

# **Fire Hazard in Dhaka City : A Case Study of the Service Area of Mohammadpur Fire Station**

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## **Introduction**

The use of fire has been indispensable to man since the very beginning of civilization. Fire has been put to a myriad of uses, from warding off predators to providing heat in a cold climate; from cooking food to running machinery. Although other forms of energy are now often used to perform many of these and other functions, these alternative forms of energy can create fire in an unwanted manner. While fire is essential for human society, failure to control it can unleash its inherent destructive power and cause great harm to society. Fire is then the source of a disaster.

Fire, as a disastrous event, can have its origin either in nature per se or in human activities. Whatever the case, it is a phenomenon that usually involves a process of occurrence, spreading, human countermeasures and then disappearance (Yan and Kubo, 1996). Fires can occur almost anywhere where inflammable materials are present. It can spread in any direction depending on topographic and climatic factors and elements on the ground, and sustain itself for any period varying from a few minutes to days or weeks, depending on the fire load, effective countermeasures or natural deterrents, before finally dying out.

Although other forms of hazards, like cyclones and floods, have overshadowed the threat from fire hazard, fires do cause considerable damage in our country. Official records from the Bangladesh Fire Service and Civil Defence (BFSCD) show that material damage due to fire in the Greater Dhaka districts (Dhaka, Narayanganj, Manikganj, Narsingdi and Munshiganj) alone was to the tune of Tk. 384.59 million in 1997. Urban settlements are particularly vulnerable. Urban areas are characterized by intense human activities in production, transport, service provision etc., and in virtually all these activities the danger of a fire breaking out exists to varying degrees. The density of human settlements with all their pertinent structures abates the spread of fire. The greater concentration of people and wealth means fires of similar intensity would risk more lives and property in a city than in a rural settlement.

Urbanization is taking place in Bangladesh very rapidly. Much of the measured urbanization is due to the migration into existing urban area from the countryside. For example, the annual growth rate of population in Dhaka City is conservatively expected to be three percent (UNFPA, 1996), which is much higher than the national growth rate.

Increased population has been linked with more frequent urban conflagrations worldwide (Haessler, 1989). In Dhaka itself the rising frequency of fires has been noted (Sayeeduzzaman, 1990). Since Dhaka would continue to grow in terms of population for some time to come, we may expect more frequent incidents of fire and consequently more loss of human lives and damage to property. The issue of fire hazard in Dhaka City deserves more attention for study in order to devise appropriate pre- and post-disaster measures to mitigate risks.

### **The Study Area**

This paper reports the results of a preliminary study on the incidents of fire that took place from 1996 to 1998 (three years) in the area of Dhaka City served by the Mohammadpur Fire Station. The study was conducted in preparation for a more in-depth investigation of the spatio-temporal pattern of incidents of fire in relation to the location of and accessibility from the fire station.

The study area (Fig. 1) is roughly 20 km<sup>2</sup> of urban land bounded by the Turag River to the west, the Tejgaon area to the east, Agargaon at the northern end and the New Market area in the south. Given its size, it has a wide variety of land use and a diverse physical character. There are residential, commercial, some industrial and mixed land uses in the area, as well as a number of educational institutions. Posh residences of the elite of the city adorn a part of the area, but there are also large tracts of slums in other parts. Some portions of the area are planned, the rest has developed in an unplanned, organic fashion. Fig. 2 shows the broad land use pattern of the area.

### **The Data for the Study**

The data on fire incidents were collected from the BFSCD records as well as from field surveys. The data collected from the BFSCD were the dates, locations, causes, duration and consequences (in terms of worth of damaged property) of incidents of fire in the study area within the given period. A survey was carried out to identify and plot on a map the exact locations and to verify the data obtained from the official records. A questionnaire survey was conducted to this end where the respondents had been owners, occupants or neighbours of the property where fires broke out. Some judgmental opinion, such as the opinion regarding the extent of service provided by the Fire Service during particular fires was also sought from the respondents. The spatial data were digitized into ARC/GIS coverages and the rest of the data were analyzed with SPSS.

