

Macroscopic Crowd Flow, Risk Modelling and Behavioural Effects of High-Density Crowding on Mumbai's Suburban Trains

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Abstract:

The suburban rail commuters of Mumbai, India, encounter the world's most densely filled trains, wedged together in tight folds of humanity. While the immediate physical manifestations of crowdedness in Mumbai are well documented, little is known about the impact this has on the copious amount of passengers. This is a significant omission since the impacts of crowding on passengers influence their attitudes, travel behaviour, and travel decisions. As a result, the purpose of this paper is to determine the physical, criminal, mental, and behavioural repercussions of rail passenger congestion in Mumbai, India. To accomplish this, a qualitative methodology was used in Mumbai, which included 30 face-to-face interviews and surveys with the daily commuters especially women and girls and the problems they face. Furthermore, non-Western countries have a weak knowledge of the impact of crowding on passengers. With rising rail ridership worldwide, the experiences of Mumbai's passengers in high-density areas may be similar to those of passengers in other Western and non-Western countries in the future. Understanding the details of the crowd, the physical difficulties within and the role of RPF (Railway Protection Force) in controlling such density is the main aim which the researcher has aimed for along with the recommendations. Given that knowledge, strategies for improving the crowding experience would be more effective.

Key Words: *Crowd Flow, Crowding Effect, Crime Control, Behavioural Aspect, Risk Modelling, Mumbai Suburban Train, India*

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Introduction

One can easily engulf their thoughts if they are not capable of believing in them stronger. Creating one's identity is very important in today's world. In a place where we live, being different is a taboo and as an individual we are not supposed to think what we want, which may affect many decisions that a person can make in his future life. India has the second largest population in the world, with millions of people residing in densely inhabited cities. Mumbai is India's most densely inhabited city (Joshi & Kale, 2013) It is located on a peninsula on the west coast of India, and its Central Business District (CBD) is located at the southern end. Mumbai's suburbs extend 120km to the north and east (Sehgal & Surayya, 2011), and follow the three railway lines: Western, Central, and Harbour (Tiwari & Kawakami, 2001). Due to the distances involved and the cost and time efficiency of other forms of transport, such as bus, rickshaw, or car (Nallathiga, 2006), residents of Mumbai's outer-suburbs can only realistically access the CBD by train (Agarwal, Mullick, & Ray, 2013; Kusters, 2009). However, the suburban railway system is also relied on by people residing close to the CBD, who may be able to afford other forms of transport, but prefer the efficiency of the trains. Therefore, the trains carry a cross section of Mumbai's residents. Mumbai's local trains are the most densely crowded in the world (Mumbai Railway Vikas Corporation Ltd & Wilbur Smith Associates, 2013), with an estimated daily ridership of 7.4 to 8 million passengers (Mumbai Railway Vikas Corporation Ltd, 2013; Mumbai Railway Vikas Corporation Ltd & Wilbur Smith Associates, 2013). Between the 8-11am and 5-9pm peak hours (Kusters, 2009), super-dense-crush loads of 14-16 passengers per square metre are often experienced (Basu & Hunt, 2012; Sehgal & Surayya, 2011). Train surveys note that at these times, passenger loads are at least double the recommended passenger capacity (Mumbai Railway Vikas Corporation Ltd & Wilbur Smith Associates, 2013). Platforms and stations also experience high levels of crowding especially during the working hours.

Train carriages are divided into various compartments, reserved for different types of passengers: second class (ladies' or general), first class (ladies' or general), "handicapped" (introduced in 2001; Kusters, 2009), and vendors. Like many other non-Western railway systems, women are allowed to enter the general compartments, but ladies' compartments are strictly reserved for women. The doors to the carriages are operated manually and passengers generally choose to leave them open, allowing for improved ventilation and efficient boarding and alighting. During the monsoon, passengers may close the doors to discourage the entrance of water (Agarwal et al., 2013). For the vast majority of the year, some passengers opt to travel on the "footboard," a runner located at the entrance to the carriage (Hirsch, Thompson, Blewitt, & Every, 2016). Significant risks are associated with this locational choice, as the pressure of the crowd inside the carriage can cause people to fall from the moving train, or to hit an electrical pole along the track (Ambe, 2014; Dargalkar, 2012; Ganesh, 2011). These circumstances often result in severe injury or death. Indeed, during the first three months of 2012 (the data collection period for this research), 805 commuters died and 867 were injured in train-related accidents (Kumar, 2012), including pedestrians being hit whilst crossing the

tracks (Kamath, 2014), and passengers falling from carriages (Hindustan Times Correspondent, 2012).

