

# Assessment of Factors responsible for Game Zone Fire Accident in Rajkot: A Case Study

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## Abstract

Numerous accidents claim the lives of many people each year. One significant category includes accidents occurring in places of entertainment. To study such accidents, we listed many such cases in Gujarat in the past 5 years like Harni Lake incident in Vadodara 2024, Morbi Bridge Collapse 2022, Ahmedabad Ride Collapse 2019 and TRP Game zone fire 2024. This work has been carried out as the assignment for University Foundation Course – ‘Critical Thinking and Research’. The authors were given this particular topic on “TRP Game Zone accident” as research project as it is the most recent incident and research on this incident may help the society and policymakers take proactive action to avoid such accidents in future.

The process of formulation of Research question triggered several questions related to our scientific process of construction and maintenance, legislation related to safety protocols and Fire No Objection Certificate (NOC), morals in business and Indian Jurisdiction. It also triggered a question whether the incident was fatal or a manmade disaster. The main objective of our research was to brainstorm on the possible reasons behind this incidence and learn what can be done to avoid such situations as citizens.

The research was conducted with the help of primary as well as secondary data. The primary data was collected by floating questionnaires to 62 respondents and conducting interviews. The secondary data comprised of research papers, Gujarat

Comprehensive General Development Control Regulations (GDCR) report, and an article authored by interns at IIT Gandhinagar. All this data played a crucial role in deriving valuable insights and meaningful conclusions for the above stated research problem. These conclusions are based on science, legislation, judiciary and protocols. The present research paper dives deep into all the above aspects and suggests protocols and inferences from the incident.

The inferences can be categorized in fire specific safety protocols, scientific solutions, legislative judiciary based solutions. These conclusions can be effectively utilized to implement preventive measures, thereby reducing the likelihood of similar incidents occurring in the future.

### **Keywords**

Science in construction, legislative loopholes, fire NOC, fire safety, delayed Judiciary, Business feud, Capital punishments, parental awareness, children's safety

### **Introduction**

On 25 May 2024, a fire accident occurred at the TRP game zone in Rajkot, Gujarat, India causing death of 27 people.<sup>3</sup> Media sources and government reports gave abundant information on the probable causes, mistakes and aftermath. With detailed analysis of the information, this accident is an eye opener to many such incidents.

TRP fire accident is not the only example accidents such as Harni Lake incident in Vadodara 2024, Morbi Bridge Collapse 2022, and Ahmedabad Ride Collapse 2019 and not just in Gujarat but all over the country there have been countless mishaps. Such incidences raise questions on the improper implementation of the process of construction and maintenance, legislation related to safety protocols and lack of Fire NOC, compromised morals in business and our jurisdiction. All these factors further trigger a question whether the incident was fatal or a manmade disaster.

It was found that at the game zone place, which was under partial construction, contained 3500 liters of fuel<sup>4</sup>. This was due to uncalculated and unplanned construction policy. So, what are scientific hazards, scientific precautions and safe methods to use and maintain at

a construction site? How can we make such places safe not just for common people but also for workers and management working there? Automation in construction area- in the world of technology, only artistic fields are not digitalized but there are two more fields' agriculture and construction are highly labored. Can we digitalize and automate these fields? Correct work environment and managed workspace with technology and automation can reduce such hazards. Also, there was no need to store large quantities of fuel. How can we reduce this wastage and follow the sustainable zero wastage policy?

Legally, quoting from the article<sup>3</sup> "According to Her FIR, the accused individuals constructed a structure measuring 50 meters in width and 60 meters in length, with height of approximately two or three stories, using metal sheet fabrication to establish gaming zone." Many times, there are loopholes in the law and system. Is there any way we can increase transparency to make sure these loopholes aren't exploited? How to be sure if it is legislation issue or lack of moral values? How can we increase moral grounds collectively as a society so that less people use law for their own benefit? Who is responsible? Is one individual is culprit or the entire system? When the construction work was going on, couldn't the facility remain closed to ensure the safety of the customers? If it was possible, then why didn't the same happen? When the facility didn't have fire NOC then why was it allowed to operate? Can this be called just an "accident" when it could have been stopped or prevented in the first place? Can this be called a 'manmade disaster' caused due to selfishness of few individuals? Victims were given lakhs of rupees from the National Relief Fund; can money be equated to life? Can we make sure more lives are not lost by maintaining a safe workplace at such construction places? What are the preventions to control such hazards? And if such accidents take place, then what kind of protection should be maintained? Should there be a regulating department to maintain such entertainment parks safety because this is not the first such accident at an entertainment park. Which steps should be taken by government officials to prevent such incidents in future?

Morally, A social loop: this incident did shake up the people of Gujarat. The incident was criticized, the government did shut down similar places temporarily and compensated the families for their loss but at the end all those protests and criticisms matter. Things didn't change. People and government forget such incidences. How can us as a society end this loop? Hence the question is to avoid such similar manmade disasters by science to improve construction workplace, by legislation and formulation of stringent laws against hazard control,

by capital punishments, by better and speedy jurisdiction and by moral development of the society. How do we bring a change in policies and protocols to save lives of people from such accidents.

We focus on the lessons learnt and deeper aspects of these accidents on scientific, judicial, legislative and moral grounds. The collected information thus helps derive the inferences listed in the research paper. This work has been carried out as the assignment for University Foundation Course – ‘Critical Thinking and Research’. The authors were given this particular topic on “TRP Game Zone accident” as research project as it is the most recent incident and research on this incident may help the society and policymakers take proactive action to avoid such accidents in future.

### **Methodology**

The research process included multiple methods of data collection. The Primary data that included questionnaire and interviews. 53 individuals from common people category were chosen for Questionnaire-1 and 9 persons from business community were chosen for Questionnaire-2. Here the subjective answers were analysed manually, and graphs were plotted on the bases of the common word in the answers.

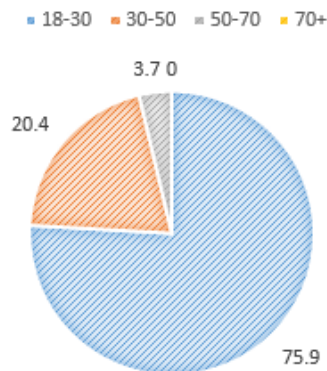
The interviews included from: a) Survivor and eyewitness b) Lawyer (JAG entry AIR 1) and c) Civil engineer and 25+ yrs of field experience. The transcripts of these interviews were meticulously summarized by the authors, who presented the findings in a clear and concise manner. The Secondary data included GDCR, NBC, Research papers, and Article by interns at IIT Gandhinagar. The secondary data not only reinforced our initial inferences but also provided additional valuable insights, further enhancing the depth of our conclusions.

