Effect of introduction of fire prevention facilities on fires in Ottoman Istanbul

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Abstract

Many fire incidents and urban-fires occurred in Ottoman Istanbul, but today we no longer face such kind of disasters.

This research analyzed records of 151 fire incidents and urban-fires from the year 1478 to 1918 in Ottoman Istanbul, paying attention to start points, burnt areas, damaged scales and calendar date of each fires with the help of GIS database in order to clarify factors that had reduced fire incidents. Subject area is set inside of the zone surrounded by the Golden Horn Inlet, Theodosian Walls and Marmara Sea.

Reduction of the numbers of fires should be attributed to enhancement of either 1) fire proof ability of each buildings through rebuilding following destruction by fires or decay by time, operated by building codes (e.g. the 1848 building code), or 2) fire fighting ability depending on both fire fighting organization (e.g. establishment of autonomous fire fighting section in 1868) and fire fighting equipments (e.g. Real Davud's introduction of fire pump to the Ottoman Empire around 1720 or installment of fire ponds in the city started from 1794).

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So, paying attention to such epoch making years as 1720 (i.e. introduction of fire pump), 1795 (i.e. the next year of the start of installation of fire pond) we counted the numbers of fire incidents per annum before and after each epoch making years.

The numbers of fire incidents occurred in all over the subject area (151 fires recorded) had not been reduced after the installation of fire ponds mentioned above. Regarding fire incidents started in or around the Grand Bazaar (in Turkish, Bedesten, 13 fires recorded), the numbers per annum declined to 1/5 after 1795, when they had started to install fire ponds in the grounds of Beyazid- and Nuruosmaniye- Mosques which are just next to the Grand Bazaar. Also those started in or around the district of Odun Gate, infamous for its vulnerability (30 fires recorded), declined to 60% per annum after 1795 compared with before.

So, those fire ponds installed in the premises of large mosques in the center of the city prevented fire from growing larger to some extent, but, as the urban fire streams proceeding through the vicinity of those fire-ponds-installed mosques was not reduced, fire fighting ability at that time seemed to be inadequate to settle down large scaled fires.

Of course we should conclude that such reduction of fire incidents can not be attributed only to the installments of fire ponds but also to other reasons combined together, but at least we can say that it was the biggest effect to reduce the numbers of fire incidents concerning those area which could protect themselves with extinguisher facilities, composed of fire pumps, fire ponds and fire fighters.

Keywords: fires, Ottoman Istanbul, fire proof ability, fire fighting ability, planning history

1 Introduction

1.1Background and purpose of the paper

Istanbul is a prominent mega-city embracing around 9 million population and 13.1 million including its suburbs in 2010. The city, suffering from its 256 fires during the years 1478-1918 according to the description by Mustafa Cezar, 2002 (the 11th Chapter, pp.354-445), has developped contemporary urban spaces after repeated destructions and constructions like Edo (old name for Tokyo). This paper aimed to 1) organize the information on the history of fires in Istanbul, 2) grasp characters of each fire and 3) consider historical background of the change of those characters, based on the above-mentioned book.

1.2 Method of the research and accuracy of data

The subject area (Fig.1) is the historic peninsula of Istanbul, that is, the area enclosed by the Theodosian Walls, the Golden Horn Inlet and the Marmara Sea. Within the 256 fires mentioned above, fires broke out in this area were 151 and 25 of them were recorded with the information how they spread out gradually.

We built up GIS database of these fires with the help of the Google-Map and the Mapinfo (GIS application soft) and considered characters of fires and their (characters') change referring to other books appropriately.

Cezar described location information of each fire with the names of city wall gates, localities, large-scaled buildings or streets. In case there were few information

Fig. 1 Subject Area (source:Baedeker)

Tab.1 Historic Events concerning fire fighting and fire-proof structure

Year	Event
1701	Reconstruction of the Grand Bazaar into masonry structure
ca.1720	Introduction of hand-pump extinguisher
1794	Installation of fire ponds (first phase)
1811	Installation of fire ponds (second phase)
1826	Independence of fire fighting organization from military power
1848	First building regulation system introduced
1864	Complete prohibition of wooden structure

to identify the location of ancient localities or streets exactly (pinpoint) (but at least got some hints), we assumed their mid-section to be the starting-points or spreading-routes of fires.

And, we drew spreading-routes with polyline style linking each building or locality said to be destroyed by fires. Even in case Cezar did not describe plural spreading-routes respectively, we drew those routes separately when we judged rationally that there should have been existing plural routes.

Thus, this database standing on Cezar's description is NOT SO accurate enough to measure burnt-areas or length of spreading-routes, we mainly have done qualitative analysis (location information).

The analysis was undertaken according to the 3 eras set by two epoch-making events; introduction of fire-pump by Real Davud (French-born Naval Engineer served for Ottoman Navy, introduced hand-pump extinguisher. Cezar, 2002. pp.356-357.) around 1720 and the first time installation of fire ponds starting from 1794 (Cezar, 2002, p.416) (Tab.1).