Mumbai's extensive local rail network—with all classes of the city's inhabitants represented as passengers—is an ideal miniature of the massive city it services. Thus, understanding the experience of passengers in Mumbai's local trains may assist in a better understanding of high-density crowding, interactions with strangers, and behaviour in public more generally

Effects of crowding in humans

Crowding refers to the condition whereby individuals or objects are closely grouped together. It can also denote the mental strain caused by an overwhelming concentration of people in a given area. Crowding, in the field of environmental psychology, refers to the subjective feeling when an individual's desire for personal space surpasses the available amount of space. Mental health problems may arise from this, including decreased performance on intricate tasks, lingering effects of stressors, and increased physiological stress. Lack of privacy and the collapse of supportive connections are the primary causes of overcrowding.

Crowding can effect a person in many ways but specially the way he thinks and behaves in a crowd as well as has a single individual. A person's behaviour will have a lot of changes when he is with a crowd and it doesn't always have to be in a negative way. Many scholars have studied on the negative impact of crowding in a person's behaviour and thoughts but it doesn't necessarily have to be always negative as the crowding impact in a positive way as well. In some situations, there is a general liking and trust for the others present, such as the mutual joy at music festivals, or the camaraderie seen at sporting events. In these cases, the affective atmosphere the positive "vibe" of the surrounding crowd – can enhance the enjoyment of the spectacle and influence the individual's emotions and behaviour.

Whilst the social, psychological, physical, and public health effects of crowding are generally known, there is a need to understand the effect of crowding on passengers in mundane high-density settings. Additionally, there is a limited understanding of the effect of crowding on passengers in non-Western societies. The rail network in Mumbai, India is an ideal location to study if, and how the effects of crowding are dependent on a person's behaviour.

Effects on Rail passengers

Mumbai as we all say is a City of Dreams. Crowd from different areas come to Mumbai to achieve their dreams and hence, has a high density of population. Mumbai local is a necessity for those who stay in Mumbai to travel. The Southern part of Mumbai is the original centre and economic heart of Mumbai but the property values are rocketing. It is difficult for those who are middle class to afford a place at such southern tip which makes them buy properties at northern tip which makes local train a necessity. Trains are a vital mode of transportation for the people of Mumbai. In the busy period of heavy traffic, the only other option available would be to use a car, which would move at a speed below 8km/h on roads that are hardly in good

condition, especially when it's raining heavily. The congested traffic is moving at such a slow pace that resourceful individuals are using loudspeakers attached to three-wheeled vehicles to advertise. Walking would be a faster option; however, the distances are too vast since the urban area spans 120km in the north-south direction.

Physical – The rail network is undeniably crucial, even though 10 to 12 passengers lose their lives each day. A number of people lose their lives in various ways while attempting dangerous acts near or on trains, such as being electrocuted while climbing on roofs, falling off overcrowded carriages, or being crushed by engines while crossing the tracks hastily. Deaths occurring on the railways have now become a commonplace occurrence. The next morning, a young worker will bid farewell to his wife and kids before heading to work, and the following day, someone will gather the remains on the railway track because he was determined to catch an overcrowded train, afraid of forfeiting half a day's pay. Living in Mumbai comes with a certain price that must be paid.

Criminal – In 2021, the National Crime Records Bureau of India³ recorded 16,431 deaths and 1852 injuries in the railway accidents. About 67.7%, which is 12,181 out of 17,993 of incidents take place from fall or collisions in railway tracks. Many accidents take place due to the track crossing for people to save time from walking in rush through bridge. In 2023⁴, Thane had the most reported deaths happening due to railway crossing. There are school as well as college going students doing this dangerous activity to board trains in time and reach the destination. The paramount point of consideration is the safety of women in over crowded locals, performing the daily chores of life are inclusive of tiring hours of traveling for a working women as, mostly the women of the new era are perfect combination of homemakers and financially independent and for the same their job plays an important character in their lives.

On a daily basis the women have to push their limits to board in a local in a city like Mumbai that is overly populated with people with aspirations and responsibilities and in the same preview, women are exposed to risings rates of criminal activities. The list starts with something as little as pick-pocketing, losing valuables amongst crowded compartments and ends into a numerous other overloaded crimes. The working women find themselves in the spheres of lawbreaking environment. Getting on a local train in a big task for all the mumbaikars as the trains are never unoccupied or under crowded and the people traveling throughout the journey are not able to get down mid-way or it isn't comfortable to get inside the train while returning back. Tiptoeing has also been flagged as one of the issues faced by trains that are overly crowded.