## Results and Discussion

### Primary Data

#### Questionnaire-1 (This was meant for common people)

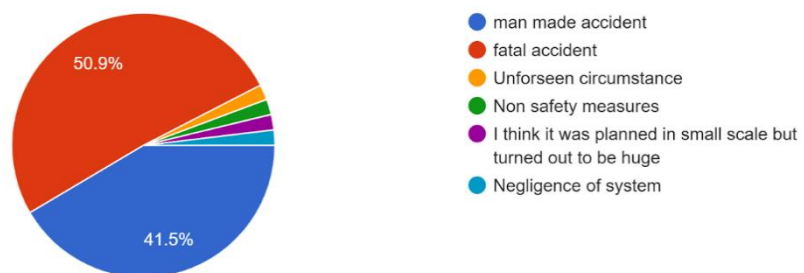
What is your age group?



**Figure 1: Age group distribution of survey participants.**

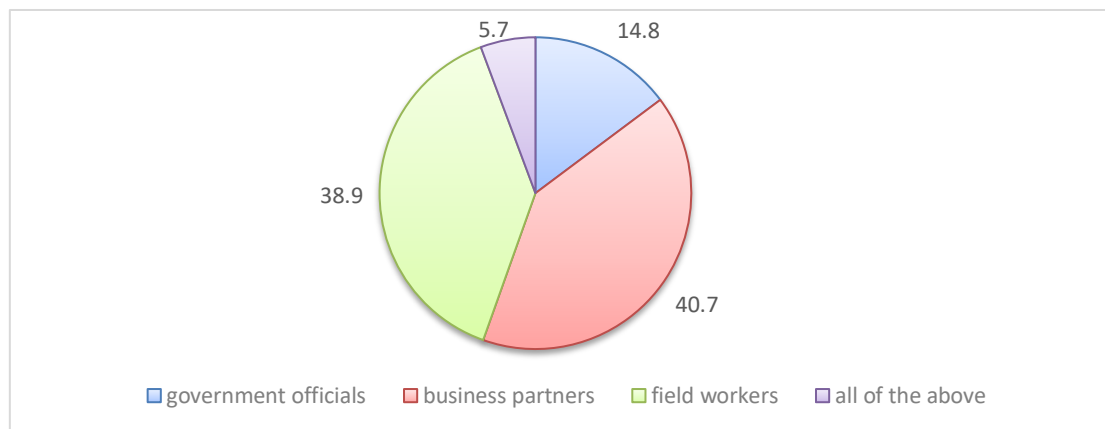
*Most of the stakeholders are below 30 and are the future of our country whereas 20.4 % of stakeholders are current working force.*

Was the accident manmade or a coincidence of fatal accident?

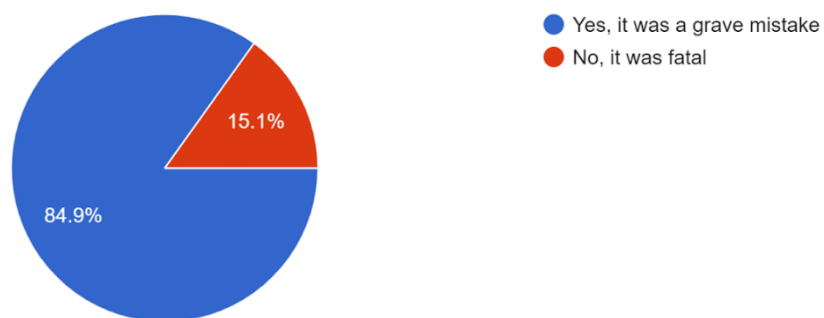


**Figure 2: Participants' views on whether the accident was manmade or a fatal accident.**

*50.9% stakeholders believe that this accident was a manmade accident as suggested in article (by Nandini Singh, Business Standard. If deemed a manmade accident, then the scope of the study expands opening up new avenues for analysis.*

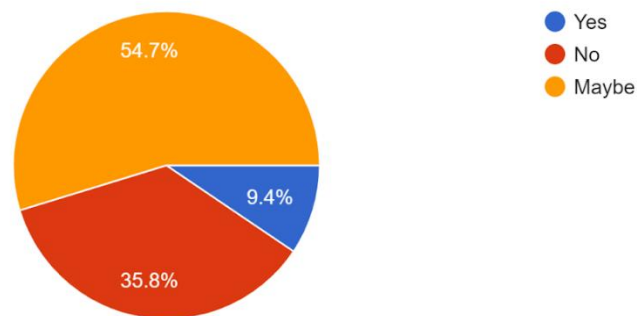
**Who do you think was responsible for this accident?****Figure 3: Participants' perception on accountability of the accident**

*Majority stakeholders think either business partners or field workers were at fault. Although there was a fairly good number of individuals think that there might be governments fault as well. Hence this can be taken in as a scope of our study.*

**Do you think this incident could have been avoided?****Figure 4: Participants' opinion on the preventability of the incident**

*In the opinion of the majority stakeholders, this incident was a mistake rather than being fatal. Hence the incident can be examined scientifically to identify the underlying mistakes and implement required measures, so similar incidents are not repeated in the future.*

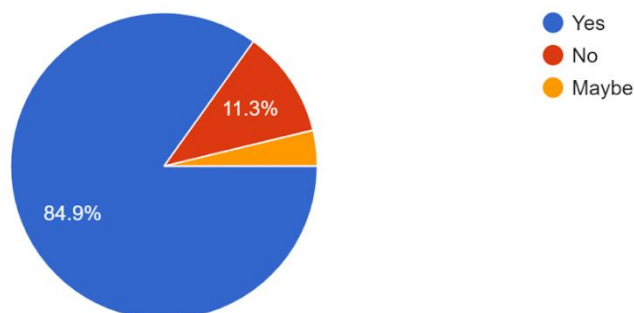
**Do you think the media has given sufficient information about the incident?**