2 Analysis

2.1 Overview of outbreak of fires

2.1.1 Transition of the numbers of fires

Tab.2 Fires broke out in Istanbul in each era

	Period (year)	Years	Population (thousand)	Numbers of Fires	(among which spreading route identified)	Average fires per annum
First Era	1478–1718	241	620	36	8	0.15
Second Era	1720–1784	74	640	72	15	0.97
Third Era	1788–1918	122	820	44	10	0.36
Total	1478–1918	440	N/A	151	25	0.34

Tab.2 shows round numbers of population of Istanbul (Chandler , 1987.) and numbers of fires in each era. Average numbers of fires per annum occured during the second era (0.97) is more then 6 times as many as the first era (0.15). Behind this phenomenon, there must have existed concentration of population and commercial- and industrial-functions to urban space, but at the same time we should presume that such records from newer period should outlive easier (securely) than those from older period.

And, in spite of such presumption, the average fires broke out in the third era (0.36) is less than half of the second (0.97). It depicts certain reasons restrained fires to break out, for sure.

2.1.2 Transition of outbreaks of fires by months

Fig. 2 shows numbers of fires broke down by months. Comparing the proportion of the numbers of fires occurred in each era by months, we may describe that during the first era, the proportions of such months as August, September, April, May, and March are high in descending order, but during the second, that of July, March and June rise (position of April and May stay similar to the former era) and instead August and September fall. During the third era, July and June continue to have large proportion, but on the other hand April and May used to be prominent during the first and second fall.

Thus, “fire concentration season” differs in each era; during the first era, it is from spring through high summer till late summer; during the second, spring till

early summer; the third, early summer till high summer.

According to the meteorological data (provided by the research assistant F. Korhan Yelkenci, belonging to the General Astronomy Division of the Astronomy Department of the University of Istanbul) observed in 2010 just below the Beyazid Tower (Former Fire-Watch-Tower under Ottoman period, located in the site of the so-called “Former Palace”, later turned into the Ministry of Army and then to the University today), the average relative-humidity (Fig.3) records the lowest in May and the second lowest in August, so the high proportion of May in the first and second eras and that of August in the first and third eras are convincing, but the falls of that of May in the third era and that of August in the second are not. There must

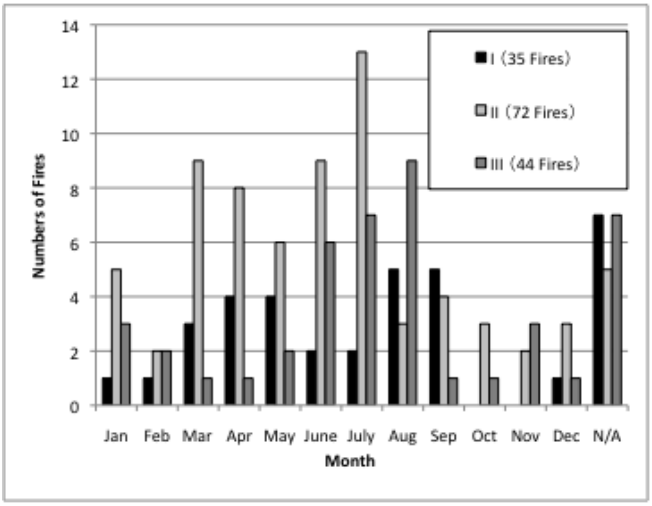

Fig.2 Numbers of Fires broke down by Months

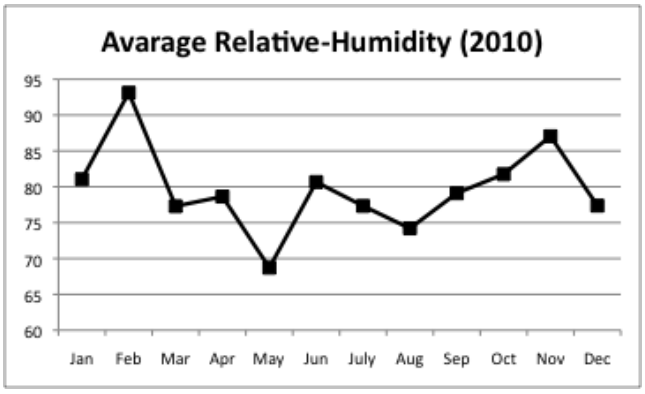

Fig.3 Average Relative-Humidity observed in Istanbul in 2010, (source: original data courtesy of Mr. Yelkenci)

be some other reason which cannot be explained by the actual meteorological data.

2.2 Onsite analysis of outbreak of fires

2.2.1 Outbreak locations

Fig.4-6 shows outbreak location of fires.

During the first era (Fig.4), fires broke out in Topkapi Palace and in its vicinity (the First Hill, "**A**" in the following sentences), the Grand Bazaar and the Old Palace together with its vicinity (the Second and the Third Hill, "**B**"), the commercial sea port facing to the Golden Horn Inlet (Eminonu, "**C**") and such residential districts also facing to the Inlet as Cibali, Fener and Balat inhabited by Greek, Armenian and Jewish people ("**D**"). Only one fire broke out on the Seventh Hill ("**E**").

