7). That automatically turned the former water way into a disposal system. Moreover, people kept on using the old waterways because degree of water hardness of the artesian wells was not suitable for drinking purposes (Tezok *et al.*, 1970, p. 7). In addition to all, existing sewage network was illegally connected to vegetable gardens on some locations (*Cumhuriyet senatosu tutanak dergisi 67*, 1971, p. 85). Cicoz River, that runs through Esenler and Sağmalcılar, became an open sewage canal. Cesspools of Bakırköy Prison and Muratpaşa neighbourhood both was leaking into Cicoz River which has caused to

spread of the disease into Esenler (Bakar, 2017, p. 254). Esenler River was carrying the waste of pig farm and food waste that was collected from different parts of Istanbul (Bakar, 2017, p. 254).

Since cholera bacteria was spreading through water and human carriers (porters), it was easy to follow the path of the bacteria. For example, the military troop in Sağmalcılar[65], an isolated settlement in the mentioned area, have completely quarantined themselves (Gürer and Meriç, 1971, p. 122). Their water source was coming from Mahmutpaşa, Kışlalar water main, a branch of Halkalı water network. However, waste of Davutpaşa barrack was leaking into artesian wells of other settlements (Bakar, 2017, p. 254). Although they isolated themselves, their waste became a threat, which turned their advantaged situation into disadvantage of others.

Indeed, spread of the disease followed the path of Halkalı water ways. Thanks to a fragmented water supply regime, in Taşköprü, disease was traced in Karadeniz neighbourhood whereas in adjacent Yıldırım neighbourhood the disease was not detected. Yıldırım neighbourhood stayed isolated since the neighbourhood had its own separate and sanitized artesian water source (Tezok *et al.*, 1970, p. 6) (Figure 4.6). In Karadeniz neighbourhood, people built their houses over the old water way. Moreover, they opened wholes into ground which overlap with existing water conduit and used them as private house-wells (Tezok *et al.*, 1970, p. 7).

Cholera epidemic took 17 days to die down. For 17 days, it had shaken first Istanbul and then the whole country. New hospitals have opened in order to fulfil the emerging need of medical care[66], borders of Bulgaria and Greece have been closed, most of the cities have banned people coming from Istanbul, 52 people have died according to the news, 50 people according to official records (*Cumhuriyet senatosu tutanak dergisi 67*, 1971). Yet the actual number is unknown since people might have kept their patients at home[67].

[65] The military troop in Sağmalcılar was the 66th Divison between 1968 to 1999. Later the building becomes Yıldız Technical University.
[66] Bakırköy Tropical Disease Hospital (*Bakırköy Tropik Hastalıklar Hastanesi*)
[67] There are news about people who didn't want to bury the dead with lime.

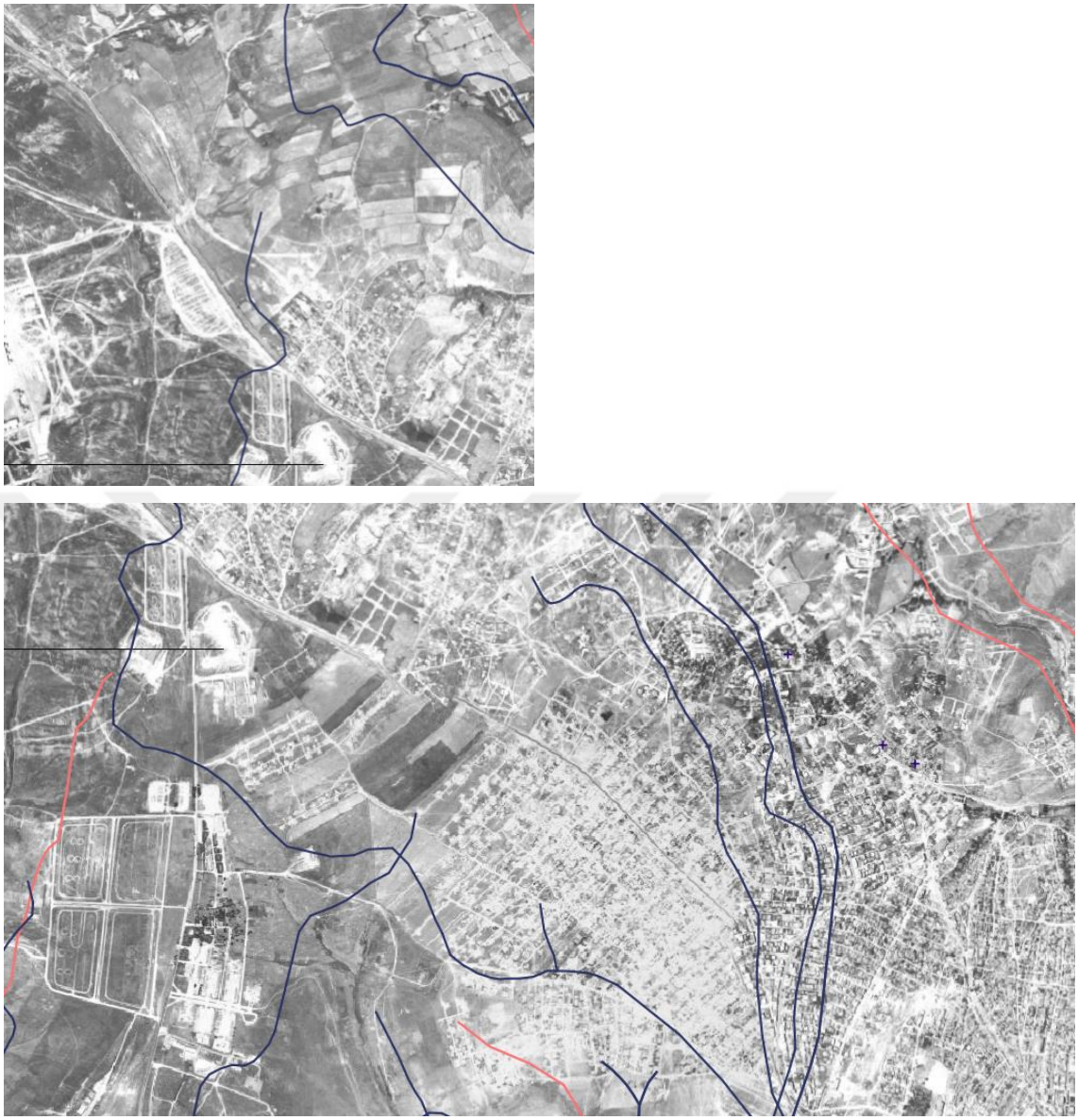


Figure 4.6: Karadeniz and Yıldırım Neighborhoods (Uzmay, 2019)

Hygiene threats in regarding to over population and expansion of *gecekondu* settlements have been discussed in the Parliament and cholera epidemic in Istanbul has opened up new discussions that interrogates the health policies of Turkey (‘Cumhuriyet Senatosu Tutanak Dergisi 20. Birleşim’, 1970; ‘Millet meclisi tutanak dergisi 31’, 1971; ‘Millet meclisi tutanak dergisi 32’, 1971; *Cumhuriyet senatosu tutanak dergisi 67*, 1971). Mehmet Şemsettin Sönmez, deputy of Eskişehir, while blaming derelict Halkalı water systems he was reminding the lack of health engineering system. “If we have had health

engineers as suggested by Refik Saydam[68]", he says, "we would have known the exact locations of these water systems" ('Millet meclisi tutanak dergisi 32', 1971, p. 645).[69] It is obvious that there is a lack of communication between institutions. Namely, the locations of the water ways were known by 1930 İsmail Remzi Map (Figure 4.7). Yet, transformation of old water systems into the new sewage canals was an unexpected move.

