Description of Fire as a Disaster with a Case Study of Delhi's Mundka Fire

Shubham Kumar Sanu[1], Smriti Rai[2], Dr. Vishwa Raj Sharma*[3]

Abstract

Fire is one of the crucial resources for the survival of human beings and since its discovery, it has played a very pivotal role in modernisation to development. Despite of various significant roles of fire as a resource in human beings' life it also plays a role as resistance when fire transforms itself from resource to hazard and disaster due to various factors. This research work aims to highlight the progress path of fire from resources to disaster, major disastrous fire incidence of India with special reference to the recent Mundaka fire disaster of the national capital Delhi, causative factors for various incidences and strategies to make cities fire disaster resilient. For this purpose mainly secondary data sources have been used. The research work finds outs that the numbers, intensity and adverse impact of fire disasters are increasing year after year despite of various initiatives by the stakeholders. Therefore a comprehensive strategy is required where individual to institutions and community to the government all have to work together to make the habitat fire disaster resilient.

Keywords: *Disaster, Fire, Mundaka Fire, Concept of Fire Disaster, Disaster Management*

1. Introduction

Disaster is an accident, event or situation that occurs due to natural or manmade causes in any area, which results in loss of human life, biodiversity, ecosystem, economy and other aspects of human life, which is beyond the capacity of affected

[1] **Shubham Kumar Sanu,** Doctoral Scholar, Department of Geography, Delhi School of Economics, University of Delhi, New Delhi-110007, India, Email: sk.sanu26@gmail.com
[2] **Smriti Rai,** Doctoral Scholar, Department of Geography, University of Delhi, New Delhi, India, Email: smriti_notebook@yahoo.co.in
[3] **Dr. Vishwa Raj Sharma*,** Associate Professor, Shaheed Bhagat Singh College, University of Delhi, New Delhi -110017, Email: vrsharma2002@gmail.com; *Corresponding Author

communities to recover itself from it. Fire is a manmade disaster mainly caused by short-circuits, malfunctioning of power equipment, flammable material, explosives, and human negligence, etc. (Sanu and Sharma, 2022). Since the discovery of fire in the Stone Age, this crucial resource as well as resistance has been playing a very pivotal role in the development of human beings and present-day civilization (Pacholok, 2013). We cannot imagine today's developed civilization without giving due credit to the discovery of fire. This resource has played an important role in making today's human modern and developed (Nave, 1975). It is very rightly said that as a servant, Agni is a very loyal servant, who provides many kinds of services, but once it becomes a lord, it brings destruction and disaster with him (Lichterman, 2000). Many examples of which are available across the world, from the global to the local level. The recent Mundaka Fire in the national capital region of Delhi is one of the examples.

Fire or *Agni*, one of the essential five elements of the earth is the phenomena of combustion in the presence of three basic and crucial elements fuel, heat, and oxygen and produce heat, light, and smoke. First, Fuel, in the form of liquid, vapour, or incandescent solid. Second, Oxygen, 'the life-giver' to form a combustible mixture and third, Heat for attaining combustible temperature are the tetrahedron of fire. Some Common Characteristics of fire are-First, fire is fast as just within 30 seconds a small flame can go out of control and turn into a major fire. Secondly, Hot, as its heat varies from 100 degrees Celsius at the floor to 600 degrees Celsius at the top of the room. This heat just within minutes can burn people, melt their clothes, scorch their lung and can push people towards death. Thirdly, Smokey, fire produces a huge amount of smoke and toxic gases like carbon monoxides which causes dizziness, fatigue, disorientation, nausea, and puts into a deep sleep. This factor makes smoke deadly. Fourthly, Dark, Fire in starting come up with brightness but quickly produces black smoke which makes its surrounding dark reduce visibility (Lizhong, et al. 2002). Fire as a resource, provides various services to human beings and played a pivotal role in the development process of the human being from determinist to the present days modern and developed. But simultaneously this resource has been playing a role of resistance too. Hazards and disaster results in the form of fire event due to human-induced causes are one of the forms of fire resistance. As it causes a high level of damage to life, property and also put under physical, economic, social, cultural and psychological stress to the discoverer of fire 'Human being' so it is the matter of concern for humans.

A Systematic Review of the earlier research work also highlights the resistance aspect of fire. Fire is primarily caused by human error, such as a short circuit, faulty electrical equipment, combustible material, explosives, human negligence, etc. Overall it is a manmade disaster (Sanghavi et al. 2009). Over 70,000 individuals in India lost their lives due to fires between 2012 and 2015 (Tomar et al. 2017). According to estimates, there were around 163000 deaths caused by fires in 2001. This represented approximately 2 percent of all deaths (Sanghavi et al. 2009). One of the most common and devastating manmade disasters that strike the city of Delhi is fire. There has been a recent uptick in the number of fires that have broken out in nearly every part of the city, from residential to commercial to industrial, which has ultimately resulted in the loss of life, personal treasures, essential official documents, psychological trauma, and has contributed to the pollution of Delhi's air as well (Kapur, 2005). The Anaj Mandi fire incident in Delhi that occurred on December 2019 was one of the most deadly fire incidents of Delhi in which more than 45 people lost their lives, and thousands of people were impacted on social and economic front (Sanu, 2022). Overall majority of the earlier research work shows that when fire transforms itself from a resource to resistance, that inflicts a great loss on human being's life, therefore, it is required to develop a resistance system, particularly in urban and industrial setups, to make population fire disaster resilient.