**Figure 5: Public's opinion on role of the media and sufficiency of information provided by it regarding the accident**

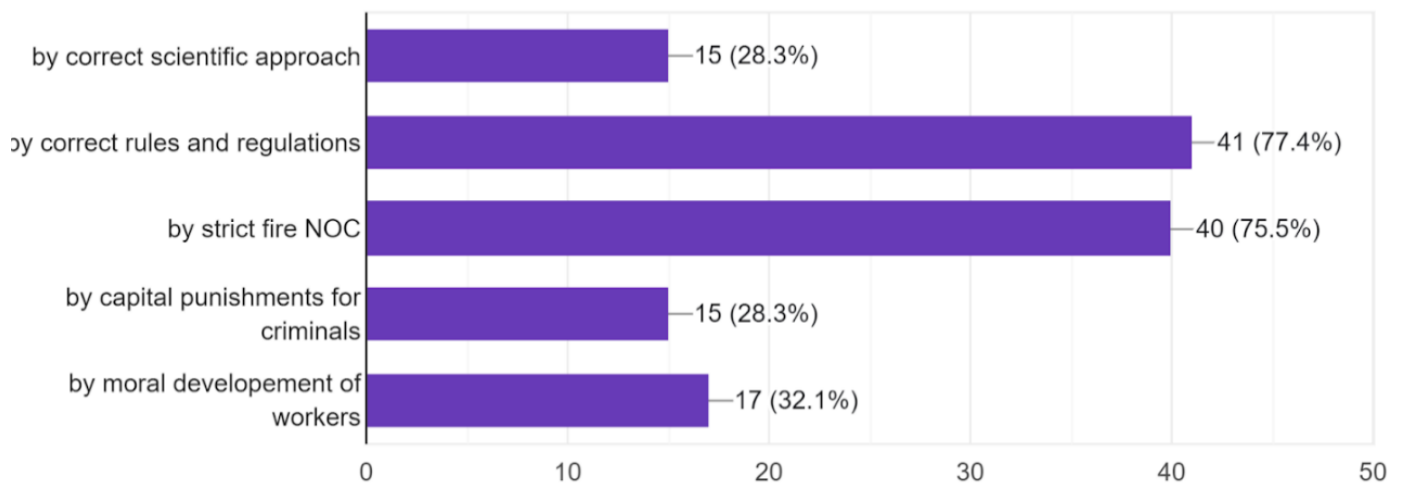
**Do you think a proper inspection should be done by the authorities?**

53 responses

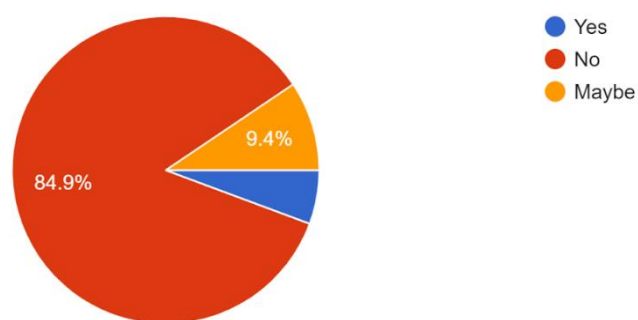


**Figure 6: Survey participants' opinion on the requirement of inspection to be carried out by the authorities**

*84.9% agree with a proper inspection of the incident.*

**By what means do you think these accidents could have been avoided? (one or more)****Figure 7: Participants' views on the ways to avoid accidents**

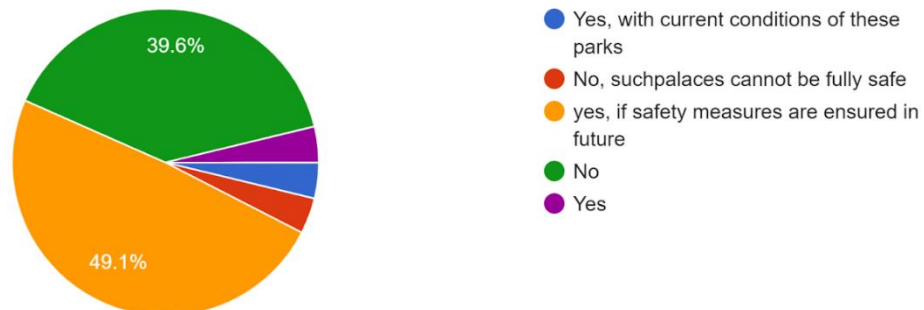
*The majority of the participants think that by following rules and regulation regarding fire safety the incident could have been avoided, while many think the correct scientific approach, capital punishment and moral development of workers could have also helped avoid the incident.*

**Should customers be allowed in places where there is ongoing construction?****Figure 8: Participants' opinion on the permission to the customers in the premises with ongoing construction**

*Majority of the participants hold this opinion that people should not be allowed while there is ongoing construction work.*



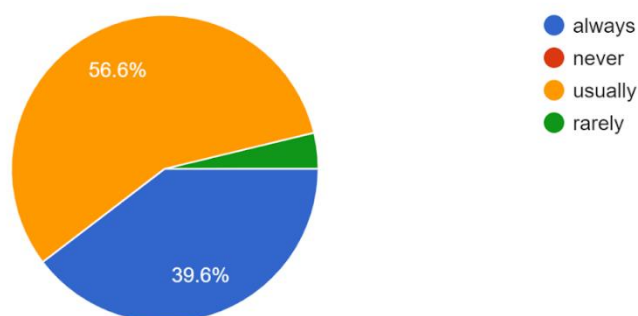
**Incident such as Rajkot Fire incident, Harni Lake incident, Ahmedabad Amusement Park accident and Morbi Bridge Accident cause harm to children. Do you think such places are safe for students and children?**



**Figure 9: Participants perception on the safety of the amusement parks for children**

*The statistics suggest that half of the participants think that amusement places are safe to go to provided safety measures are ensured, while many think it is not safe.*

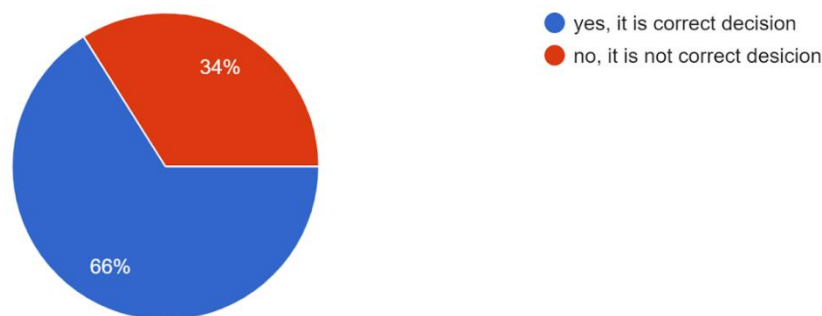
**Do you think our judiciary system is slow?**



**Figure 10: Participants' perception about the speed at which the judicial system works**

*Since in opinion of 56.6% stakeholder's Indian judiciary system is usually slow and 39.6% think it's always slow. We can further analyze this into our inferences. This key point is also subsequently discussed in the interview section.*