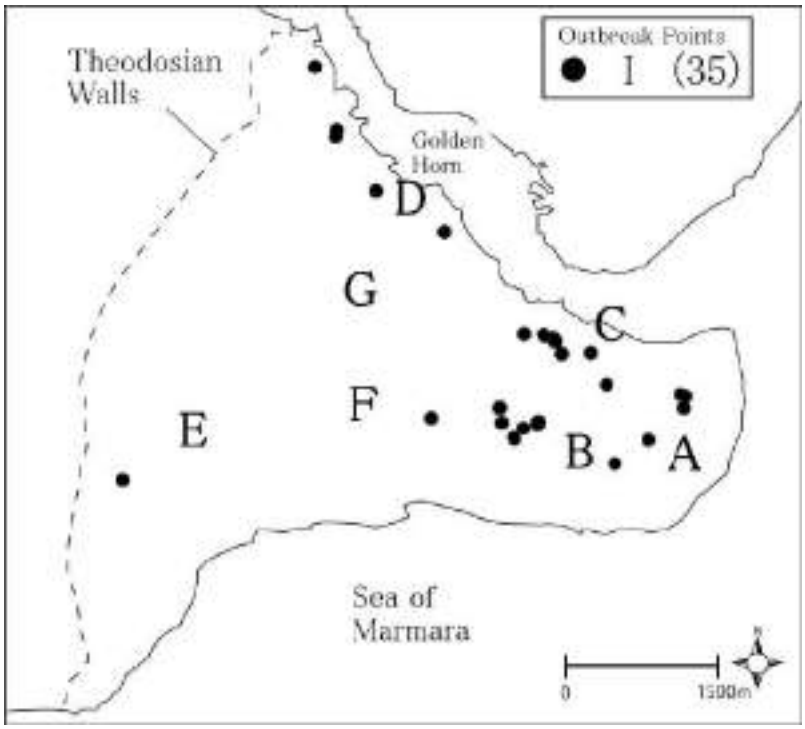

Fig.4 Outbreak Points of Fires during the first era (1478-1719)

The contrast between **D** and **E** may be attributed to the facts that 1) Non-Muslim people were restricted to live in smaller house than that of Muslim people (Kuban, p.355.,), 2) **E** was occupied by Muslim people and their houses were composed of several buildings scattered around in premises (Kuban, 2010. p.240.) and 3) large area of **E** was occupied by the so-called Kulliye, that is, a complex of buildings for various benevolent services for local community (Kuban, 2010. pp.313-314.).

During the second era (Fig.5) , more than 6 times as many fires per annum broke out as during the first. The occurrence status of fires around **A** did not change, but numbers broke out around **B**, **C** and **D** increased. Among them, Balat District in **D** gained population density more because of absorbing those Jewish people eventually being forced to move out from **C** for the construction of New-Mosque (Yeni Camii) at the end of the 16th century (Kuban, 2010. p.69.). And, fires broke out to the west of **B** (in the vicinity of the saddle-point formed by the Third and the Forth Hills over to the sea of Marmara, "**F**"), in the vicinity of Conqueror's Mosque (Fatih-Camii) (the Fifth Hill, "**G**") or in the Marmara side of **E** (Samatya District) came to be

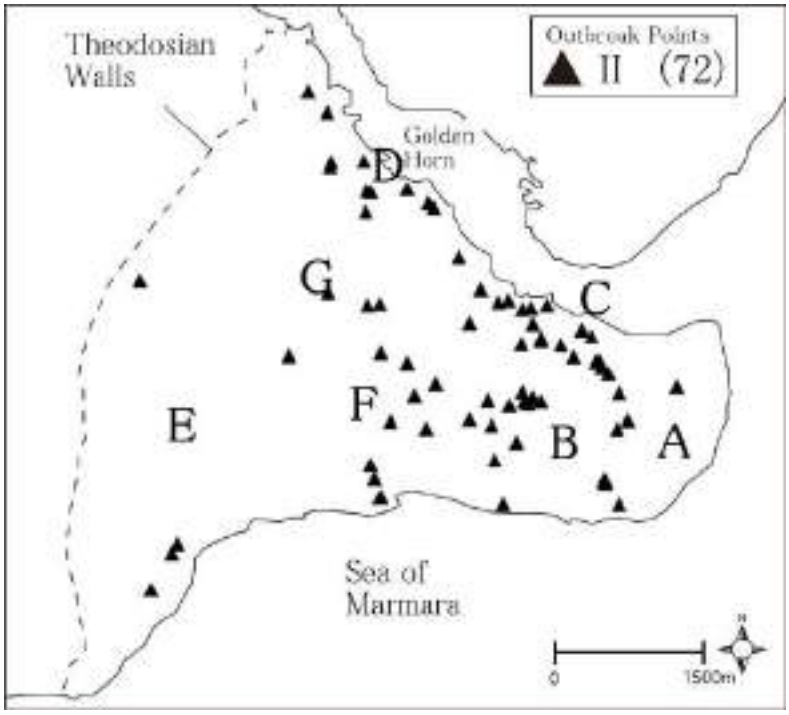

Fig.5 Outbreak Points of Fires during the second era (1720-1794)

observed. In this era, in **F** and **G**, such markets founded by Ottoman Sultan Mehmet II (the Conqueror) as Sultan pazari Market and Sarachane Market were thriving because of the trade expansion between Balkan Peninsula and Istanbul (Kuban, 2010. p.281.).