2. Objectives

To highlight the basis aspects of fire disaster.

To discuss the major fire disasters of India.

To explain disastrous Mundka Fire Incidence and provide suggestive measures to deal with fire disaster.

3. Data Sources and Methodology

For the purpose of this research work, various secondary data sources were used that consisted of data from the National Disaster Management Authority, reputed newspapers like Hindustan Times, research papers and other public documents. The collected data were cross-checked, verified and then further used for analysis and result writing.

4. Concept of Fire

Fire as a disaster is a process results from ignorance, malfunctioning of the system, misinformation, and lack of foresightedness which results in fire exposure, sensitivity, vulnerability and fragility by this population comes under the stress of fire risk, danger, and threat which leads to fire hazard and finally the combination of great magnitude with hazard make it fire disaster (Sanu and Sharma, 2022). This is the concept and formation process of a fire disaster.

In this process, there are basically 4 stages through which the progress of fire from a resource to a resistance occurs.

4.1. Stage I: Factorial Stage: This stage explains the factors which turn fire into resistance. That includes firstly, Ignorance, which means having a lack of knowledge or information about the adverse effect of fire. Second, Malfunctioning of the system explains the failure of any system to function normally. Thirdly, Misinformation, which means incorrect information given and collected by the subject and authority about fire safety measures. And finally, Lack of Foresightedness means the absence of an ability to see the adverse impact of fire in the future and not taking appropriate measures for it. These four factors or tetrahedron are the basic aspect which transforms fire as a resource to the path of resistance.

4.2. Stage II: Vulnerable Stage: This includes Firstly, Fire Exposure, which means having no protection from fire. Secondly, Sensitivity to fire means feeling liable to be affected by the fire. Thirdly Fire Vulnerability means being exposed to a fire that can harm and finally, Fire Fragility explains the quality of people and surrounded materials being easily damaged by fire. This tetrahedron of vulnerable stage leads to the third stage.

4.3. Stage III: Risk Stage: Vulnerable stage leads to the situation where Firstly, Fire Threat emerge which means anything likely to cause fire danger, secondly, Fire Danger means a possibility to suffer from the harm of fire, and finally Fire Risk, which means a situation being exposed to fire. This stage leads to the fourth stage.

4.4. Stage IV: Hazardous Stage: This stage is such that when it occurs having less impact on human life, is called a hazardous Stage. This is the product of a vulnerable stage. Under this Fire Hazard comes which puts something at risk of being lost. Once it makes

a combination with the greater Magnitude in terms of loss and impacts it leads to the Final Stage of transformation of Resource to Resistance (means fire to fire disaster).

4.5. Stage V: Disastrous Stage: When a hazard comes with great magnitude and affects human life adversely that leads to a fire disaster.

The concept of Fire Disaster incorporates the above mentioned pentagonal stages of its formation process (Figure 1)