Mental- As the number of people or crowd increases, so does the fear in the minds of travellers. The crowd elicits negative emotional responses in quite a few individuals. Their emotional reactions varied from feeling upset and disappointed to feeling irritated and annoyed. From feeling uncomfortable in a crowded place, to worrying about not getting off at their intended stop because of the overwhelming crowd, to being afraid and frozen with fear at the thought of accidentally falling from the train onto the tracks. Women who travel, whether by

³ Rajesh kumar thakur, 2022, <https://www.newindianexpress.com/nation/2022/Sep/01/railways-records-38-per-centrise-in-accidents-in-2021-shows-ncrb-data-2493613.html>

⁴ Nitesha natu and somit sen, 2021 <https://timesofindia.indiatimes.com/city/mumbai/train-mishaps-half-in-maharashtra-but-state-is-still-first-on-list/articleshow/87450254.cms>

public transport or simply going about their day, also experience the distress of receiving unwanted physical contact and uncomfortable gazes from strangers. This fear extends to moments such as crossing bridges, using elevators, and sometimes even when using escalators, causing significant emotional distress for these women. The distress felt by numerous individuals often leads to their irritated conduct towards one another, subsequently resulting in conflicts among them.

Behavioural – Individuals who choose to journey by train often endure the most severe cases of overcrowding and are confronted with diverse individuals, resulting in an impact on their demeanour. When traveling, individuals might need to struggle to find seats, stand comfortably, or even board the train. They may have to resort to tiptoeing in order to reach their destination a little faster. Every day in these local trains, people get so frustrated with the daily rush that they resort to fights, hair-pulling and shouting at each other, creating a constant drama.

Role of RPF in Crowd Controlling

Railway Protection Force plays a crucial role in protecting the people who travels by railway by controlling the crowd maintaining peace and also the protection of railway property. They were entrusted with many other duties for smooth functioning in railway stations and local trains.

- Safeguarding and accompanying passenger trains when crossing high-risk regions.
- Our main objective is to offer comprehensive security measures, encompassing access control, regulation and overall safety within the platforms, passenger areas, and circulating spaces.
- In order to ensure the safety and security of railway facilities, as well as the well-being and comfort of passengers within designated areas.
- The objective is to eliminate any obstacles that may impede the transportation of railway assets or restrict passenger movement within the designated areas.
- To perform any additional actions that contribute to enhancing the safeguarding and protection of railway property, as well as ensuring the safety and well-being of passengers in the designated passenger area.

In order to ensure effective operations and the maintenance of order, it is imperative for the Railway Protection Force to adhere to certain duties. These responsibilities include efficiently managing the crowd and preventing any potential chaos or disruptions from occurring. In order to ensure smooth functioning and the protection of the public from unnecessary altercations, numerous amendments were made to the responsibilities and tasks entrusted to the Railway Protection Force. The duties that have been assigned to the Railway Protection Force are outlined as follows:

1. The Railway Protection Force will be granted legal authority to offer protection and ensure the safety of passengers and their belongings, thereby enhancing the overall facilitation provided to passengers.
2. The regulation of access control to stations can lead to a more efficient management and enhanced security in both the passenger area and circulation area of the platforms.
3. The concept of empowerment provided by The Railways Act is aimed at enabling and facilitating smoother train operations. Numerous provisions within The Railways Act are dedicated to ensuring hassle-free train operations, thus enhancing efficiency and effectiveness.

4. If new responsibilities were assigned to the RPF, it would lead to the most effective use of the available human resources.
5. The Railway Protection Force will have the authority to implement measures aimed at preventing any criminal offense against passengers. Additionally, they will possess legal powers to detain individuals engaged in such offenses.