During the third era (Fig.6) , the numbers of fires per annum decreased by less than half of the former. Fires occurred similarly in **A**, **B** and **D**, but less occurred in **C** and **F**. In 1794, authority installed fire ponds in **B** (in the premises of the Beyazid and the Nuruosmaniye Mosques), **C** (in the premises of the New and the Suleymaniye Mosques) and **F** (in the premises of the Laleli Mosque). In 1810 they installed fire ponds again in **C** (in the premises of the Suleymaniye Mosque) and **F** (in the premises of the Sehzade Mosque) and newly in **A** (in the premises of Sultanahmet Mosque) and **G** (in the premises of the Conqueror's Mosque) (Kuban, 2010. p.418.). Regarding **C** and **F** equipped with fire ponds dropped frequency of fires, but on the other hand, **B** also equipped with fire ponds could not drop the frequency.

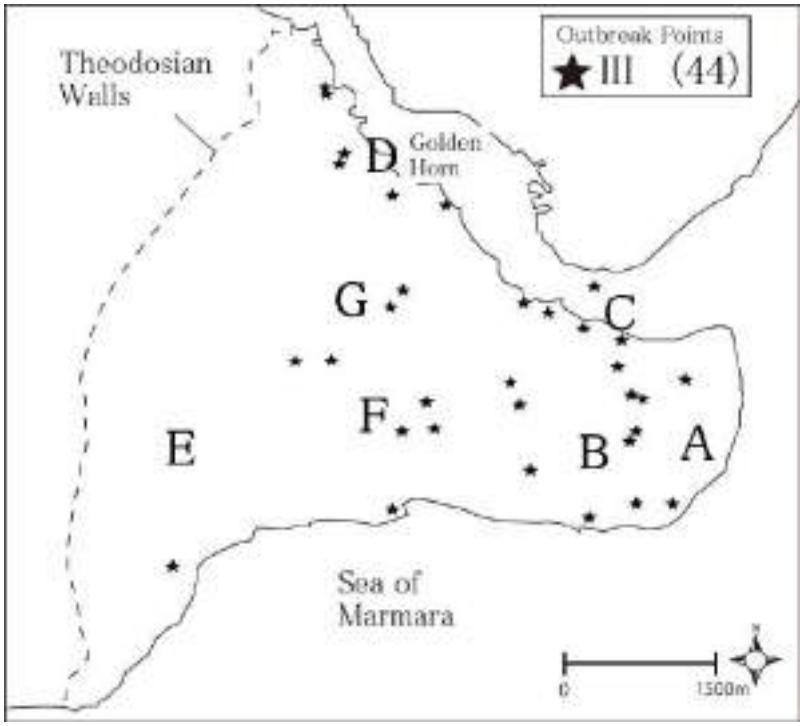

Fig.6 Outbreak Points of Fires during the third era (1795-1918)

2.2.2 Spreading route

Fig.7-9 shows spreading routes of fires recorded in each era. Triangle- or Star-shaped points depict start of each fire and polylines extending out from those points show spreading routes.

No spreading route is recorded during the first era (Fig.7).

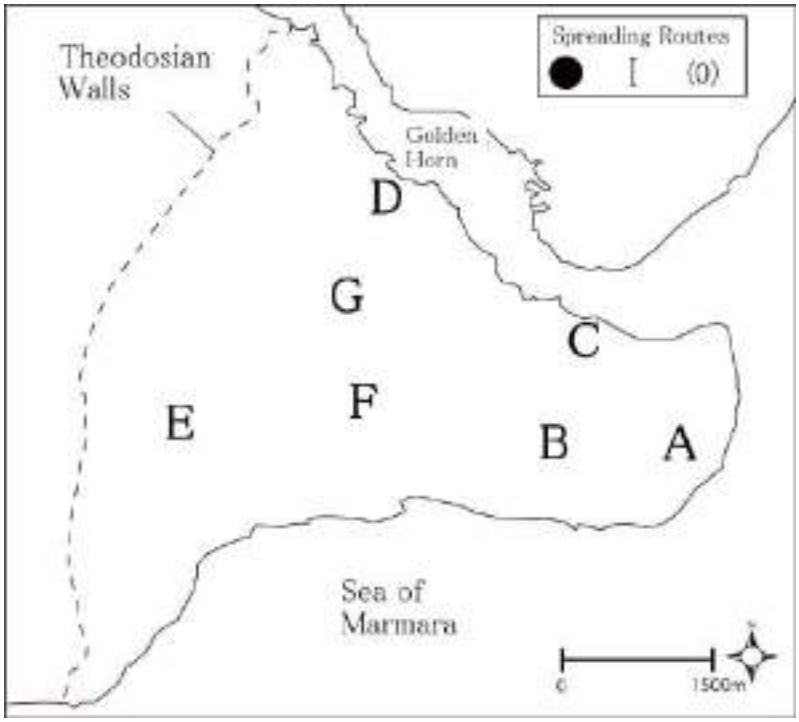

Fig.7 Spreading Routes of Fires during the first era (1478-1719)

During the second era (Fig.8), half of the fires recorded with spreading routes were generated in **C** and **D** facing to the Golden Horn Inlet. This may be attributed to such facts as 1) **C** and **D** were densely inhabited and flourishing for their commercial and industrial functions, 2) **D** was not equipped with fire ponds and 3) the prevailing wind observed in almost all months comes from the Golden Horn Inlet (Fig.10 shows wind-rose chart, made from the meteorological data mentioned above).