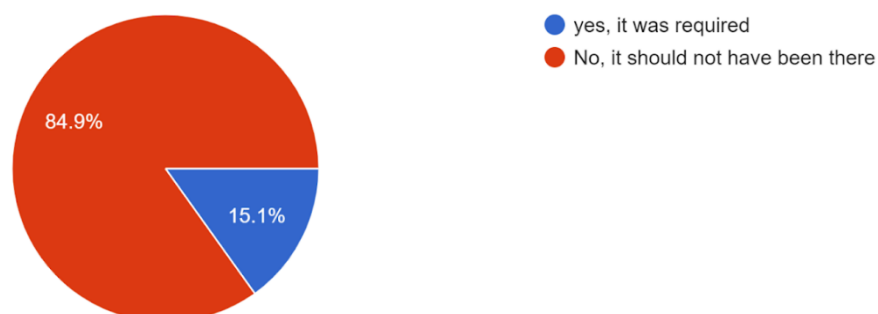
**Currently the government has closed all the game zones and such entertainment parks to ensure and apply safety protocols. Do you think this should be done in all states?**



**Figure 11: Participants' opinion on the temporarily shut game zones and amusement parks amid the Rajkot incident**

*66% of individuals believe this decision is correct and should be implemented in other states as well. We can also draw our inferences from the new policies and rules Gujarat government has made "According to new rules, the game zones have to display the capacity of their zones and the validity of their licenses on a big board visible to the visitors. All the game zones will have to depute fire, safety, and electrical-related staff at the site, apart from training all the staff working in the zones, as they need to evacuate visitors in case of an emergency."*<sup>8</sup>

**According to media sources 3500 liters of fuel was at site along with other inflammatory materials. Do you think it was required, or should it not have been there?**

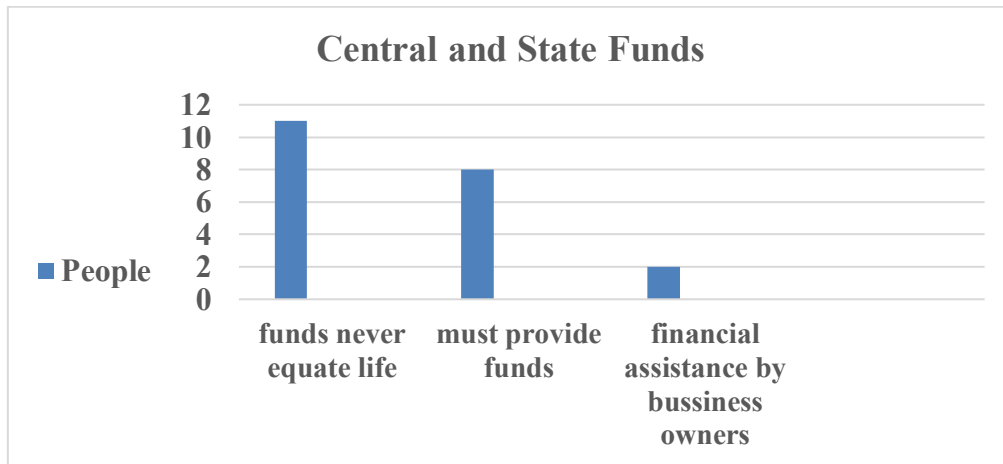


**Figure 12: Participants' opinion on the storage of inflammatory material at the site**

*Majority of the participants think that the fuel should not have been there.*

### Central and State governments compensated the families of victims. Your opinions on it:

We received 22 responses written by the stakeholders and on further analysis of them we can plot the following graph

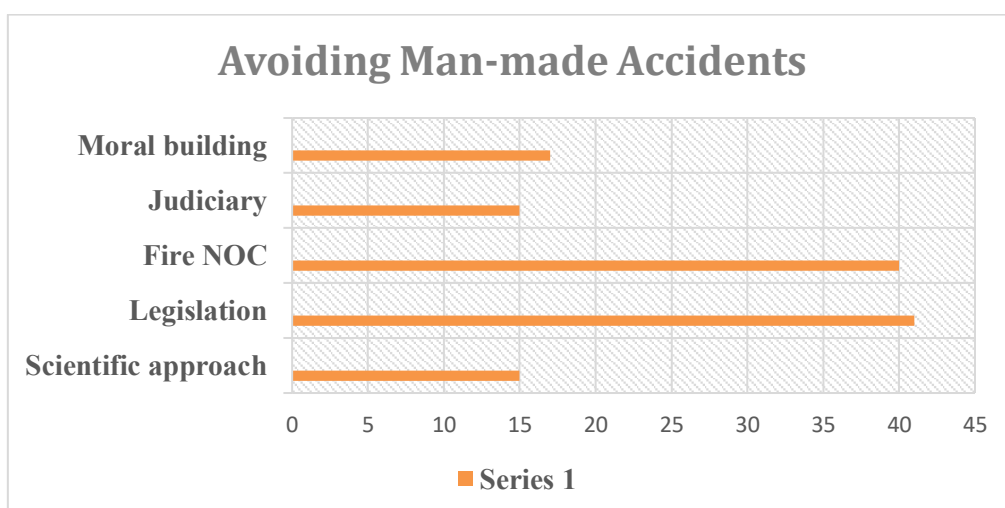


**Figure 13: Public opinion on the compensation provided by Government to the victim's family**

*The responses suggest that most people believe life doesn't equate to money.*

### Give suggestions on how such an accident could have been avoided.

We received 22 responses written by the stakeholders and on further analysis of them we can plot the following graph

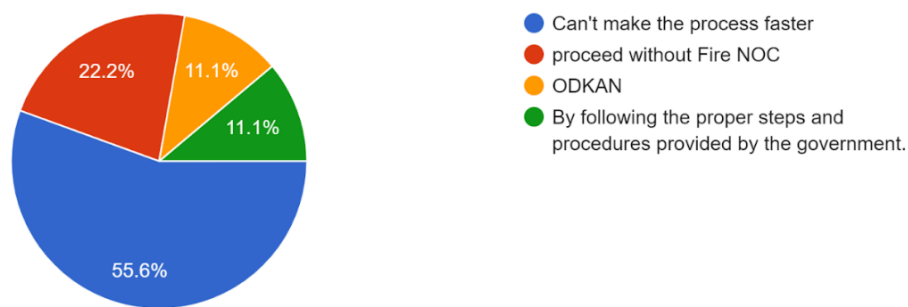


**Figure 14: Participants' opinions on how such accidents can be prevented**

*This question is of significant importance, as it yields and provides us with the above statistics that form the basis for deriving our inferences drawn from the answers given by the stakeholders. Also, many safety measures suggested have been used to derive our inferences. These inferences are subsequently detailed in the inferences section.*