Under the conditions of incomplete modernization, infrastructures mostly tend to follow increased urbanization. Instead of networked systems, substitutions were preferred to fulfil the immediate needs since "building a proper network for *gecekondu* areas weren't planned" (İsvan, 2011, p. 112) as these settlements assumed as temporal settlements. In places where Terkos water couldn't access, there were water trucks (*arazöz*) as a most volatile element of distribution, then fountains have proliferated, either connected to Terkos network or a local well network. There were also water tanks outside of this network, which in need of regular refillings (Figure 4.8). Instead of sewage networks, cesspools became the pattern of partial substitutions.

As discussed above, in Sağmalcılar case, subterranean fabric followed the *gecekondu* fabric, sporadically. Existing Halkalı waterways were located and performed simultaneously with the other layers of the area; cesspools, re-appropriated sewage canals (transforming the old Halkalı water canals into sewage canals), rivers, wells later prepared the ground for cholera outbreak in 1970.

[68] When he was in charge, Refik Saydam, Minister of Health between 1923 and 1924, have suggested for health engineering (*sağlık mühendisi*) program, a perfect applicators in order to have modern city. Civil engineering graduates will later study Science of Health two more years to become health engineers.
[69] As I mentioned earlier, İsmail Remzi, an officer in ISI, has mapped the existing situation of Halkalı Water ways in 1930. These water ways were known actually.

Figure 4.7:Halkalı Water ways map of 1930 by İsmail Remzi (Çeçen, 1991)

Figure. 4.8. Arazöz and Water tanks as water substitutions (İsvan, 2011)

4.2. Emphasized Outcast: Neglected Infrastructure and Quarantines

Government embraced an uncanny approach to the outbreak. Prime Minister Demirel declared that "Disasters like fire, flood and epidemic illnesses are volition of God" (cited in Bakar 2017 p. 25). As cholera was standing as a serious threat for Turkey between 1965 to 1970, government have hesitated to diagnose cholera in 1970 Sağmalcılar epidemic (Figure 4.9). The second phase of the sixth cholera pandemic in history, started from Philippines in 1961 and travelled through Iran and Russia, to northern and eastern borders of Turkey in 1970 (Tezok *et al.*, 1970, p. 1) (Figure 4.10). This type of Cholera was named as "El-Tor" Type[70] of cholera and it took time for professionals to agree on either it was contagious or not. Moreover, when it came to Turkish border, from north to east, precautions to stop *Vibrio cholera* to enter the country were appeared in national media. Even in Hayat Magazine, monthly popular culture magazine, cholera appeared as a special topic (*Hayat Magazine*, 1970; Koray, 1970; Kuseyri and Yarbag, 1970; Yarbag and Koray, 1970). Especially immunization campaign was promoted in the magazine and displayed with encouraging images of Yeşilçam artists, Governor and Mayor of Istanbul, while they were being vaccinated (Kuseyri and Yarbag, 1970) (Figure 4.11). In the meantime, Turkey had started to take serious precautions on the borders. Yet, Minister of Health, Vedat Ali Özkan announced that the epidemic that was seen in Sağmalcılar was not cholera as suspected, it is gastroenteritis- a disease that spread via contagious water and cause diarrhea and shows very parallel symptoms with cholera (*Milliyet*, 1970c)[71].

[70] El Tor type of cholera is much more resistant to outsider factors. Because of that, it settles for a longer time in comparison to classical cholera (Tezok *et al.*, 1970, p. 11).
[71] Later in parliament, he denied that he said like that. He has blamed the newspaper, Milliyet, about disinformation.

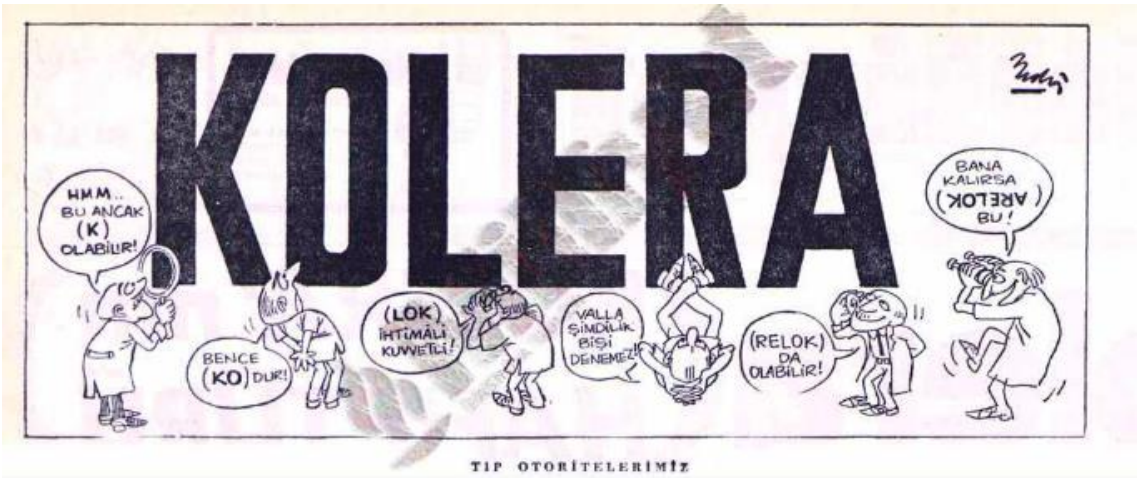


Figure 4.9 As cholera was a serious threat for Turkey between 1965 to 1970, government have hesitated to diagnose cholera in 1970 Sağmalcılar epidemic (*Milliyet*, 1970e)

According to Tezok and his friends, a team of medical doctors from Gülhane Military Hospital, who made the first research on 1970 Cholera outbreak, the disease jumped to Turkey probably from northern neighbours, instead of Iran, since Istanbul was the first city was effected[72] (Tezok *et al.*, 1970, p. 1). On the other hand, within 8 days since the first case was declared, the disease showed up in other parts of Turkey (i.e. Bursa, Çorum, Mersin) via mobility of people from Sağmalcılar (*Milliyet*, 1970d).

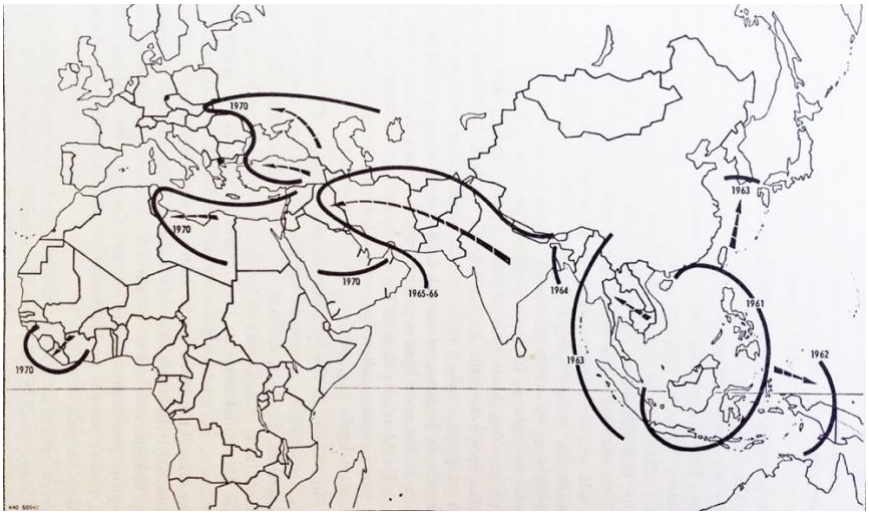


Figure 4.10: Journey of cholera disease 1961 to 1970, A Map by World Health Organization (Onul, 1971)

[72] After the declaration of first case, Tezok and his friends went to Sağmalcılar to understand the reason of the epidemic. Thanks to their investigation in the area and talk to authorities to have the first hand source we know more or less the situation back then.