During the third era (Fig.9), the numbers of fires with long-spreading-routes

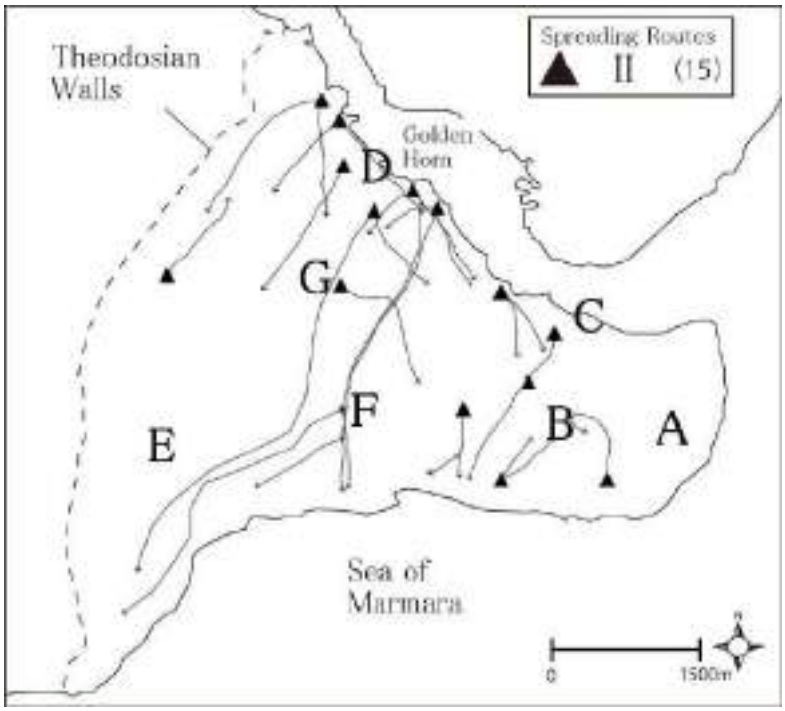

Fig.8 Spreading Routes of Fires during the second era (1720-1794)

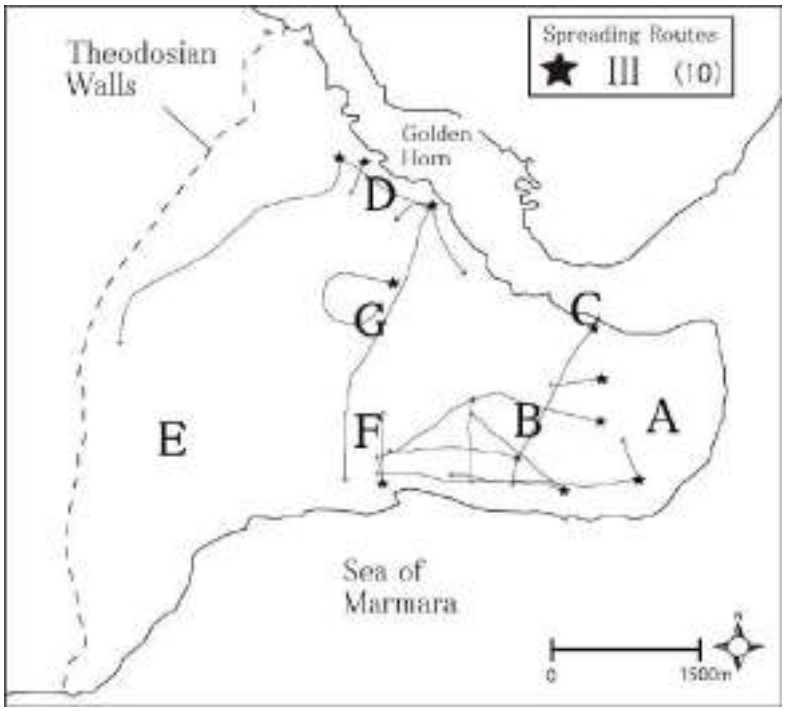

Fig.9 Spreading Routes of Fires during the third era (1795-1918)