On the occasion of Republic Day, the personnel of the Railway Protection Force (RPF) were provided with segways⁵ innovative electric vehicles that are two-wheeled, self-balancing, and powered by batteries. The Western Railway authorities allocated a total of six segways to the officials who were assigned to key railway stations in Mumbai. The electric scooters, which are powered by batteries, will assist the Railway Protection Force (RPF) in monitoring all areas within the railway stations. The utilization of these segways would greatly assist the RPF personnel in effectively monitoring all part of the railway stations, particularly the lengthy platforms. The Indian Railways has taken an unprecedented step with this initiative, which has never been done before. The RPF has been given a total of six segways, and they are anticipating receiving an additional five segways in the upcoming weeks. It has been reported that the stations of Mumbai Central, Churchgate, Bandra Terminus, Borivali, and Andheri have plans to utilize battery-operated vehicles with the purpose of managing crowds and conducting regular patrols within the stations. Officials who have been deployed at Marine Drive in south Mumbai are currently utilizing Segways for patrolling purposes along the promenade. The move to introduce these scooters was taken after considering the rapid extension of platform area on the stations. The segways would increase the mobility of the security staff allowing them to provide timely assistance to commuters seeking their aid.

Training for RPF in mob psychology and crowd control

In the past few years, the national transportation system has experienced significant financial losses due to various protests, such as the Citizenship Amendment Act (CAA) protests, farmers protests, and the protests by students who were dissatisfied with the irregularities in railway recruitment board exams. Just a little time ago, trains were set on fire by protesters as a form of opposition towards the Agnipath program implemented by the government. Throughout the duration of the course, the individuals will receive comprehensive training in a multitude of areas essential for maintaining public safety. This includes crowd control techniques, effective management of public order, understanding and navigating mob psychology, analyzing police interactions with the general public, promoting communal harmony, mastering the use of fire-fighting equipment. Additionally, the program will cover riot control procedures, enlighten participants on the importance of human rights, instruct on the proper utilization of less lethal weapons, provide hands-on experience with various equipment and ammunitions, and familiarize them with the latest developments in managing public order effectively.

⁵Mirror now digital, 2019 <https://www.timesnownews.com/mirror-now/civic-issues/article/rpf-personnel-at-mumbai-railway-stations-now-have-segways-for-crowd-control-patrolling-western-railway-irctc-railway-protection-force/355921>

The Agnipath Scheme

As we studied above, the crowd can effect the behavioural and mental thinking capacity of a person. A person when in crowd behaves in a complete different way than he actually is thinking or want to do as the psychology of a person vary or change when there is a submergence of thoughts and ideas by the majority of people. The majority always rules the mind of minority creating a effect of spread of negative thoughts among many people. The introduction of the Agnipath Scheme by the Centre has sparked protests across various states throughout the country. Many incidents of burning coaches of numerous trains had happened as a result of this movement. Once the movement turned violent, its repercussions could also be felt in Mumbai, particularly affecting the passengers arriving on trains. Many trains which were en route to Mumbai, had to be cancelled as a result of the protests taking place. The protesters set fire to a large number of boxes. Hence, in order to ensure the safety of the passengers, a significant number of train services were being cancelled.

Mumbai is a state where the use of local trains is utterly necessary and the crowd traveling from local trains are more than any other place. As a result of this scheme, many trains were cancelled which resulted a tense in the minds of people especially the Mumbaikars as they depend on local train for traveling from one place to another. The Central Government has given a directive to the Railway Protection Team (RPF) throughout the nation, urging them to maintain a high level of vigilance. Because of this, the leaves of RPF officers and employees were cancelled as a consequence. The employees of the Railway Protection Force (RPF) were instructed to ensure their presence in large numbers at the railway stations in Mumbai, and to seek assistance from the Railway Police if required. Instructions were provided to enhance and strengthen security measures at densely populated and vulnerable stations. The Indian Railways incurred a massive loss of a total of Rupees ₹259.44 crore because of the extensive destruction and damage caused to its valuable assets during the widespread protests conducted in opposition to the Agnipath scheme implemented by the Central Government. In addition, the railway minister mentioned that the Agnipath protests had a significant impact on more than 2,000 trains throughout the nation.

Future difficulties in other states

We studied about how crowding effect the people in many ways and what all measures have been taken till now in Mumbai but this can effect other states as well as the current situation of population is being increased in every other corner of India. As per the data we studied that 90% of people have the fear of increasing crowd in trains not only in Mumbai but also every other states. There is a rapid growth in other cities as well so the population will get distributed which will directly lead to increase in crowd in locals ie. an increase in travellers in every cities. It's on how other states will take inspiration or efforts to manage and control the increasing population and how they manage the crowd. Some also think that maybe due to the crowd in these metropolitan city, people may migrate to other states and cause a trouble there. There are also an increase in the people travelling to other places to explore which will