### **Analysis**

#### *Pattern of Fire Locations*

Fig. 1 shows the locations where incidents of fire were reported. It can be seen that some locations had multiple incidents within the span of three years. There were a total of 125 incidents of fire at 110 locations. 37 (29.60 percent) of the fires were rather minor, lasting for less than 15 minutes, while it took more than 45 minutes to extinguish 16 (12.80 percent) of the 125 fires (as seen in the last column of Table 4). The Nearest

Neighbourhood technique was employed to ascertain the pattern of the locations of fire incidents. A value of 0.06 was obtained which suggests that the points indicating the locations were more clustered than random.

Table 1 shows the number of locations where there were reported incidents of fire and the number of such incidents by land use category. Apparently residential establishments have a higher share of the locations (48.18 percent) and incidents (53 percent) as compared to, say, commercial establishments (34 percent and 48 percent, respectively). However, since there are possibly many more residential structures than commercial or industrial, if the total number of each category of establishments is taken into consideration, the share of fire in those categories of land use may emerge to be significantly higher. Although figures do not exist on the total number or inventory of structures by category, a methodology has been devised to obtain an estimate. There is a widespread popular notion that slums are particularly susceptible to fire. However, this notion was not strongly supported by observed data. When the residential category of land use was further divided into slums and non-slum residential, only about 18 percent of the fires in residences were found to be in slums. The mean duration of fire was significantly higher in slums, 67.8 minutes as compared to 28.09 minutes in the non-slum residential category. The higher average duration was largely due to one extreme event, however. Another important fact that is revealed from the table is that commercial establishments, more specifically some shopping centres, are particularly prone to fire hazards. 25 incidents of fire took place in 12 such centres within a span of three years. Field investigation revealed that most of these centres have 'sweatshops' in the top floors where workers work with inflammable material like cloth and paper in cramped, overcrowded conditions.

**Table 1.** Number of Fire Locations and Incidents by Land Use Category

Land Use/ Use of Structure		No. of Fire Locations ( percent)	No. of Fire Incidents ( percent)
Residential :	Total	53 (48.18)	53 (42.40)
	Slum	10 (9.09)	10 (8.0)
	Non-Slum	43 (39.09)	43 (34.40)
Commercial :	Total	34 (30.91)	48 (38.40)
	Shopping Centre	12 (9.60)	25 (20.00)
	Other	22 (20.00)	23 (18.40)
Industrial		13 (11.82)	13 (10.40)
Hospital/Clinic		3 (2.73)	3 (2.40)
Institutional/Office		5 (4.55)	6 (4.80)
Other		3 (2.73)	3 (2.40)
<b>Total</b>		<b>110 (100)</b>	<b>125 (100)</b>

*Source of Fire*

It is important to learn what the major causes of fire are to assess the risks involved in a given situation as well as to formulate strategies to reduce risks. In an overwhelming majority (61.60 percent) of cases, the fire was found to originate from electric short circuits (Table 2). Short circuit was the major source in all types of land use, except in slums, where only one out of ten incidents (ten percent) had originated in an electric short circuit (Table 3). Gas line leakage came in a distant second with 12.00 percent of cases.

**Table 2.** Source of Fire Incidents

Source of Fire	Frequency	Percentage
Electric short circuit	77	61.60
Gas line leakage	15	12.00
Kerosene/gas stove	7	5.60
Open lamp/candle	7	5.60
Cigarette	4	3.20
Arson	3	2.40
Electric heater (cooking)	3	2.40
Overheated machine	3	2.40
Mosquito coil	1	0.80
Unknown	5	4.00
<b>Total</b>	<b>125</b>	<b>100.00</b>