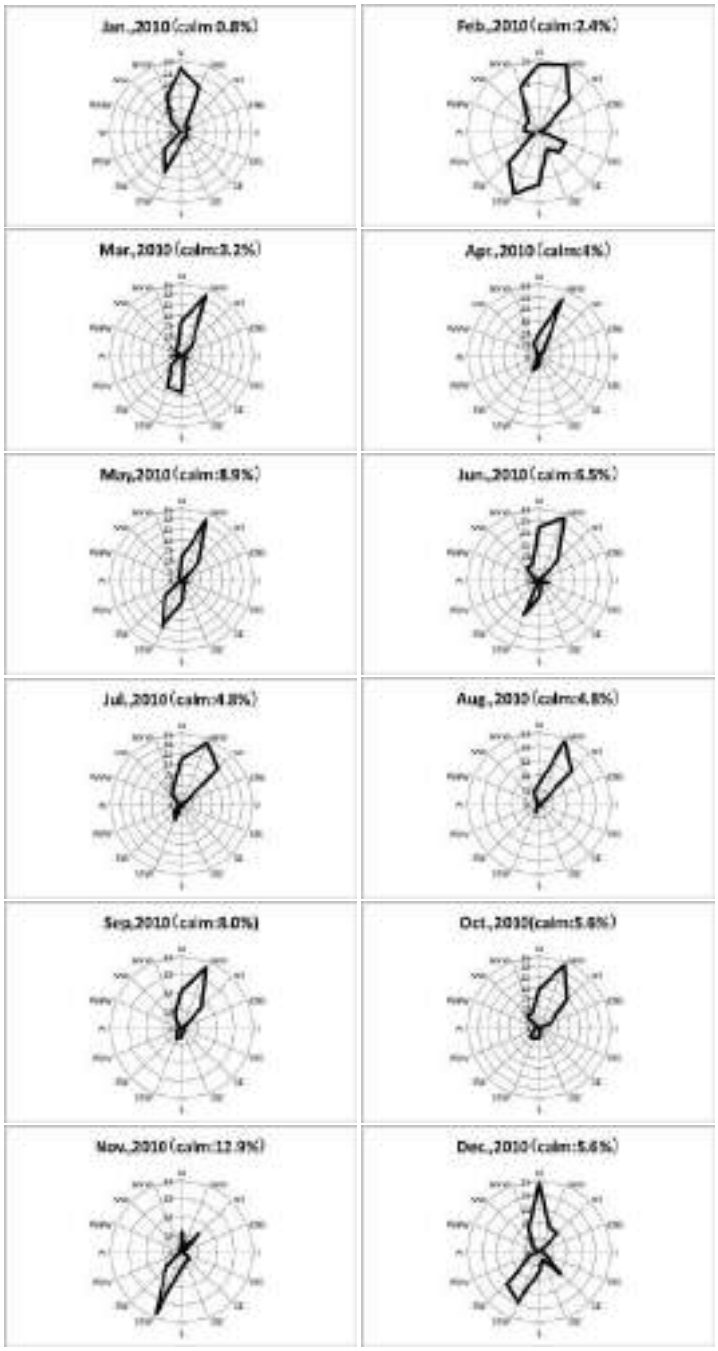

Fig.10 Wind-Rose Chart in 2010 (data: courtesy of Mr. Yelkenci)

derived from the minority district facing to the Golden Horn Inlet declined (though still occurring).

E, less suffered from outbreaks of fires, also less damaged by those spreading

fires (though, Samatya District inhabited by Armenians and Greeks burnt). This may be interpreted as the result of being low building-coverage ratio mentioned above, similar to the fact that those fires broke out in the premises of Topkapi Palace tend not to grow larger.

2.3 Start of Building Regulation and its Effect

2.3.1 Development of Building Regulation

According to the description by Celik (Celik, 1986. pp.51-54) (Tab.3), the first systematic Building Regulation (Ebniye nizamnamesi) together with Building Declaration (Ebniye beyannamesi) were issued in 1848. They defined “Kargir” or masonry structure and started to control height of building in accordance with whether it hwas to be built in masonry (less than 22m) or wooden (less than 16m) structure.

Then, in 1864 Government issued a decree saying that henceforth they

Tab.3 Development process of building regulation after 1848

	Concerning fire-proof construction	Concerning height	Concerning street classification	Concerning (improvement) of infrastructure	Acknowledgement
1848 Regulations (Ebniye Nizamnamesi) and Declaration (Ebniye beyannamesi) for Buildings	Introduction of definition of Kargir (masonry)	Kargir structure, less than 22m; wooden structure, less than 16m	3 classes	Large vacant land area, small building lots, development permission for plots or open fields	
1856	Urban redevelopment of Beyoğlu after the Great Fire of Pera				
1863 Street and Building Regulation (Turuk ve Ebniye Nizamnamesi)			5 classes		
1864 Government Decree	Prohibition of wooden structure within the territory of the Capital City, except for those installed with Kargir Fire Wall				
1865	Establishment of the Commission for Street Improvement, commencement of street-widening projects and other redevelopment of Beyoğlu after the Great Fire of Beyoğlu				
1868	Planning of the New Street Network				
1875 Regulations on Construction Methods in Istanbul (Istanbul ve Belde-I Sebsede Yapilacak Ebniyenin Sureti-I Inşaiyesine dair Nizamname)	Complete prohibition of wooden structure in the Inner Zone and prohibition of them in the Outer Zone, except for those equipped with Fire Wall				Part of the area linking Aksaray-Unkapani-Azapkapi-Galata-Pera-Ortaköy was the Inner Zone, West, the Outer Zone
1882 Building Law (Ebniye Kanunu)		Introduction of the regulation for height of building in accordance with width of street	5 classes	Introduction of the Torla Rule (Infrastructure reorganization in case of fire causing damage of more than 10 buildings)	