Figure 4.11: Especially immunization campaign was promoted in the magazine and displayed with encouraging images of Yeşilçam artists, Governor and Mayor of Istanbul while they were being vaccinated (Kuseyri and Yarbag, 1970)

In 1965, after this disease was seen in Iran, Head of the National Security Council, Refet Ülgenalp has warned the government about the possibility of cholera but the reply was "there is no danger as we had the precautions." ('Millet meclisi tutanak dergisi 31', 1971, p. 599). Because of its closeness to Syrian Border, South-eastern region of Turkey was declared as "fragile area" by the government-later Marmara region was declared as "fragile area" (Figure 4.12). In *gecekondu* areas in Istanbul, mobile immunization equips were working (*Cumhuriyet*, 1970). However, according to professionals, immunization provides a partial protection for the disease. Namely, in the absence of "hygienic living conditions", bacteria can provide its satisfactory habitat and makes the immunization idle (Tezok *et al.*, 1970; Bakar, 2017). Therefore, as it was appeared in 1930 Public Hygiene Law, providing a healthy environment for the citizens is not only

the duty of Ministry of Health, but also it is the work of other organizations who were in charge, from Ministry of Public Works to local governments.

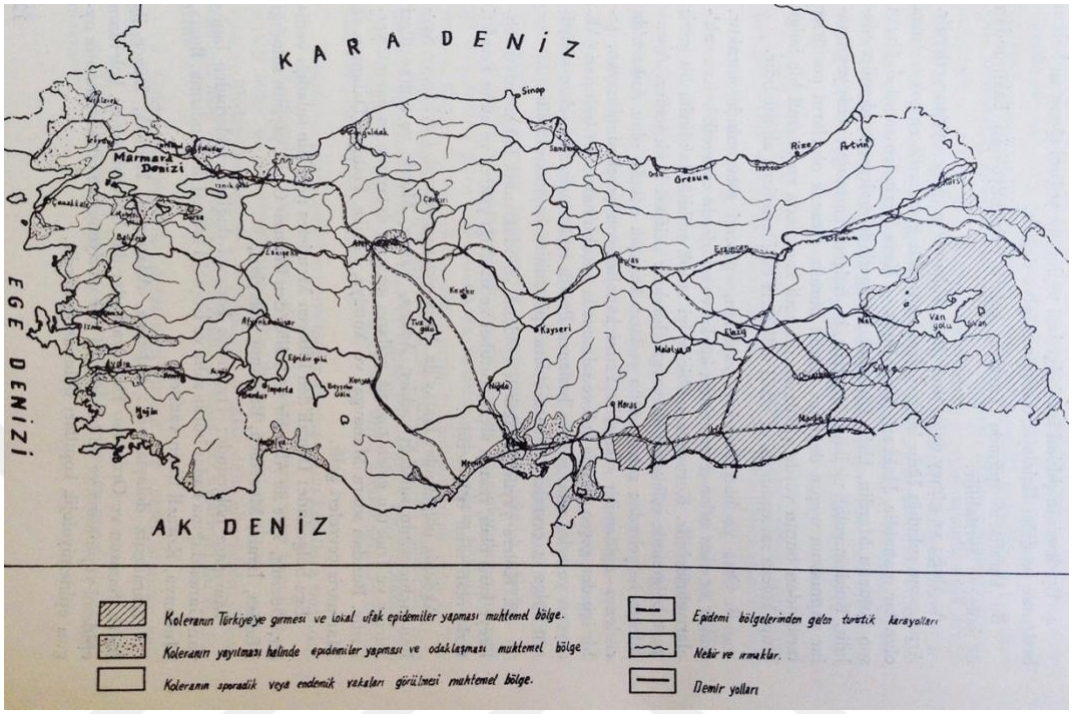


Figure 4.12: Possible spread geography of cholera (Onul, 1971)

Reşit Ülker, deputy of Istanbul, was criticizing the government on their priorities while claiming that they should have invested on providing hygienic living conditions for the citizens, instead of constructing the bridge (‘Millet meclisi tutanak dergisi 31’, 1971, p. 617). Vedat Ali Özkan answered Ülker’s criticism as “It was discussed before, without a proper sewage system who needs an opera house?” while reminding that CHP was in charge when the discussions about the priority of the opera house took place. He argued that the discussion on the priority of investments whether it was a sewage system or a bridge or a factory did not mean anything. (‘Millet meclisi tutanak dergisi 32’, 1971, pp. 645, 648). As it can be understood from Özkan’s speech, instead of investing on sanitation systems, the state has chosen to invest on industry and in the end, the first one had to have a fragmented presence. According to Tekeli, both industry and infrastructure investments demand capital and it is compelling for developing countries to fulfil both of them. Mostly these countries prefer to invest on industry (Tekeli, 2009, p. 149). Sewage systems are the most neglect type of infrastructures since they can be

substitute with cesspools with a lower cost. Building a centralized sewage network costs a lot and it took time to price this service in order to pay off itself (Tekeli, 2009, p. 149). A couple of neighbours in 1968 have established their own sewage association "*Kanalizasyon ve Güzelleştirme Derneği* (Sewage and Beautification Association)", while raising money for the cost, they were demanding the government's expertise. However, infrastructural investments on *gecekondu* areas are too basic and below standards that it didn't cost much in comparison to other housing areas. So it cannot be said that their costs are burden for public (Tekeli, 2009, p. 127).

Another reason of the neglection of infrastructures, as I mentioned before, their hidden nature. "This issue is beyond parties and I mention that this (sewage system) was not built since it was not located *outside*, it was located *under the ground.*" ('Millet meclisi tutanak dergisi 31', 1971, p. 619) said Reşit Ülker in 1971 Parliament Meeting.

Back in 1966, a group of professors from Ankara University has warned the government about restraining the Muslim practice of pilgrimage to Mecca since cholera was encountered mostly in pilgrimage geographies and they were claiming that pilgrims may be porter (carrier) of the disease ('Millet meclisi tutanak dergisi 31', 1971, p. 600). It was discussed widely yet there was no decision about the pilgrimage. Since 1970, travellers were asked about immunization cards, if they didn't have, they needed to be stuck in 5 days of quarantine (Kuseyri and Yarbag, 1970). Ships that were travelling from suspicious countries bypassed, beaches on the northern shores were closed and immunization campaign, especially on the borders, escalated (Kuseyri and Yarbag, 1970). Selling ice-cream, water and beverages in the street was forbidden by August 19 (*Cumhuriyet*, 1970). Provincial Health Director, Nuri Ertürkoğlu recommended to drink only boiled Terkos water (*Cumhuriyet*, 1970). In August 28, cholera vaccination was completely out of program except *gecekondu* areas and people who will travel abroad as they became the most hazardous group ('Millet meclisi tutanak dergisi 31', 1971, p. 612). Although after 1965 Iran outbreak, Ministry of Health has doubled the chlorination of water, therefore still there was no consistency in chlorination processes because there wasn't a centralised water network in Istanbul. Only centralised water system was Terkos water system and only it had enough equipment and automatization

for chlorination. Yet Terkos water reached through a very limited area. Places which were out of Terkos water network, fed through local subterranean waters (Figure 4.13). They have constructed in miscellaneous locations. Well waters were too dispersed to manage properly.