indirectly increase travellers which may increase the use of railways. Some people tend to believe that population is an alarming concern for the world. It's the chase for the survival of the fittest. People could go to any extent to survive and feed themselves and their loved one's and to live a richer and healthier life. There are already various accidents happening due to crowding in railways in some of the states which may increase gradually in future. People coming in search for jobs and to achieve their dreams in various parts of states will increase as there will be more population and less opportunities for all. The places where there will more opportunities for people will eventually become populated as people have to survive no matter what and the race in today's world keeps on rocketing as people wish to achieve what they want and also lead a happy life. The impact of increasing population on states and countries can vary depending on various factors, including the rate of population growth, the existing infrastructure, resources, and the effectiveness of government policies. Ultimately, the impact of increasing population on states and countries depends on how well governments and societies can manage the associated challenges and leverage the opportunities for sustainable development.

Case laws

One notable case is the Union of India v. Pratap G. Pawar & Ors, which was heard by the Bombay High Court. In this case, the issue of safety and security in local trains was addressed. The court directed the authorities to take necessary measures to ensure the safety and security of commuters, including the installation of CCTV cameras, alarms, and increased police presence.

Mumbai Grahak Panchayat v. Union of India⁶, where the Supreme Court of India issued guidelines concerning the overcrowding in Mumbai local trains. The court emphasized the need to enforce regulations on the number of passengers allowed per train carriage to prevent accidents and ensure the safety of the commuters.

State of Maharashtra v. Chandrabhan Talekar (2003): In this case, the accused was charged under Sections 304 (culpable homicide not amounting to murder) and 354 (assault or criminal force to woman with intent to outrage her modesty) of the IPC for throwing acid on a woman inside a train. The Bombay High Court upheld the conviction and emphasized the need for strict punishment in cases of acid attacks.

⁶ <https://indiankanoon.org/doc/1600915/>

Criticism

There are various technologies and department assigned for the role of managing such crowd in local trains not only in Mumbai but also in every states. It is the duty of people working in that department such as Railway Protection Force ie. RPF or any other assigned department to make sure there is a smooth working and no incidents are taking place due to the overcrowd and even to control the crowd properly so that no life is being hurt due to the overcrowd or even by the mistake of any. The RPF (Railway Protection Force) according to the data was provided with segways, a two wheeled electric vehicle, self balancing and run by batteries for the use of protection of people especially at places where there is huge crowd and large platforms, but according to the data no people have seen a officer using any such vehicle. The amount of corruption also effects this as taking bribes from those who can afford and settle any disputes happening between people. All offices are located on the southern side and all residences are in the Northern areas. Which means that many of the people travel southwards and during evening they go home northwards. That's one sided traffic always, which is really bad and the Railway authorities have never done anything regarding this as increase in train numbers during required time. It is disheartening to note that no efforts are made to acknowledge or commemorate those who tragically lose their lives as a result of overcrowding, slipping or falling between the tracks either while boarding a train or simply while crossing them. There exist numerous individuals who remain anonymous due to lack of acknowledgment, such as by their names or locations. In today's world, there is a lack of initiative to create a computer programme or utilize technology that would thoroughly analyze every aspect of an accident, including its precise location, time, and nature, in order to identify patterns and thereby enable the implementation of more effective preventive measures. Officials have not taken action despite the presence of numerous studies on the subject matter. The main issue lies in the fact that the railways lack a system of responsibility and answerability. The situation will not undergo any transformation until they take appropriate steps to rectify the issue of accountability. In order for individuals who are striving for their overall welfare not to be in danger of losing their lives, it is necessary to implement effective and stringent measures. There have been instances where it was instructed to implement effective measures to prevent the occurrence of deaths and threats to people caused by overcrowding in Mumbai local trains. However, many of these incidents may not even happen, and if they do, they are often not addressed adequately. For example, the installation of cameras was carried out successfully, but many of them either do not function properly or are ignored due to lack of attention until something serious happen.