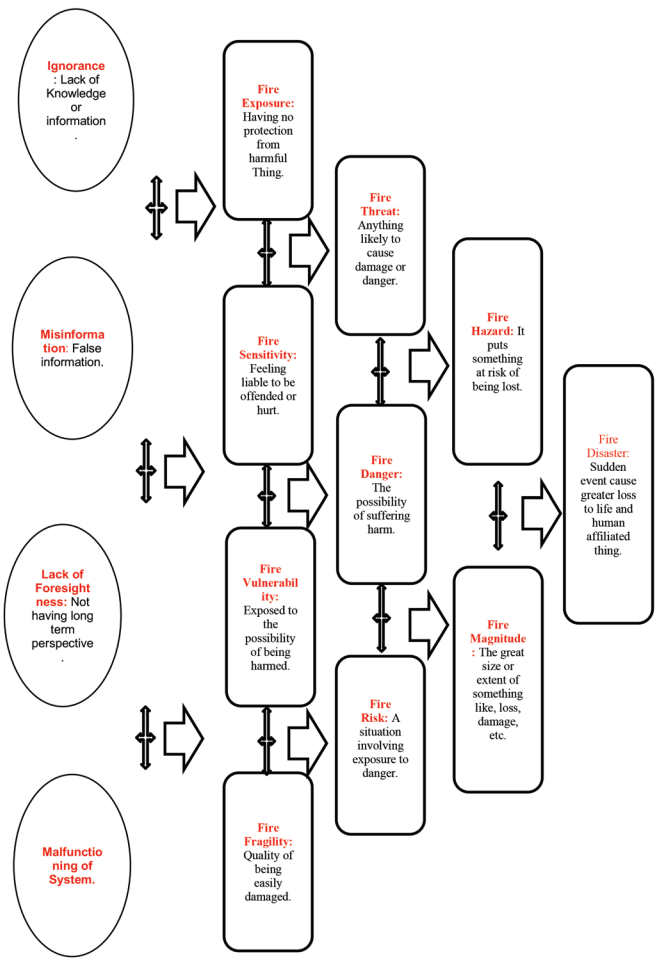

Figure 1: Concept of Fire Disaster

Source: Created by Authors

5. Classifications of Fire:

Fire can be classified in different categories on different basis like on the basis of intensity it is classified into Small, Medium, Serious and Major fire. On the Basis of Location of occurrence into industrial, household, household cum industrial, transformational, etc.

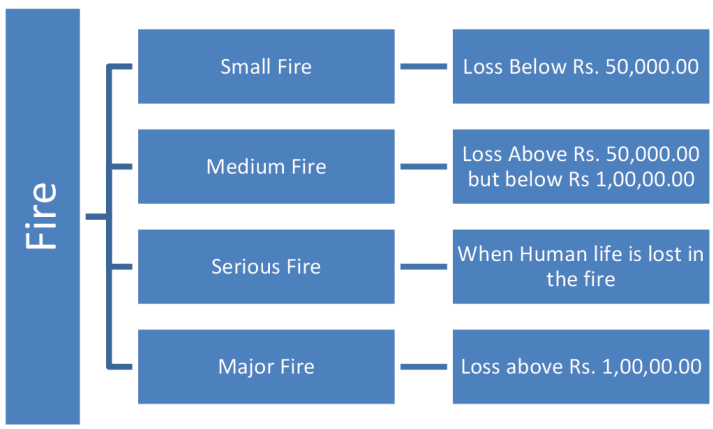

Figure 2: Classification of Fire on the basis of Intensity

5.1. Classification of Fire Based on Combustible Material:

Class 'A' Fire: This type of fire include combustible solids like wood, cloth, paper, etc. in which combustion generally occurs with the formation of glowing ambers. To extinguish fire water is necessary.

Class 'B' Fire: This type of fire include Flammable Liquids like Kerosene, Naphtha, Gasoline, oil, etc. to extinguish fire blanketing effect is essential.

Class 'C' Fire: This type of fire includes Flammable Gases like Methane, Ethylene, LPG, Propylene, Hydrogen, etc. to extinguish fire Dry chemical powder or Carbon dioxide gas is essential.

Class 'D' Fire: This type of fire includes Reactive metals like magnesium, sodium, titanium, etc. to extinguish such fire special dry chemical powders are essential (Chiraj et al. 2021).

5.2. Classification of Fire Based on Location of Occurrence:

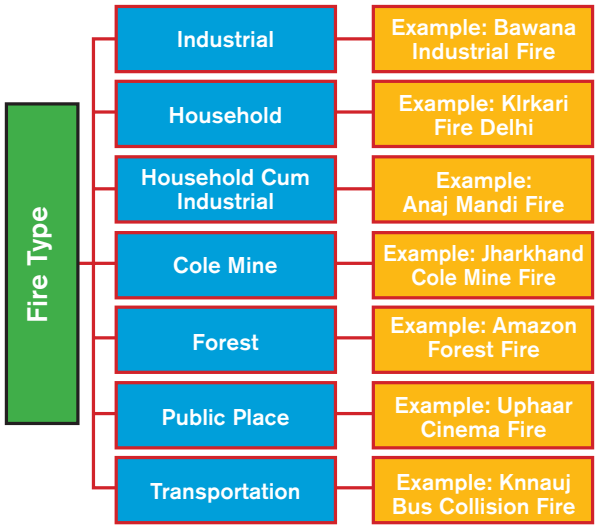

Figure 3: Classification based on location of fire

On the basis of geography, fire can also be subdivided into different categories, as represented in Figure 3 such as industrial fires, which occur in industrial settings or factories, such as the Delhi Bawana factory fire. When fire strikes in a house, it is known as a household fire, such as the Kirkari fire of Delhi in which more than eight people perished. Fire in small-scale or household industries of residential areas is known as household cum industrial fire for example the Anaj Mandi fire of Delhi. In Anaj Mandi, household industries were operating and the devastating fire in a unit resulted in the death of more than 45 people. Fire also occurs in Cole mine one of the various examples is Jharkhand Cole mine fire. Incidence of fire in forest area is very common, particularly in the summer costs massive loss of biodiversity such fire is called forest fire like the Amazon forest fire. When fire incidents occur at any public place like the Uphaar Cinema incident is termed as a Public place fire. Fire incident also occurs in vehicles or various mode of transportation like rail, bus, etc. which costs enormous damage to life like the recent Knnauj Bus fire.