### **Questionnaire 2 (This was meant for business community)**

Assume you are the owner of a construction business. you are about to construct another floor for a shopping mall which has 3 floors and the top floor is game zone and movie theater. but the problem is Fire NOC. A government document required whose inspection takes place in three stages Assume you are the owner of a construction business. you are about to construct another floor for a shopping mall which has 3 floors and the top floor is game zone and movie theater. but the problem is Fire NOC. How would you make this tedious process faster? (you can type your ideas)



**Figure 15: Perception of participants from business backgrounds about Safety documentation process**

*This question was meant to examine what business individuals would do morally when in a situation similar to our study. It suggests that the business community would try to avoid going through the legal process required for fire NOC. It also suggests that the legal procedure is not user friendly.*

### **Interview**

The structured interview with 3 Experts was conducted.

- a. Survivor and Eyewitness
- b. Lawyer and AIR 1 JAG ENTRY (INDIAN ARMY)
- c. Civil Engineer and 25+ years of field experience

### **a. Survivor and Eyewitness**

#### **Questions**

1. How your experience was in the TRP game zone and in detail explain the sequence of events that took place.
2. Did the place look safe initially when you entered the place?
3. Were you injured? What impact did the accident have on you physically or mentally?
4. Did you receive government funds or not?
5. Safety protocols you would suggest to such entertainment parks.
6. Your opinions on this accident and how do u think this could have been avoided?

#### **Summary of the interview**

The interviewee describes a harrowing experience at TRP Game Zone, where a fire broke out while they were bowling on a busy Saturday. Initially, they dismissed a strange noise, but soon after, smoke and darkness engulfed the area, leading to panic. Despite attempts to call for help, no one from downstairs responded, prompting the group to break through a steel wall and escape. While the interviewee suffered minor burns, their friend's younger brother sustained serious injuries and was hospitalized. The government provided financial aid for the injured and the families of those who died, though the exact amounts were unclear. The interviewee emphasized the importance of fire safety measures, such as obtaining a Fire NOC, ensuring emergency exits, and keeping hazardous materials like petrol and diesel separate from flammable work areas.

*These safety measures and incidents described by the interviewee further help us deriving the inferences for our research*

### **b. Lawyer and AIR 1 JAG ENTRY (INDIAN ARMY)**

#### **Questions**

1. A lot of common people say that jurisdiction in India is slow. But many times, we have heard from people practicing the law that such a lengthy procedure is necessary. "No innocent should be punished". Please put some light on this and let us know about a

few legal terms or sentences taught during your education period. Also give your opinion on it.

### **Answer**

One of the main reasons for the delays in the justice system is the lengthy procedures that must be followed.

The concept of due process ensures that every individual has the right to a fair trial, which is a fundamental right in India. This means that proper evidence must be collected, witnesses examined, and legal protocols adhered to, all of which contribute to the extended duration of cases.

The Indian Constitution is structured around a system of checks and balances involving three branches: the judiciary, the legislature and the executive. The judiciary plays a crucial role in ensuring that laws are not in violation of fundamental rights. For instance, if a law is perceived to infringe on the right to freedom of speech, any citizen can challenge it in the Supreme Court. The Court will thoroughly analyze the law, considering various factors, which can be a time-consuming process.

A core principle of the justice system is to prevent the punishment of the innocent, even if that means some guilty individuals may evade justice. This commitment to fairness is paramount, reflecting the philosophy that it's better for ten guilty individuals to go free than for one innocent person to be wrongfully convicted

2. Referring to the Rajkot fire incident that caused death of 27 people. Quoting from the article, "According to FIR, the accused individuals constructed a structure measuring 50 meters in width and 60 meters in length, with height of approximately two or three stories, using metal sheet fabrication to establish gaming zone."

There will always be loopholes in law and system. There will also be people who use this grey area. Is there any way we can increase transparency and frame rules in way such that we can minimize the grey area, is this a problem with legislation or a problem of lacking moral ground? How can we increase moral grounds collectively as a society so that less people use the law for their own benefit?

**Answer**

There are two perspectives here, both of which should be balanced.

First, laws should be defined clearly to minimize confusion and prevent varied interpretations. Increasing awareness about laws and legal processes is essential. Also, instilling values of morality and integrity from a young age is crucial. For which, education system should incorporate ethics and civic responsibility into their curricula to nurture a sense of accountability and respect for the law. Second, on the other hand, grey areas allow for flexibility in interpreting laws, enabling courts to adapt legal principles to unique circumstances. In the landmark judgment in Justice K.S. Puttaswamy (Retd.) vs. Union of India (2017), the SC interpreted the right to privacy as a fundamental right under Article 21 of the Constitution.

3. As a lawyer, what are your opinions on capital punishment for criminals? Many people side with capital punishment but there is a huge group of people who say that capital punishment might not give chance to the culprits to live a better life after the punishment. What are your opinions? Would capital punishment decrease crime rates, or would it cause lack of trust in the judiciary system?

**Answer**

Capital punishment can serve as a deterrent for severe crimes like mass murder and rape, providing a sense of justice for victims and their families. Though, it is crucial to have a strict legal process to ensure that no innocent person is wrongfully sentenced to death. The Indian legal system, particularly through Hon'ble Supreme Court ensures this by applying it in "rarest of rare" cases. This principle aims to ensure that only the most egregious offenders warrant such severe punishment, aligning with natural justice principles. Furthermore, for capital punishment to be an effective deterrent, it must be implemented swiftly. Delays in legal proceedings can undermine their intended purpose, as potential offenders may not perceive an immediate consequence for their actions.

4. The government often gives funds to the families of victims. In the recent fire accident. That's what the government did. Yes, helping the family of victims is a must and this is the least the government can do. Although our survey proved that many people have opposite opinions. A survivor from the same incident quoted " these funds might help the injured and their family but not the dead." Your opinions on this.