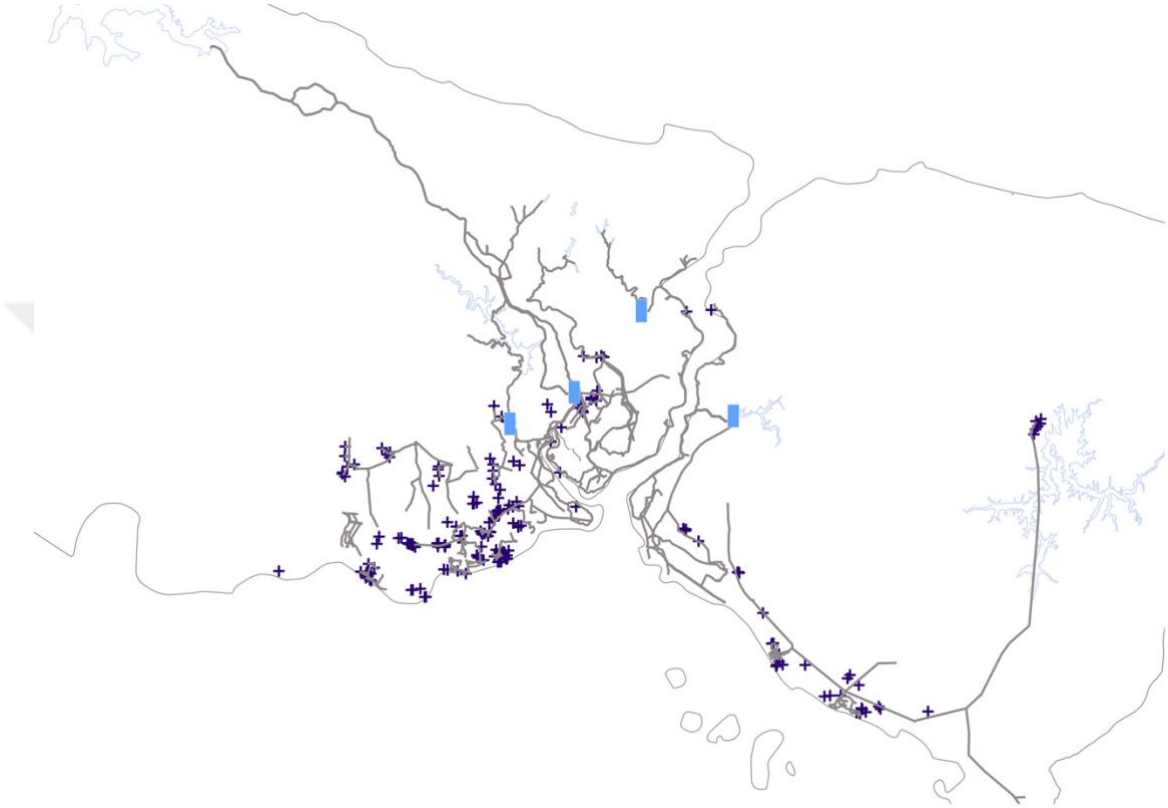


Figure 4.13: Places which were out of Terkos water network, were feeding through local subterranean waters (Uzmay, 2019)

Esenler and Sağmalcılar had not been quarantined by the officials yet they have become the subject of an emphasized outcast (Figure 4.14). Infrastructures like water and sewage, hadn't been "normalized" for the people of Esenler and Sağmalcılar in 1970. They were left out of the networked city. Not only they have been excluded in terms of infrastructural systems, but also they have been quarantined- not by the direct legislations by the state, but by the hand of autonomous powers.

"From the first day of the disease" mentions deputy of Istanbul Reşit Ülker, "in the night of October 12, 1970, Sağmalcılar should had been quarantined. Government shouldn't had concerns like offending public or waiting for test results… Surrounding

of Sağmalcılar should have been enclosed with steel, iron was not enough!" ('Millet meclisi tutanak dergisi 31', 1971, p. 614). He also mentioned that this crisis is more dangerous than student demonstrations and those who are in charge should have taken measure firstly for the disease other than the demonstrations ('Millet meclisi tutanak dergisi 31', 1971, p. 614) . There was also a small scaled global panic related to travellers coming from Turkey. People were rejected by other countries like US, borders of Greece and Bulgaria have been closed for days and neither food nor people were allowed to cross the borders (*Milliyet*, 1970d). It affected exports ratios of Turkey as most of fresh fruit have been lost while waiting in the border, as well as workers, who must have stayed on the border.[73] Especially, the latter one have hit the inner market in terms of the adequacy of the work force. Sağmalcılar and Esenler were industrial areas which were home to many factories and workers. There have been an autonomous isolation since there was no action from the government. Workers who were working in these districts have stopped coming to work. Vica versa, workers from these districts have been banned from other parts of the city.

[73] However, there was no official quarantine to the country from WHO. According to Gültekin, Prof. Dr. Ekrem Kadri Onat have prevented Turkey from being quarantined as explaining the type of the bacteria (Gültekin, 2017).


CENAZELER ARASINDA DÜĞÜN YAPILDI

SAĞMALCILARDA KOLERA.. CENAZE... DÜĞÜN..

Figure 4.14: Esenler and Sağmalcılar had not been quarantined by the officials yet they have become the subject of an emphasized outcast (*Milliyet*, 1970a)

According to the Public Hygiene law, if a district put into quarantine, government would be responsible to take care of the residents. Reşit Ülker mentions that the mayor of Esenler was indeed demanding a quarantine for the residents since they were autonomously isolated in any case[74] ('Millet meclisi tutanak dergisi 31', 1971, p. 615). In return, Sağmalcılar was identified as too complex to isolate, by the Minister of Health. Since there was no quarantine in the districts, mobility among people continued. They have travelled to the other parts of Turkey. Yet once they have left Sağmalcılar, (in some places) the officials have performed an autonomous isolation policy (Figure 4.15). Later it became the plea for the Minister of Health of not declaring a local quarantine. Firstly, quarantine was not expressed as the absolute solution to end a

74 Although it was written in Public Health law, the cholera patients and possible porters should be kept at their houses, if needed, by the control of the municipal police. Quarantined houses should be fed by the Turkish Government since they were completely isolated from the life ('Millet meclisi tutanak dergisi 31', 1971, p. 613).

cholera epidemic in 1970s, as it doesn't seem as a proper solution even in today.[75] If there will be an isolation, what will be the boundaries of this exclusion? The lack of water infrastructure plan and a map also made impossible to define the affected areas.