6. The Scenario of Fire and some of the Devastating Fire of India:

Incidences of fire as a disastrous event are not new but the new thing is that the frequency and devastating effect of it is increasing day by day due to various anthropogenic

incidences. According to the Global Diseases Burden Report 2018, across the globe in 2017 around 9 million fire incidents and 1.2 lakh deaths were recorded out of that India recorded 1.6 million fires and 27,027 deaths, which means every fifth fire-related death occurred in India. The figure of death due to fire is 2.5 times more than the figures of China, where 10,836 people died due to fire in 2017. During the period from 1990 to 2017, there is a 30 per cent increase in death due to fire. Around 9 million fire all across the world shows that it is the major cause for the loss of life, property and other valuable resources. The condition in India also not very good as around 1.6 million fires occur in India. India has witnessed many severe fire incidences in the past. According to the Fire Safety in India report, 2019 the number of lives lost in fire accidents is mounting every year as 19000 people died due to fire accidents in the country in 2015, which is more than 5 times the number of people who died due to all other disasters in the same year (Chirag, et al. 2021). According to the India Risk Survey 2019 fire is one of the major risks for business purposes also. With the passage of time and increase in technologies, reckless economic development, change in lifestyle of the population, increasing pressure on the land and resulted in pressure on it increase the risk of fire all across the world as well as in India and especially in the highly densely populated urban areas (Sanghavi, et al. 2009). Some of the major fire incidences of India have been mentioned in the Table 1.

Table 1: Some of the Devastating and Disastrous Fire Incidences of India

Date of Fire Incidence	Name of Fire Incidence	Major Cause	Number of death and injuries
14th April 1944	Great Bombay Dock Fire	Explosion lead to fire	336 person died and 1040 injured
17th May 1968	Gopavarapuvarigudem Fire Near Vijayawada, Andhra Pradesh		200 persons died
8th February 1981	Venus Circus, Bangalore, Karnataka	electric short circuit	92 death and more than 300 injured
23rd December 1995	Dabwali Fire Accident, Sirsa, Haryana	electric generator short circuit	540 people died and 160 injured

23rd February 1997	Baripads Fire, Odisha	Electric Spark	206 died and 148 injured
7th June 1997	Brihadeeswarar Temple Fire, Thanjavur, Tamil Nadu	Caused by spark	48 died and 200 people injured
13th June 1997	Uphaar Cinema Fire, Green Park, Delhi	Short-circuit	59 died and more than 103 injured
26th June 2002	Sree Lee International Footwear Factory Fire		42 died
23rd May 2003	Ladhowal Rail Fire Disaster	dropped cigarette	39 died and more than 15 injured
23rd January 2004	Srirangam Marriage Hall Fire, Tamil Nadu	Short Circuit	57 died and more than 50 injured
16th July 2004	Kumbakonam School Fire, Thanjavur, Tamil Nadu		More than 100 died and 100 injured
10th April 2006	Victoria Park, Meerut fire, Uttar Pradesh	Short circuit	100 died and 150 injured
23rd March 2010	The Stephen Court Fire, Kolkata, West Bengal	Short circuit	43 people died
9th December 2011	AMRI Hospital Fire, Kolkata, West Bengal	Short Circuit	89 death
30th July 2012	Nellore Train Fire,	Crackers	32 passenger died and 26 injured
5th September 2012	Sivakasi Factory Explosion Fire, Tamil Nadu	the high ambient temperature in the factory	40 died and more than 70 injured
10th April 2016	Puttingal Temple Fire, Kollam, Kerala	Sparks from a firecracker	111 died and 350 injured
20 January, 2018	Bawana Firecracker Unit Fire, Delhi	short-circuit	17 died and over 30 injured

12 February 2019	Hotel Arpit Place Fire, Karo Bagh, Delhi	short-circuit	at least 17 died
24th March 2019	Coaching Centre Fire, Surat, Gujarat	Electric Short Circuit	22 died and more than 19 injured
8th December 2019	New Anaj Mandi Factory Fire, Rani Jhansi Road, Delhi	Electric Short Circuit	45 died and more than 56 injured
10th January 2020	Kannauj, Bus-Truck Accidental Fire, Uttar Pradesh	Collision cause fire	At least 20 died and more than 25 injured.
13th May 2022	Mundka Factory Fire	Electric Short Circuit	27 died

Source: National Disaster Management Authority 'Fire Safety in India', 2019 and New Paper Reports.

7. Major Causes of Fire

There are various causes which make fire hazardous which varies from electric short circuit to malfunctioning of machines or careless smoking to kitchen pieces of equipment. But to understand comprehensively the cause of fire we have to look at the fire in urban areas and fires in rural areas differently as both have a different geographical, social, and technological levels of advancement.