**Table 3.** Percentage of Fires Originating from Electric Short Circuits

Land Use/ Use of Structure	No. of Fire Incidents Originating in Short Circuit	% of Fire Incidents Originating in Short Circuit
Residential : Total	30	56.60
Slum	1	10.00
Non-Slum	29	67.44
Commercial : Total	29	61.70
Shopping Centre	19	76.00
Other	10	45.45
Industrial	10	76.92
Hospital/Clinic	2	66.67
Institutional/Office	4	66.67
Other	2	66.67
<b>Total</b>	<b>77</b>	<b>61.60</b>

*Extinguishing of Fire*

The survey revealed a high level of community participation in fire fighting when a fire breaks out in the neighbourhood. This may be due to both altruistic intentions and the self-serving urge to control the fire before it spreads and engulfs other structures. In 44.80 percent of incidents the fire was extinguished by the local people without the intervention of BFSCD. The local people assisted the BFSCD firefighters in extinguishing the blaze in 39.20 percent of cases. The Fire Service personnel had put out the fire without community assistance in only 16 percent of the cases. Most of these cases were serious incidents of fire where the local community could do very little except call in the professional firefighters.

Table 4 shows BFSCD's performance in reaching the fire scene vis-a-vis the duration of the fire. Even when only the short-lived fires (lasting for up to 15 minutes) are considered, fire trucks had reached the site before the fire had been put out in almost a fourth of all cases. In a little less than half the cases they did not reach the scene at all and in the other cases they reached the scene too late. In fires that lasted for more than half-an-hour, there was no case of failure to reach the site, though in nearly a fourth of the cases, they reached there after the fire had been extinguished. This did not happen for any of the fires that lasted for over 45 minutes.

**Table 4.** Time of Arrival of BFSCD Personnel with Respect to Duration of Fire

Duration of Fire (Minutes)	Time of Arrival of BFSCD Personnel			Total Number of Fires
	Before fire was put out	After fire was put out	Did not arrive	
0-15	9	12	16	37
15-30	21	16	2	39
30-45	23	10	0	33
45+	16	0	0	16
<b>Total</b>	<b>69</b>	<b>38</b>	<b>18</b>	<b>125</b>

The survey revealed that water is the most commonly used material to fight fires. It was used to extinguish 82.40 percent of the fires. In nearly a quarter (26.40 percent) of the cases the electric and/or gas supply lines were turned off. Fire extinguishers and foam were used in 10.40 percent of cases. While water is the most important fire extinguishing material, its scarcity is becoming a critical issue, raising the potential damage from fire incidents. In nearly one in five (21.60 percent) of the surveyed cases lack of water was cited as a hindrance to fighting fire. Water hydrants for fire fighting are not installed in the city, and was not that essential either, in view of the abundance of canals, ponds, ditches, marshes etc. within a short distance from every point of the city except in small pockets

of the most densely built-up areas. However, with increased urbanization and filling up of such water bodies, the availability of water to fight fire can no longer be taken for granted. Other major fire fighting hindrances as reported include obstruction created by the crowd of onlookers (16.80 percent), lack of knowledge of the people about tackling fires (13.60 percent), and difficult access to the fire scene (8.00 percent).

A general lack of preparedness to fight fire was observed throughout the study area. Although shopping centres had a significant share of the reported fires, none of them had any fire warning or fighting facilities. Of the 53 residential establishments where incidents of fire took place, only one had a fire extinguisher. Even two of the seven readymade garment factories had no fire fighting equipment. Apart from the two petrol pumps, the lone bank and one of the two restaurants, the commercial establishments had no fire fighting equipment either.