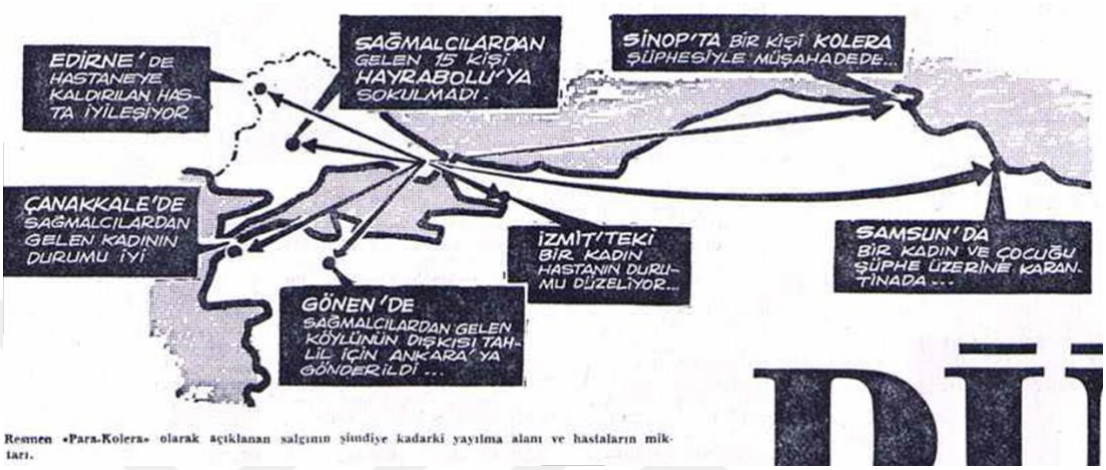


Figure 4.15: Yet once they have left Sağmalcılar, (in some places) the officials have performed an autonomous isolation policy (*Milliyet*, 1970b)

Esenler and Sağmalcılar had been excluded during the cholera outbreak. Both municipalities needed take their own precautions. For example, although there was no regulation regarding to disinfection issue by the Ministry of Health, Sağmalcılar disinfected the trafficking people in the neighbourhood. On the other hand, there was no disinfection in Esenler neighbourhood[76] ('Millet meclisi tutanak dergisi 31', 1971, p. 611). They were isolated, confused and left alone in the period. Although there were safety measures before and during the epidemic, there was no exact orders neither from the state nor the professionals.

Sağmalcılar and Esenler became spaces of exclusion. After this cholera breakdown, name Sağmalcılar has been changed into "Bayrampaşa" in reference to the owner of the

[75] In his defence in the parliament, while claiming that it was not a solution for sprawl, Vedat Ali Özkan also mentioned that although there was quarantine in Russia, it couldn't effect the spread of the disease, soon after it infected other parts of the country (*Cumhuriyet senatosu tutanak dergisi 67*, 1971, p. 87).
[76] "I have disinfected myself and my car in Sağmalcılar after leaving there. When I have come to Esenler, there was no precaution! I came back to Sağmalcılar to disinfect myself again before I went home" Reşit Ülker's speech on ambigious standarts of quarantine and disinfection between neighbourhoods ('Millet meclisi tutanak dergisi 31', 1971, p. 611).

gardens in the area. It was not a coincidence that Sağmalcılar was the point of eruption for disease. According to Yanardağ, although the disease was seen in other places like Esenler or Küçükköy, the name Sağmalcılar was associated with the disease (Yanardağ, 2009). People from Sağmalcılar were excluded from society especially because of the exaggeration in the media. For example, one of Yanardağ's informants said that "For instance I and my friends had never been in a junkyard. Yet in those times, journalists called us and took our photos in the trash dump of the school. And in the news of the following day, it was stated that cholera spread like this." (Yanardağ, 2009, p. 49). In the media, people of Sağmalcılar depicted as scapegoats of the disease. That affected the daily life of people from Sağmalcılar. According to another informant of Yanardağ, "Sedat Amca", people has run away from him when they have seen that he had walked towards Topkapı-Sağmalcılar bus atop and started to disperse with fear while shouting "go away, there is cholera!" (2009, p. 50).

Sağmalcılar cholera epidemic appeared as sequential and miscellaneous chain of events. Back in 1970 Istanbul cholera epidemic, the actual *raison d'etre* is unknown. There were more than one agent that could build a suitable habitat for the bacteria; rivers, sewage system, derelict Ottoman water ways, trash dump in Habibler and porters. In addition to all, these infrastructural systems were not planned or partially planned by different authorities. Indeed, they were also built by different initiatives from locals to government.[77] Because of this disconnection there was no map or information of the whole system. Namely, even they have put Sağmalcılar and Esenler into quarantine in order to stop human interaction in the neighbourhood and eliminate the porter factor, either because of the rivers or hidden underground sewage tunnels, or abandoned Ottoman water systems the disease would have been spread into related geographies.

[77] İller Bankası, Municipalities, DSİ, local assocaitions

5. CONCLUSION

By revealing the hidden infrastructural relations in the city, this thesis dealt with the hydropolitics in Istanbul with on focus on the cholera outbreak that happened in Sağmalcılar and adjacent neighbourhoods in 1970. Mapping the water geographies of Istanbul in history has helped me formulate two main questions: How did the transition from fragmented historical water networks to a centralized modern one take place in Istanbul? Secondly, considering the dual infrastructural system of Istanbul, how did the solutions devised during this transition and interact with the existing inequalities? The answers to these questions have intersected in the thesis.

The city was seen as a single object and the product of a "systemic machine" which should be organised via using the latest science and technology available (Graham and Marvin, 2007, p. 44). Citing David Nye, Graham and Marvin argue that technology was identified as "natural, inexorable and autonomous" while cityscapes were displayed as "empty" space (city was seen as a tabula rasa to practice new forms of technological triumphs) for practicing the technology (2007, p. 45).

In literature regarding cities, the post-industrial city appears as a networked and well organized city in order to fulfill the needs of a capitalist system. Whereas, while to be connected into this networks like roads, electricity, internet, water are "normalised" for *Homo civitas*, the shunned areas in the city becomes the subject of an urban inequality. Distribution of goods equally, within and between the cities was the ideal of the modern city. Citizens that were imposed to inequality in terms of water, electricity and sewage systems were subjected to an emphasized outcast. Fragrant and contaminated city was the first challenge of urban engineers in order to achieve rationality and cleanness in a contaminated city. (Graham and Marvin, 2007, p. 44). Yet, in the atmosphere of urban inequality, poor hygiene conditions resulted serious epidemic illnesses in the centre of the "modern city".

Istanbul had scarcity throughout its history. Although subterranean water sources were important water sources since Roman Era, Istanbul's water need mostly depended on surface waters. As Tchihatchef, a 18th century geologist who made a survey in Istanbul, explained that water need of the city was highly obliged to atmospheric conditions, and there was a limited water source area for an increasing population (Tchihatchef, 2019, p. 71). The population of Istanbul remained more or less the same till 1930s Istanbul. Therefore, during the first years of Republic, water of the city depended on both old and new systems. That resulted a dual picture in terms of water distribution: on the one hand, there was the historical water network, and on the other, there was a reformed Terkos water system. But it was a partial system and completely opposed to the modern infrastructural ideal: a networked city, in order to control the flow of water. After 1950s, the population of Istanbul unprecedently doubled itself in a very short amount of time. Existing housing stock become insufficient for the rising population and the new comers obliged to find their own housing solutions: *gecekondu*s. Current insufficiencies in the urban infrastructure had direct effects on the quality of life in *gecekondu* settlements. Neglection of water and waste management in these areas worsened the living conditions of disadvantaged communities who were already suffering from poor housing conditions and were unable to access urban resources.

Closeness of industrial geography to cholera geography was not a coincidence. The conditions in industrial area -Haliç (Golden Horn)- was unhealthy. The area was covered with makeshift solutions to answer the increasing requests of new Republic and they were haphazard. Therefore, the infrastructural base of these areas displayed a fragmented structure. The new comers to the city, settled in the adjacent areas of industrial places which were not only threatened by industrial waste but also geographically free from regulations on construction within the municipal borders of the city (Keleş, 2016, p. 537).