7.1. Roots of Fire in Urban Area:

Urban area literally in India means having high population density, congestion, crowd, careless infrastructure, high rise buildings, narrow lane, self-centered societies and unaware population in respect of various disasters (Sharma, et al. 2021). These characteristics make cities or urban areas more prone to various disasters and particularly to fire disasters. Major factors that lead to a fire in urban space are: Electric Origin: Approximate 34 per cent of the fire is caused by deficiency or defectiveness in wiring, overload, illegal use of electricity, use of sub-standard equipment, and fluctuations in electricity supply. The massive fire of Anaj Mandi was also caused due to an electric short circuit. Careless Smoking: This is the second most important cause

of the fire and contributes 29 per cent due to careless disposal of burning cigarette or beedi, matchsticks, etc. Kitchen Fire: Due to carelessness and negligent use of LPG or kerosene stove kitchen and ovens cause 9 per cent of fire in an urban area. Very recently of Kirkari Fire Incidence, Delhi, 23rd December 2019 where 9 people died and 3 injured was also caused by LPG gas cylinder blast. Arson: About 3 per cent are caused due to extremist activities, group or faction rivalry, revenge, etc. Example: Burning of Various soaps and houses in Delhi's February Riots 2020. Other Causes: About 17 per cent of fires are caused by sparks from machinery, chemical reaction, explosion, lightning, gas leakage, etc. (Figure 4).

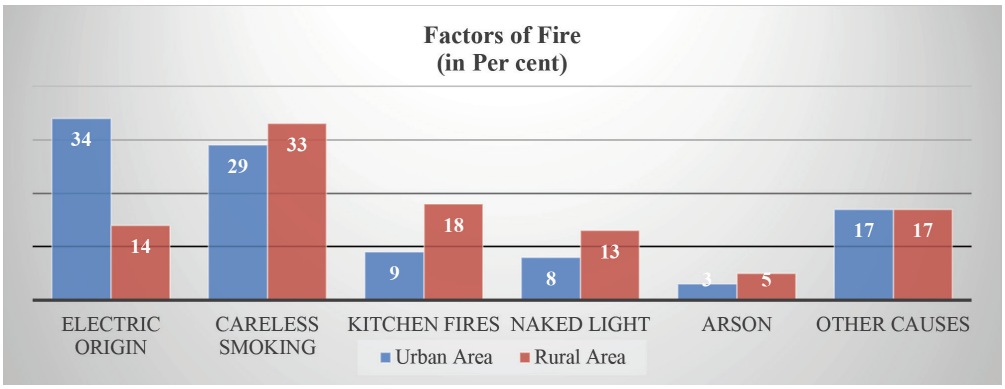

Figure 4: Major Causative Factors of Fire

Source: Understanding Man Made Disasters, MPA-002

7.2. Roots of Fire in Rural Area

Less population, population density and nearness to nature makes the rural area less vulnerable to fire hazard. The incidences of building fires are very less in a rural area as compare to urban counterpart (Jagnoor, 2009). This fact shows the positive aspect of rural areas in terms of vulnerability to fire. But the fact is that most of the fire incidences of rural India are not recorded or reported to the concerned authorities due to lack of communication between people and institutions. So according to data, the rural area is less prone to this hazard but in a true sense, fire is resistance for both the counterpart. Major causes of fire in the rural area are:

Careless Smoking: careless disposal of burning cigarette or beedi ends, matchsticks, etc become a cause for 33 per cent of fire incidences in a rural area. Kitchen Fire: About 18 per cent of fires are caused by igneous equipment of a kitchen. Electric Origin: use of sub-standard equipment, illegal tapping, short circuit, etc become a cause for 14 per cent of the fire. Naked Light: Careless and inattentive use of naked flames, candles, oil lamps, cause about 13 per cent of the fire. Arson: About 5 per cent are caused due to extremist activities, group or faction rivalry revenge, etc. Other Causes: About 17 per cent are caused due to spontaneous combustion, gas leakage, open fire, lightning, sparks hot ashes, etc. (Figure 4).

The Devil of December or the Anaj Mandi fire and even Mundka fire was caused due to electrical malfunctioning in industrial unit. So understanding the cause of fire in the industrial sector and different types of electrical malfunctioning are important. Industries which work as the source of livelihood and transformer of primary products or raw materials into the finished products. Despite of its various advantages we need to also understand the flows and mistakes that happen in industries intentionally or unintentionally which lead to fire disaster.