### **Conclusion**

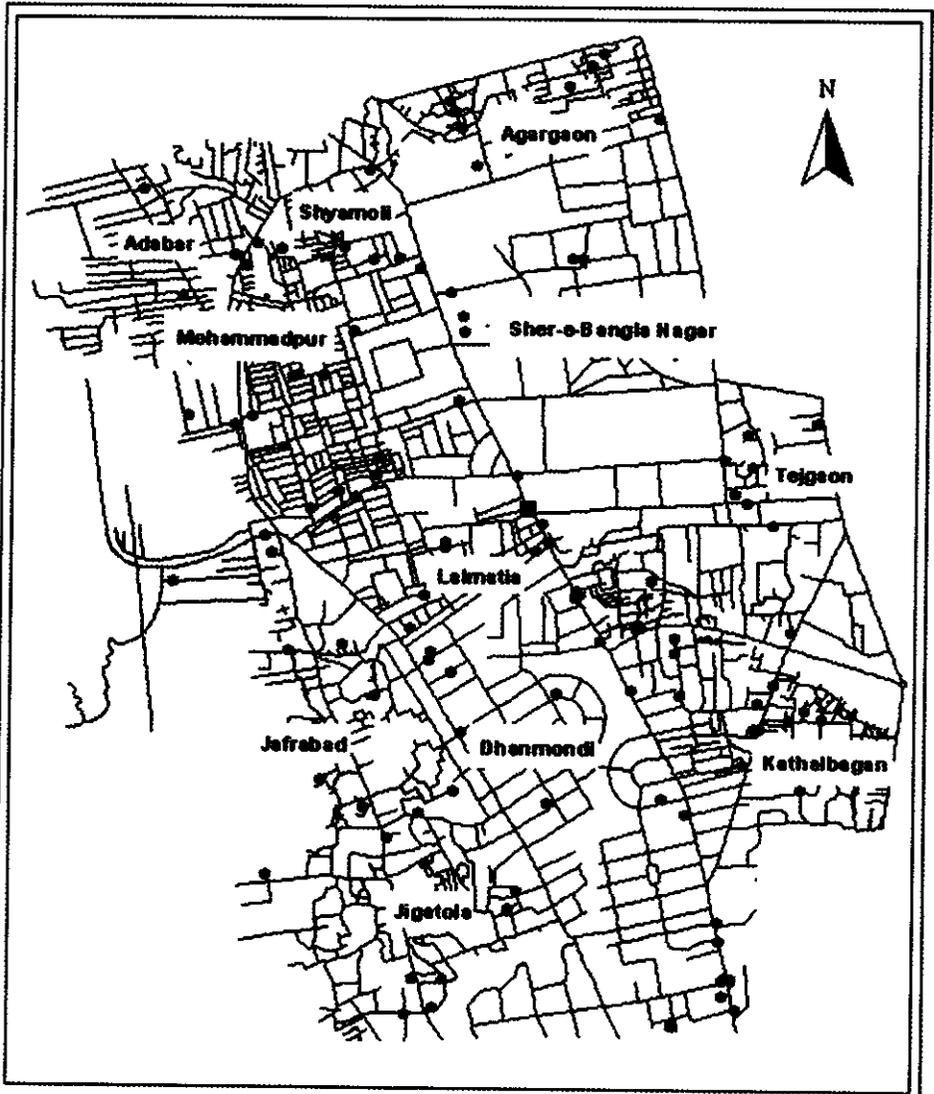
There is a general lack of awareness or sense of urgency regarding fire hazard in Dhaka City. This lack of awareness and preparedness has been reported by others, such as Ahmed (1998). This is in spite of the facts that fires cause considerable damage and the media have given sensational coverage to some incidents of fire in the city. The rapid growth of the city by building on open spaces, filling up of water bodies, encroaching on right-of-ways and cramped living conditions are exacerbating the situation. Fire inspection is lax, if existent at all. The Bangladesh National Building Code has elaborated directives for making buildings relatively safe from the hazard of fire, but they are largely ignored by the builders.

Marked improvement is necessary in both fire prevention and fire fighting. Fire prevention can be improved by strict enforcement of planning regulations to prevent hazardous land uses from being located in densely built up areas. Electric short circuits were identified as the major cause of fires. This may be due to old and faulty wiring and unauthorized connections. Proper fire inspection and maintenance of electricity supply lines can reduce the hazard of fire. To improve the fire fighting aspect, indiscriminate filling up of water bodies must be prevented and adequate right-of-ways should be ensured. This is particularly important in the fringe areas where new developments are taking place. Public awareness campaigns, including fire drills, may be conducted. Also, careful planning of the number and locations of fire stations is needed.