Water infrastructure need was subsidized via subterranean water sources or transported water (via water-tender: *arazöz*), while the need of waste infrastructure was sustained via cesspools. Yet the population was too high to lean on cesspools. Short after rivers have turned into open waste canals while the waste water was leaking from cesspools to

subterranean water sources. Sewage networks are expensive and they do not pay for themselves contrary to electric or water infrastructures and their hidden position under the ground caused their neglection (Tekeli, 2009). Together with the inequalities in the *gecekondu* neighbourhoods and the infrastructure scarcity pave the way for 1970 cholera incident. Tekeli, Gülöksüz and Okyay defined 70s Istabul with its distincitves as "*Gecekondulu, dolmuşlu, işportalı* city" (1976) but they forget one, it was also the city with impermanent infrastructure.

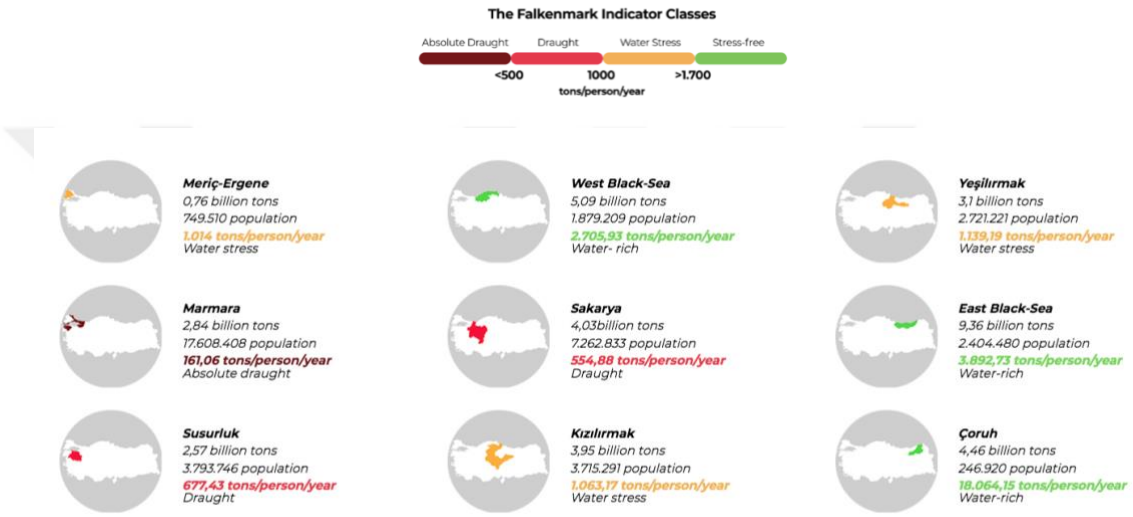


Figure 5.1: Istanbul's name is on list of alarming cities due to its rising population (*Water of Tomorrow*, no date).

The story of infrastructure Istanbul still has many questions to ask and paths to follow. Lately, it was reported that the soil of Melen Dam, the latest dam of Istanbul under construction, is not suitable for holding water. Not only the politics of bringing water from Melen River should be questioned but also future of water need in Istanbul should be discussed. In 2017, the city of Cape Town announced that they were running out of water and Cape Town became the first major city in the world which may run out of water soon: meaning "Day Zero". A day that water amount in the major dams decline to 13.5%. Under the regulations considering water supply, they are still postponing the day. When the day comes, the daily consume of water per person will be reduced to 25

lt.[78] Istanbul's name is also on list of alarming cities, due to its rising population especially after the 10 months drought in 2014 (*BBC News*, 2018) (Figure 5.1). Water withdrawal[79] of Turkey is among the few countries following, China, USA, Mexico, Japan, Russia, Brazil by 2014 (Table 5.1). Moreover, watersheds should be protected against the escalating speed of increase in urbanization (van Leeuwen and Sjerps, 2016) and megaprojects (Figure 5.2).

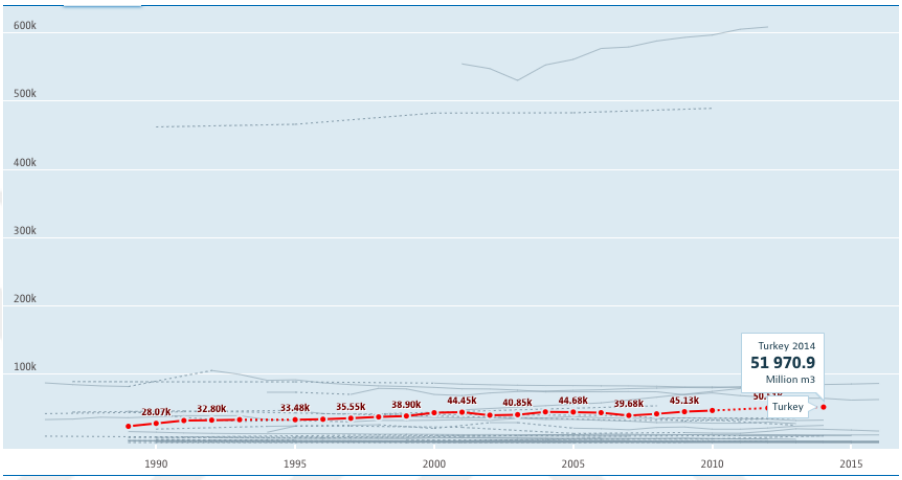


Table 5.1. Water withdrawal of Turkey is among the few countries following, China, USA, Mexico, Japan, Russia, Brazil by 2014. Data covers between 1990 to 2014. (OECD Data, no date)

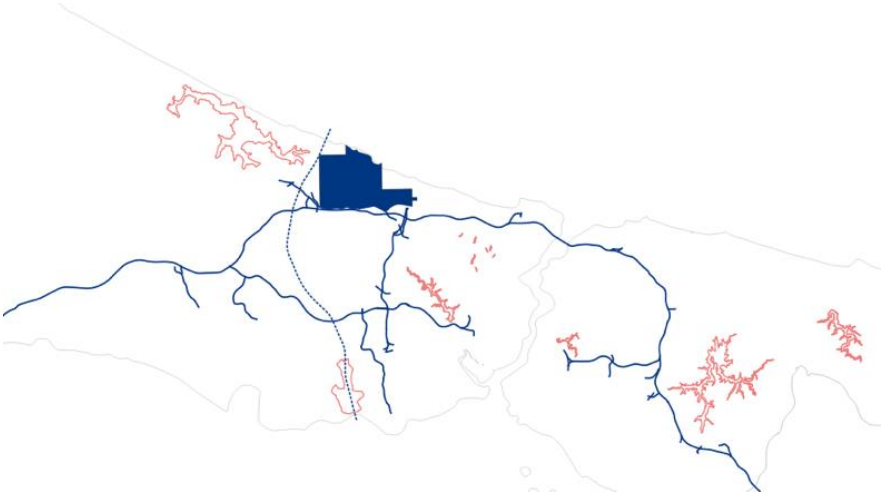


Figure 5.2: 3rd Airport, 3rd Bridge and projecting "Canal Istanbul" too close to water sources of Istanbul (Şeten and Tülek, 2019)

[78] Today Daily water consumption per person is 190 lt.