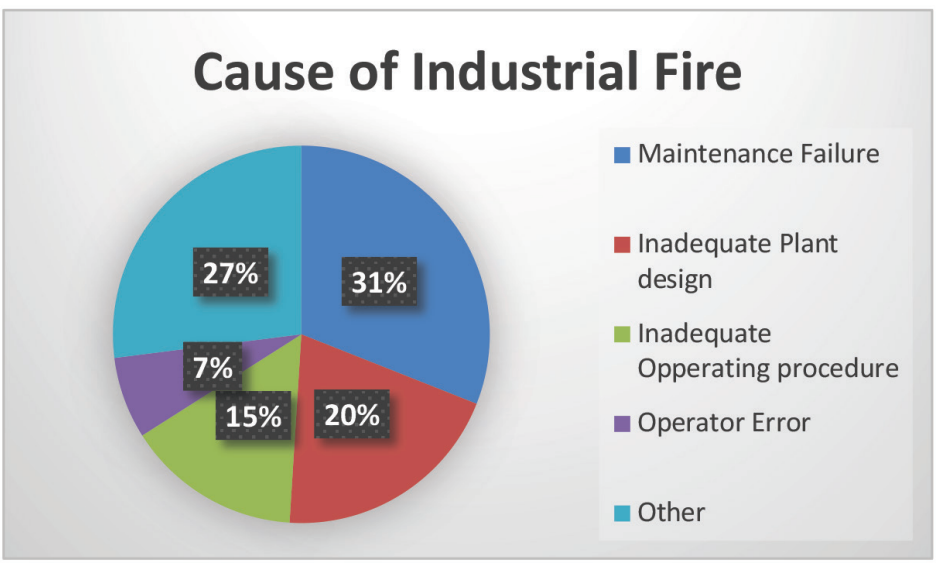

Figure 5: Causes of Industrial Fire

Source: Proceedings Report of 15th formation day of NDMA, September 2019

7.3. Cause of Industrial Fire: Around 31 per cent of fire in industries are caused by maintenance failure, flowed by other causes which include explosion, etc contributes 27 percent of it, flowed by inadequate plant design and the inadequate operating procedure causes 20 and 15 percent respectively and finally, 7 percent of fire in industries occurs due to operators error (Figure 5). Short-circuits in industries are mainly caused by insulation failure, bad housekeeping, improper earthing, inappropriate fuses, failure of a circuit breaker, overheating of cable and equipment due to overloading, inappropriate warring and use of cheap electrical products.

8. Existing and Emerging Fire Risk in India

Day by day increase in population, economic development, industrialization, urbanization, emerging technologies, changing lifestyle of human beings raises the existing risk of fire hazard. There are various existing and emerging factors surging fire risk in India.

Rapid Unplanned Urbanisation and Economic Development: This process is increasing the risk of fire in urban and semi-urban areas. Narrow and congested lanes, high rise buildings, very densely populated lanes, make the entrance of fire tenders difficult or most of the time impossible when fire incidence occurs. The flow of rules and regulations in Industry, Household Industry and Illegal Industry: Every day upgraded advanced technology and materials come in industrial sectors and the prescribed fire safety norms are not able to keep up with the risk posed by them. No proper take care of wear and tear of machinery, storage system, and unorganized industries in the residential area lead to the emergence of fire risk.

Increasing Density of Transport and Transporting network: increasing transport and transporting network all across the country and transportation of inflammable material, use of electric vehicle, improper management of battery charging stations, etc. are rising the risk of fire. Modernization of Residential buildings: use of glass façade, composite aluminium panel, false ceiling, PVC foam, upholstery, etc. and unawareness about these materials advantages and disadvantages in residential buildings, some of which also don't have fire regulation are an accelerator of fire risk. Limited coverage of Fire Brigade: coverage of fire service departments all across the nation are limited and

also facing the problem of fewer number staffs, absence of upgraded technology, and other types of equipment to fight the fire more efficiently is also one of the reasons for emerging fire risk in India. Privatization of India's Ammunition industry, older nuclear power plant, multilevel parking, and buildings are going to pose a high risk to a fire event. It shows that if a fire is not handled carefully it can lead to a huge loss of property and life so there is a need to improve and strengthen the ecosystem for fire risk prevention, mitigation, and preparedness.

9. Mundka Fire Incidence of Delhi:

In West Delhi's Mundka on the Friday evening of 13th May massive fire broke out in the four-storey building as per report was caused by a short-circuit on the first floor and engulfed the life of 27 people (Bhandari, 2022). When the fire spread, the people inside the building were on different floors. On the first floor the employees were working at the offices of the CCTV and Wifi router assembly unit. Most people were on the second floor attending the motivational speaker's session. Others on the third floor were working at the assembly units (Singh and Bhandari, 2022). Survivors explain the situation that there were no windows in the hall on the second floor. Glass panels that covered the building on all sides were bolted, leaving just one exit from the inferno- a lone staircase. But that route was also blocked by the blaze. A survivor Rawat Said "The staircase was on fire. There was no way to leave the building. The people in the room were gasping for breath. People were screaming and shouting for help. "The bodies are completely charred. Even the conditions of the injured persons are critical" (Bhandari, 2022).

The bodies were so charred that even the loved ones struggled to identify fire victim's charred bodies. A bangle, bracelet or nail paint, locket, shoe, etc. were used as the identifier by the family members of the victims at the mortuary of the Sanjay Gandhi Memorial Hospital (Bhandari and Pillai, 2022). Initially out the 27 died bodies only eight have been identified and the process of identification keeps going on for more than two three days. The adversity of fire can be understood by the fact that to identify the dead, police used forensic science exports and DNA testing (In case of unidentified bodies and decomposed dead bodies, DNA profile is the only source to establish the identity of an individual. DNA extracted from biological material like bone or teeth can be used for the identification of the deceased. Teeth is considered the best source for obtaining

DNA for profiling). A team of FSL visited the site and collected forensic samples. DNA sample of family members were used to identify the charred body (Bhandari, 2022a).