source: Celik, Zeynep, 1986. The remaking of Istanbul: Portrait of an Ottoman City in the Nineteenth Century, University of Washington Press, pp.51-54

prohibited wooden structure except for those buildings installed with Kargir firewalls. This prohibition developed into another phase in 1875 ; 1) wooden structure was completely prohibited in the inner part of the capital city (eastwards from the axis connecting Aksaray- Unkapani- Azapkapi- Sisli/Pera- Ortakoy till Bosphorus Strait) and 2) prohibited unless it equipped itself with masonry firewalls in the outer part (westwards from the axis mentioned above).

As for height-control, Building Law (Ebniye kanunu) issued in 1882 introduced regulation for height in accordance with width of streets running in front of those buildings.

Thus, gradually Ottoman capital gained ways to regulate the size and volume of buildings composed of flammable materials for the sake of suppress fires.

2.3.2 Fires after the enforcement of masonry structure

Now focusing on those fires occurred after the definition of Kargir structure in 1848. In the subject area, 22 fires broke out after 1848 and interestingly enough most fires came out from the same or neighboring places as the former ones.

Tab.4 shows fires I) occurred in the same district (premises) as the precedents and II) occurred (possibly) in the neighboring area or in the same point of the precedents, after 1848.

Among the former ones Samatya (No.1 of Case I) was destroyed before the enforcement of Kargir obligation in 1864 and again in 1882. Hocapasa (No.2 of Case I) and Sublime-Porte (No.3 of Case I) caught fire after 1864 and, as for Hocapasa, the name never came out to the history of fire henceforth, but Sublime-Porte again (Feb., 1911), though it is not a good case to study more because of its special characteristics.

Tab.4 Places suffered from fire after 1848 more than twice

I) Fires occurred in the same district (premises) as the precedents after the 1848 Regulation

	Name of place	Month/Year	Note
1	Samatya District	Aug.,1852 and Jul.,1882	After the fire in1852, Obligation enforced.
2	Hocapasa District	Aug.,1865 and 1865 (no further info.)	After the enforcement of Obligation Fire occurred.
3	Sublime Porte (Babiali or Grand Vizier's Office)	May,1878 and Feb.,1911	After the enforcement of Obligation Fire occurred and another one occurred later.

II) Fires occurred (possibly) in the neighboring area or in the same point of the precedents after the 1848 Regulation

	Name of place	Month/Year	Note
1	Sultanahmet	1852 (no further info.)	After the fires in1852 and 1880, Obligation enforced and another one occurred later.
	Atikapi	Jun.,1860	
	Ishakpasa	1912 (no further info.)	
2	Koska and Lalali	Jun.,1855	After the fires in1855 and 1856 Obligation enforced and an other one occurred later.
	Aksaray	Nov.,1856	
	Uzunsarsi (spread over from)	Jul.,1911	
3	Fener and Kiremit	Apr.,1881	After the fire in1861 Obligation enforced and another one occurred later.
	Balat	Jul.,1911	
4	Fener and Kiremit (double-count)	Apr.,1881	After the fires in1881 and 1883 Obligation enforced and another two occurred later.
	Halicilar	Dec.,1883	
	Circir (spread over from)	Aug.,1908	
	Sultansolin	Jun.,1918	
5	Gedikpasa	Sep.,1865	After the enforcement of Obligation fire occurred and another one occurred later.
	Uzunsarsi (spread over from) (double-count)	Jul.,1911	

Among the latter ones, there are some cases which seem to be interesting; chatching fires more than twice after the enforcement of Kargir structure. It implies the possibility that even reconstructed buildings with Kargir structure might not to be able to stop fires to occur, as the vicinity of Sultanahmet (No.1 of Case II) and Gedikpasa (No.5 of Case II) in which people were obliged to rebuilt their buildings with full-Kargir structure (another possible interpretation is that the precedent did not touch the places which followers burnt down, or, Ottoman officials were not so keen to let people keep the regulations).

2.3.3. Historical tendency and the effect of regulation

Another question is whether such new regulations set by Ottoman officials had

clear effects on stopping the tendency of fire till then, or not.

Tab.5 shows fire history in the areas shown on Tab.4.

As for Hocapasa (No.2 of Case I) , though many high officials serving for Sultan lived in at that time, it was caught fires 7 times and destroyed every 10-20 years until the third quarter of the 18th century and twice let Sublime-Porte burn down (No.3 of Case I), but as we saw above after the fire in 1865 it never caught fire. This fact may be attributed to the effect of regulation for structure, but also to the possibility that high officials followed Sultan's move to Galata/Pera side of the city (Celik,pp.38-39) and so population and building densities might go down.