It must be borne in mind that wholesale replication of fire prevention and fighting strategies from other countries may not work. It is necessary to gauge the overall attitude of the people towards fire including perception of fire hazards by people, planners, policy makers and the way these perceptions influence fire risk to identify culturally viable fire prevention procedures (Robeson, 1988; Seley, 1979). More research is required in this direction.

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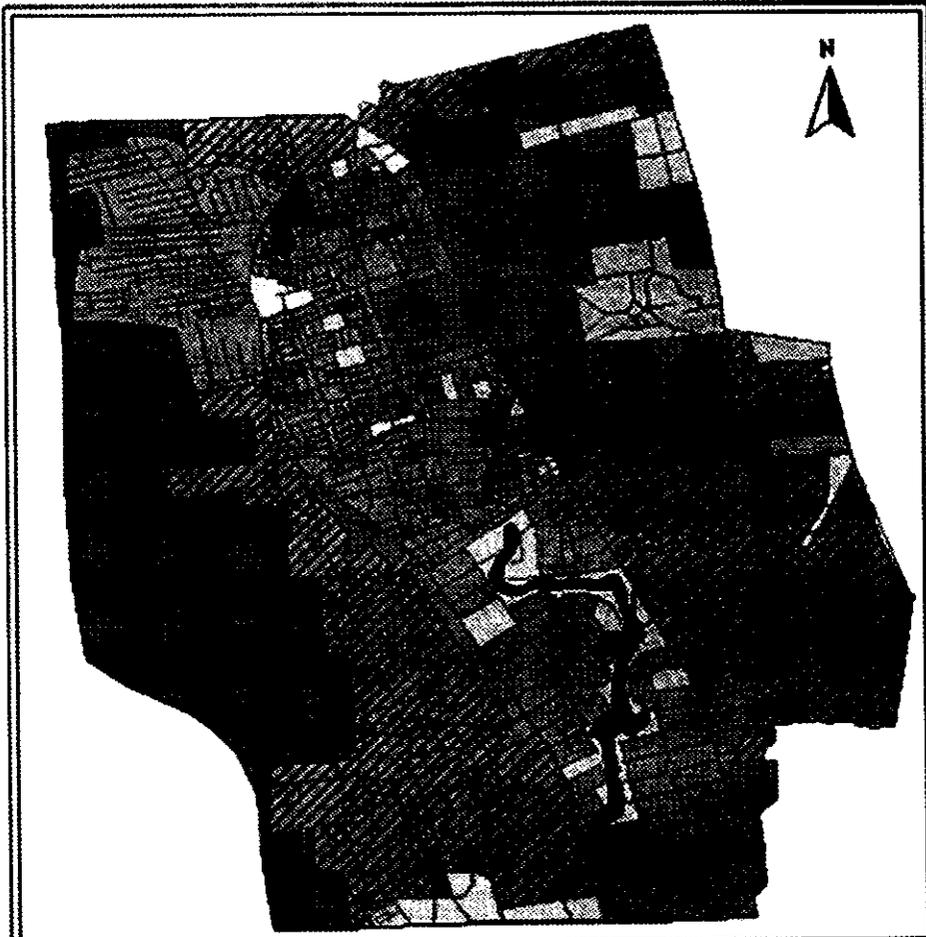


**Fig.1 Locations of Incidents of Fire**

**Legend** ● location of Fire  
■ location of Fire Station  
— Road

Scale: 1:28,000

250 0 250 500 750 1000 Meters



**Fig. 2 Land use Map of Mohammadpur Fire Station Service Area**

- Legend:
-  Planned Residential Area
  -  Mixed Residential Area
  -  Commercial
  -  Industrial
  -  Institutional
  -  Slum
  -  Open space
  -  Water body
  -  Low land
  -  Fountain

Scale 1:30,000



0.5 0 0.5 1 Kilometers