[79] Water withdrawals, or water abstractions, are defined as freshwater taken from ground or surface water sources, either permanently or temporarily, and conveyed to a place of use. (OECD Data, no date)

REFERENCES

Acara, E. (2018) ‘Sequestering a River: The Political Ecology of the “Dead” Ergene River and Neoliberal Urbanization in Today’s Turkey’, Annals of the American Association of Geographers. Routledge, pp. 1–12.

Amin, A. and Thrift, N. (2017) ‘Seeing Like a City’. Cambridge: Polity Press.

Anadolu Ajansı (2019) Cumhurbaşkanı Erdoğan’dan Istanbullulara sandığa gidin çağrısı, NTV. Available at: https://www.ntv.com.tr/turkiye/cumhurbaskani-erdogandan-Istanbullulara-sandiga-gidin-cagrisi,21Hmt3ckjEWfgy4S5mtCsw (Accessed: 30 August 2019).

Anand, N. (2017) Hydraulic City: Water and The Infrastructures of Citizenship in Mumbai. Durham and London: Duke University Press.

Aru, A. and Gorbon, R. (1957) ‘Levend Mahallesi’, Arkitekt, pp. 174–181.

Bakar, C. (2017) ‘Kırk yedi yıl sonra yeniden bir salgının hikâyesi : 1970 Sağmalcılar kolera salgınından günümüze dersler’, 15(3), pp. 245–269.

BBC News (2018) ‘The 11 cities most likely to run out of drinking water - like Cape Town’, 11 February. Available at: https://www.bbc.com/news/world-42982959.

Björkman, L. (2013) ‘Becoming a Slum: From Municipal Colony to Illegal Settlement in Liberalization Era Mumbai’, Contesting the Indian City: Global Visions and the Politics of the Local, 38(January), pp. 208–240.

Bozdoğan, S. (no date) ‘Landscapes of Power: Dams in Modernist Political Imaginary’, in Demirtaş, A. (ed.) Graft. Graham Foundation.

Carse, A. (2017) ‘Keyword: Infrastructure’, in Harvey, P., Jensen, C. B., and Morita, A. (eds) Infrastructures and Social Complexity. New York: Routledge.

Çeçen, K. (1988) Mimar Sinan ve Kırkçeşme Tesisleri. İSKİ.

Çeçen, K. (1991) Halkalı Suları. İSKİ.

Çeçen, K. (1996) Roma Su Yollarının En Uzunu. İSKİ.

Çeçen, K. (2000) Istanbul'un Osmanlı Dönemi Su Yolları. Edited by C. Kolay. Istanbul: İSKİ.

Corbin, A. (1986) 'The Foul and the Fragrant', in The Journal of Interdisciplinary History, pp. 587–612.

Cosgrove, D. E. (1990) 'An elemental Division: water control and engineered landscape', in Cosgrove, D. E. and Petts, G. (eds) Water, Engineering, and Landscape: Water Control and Landscape Transformation in the Modern Period. Belhaven Press.

Cronon, W. (1991) Nature's Metropolis: Chicago and the Great West William Cronon, Pacific Historical Review.

Crow, J. (2015) 'Water and the Creation of a New Capital', in Istanbul and Water, pp. 115–128.

Cumhuriyet (1937) 'Susuzluk Derdi: Sular Umum Müdürünün Verdiği İzahat', 5 August.

Cumhuriyet (1938) 'Istanbul'da Hakiki Bir Su Meselesi Var Mıdır?', 18 January.

Cumhuriyet (1970) 'Koleraya Karşı Tedbirler Arttırılıyor: Halk aşı için sıraya girdi', 20 August.

'Cumhuriyet Senatosu Tutanak Dergisi' (1970), 62.

'Cumhuriyet Senatosu Tutanak Dergisi' (1971), 67.

DAMOC (1971a) 'II-Master Plan and Feasibility Report For Water Supply and Sewerage for the Istanbul Region: Volume II-Part I Water Supply Studies Grater Istanbul Project Area'. Los Angeles, California-United States of America.

DAMOC (1971b) Master Plan and Feasibility Report For Water Supply and Sewerage for the Istanbul Region: Volume I General Background Studies. Los Angeles, California-United States of America.

Dinçkal, N. (2008a) ‘Arenas of Experimentation: Modernizing Istanbul in Late Ottoman Empire’, in Hard, M. and Misa, T. J. (eds) Urban Machinery: Inside Modern European Cities. Cambridge, Massachusetts; London England: MIT Press, pp. 49–70.

Dinçkal, N. (2008b) ‘Reluctant Modernization: The Cultural Dynamics of Water Supply in Istanbul, 1885–1950’, Technology and Culture, 49(3), pp. 675–700.

Drinking, Utility and Industrial Water Supply Project of Istanbul Fisibility Report Summary (1987). Ankara: TÜMAŞ.

Edwards, P. N. (2002) ‘Infrastructure and Modernity: force, time, and social organization in the history of sociotechnical systems’, in Misa, T. J., Brey, P., and Feenberg, A. (eds) Modernity and technology. MIT Press, pp. 185–225.

Enerji ve Tabii Kaynaklar Bakanlığı (1964) Istanbul Şehri, Büyük Istanbul ve civarındaki sür’atle gelişen Endüstri Sahasının İçme Kullanma ve Endistri Suyu ile Kanalizasyon. Ankara.

Erdem, B. Z. (1948) Istanbul Sular İdaresinin 1933-1947 Yıllarındaki Çalışması. Istanbul Halk Basımevi.

Ergin, O. N. (1996) Istanbul Şehreminleri (Büyükşehir Belediye Başkanları) 1855-1928. Edited by A. N. Gallitekin. Istanbul: İşaret Yayınları.

Esmer, K. (1983) ‘Tarih Boyunca Istanbul’un Suları ve Istanbul Su ve Kanalizasyon Sorunu’. İSKİ Genel Müdürlüğü.

Gandy, M. (1999) ‘The Paris sewers and the rationalization of urban space’, Transactions of the Institute of British Geographers, 24(1), pp. 23–44.

Gandy, M. (2002) Concrete and Clay: Reworking nature in New York City. MIT Press.

Gandy, M. (2005) ‘Rethinking urban metabolism: water, space and the modern city’, City, 8(3), pp. 363–379.

Goubert, J.-P. (1989) The Conquest of Water: The Advent of Health in the Industrial Age. Princeton, New Jersey: Princeton University Press.

Graham, S. and Marvin, S. (2007) Splintering Urbanism: Networked Infrastructures, Technological Mobilities, and the Urban Condition, Technology and Culture.

Gültekin, E. (2017) ‘Prof. Dr. Ekrem Kadri Unat (1914-1998)’, Nobel Medicus, 13(1), pp. 81–82.

Gürer, İ. and Meriç, N. (1971) ‘2200 Kişilik Bir Toplumda Kolera Portörlüğü Araştırması’, Mikrobiyoloji Bülteni, pp. 110–126.

Harvey, D. (1996) ‘the Nature of Environment : the Dialectics of Social and Environmental Change *’, pp. 1–51.

Hayat Magazine (1970) ‘Kolera Çiğ Köftenin Başına Patladı’, September.

Hughes, T. P. (1989) ‘The Evolution of Large Technological Systems’, in Bijker, W. E.,

Hughes, T. P., and Pinch, T. (eds) The Social Construction of Technological Systems: New Directions in the Sociology and History of Technology. Cambridge, Massachusetts; London England: MIT Press.

infra- (2019) Online Etymology Dictionary. Available at: https://www.etymonline.com/word/infra#etymonline_v_42483 (Accessed: 24 August 2019).

infrastructure (2019) Online Etymology Dictionary. Available at: https://www.etymonline.com/search?q=infrastructure (Accessed: 24 August 2019).