**Answer**

While compensation cannot erase the emotional pain of losing a loved one, they can alleviate some immediate financial burdens. This support helps families manage day-to-day needs during a devastating time. The loss of a sole breadwinner is devastating, that no amount of money can replace. Therefore, it's crucial that financial aid is paired with accountability for the incident. This includes investigating the causes of the tragedy and addressing any negligence or regulatory failures. Ensuring strict safety regulations and learning from past mistakes can help prevent similar incidents in the future. A holistic approach needs to be taken that addresses both immediate and long-term needs to make a significant difference

5. As a lawyer, what is something you might want to change about our judiciary and legislative system?

**Answer**

Laws should be drafted in a clear and unambiguous manner to prevent misinterpretation. This could help in reducing litigation arising from vague legal language. Forming balanced committees, including legal experts, practitioners, and representatives from diverse backgrounds, can ensure that laws are comprehensively reviewed and reflect a broad range of perspectives before being finalized. Simplifying the documentation required for legal proceedings can make the system more accessible and efficient. Implementing measures to reduce the number of adjournments and streamline court schedules can help ensure that cases are resolved more quickly. This might include stricter regulations on the grounds for requesting delays and better case management systems.



6. Corruption is a major issue that is faced by almost all countries. Give light on the laws that prevent corruption. State your opinions on corruption and how it could be prevented.

**Answer**

Prevention of Corruption Act (1988), Lokpal and Lokayuktas Act (2013), Foreign Contribution (Regulation) Act (FCRA), Prevention of Money Laundering Act (PMLA). Multifaceted Approach to Combat Corruption is needed. First is Promoting a culture of integrity and ethics in both public and private sectors is essential. Education and awareness campaigns can instill these values. Second is Strengthening institutions tasked with enforcing anti-corruption laws is critical. Lastly, utilizing technology, such as e-governance platforms, can minimize face-to-face interactions and streamline processes, reducing opportunities for corrupt practices.

**c. Civil Engineer and 25+ years of field experience**

**Summary of the interview**

The interviewee explains fire-safety construction practices, emphasizing that there are safer alternatives to metal sheets for dividing floors, as metal can leak and is not always fireproof. They emphasize the need of providing personnel with adequate fire safety training, correctly storing combustible products, and periodically maintaining electrical equipment. The respondent further claims that Fire NOC is required for all building projects and must be obtained from a government-approved organization. To eliminate potential dangers, they recommend scheduling work and client zones apart. When asked about worker safety, the interviewee indicated that their crew is trained in fire safety practices and has never had a close encounter with a dangerous situation. They feel that adhering to fire safety laws and protocols would have helped to prevent the Rajkot fire, and that guaranteeing safety is a moral responsibility shared by engineers and business owners alike.

## Secondary Data

### 1. GDCR<sup>1</sup>

**GDCR** (Gujarat Development control regulations) is general development control regulations under clause (m) of sub section (2) of section 12 of the Gujarat Act.

The fire at the TRP Game Zone in Rajkot, Gujarat on May 25, 2024, was a man-made disaster that killed 27 people and injured three:

#### *Cause*

Sparks from welding work on the first floor of the game zone fell on flammable materials stored on the premises.

The game zone was built on temporary structures to avoid getting the required permissions and approvals, including a fire no objection certificate.

#### *Court's observations*

The Gujarat High Court noted that the fire took advantage of loopholes in the Gujarat Comprehensive General Development Control Regulations (GDCR).

#### *Important references from GDCR*

- *Section B between Page 17 to page 57 highlights permissions required for development and building use and clearly states procedures to be followed during construction. It highlights the procedure for obtaining, revising and revalidating a development permission.*
- *Section B page 26 clearly states the responsibilities of owner and/or developer and persons on record.*
- *Section C page 59 to 81 explains general planning regulations.*
- *Section C page 122 briefs about Special buildings category under which a game zone is considered.*
- *Section D: page 154 states fire preventions and safety measures*  
*Page 177 explains the regulations followed by special buildings*  
*Page 200 highlights the importance of quality control and inspection*
- *Section F contains a total of 29 schedules which must be followed during and post construction.*
- *Section F form no 2D, Form 2E, form 15 and Form 16 can also be referred to in this case.*

### *Arrests*

Twelve people have been arrested in connection with the fire, including six government employees and four owners and a manager of the game zone.

## **2. Articles from Newspapers/Magazines**

### **2024 Rajkot gaming zone fire<sup>2</sup>**

- a. As per the information available publically<sup>2</sup>, the Rajkot gaming zone fire in May 2024 involved many flammable materials, including:

Diesel: 1,500–2,000 liters for generators

Petrol: 1,000–1,500 liters for go-karts

Oils: For various rides

Fibers and fiberglass sheets: Highly flammable materials

- b. The fire spread rapidly to the flammable materials, causing one of the biggest man-made tragedies in recent memory. The Gujarat High Court called the fire a "prima facie 'man-made disaster'"<sup>3</sup>.

- c. A technical review article published by IIT Gandhinagar<sup>4</sup> meticulously examines the technical intricacies of the event, providing a comprehensive analysis of the underlying causes, outlining preventative strategies, and detailing precautionary measures to mitigate the likelihood of similar occurrences in the future. The article suggested general preventive measures regarding structure and materials used to build it, location and spacing, permissible population, evacuation routes, sing boards, adequate fire safety and firefighting equipment, trained staff. These preventions are also mentioned in NBC (National Building Code)<sup>5</sup>.

*The NBC norms that can be referred to for the same are 6.4.2.1, 6.4.2.1.d, 4.9, 5, 3.1.5, D-8, 6.4, 6.4.1.1, 4.8, 3.4.5.4, 5.1, 4.4.2.2.b & Table 5, 4.4.1.d, 4.11*

## RAJKOT FIRE TRAGEDY: A TECHNICAL OVERVIEW<sup>4</sup>

“The tragic fire at the TRP Game Zone in Rajkot, Gujarat, on May 25, 2024, which resulted in 28 casualties, underscores the critical need for stringent fire safety protocols and regulations, particularly in temporary structures. The incident was triggered by sparks from welding work igniting flammable foam sheets stored nearby, leading to a rapid and devastating blaze. The response from the fire department was delayed and hampered by inadequate safety measures, contributing significantly to the high casualty rate.

Key observations reveal multiple lapses, including improper storage of flammable materials, lack of fire alarms, insufficient fire-fighting equipment, inadequate evacuation routes, and unauthorized structural modifications. Additionally, the presence of obstructive elements and insufficiently trained staff further complicated the rescue operations.

In the aftermath, legal actions were taken against six individuals, including the game zone owner, and the government suspended several officials for negligence. The Gujarat High Court termed the incident a “man-made disaster” and a Special Investigation Team (SIT) was formed to probe the fire. Moreover, financial assistance was announced for the victims’ families.