9.1. Post Disaster Responses from Various Authorities:

The North Delhi Municipal Corporation (NDMC) said a preliminary investigation found that the commercial building was operating without a factory licence, sanctioned building plan and basic safety measures. A municipal official said that the action against industries in non-conforming areas has been taken several times but new units keep opening up (Bhandari, 2022b). The official said "The unit did not have a valid factory licence or DPCC (Delhi Pollution Control Committee) consent to operate. An application may have been filed by a unit in this property in 2014-15 but no licence was issued. This property lies in a non-conforming are (area where industrial activity was not allowed. Further The building was located in the Lal Dora extension area of the Mundka village where industrial activity is not allowed". Another official told that "only trades, like grocery shops and solons are allowed in Lal Dora extensions, but such a large assembly of people in the unit indicates that large-scale factory work was being carried out" (Pratap et al. 2022).

A Delhi Fire Service (DFS) official said the building did not have firefighting arrangements and it never applied for a fire clearance inspection. "The building only had one entry-exit door. The occupants of the building were trapped because the fire started from the first floor and engulfed the staircase that was the only exit route. "Some charred bodies were lying near the lift's access point on the second floor, suggesting that people may have tried to use it to get out of the building," said Fire station officer of Kirti Nagar, Ashok Kumar (Pratap, et al. 2022).

Additional commissioner of police (western range) Chinmoy Biswal mentioned that "We have learnt that the two brothers had taken the first floor of the building on rent in 2018 to run their company's office. Between 2019 and 2021, they took two more upper floors." As per the FIR filed in this case 100 employees worked at the company of which 50 were women. However, surviving employees reported more than 200 people were working at the site. Police have registered a case under charges of culpable homicide not amounting to murder, attempt to commit culpable homicide, concealing design to commit offence punishable with imprisonment, and common intention under the

Indian Penal Code's sections 304, 308, 120 and 34. "According to the inquiry, three floors of the building had been rented out to Harish Goyal and the owner of the building, Manish lakra, lived with his family on the top floor. The basement was being used for storage purpose and ground floor was vacant," the official said. The inquiry report has also found that no property tax had ever been paid by the owner even though notices were issued by the department. Survey has been launched across municipal zones to identify more such illegal buildings (Bhandari, 2022c).

Taking suo motu cognigance of the fire a team from the National Human Rights Commission (NHRC) visited the spot to probe if the worker in the building were subjected to any human rights violations (Singh, 2022).

"People either escaped with minor injuries or were entirely burnt," a doctor said. There were no patients who went hospital with major wounds (Pillai and Bhandari 2022).

As usual Delhi chief minister Arvind Kejriwal ordered a magisterial inquiry and also announced Rs 10 Lakh compensation to the families of the victims and said that DNA tests will be conducted to identify bodies, most of which were charred beyond recognition, so that the families could be informed. Concerned municipal corporation and Delhi State Industrial and Infrastructure Development Corporation (DSIIDC) were asked to explain the side (Goswami, 2022).

Jai Prakash, BJP leader told "making announcements about creating a world-class city should only take place after the agencies concerned have made the city a safer place for its residents" (Goswami, 2022).

9.2. Major Laws Violations and Background of the Causative Factors:

The tragic death of 27 people in a major fire in the Mundka building has underlined that the city authorities have learned little from similar incidents in the past that exposed the utter lack of safety mechanisms and the gaping holes in their implementation. The building was operating without licence- same as the building in north Delhi's Anaj Mandi area where a fire in 2019 killed 45 people (Singh, 2022).

Major loophole in the case of Mundka fire was the lack of factory license: The factory operator did not have a valid factory licence from the NDMC. Building Plan: The building plan of the structure was not sanctioned. Fire NOC: The building did not

have No Objection Certificate form the fire department. Even officials said that the owners never applied for the NOC as the building was illegal. Safety Provisions: There were no adequate safety provisions, including those for firefighting. Single Entry/Exit: The building had just one narrow entry/exit. Building with such large assembly and industrial units need a separate fire exit. Lal Dora Area: The building was constructed in a Lal Dora extension where industrial activity is not allowed. Non-Conforming Area: MCD has made several claims in the last few years about closing factories in non-conforming areas but such a large unit operating on National Highway raise questions about these claims.

A K Jain former town planner and retired commissioner (planning), Delhi Developent Authority, said there has been complete laxity in regulating Lal Dora areas. "DDA had suggested to the Delhi government that the list of all the factory units operating in such areas should be put in public domain so that people can check if a unit is operating legally. However, the suggestion wasn't accepted and the illegality continued." Even in the recent past the municipal corporations of Delhi have submitted multiple affidavits promising to close industrial units in non-conforming areas of the city in the Supreme Court but the tragedy in Mundka has also raised questions about the efficacy of such drives (Singh, 2022a). After the Suo motu of the National Human Rights Commission two separate panels were formed after the Anaj Mandi fire to lay down an action plan to tackle the problem of illegal industrial activities going on from residential areas. The first one, a special task force, was formed by the ministry of housing and urban affairs. The second, an interdepartmental committee, was headed by the chief town planner of the South MCD. The panel submitted the action plan in 2020, and the STF gave its recommendations in 2021. Both have not been implemented yet as per officials' opinion (Singh 2022a).