In the vicinity of Uzuncarsi, Gedikpasa and Grand Bazaar (No.3 of Case II), that of Fener and Balat (No.4 of Case II) and that of Laleli, Koska, Aksaray and Langa (No.5 of Case II), though in deed they each occupy vast territory of the city, people experienced several fires .

About the vicinity of Uzuncarsi, Gedikpasa and Grand Bazaar (No.3 of Case II), 5 fires occurred with interval of 30 years in the 18th century. Though installed with fire pond in the premises of Nuruosmaniye Mosque in 1794, the quarter suffer 3 fires and one after the enforcement of Kargir in 1864. So, as we saw macro-scope study at 2.2.1, frequency of fire seems not to decline.

But, in the vicinity of Fener and Balat (No.4 of Case II) and that of Laleli, Koska, Aksaray and Langa (No.5 of Case II), the numbers of fire decline clearly around the end of the 18th century. The former suffered 9 fires till the end of the 18th century and never to be equipped with fire pond and after the turn of the century 4 (during the 18th century 6 with interval of ranging from 2 to 30 years, and during the 19th century 3 with interval ranging from 13 to 50 years). The latter, though just next to barracks of Jannisary Troops obliged for fire fighting till 1826, suffered from 9 fires

Tab.5 Fire history in the areas shown on Tab.4

Fire history in the Areas shown as Case I)		
	Name of Place	Month/Year (spacial info.)
1	in the vicinity of Samatya	Nov. 1747
		1756 (no further info.)
2	in the vicinity of Hocapasa	Aug.1701
		Jul.1725
		Jan.1746
		Oct.1755 (reached to Sublime-Porte)
		Jan.1767
		Jul.1800
		Aug.1826 (reached to Gedikpasa, Kadirga, Beyazid, etc)
3	in the vicinity of Sublime-Porte	Oct.1755 (came over from Hocapasa)
		Jul.1808 (came over from Hocapasa)
		Nov.1808
		Jan.1839
Fire history in the Areas shown as Case II)		
	Name of Place	Month/Year (spacial info.)
1	in the vicinity of Sultanahmet	Jul.1741 (Sultanahmet)
		1802 (no further info.) (Sultanahmet)
		Oct.1826 (Ahirkapi)
2	in the vicinity of Fatih and Saltanselim	May.1725 (Halicilar)
		Jul.1728 (Sultanselim)
		Jun.1752 (Sultanselim)
		Aug.1833 (southwestwards from Cibali)
3	in the vicinity of Uzuncarsi, Gedikpasa and Grand Bazaar	May. 1725 (Gedikpasa)
		Jun.1752 (Gedikpasa)
		Dec.1754 (Uzuncarsi)
		1790 (no further info.) (Uzuncarsi)
		Sep.1792 (from Odunkapi to Uzuncarsi)
		Aug.1826 (Gedikpasa)
4	in the vicinity of Fener and Balat	May. 1600 (from Balat to Eminonu)
		Aug.1640 (from Balat to Sultanselim)
		Apr.1679 (Fener)
		Sep.1701 (from Ayvansaray to Balat)
		Jul.1729 (southwestwards and southeastwards from Balat)
		Mar.1739 (Fener)
		Dec.1745 (Fener and Kiremit)
		Jul.1782 (Fener)
		Aug.1784 (Fener and Kiremit)
		1815 (no further info.) (Balat)
		Feb.1828 (Balat)
5	in the vicinity of Laleli, Koska, Aksaray and Langa	Jun.1645 (from Beyazid to Langa)
		Apr. 1722 (Koska)
		Mar.1752 (Langa)
		Jun.1752 (Koska)
		Mar.1754 (Langa)
		Jun.1754 (Aksaray)
		Jul.1756 (Kadirga)
		1778 (no further info.) (Langa)
		Aug.1782 (from Ayakapi to Langa)
		Jul.1811 (Langa)
		Aug.1833 (from Cibali to Langa)

till the end of the 18th century and after being equipped with fire pond at Laleli Mosque, 5 (during the 18th century 7, and during the 19th century 4, though both periods show similar range of interval).

It is hard to distinguish the possible effect of building regulation over fire-prevention from that of installation of fire pond, but in the vicinity of Fener and Balat, fire pond was never installed.

3 Conclusion

This paper reveals such facts as 1) the numbers of fires once increased till the end of the 18th century and then started to decrease around the same time as the installation of fire ponds, 2) originally, spring to summer seasons being short of rainfall occupied larger proportion of months in which fires broke out, but after the period of installation fire ponds the proportion of spring season fell, 3) as population and commercial- and industrial-functions were being concentrated on gradually, fire risk had risen, but the numbers of fire broke out decreased after the installation of fire ponds in such densely-inhabited or thriving commercial- and industrial- districts, 4) half of those fires recorded with their spreading-routes started from the Non-Muslim Districts in which space of living inevitably condensed, 5) even after the enforcement of masonry and fire proof structure called Kargir within the city territory in 1864.

Still, we should pursuit accuracy of consideration with the combination of fire, calendar, wind-rose chart and relative-humidity as well as concrete density of population and implementation of building regulation at that time.

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