Foam sheets, typically made from flammable polyurethane or polyethylene, contain many C-H bonds. When heated, these bonds break, releasing volatile compounds that react with oxygen, quickly producing heat, flames, and combustion gases. The C-H bond, with a bond energy of about 413 kJ/mol, stores significant potential energy. When broken, it releases high energy, sustaining the fire.

Combustion of these materials releases toxic gases such as carbon monoxide, carbon dioxide, formaldehyde, and hydrogen cyanide, causing dizziness, headache, nausea, confusion, and loss of consciousness. High concentrations can be fatal within minutes, while prolonged exposure to lower concentrations can lead to chronic respiratory issues, cardiovascular problems, and neurological damage. These toxic gas releases likely contributed significantly to fatalities.

This incident highlights the dire consequences of neglecting fire safety standards and emphasizes the urgent need for comprehensive fire safety audits, stricter enforcement of regulations, and enhanced training for staff to prevent such tragedies in the future.”

### 3. Research Papers

The global construction industry is witnessing an emerging trend towards "zero-waste" practices at the site level, yet our understanding of this concept remains limited. As per the literature, Zero-waste construction also seemed to be an important practice to be followed for several reasons, including:

#### *Environmental benefits*

Zero-waste construction reduces the amount of waste sent to landfills, which helps to preserve natural ecosystems and reduce greenhouse gas emissions. It also reduces the need for raw materials, which helps to conserve resources and mitigate environmental degradation.

#### *Economic benefits*

Zero-waste construction can save money through more efficient use of materials, reduced waste disposal costs, and lower operational costs. It can also lead to increased property value and lower maintenance costs over time.

#### *Social benefits*

Zero-waste construction can create healthier living environments by reducing exposure to harmful substances. It can also boost community awareness and involvement in sustainability.

Hence, we studied two research papers based on zero wastage policy, and we presented their findings below.

#### **a. Analytical Framework of ‘Zero Waste Construction Site’: Two case studies of Shenzhen, China**

This research paper by Lu et al.<sup>6</sup>, endeavors to illuminate the waste management concept of "zero-waste construction site" by meticulously defining its core meaning, establishing clear system boundaries, specifying the appropriate assessment period, and outlining operational strategies. These elements are subsequently integrated into a comprehensive analytical framework.

The research paper promising approach to understanding and achieving zero waste in construction which includes multifaceted approach that gives a robust foundation to research. The paper acknowledges the system's complexities and focuses on practicality that contributes to a broader goal. This goal is to contribute to societal shift to zero wastage.

## b. Study of Zero Waste Management in Indian Construction Industry

This article by Yoganandam et al.<sup>7</sup>, has presented a detailed study about zero waste management in Indian construction industry. They have categorized the construction waste primarily in two types: (i) structure waste, which includes materials such as broken concrete, steel bars, and unused wood; and (ii) finishing waste, which encompasses a wider range of materials like leftover cement, broken tiles, excess paint, and packaging from appliances. India, with its rapidly expanding urban population and numerous high-rise buildings, faces a significant challenge in managing the substantial volume of construction and demolition waste. This waste occupies considerable space in landfills, posing significant environmental concern.

## Conclusion

It is very important for the entertainment parks in fact all constructions in public domain to follow the guidelines and the rules set by the government through GDCR and NBC.

For fire safety, the following norms can be referred to:

NBC (National Building Code)<sup>5</sup>.

*The NBC norms that can be referred to as the same are*

*6.4.2.1, 6.4.2.1.d, 4.9, 5, 3.1.5, D-8, 6.4, 6.4.1.1, 4.8, 3.4.5.4, 5.1, 4.4.2.2.b & Table 5, 4.4.1.d, 4.11*

GDCR<sup>1</sup>

- *Section B between Page 17 to page 57 highlights permissions required for development and building use and clearly states procedures to be followed during construction. It highlights the procedure for obtaining, revising and revalidating a development permission.*
- *Section B page 26 clearly states the responsibilities of owner and/or developer and persons on record.*
- *Section C page 59 to 81 explains general planning regulations.*
- *Section C page 122 briefs about Special buildings category under which a game zone is considered.*
- *Section D: page 154 states fire preventions and safety measures*

*Page 177 explains the regulations followed by special buildings*

*Page 200 highlights the importance of quality control and inspection*

- *Section F contains a total of 29 schedules which must be followed during and post construction.*
- *Section F form no 2D, Form 2E, form 15 and Form 16 can also be referred to in this case.*

Further the inferences made are categorized as:

- Safety concerns
- Safety measures for fire accidents
- General safety measure for hazards
- Rules for the
- Legislation
- Judiciary

### ***Safety Concerns***

- One Way in, One Way Out: A big problem is that there's only one entrance and exit. This could be dangerous if there's an emergency.
- Blocked Exits: People might not be able to get out quickly because the exits are blocked.
- No Fire Alarm: There's no system to warn people if there's a fire.
- Built Without Permission: The structure wasn't built with the proper approvals, which means it might not be safe.
- Flammable Materials: The structure is made of materials that can easily catch fire, which is a major concern.
- Flammable Storage: Storing a lot of flammable liquid like diesel is very dangerous.
- Electrical Hazards: The way the electricity is wired is unsafe and could cause a fire.
- Broken Equipment: Some of the fire extinguishers don't work, which could be a problem in an emergency.
- Hard to Find Exits: People might not be able to find the exits quickly.
- Staff Not Trained: The people working there don't know what to do in case of a fire.

## ***Safety measures for fire accidents (Questionnaire, interview of survivor, IITGN)***

### **Fire Safety**

- Clear the Area: Keep the area around the structure clear of anything that could catch fire.
- No Open Flames: Generally, open flames like bonfires should be avoided.
- Kitchen Safety: If there's a kitchen area, it should be separate and protected.
- Electrical safety: Regular Inspections should be conducted and licensed electricians conduct frequent inspections of all electrical systems to prevent faults that could spark fires. There should be Backup Power Systems for example install fire-resistant backup power systems for critical operations, such as emergency lighting and communications.
- Flammable Materials: There should be proper storage to store flammable materials, such as fuel for rides or fireworks, in fireproof storage areas away from public spaces. Safe Cooking Areas should be designed by designating specific well-ventilated cooking areas for food stands with appropriate fire safety equipment nearby.
- Visitor Awareness should be maintained by displaying fire safety rules at entrances, ride lines, and in guest areas. Remind guests not to carry flammable materials or engage in unsafe behavior (e.g., smoking in non-designated areas).