9.3. Visualizing the Past and Future Scenario:

In the last five years Delhi witnessed three deadly fire incidents in which more than 77 people died but not much has changed on the ground. In 2018, 17 people died after being trapped inside a burning factory in the Bawana area. The next year, 17 people were killed during a blaze in Karol Bagh in February. Months later 45 labourers died in a factory fire in north Delhi's Anaj Mandi. The government was quick to order a probe by a magistrate in all cases and the reports were also submitted, but there has been

no clarity on the kind of action taken against the official or the agencies (Shekhar and Singh, 2022). According to officials, a high-power committee appointed to investigate the Bawana factory fire had concluded that there was a "failure of agencies" that led to the disaster. The committee blamed five agencies – Delhi State industrial and Infrastructure Development Corporation, Labour Department, Delhi Fire Services, North Delhi Municipal Corporation and Delhi Police. All the culprit of Arpit Hotel case, Anaj Mandi Fire are out on bail and are involve in their day to day activities. This clearly shows the slow and lethargic process of law order and justice (Pratap, et al. 2022).

The initial probe shows that the accident was waiting to happen because the owner and the tenant did not comply with mandatory safety requirements. Every time an incident such as this happens, the blame for flouting rules mostly lands on the building overs. But key questions remain unanswered: How could the owners of the building and the company that took it on rent manage to operate for so long without complying with clearance? How could the civic body approve a design plan for a multi-storey building with only one entry and exit? Didn't regular inspections take place? What were various authorities were doing?

Even just after four days of the Mundka fire incidence fire broke out at a four storey building on GT Karnal Road near Ashok Vihar in north-west Delhi were Manager of the banquet hall died due to fire and rest 11 persons who were inside the building when the fire started managed to get out safely (Hindustan Times, 2022).

Not just that just after six days on 19th of May another fire occurred in a factory in north-east Delhi's New Mustafabad area in which one person dead and 6 injured. The factory manufactured and painted air cooler fan blades and metallic bodies of stabilizers and inverters. All seven were workers at the factory that was operating in two-storey dilapidated building spread in a 200 square yard area in the congested street number 23 in New Mustafabad. Atul Gard said that the factory did not have a no-objection certificate (NOC) form the fire department. East Delhi Mayor Shyam Sunder Aggarwal said that an inquairy committee will be formed to probe into the matter. "The unit did not have a licence to operate. It had been challaned. Only certain trades are allowed in residential areas and this unit was illegal," he said (Singh, 2022b).

Capital city of India is highly vulnerable to fire disaster due to congestion, over population, multiplicity of departments and laxity at various level of society. In case of Delhi identification of vulnerable areas and formulation of detailed disaster management plans need to be implemented in the city. In residential areas with dense

population, setting up fire hydrant system with common water tanks, the alteration of road widths at key intersection points to allow movement of fire tenders, and the urgent tackling of unauthorized construction is needed. Further, fire department should be equipped with the latest technologies, and the mechanisms to issue fire safety clearances should be made stringent.

10. Conclusion

The strategy for urban fire prevention can be achieved through long term and short-term goals. The short- term goals include measures of safety that can be added to the existing infrastructure through education, awareness and introduction of rules. Whereas, the long-term goals include the change in the decision-making process, passing of laws and the development of planned infrastructure that supports and safeguards the life of people against anthropogenic hazards. There is a lackadaisical approach to fire safety in the unplanned and organic development of urban settlements of India. Lack of preparedness amongst the people regarding fire safety is another major cause as in report on the webinar hosted by the National Disaster Management Institute on November 2020; the lack of responsibility amongst the community was identified as one of the major causes for loss of life. Fire safety measures can only be successful if it is community and owner driven. Monitoring of construction and the socio-economic activities in the area can be most effective if the community work a unit to ensure there is space for the well-being. Delay in first response due to traffic as experienced even in Mundaka fire when the fire services delayed 18 minutes due to traffic congestion in the Peeragarhi area. There is a dire need for education and management of traffic to give way to first responders. Urban design and planning should incorporate lanes designated to first responders. It is very well known that the major cause of death in a fire is suffocation due to inhalation of smoke. Therefore, education on the management of smoke and proper ventilation should be included in the planning and development process by proper education of architects in safety means and measures and smoke management. The use of sprinklers as the best automatic response for fire suppression even if it is a gravity fed system through overhead tank, which would be effective in areas of high congestion and old buildings. Furthermore, an outline of the means and methods to be practiced by the private and public sectors, the civil society organizations and the academia to manage and prevent anthropic- fire hazard creation in cities demands our urgent attention.

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