‘Istanbul Belediye Mecmuası’ (1941), 192.

Istanbul Sular İdaresi (1958) Istanbul Sular İdaresi Faaliyetleri. Istanbul Tan Matbaası.

Istanbul Sular İdaresi (1961) ‘10 Yıllık Su Proğramı’.

Istanbul Türk Anonim Su Şirketi (2018). Available at: https://www.peramezat.com/urun/Istanbul-turk-anonim-su-sirketi-beyoglu-1930.

İsvan, A. (2011) ‘Başkentin Gölgesinde İsanbul’.

Jerrold, W. B. (1872) London : a pilgrimage / illustrations by G. Dore.

john-snow-s-cholera-map (no date) 2017. Available at: https://medicalfuturist.com/digital-maps-help-fight-epidemics (Accessed: 28 August 2019).

Kaika, M. (2004) City of flows : modernity, nature, and the city.

Kaika, M. (2006) 'Dams as symbols of modernization: The urbanization of nature between geographical imagination and materiality', Annals of the Association of American Geographers, 96(2), pp. 276–301.

Kazgan, H. and Önal, S. (1999) Istanbul'da Suyun Tarihi.

Keleş, R. (2016) Kentleşme Politikası. 15th edn. İMGE Kitapevi.

Kentel, K. M. (2018) Assembling ' Cosmopolitan ' Pera : An Infrastructural History of Late Ottoman Istanbul. University of Washington.

Koray, G. (1970) 'Hayatımıza Giren Kolera', Hayat Magazine, November, pp. 17–19.

Kuseyri, S. and Yarbag, C. (1970) 'Kolera Raporu', Hayat Magazine, August.

Larkin, B. (2013) 'The Politics and Poetics of Infrastructure', Ssrn.

Latour, B. (1993) We Have Never Been Modern, Configurations.

Latour, B. (2005) Reassembling the Social: An Introduction to Actor-Network Theory. Oxford University Press.

van Leeuwen, K. and Sjerps, R. (2016) 'Istanbul: the challenges of integrated water resources management in Europa's megacity', Environment, Development and Sustainability. Springer Netherlands, 18(1), pp. 1–17. doi: 10.1007/s10668-015-9636-z.

Mango, C., Dagron, G. and Greatrex, G. (eds) (1995) Constantinople and Its Hinterland. VARIORUM.

'Millet meclisi tutanak dergisi 31' (1971).

‘Millet meclisi tutanak dergisi 32’ (1971).

Milliyet (1970a) ‘Cenazeler arasında düğün yaıldı’, 19 October.

Milliyet (1970b) ‘Dün 4 kişi öldü’, 19 October.

Milliyet (1970c) ‘Hasta Sayısı 150’yi Aşıyor’, 15 October.

Milliyet (1970d) ‘Istanbul’a Yabancı Gemiler Gelmiyor’, 21 October, p. 11.

Milliyet (1970e) ‘Kolera’, 17 October.

Murray, M. J. (2013) ‘Afterword: Re-engaging with transnational urbanism’, in Samara, T. R., He, S., and Chen, G. (eds) Locating Right to the City in the Global South.

Nye, D. E. (2006) Technology Matters: Questions to Live with., Journal of Chemical Information and Modeling.

OECD Data (no date) Water Withdrawls, 2018. Available at: https://data.oecd.org/water/water-withdrawals.htm (Accessed: 31 August 2019).

Onul, B. (1971) ‘Kolera’, Ankara Üniversitesi Tıp Fakültesi Yayınları. Ankara Üniversitesi Basımevi, (249).

Penner, B. (2013) ‘Bathroom’, in Bathroom, pp. 487–492. Available at: http://ir.obihiro.ac.jp/dspace/handle/10322/3933.

Picon, A. (2018) ‘Urban Infrastructure, Imagination and Politics: from Networked Metropolis to the Smart City’, International Journal of Urban and Regional Research, 42(2), pp. 244–262.

Sayılarla Istanbul (2001). Available at: http://www.ibb.gov.tr/tr-TR/BilgiHizmetleri/Istatistikler/Documents/demografi/t211.pdf.

Scott, J. C. (1988) Seeing Like a State. New Haven and London: Yale University Press New.

Şeten, S. and Tülek, M. (2019) Mega Projects. Available at: https://megaprojelerIstanbul.com/ (Accessed: 31 August 2019).

structure (2019) Online Etymology Dictionary. Available at: https://www.etymonline.com/word/structure#etymonline_v_22198 (Accessed: 24 August 2019).

Sungur, E. (1970) 'Kanalizasyon Sorunu', Cumhuriyet, 26 October.

Swyngedouw, E. (2004a) 'Hybrid Waters: On Water, Nature, and Society. In social power and the urbanization of water', pp. 7–26.

Swyngedouw, E. (2004b) Social Power and the Urbanization of Water: Flows of Power. New York: Oxford University Press.

Swyngedouw, E. and Kaika, M. (2000) 'The Environment of the City… or the Urbanization of Nature', A Companion to the City, pp. 567–580.

Tarih Boyunca Istanbul'un Su Davası (1950). Istanbul Halk Basımevi.

Tchihatchef, P. de (2019) Istanbul ve Boğaziçi. İş Baknası Yayınları

Tekeli, İ. (2009) 'Günümüzdeki Kentsel Altyapı Sorunları Nasıl Kurgulanabilir?', in Kentsel Arsa, Altyapı ve Kentsel Hizmetler. Tarih Vakfı Yurt Yayınları, pp. 108–187.

Tekeli, İ. (2013) Istanbul'un Planlanmasının ve Gelişmesinin Öyküsü. Istanbul: Tarih Vakfı Yurt Yayınları.

Tekeli, İ., Gülöksüz, Y. and Okyay, T. (1976) Gecekondulu, İşportalı, Dolmuşlu Şehir. Cem Yayınevi.

Terkos fabrikası inşaatı ile bazı yerlere yapılan terfi istasyonları inşaatı albümü (no date).

Tezok, F. et al. (1970) 'Kolera'ya Genel Bir Bakış', Mikrobiyoloji Bülteni, 4(4).

Varlik, N. (2015) 'Plague and Empire in the Early Modern Mediterranean World', Plague and Empire in the Early Modern Mediterranean World.

Vidler, A. (2011) The Scenes of the Street and Other Essays. The Monacelli Press.

Wagner, M. (1935) ‘Istanbul havalisinin planı’, (Arkitekt), pp. 301–306.

Water of Tomorrow (no date) 2019. Available at: https://www.yarininsuyu.com/en (Accessed: 31 August 2019).

WHO/UNDP Advisory Team (1971) Istanbul Water Supply Project Proposal For Financement. Istanbul.

Yanardağ, P. (2009) The Epidemic, The Prison House and the Global City Belonging and Identity in Bayrampaşa.

Yarbag, C. and Koray, G. (1970) ‘Kolera Istanbul’da Panik Yarattı’, Hayat Magazine, October, pp. 12–13.

Yurdakul, İ. (2010) Aziz Şehre Leziz Su: Dersaadet (Istanbul) Su Şirketi (1873-1933). KİTABEVİ.

Yüzak, Ö. (2011) ‘Habibler Mahallesi’nin Kadınları’, Cumhuriyet, 8 June.