### **Firefighting Equipment**

- Water Supply: There needs to be enough water available in case of a fire.
- Fire alarms should be compulsory for all kinds of public buildings
- Fire Buckets: Make sure there are enough fire buckets on hand.
- Sprinklers can be added during the initial construction itself
- Professional Help: It's a good idea to have a plan for how the fire department will respond in case of an emergency.
- Someone in Charge: There should be someone responsible for fire safety and knowing what to do in an emergency

### **What Needs to Be Done**

- More Exits: Add more exits to make it easier for people to get out.
- Clear the Way: Make sure there are clear paths to the exits.
- Install Fire Alarm: Put in a system that will alert everyone if there's a fire.



- Follow the Rules: Get the necessary approvals for the structure.
- Use Safe Materials: Use materials that are less likely to catch fire.
- Store Flammables Safely: Store flammable liquids in a safe and secure location.
- Fix Electrical Wiring: Make sure the electrical wiring is safe.
- Check Fire Extinguishers: Make sure all the fire extinguishers are working properly.
- Clear Signs: Put up clear signs that show people where the exits are.
- Train Staff: Train the staff on what to do in case of a fire.

### ***Safety measures for fire accidents (Questionnaire, interview of survivor, IITGN)***

General preventive measures that should have been followed:

#### **Structure**

The structure should be made from fire-resistant materials to ensure safety, avoiding easily flammable decorations like paper or synthetics. Since it is temporary, it must be removed when no longer needed. A sturdy build with a strong base, such as wooden posts, is essential for stability. Height restrictions must be followed for both ceilings and signs. Flooring should be made of treated wood or mats to prevent accidents. Additionally, the structure should be strong enough to withstand strong winds, ensuring durability in various weather conditions.

#### **Location and Spacing**

The structure should have ample clear space around it to ensure safety and accessibility. It must also be positioned at a safe distance from potential hazards like fences or railway lines to prevent accidents and obstructions.

#### **Permissible population**

Allow only no. of people such that they can sit and stand comfortably, no. of people that the structure is designed for.

#### **Evacuating routes**

It should be made sure that there are sufficient exits with clear signs so that it is easy to locate them, and the exits should be wide enough for people to evacuate and it should be easy for fire trucks to reach the structure in case of an emergency. There should be emergency power supply in case of blackout.

***By Legislation (Questionnaire, NBC, GDCR)***

Before starting operations and allowing public entry, obtaining legal permits or NOCs from the Municipal Corporation and the state fire department is mandatory. Any welding or work involving potential ignition must be closely monitored by the owner or contractor and should not be conducted when the site is occupied by the public. Storing flammable liquids beyond the permissible limit set by the National Building Code is prohibited. Regular site inspections must ensure proper storage of flammable materials and prevent fire hazards. Additionally, all workers should be trained in using first aid firefighting equipment and must be aware of potential workplace hazards.

- In reference to having better and well-structured laws:
  - i. laws should be defined clearly to minimize confusion and prevent varied interpretations. Increasing awareness about laws and legal processes is essential.
  - ii. Instilling values of morality and integrity from a young age is crucial. For which, the education system should incorporate ethics and civic responsibility into their curricula to nurture a sense of accountability and respect for the law.
  - iii. Grey areas allow for flexibility in interpreting laws, enabling courts to adapt legal principles to unique circumstances. In the landmark judgment in Justice K.S. Puttaswamy (Retd.) vs. Union of India (2017), the SC interpreted the right to privacy as a fundamental right under Article 21 of the Constitution.
- In reference to having capital punishments in law:
  - i. Capital punishment can serve as a deterrent for severe crimes like mass murder and rape, providing a sense of justice for victims and their families. Though, it is crucial to have a strict legal process to ensure that no innocent person is wrongfully sentenced to death.
  - ii. The Indian legal system, particularly through Hon'ble Supreme Court ensures this by applying it in "rarest of rare" cases. This principle aims to ensure that only the most egregious offenders warrant such severe punishment, aligning with natural justice principles.

- iii. For capital punishment to be an effective deterrent, it must be implemented swiftly. Delays in legal proceedings can undermine their intended purpose, as potential offenders may not perceive an immediate consequence for their actions.

### ***By Judiciary (interview of lawyer)***

In the aftermath, legal actions were taken against six individuals, including the game zone owner, and the government suspended several officials for negligence. The Gujarat High Court termed the incident a “man-made disaster” and a Special Investigation Team (SIT) was formed to probe the fire. Moreover, financial assistance was announced for the victims’ families.

In the survey 96.2 % of people voted that our judiciary is slow and 28.3% of people think capital and speedy jurisdiction is the only solution.

Although, through the interview we know:

1. One of the main reasons for the delays in the justice system is the lengthy procedures that must be followed.

The concept of due process ensures that every individual has the right to a fair trial, which is a fundamental right in India. This means that proper evidence must be collected, witnesses examined, and legal protocols adhered to, all of which contribute to the extended duration of cases.

The Indian Constitution is structured around a system of checks and balances involving three branches: the judiciary, the legislature and the executive. The judiciary plays a crucial role in ensuring that laws are not in violation of fundamental rights. For instance, if a law is perceived to infringe on the right to freedom of speech, any citizen can challenge it in the Supreme Court. The Court will thoroughly analyze the law, considering various factors, which can be a time-consuming process.

A core principle of the justice system is to prevent the punishment of the innocent, even if that means some guilty individuals may evade justice. This commitment to fairness is paramount, reflecting the philosophy that it's better for ten guilty individuals to go free than for one innocent person to be wrongfully convicted

2. Capital punishment can serve as a deterrent for severe crimes like mass murder and rape, providing a sense of justice for victims and their families. Though, it is crucial

to have a strict legal process to ensure that no innocent person is wrongfully sentenced to death. The Indian legal system, particularly through Hon'ble Supreme Court ensures this by applying it in "rarest of rare" cases. This principle aims to ensure that only the most egregious offenders warrant such severe punishment, aligning with natural justice principles. Furthermore, for capital punishment to be an effective deterrent, it must be implemented swiftly. Delays in legal proceedings can undermine their intended purpose, as potential offenders may not perceive an immediate consequence for their actions.

To enhance fire safety awareness in places like TRP Zone and Rajkot, public awareness campaigns using social media, posters, and workshops should be conducted. Regular fire drills and training for shop owners, employees, and security staff on using firefighting equipment are essential. Strict enforcement of fire safety guidelines, including inspections, proper equipment installation, and marked emergency exits, should be ensured. Engaging the community through local fire safety committees and educating students can further promote awareness. Lastly, government initiatives like helplines, stricter regulations, and incentives for businesses adopting fire safety measures can help improve overall preparedness

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