Solution

The overcrowding and its effects will continue unless and until there is a proper solution to it. Lives of every single individual matter and its disheartening to see the people who travel by local trains suffering from all such difficulties are those who may have to loose their life for the same efforts of leading a happy life for them as well as their loves one's. As per the data that we have collected many people think in various way and had various solutions to the matter

of over crowd and also have observed various other reasons for these people to behave in such manner. While many think that the people fights or behaves in a different manner in local trains because they may going through a various other difficulties specially in work places which all burst up due the frustration and irritation created in these trains. While some also think this happens because some people's behaviour triggers other people or maybe some people are generally a mean person and don't care about others as people nowadays have become selfish and rude and are not understanding and have no patience at all but definitely some are the exceptions. However, every individual had their own theory but the common element was crowd. The crowd in the trains is the main element that triggers a person to a extent that they need to shout or even sometimes fight with others because after returning from work he/she almost gets totally tired and wishes to sit down for a while in the local train, and when they doesn't find any space and so does argues for a fourth seat. Some believe that there are a lot of factors that contribute to this behaviour-

- Generally when one computes through trains on a daily basis or for a long period of time the purpose of using the train is some kind of work, which physically and mentally drains them and mostly people are drained and frustrated
- The environment of the train is very loud, chaotic and suffocating (Mumbai trains) and there are people of all kinds ones who are considerate and one's who are not, the environment is disturbing enough to push a frustrated person over their limits
- There are various other environmental, social, mental and physical factors that are involved while using trains that may look small but when they come together they manage to trigger a person.

The crowd itself is a biggest trigger. You must have seen the difference in the same person who travels in a crowded train versus in a non-crowded train. The same person who is so frustrated and irritated in a crowded train will be calm in a uncrowded train. The unsaid norms that are there which especially the ladies compartment follows is so foolish. People "claim" their seats and hold seats for their friends who are still aren't in the train and will come in later stations. People who don't follow this norm will keep standing till they get down. Even the calmest one get irritated and shouts at others. Since they are calmest and have trained their mind as such that when they see chaos they get irritated and frustrated. Consider an individual known for their calm and patient demeanour. They may encounter a situation on a train where external factors, such as overcrowding, delays, or unexpected disruptions, lead to heightened stress. Additionally, personal stressors like work pressure or family issues may compound their overall stress levels. In this scenario, the person's usual patience might be tested as frustrations build up. Perhaps someone unintentionally bumps into them, triggering a reaction that, under normal circumstances, they would handle with composure. The combination of external pressures and personal stress could then manifest in an argument, as the person, despite their typical calmness, reaches a threshold where they respond differently than usual. This example illustrates how various factors, both external and internal, can converge to influence an individual's behaviour, even if it deviates from their usual calm and patient demeanour. The idea of calmness and patience fades away when people of diverse backgrounds are clogged in one place. Factors such as stress contributes to arguments, this combined with overcrowding may be the primary cause for arguments in trains.

These various issues can only be solved by taking appropriate measures to handle these crowds so as to gradually stop the death rate of people due to such over crowding in Mumbai local or any other states. Frequency in trains and having automated doors to the trains is the most common solution suggested by many. Proper maintenance and system order for over crowding would also help these effects. A ticket handling and checking system that is properly executed and is rigid enough to curtail the ticket less people from travelling in trains which will be something similar to metro will also help decrease the crowd. Creating a fast development of metro to not only Southern Mumbai but also to places like Vasai Virar will decrease the crowd in Mumbai locals and will also help the people travel much quicker and safely. Mumbai metro project is a practical step towards overcrowding, however a lot of work is still left which creates traffic on road, the project should be completed quickly. Increasing the length of trains from 12 coaches to 15 coaches and introduction of direct trains which is a super fast train more often will help reduce the crowd and distribute the crowd accordingly.

Addressing the issue of overcrowding in Mumbai's local trains requires a comprehensive strategy that spans various domains. Firstly, a significant aspect involves the enhancement of infrastructure. This entails expanding the existing railway network, adding more tracks, and augmenting station capacities to accommodate the escalating number of commuters efficiently. Simultaneously, promoting alternative modes of transportation, such as buses and water transport, serves to diversify commuting options and alleviate the strain on the rail network. Optimizing train services is crucial. Increasing the frequency and efficiency, particularly during peak hours, provides commuters with more choices and reduces congestion. Technological solutions play a pivotal role, encompassing real-time tracking, smart ticketing, and crowd management systems. These innovations not only enhance overall system efficiency but also empower commuters with real-time information, enabling them to make informed decisions about their travel.

Encouraging flexible work hours and remote work policies among employers contributes to spreading out commuting times, mitigating the concentration of passengers during peak hours. Public awareness and education campaigns are essential in fostering a more organized travel experience. By educating commuters about proper train etiquette, queuing, and efficient use of space, a collective effort can be made towards creating a less congested environment.

Urban planning strategies form another integral component of the solution. Integrating policies that reduce the necessity for long-distance commuting disperses population density, alleviating pressure on local train services. Collaborating with the private sector for investment in transportation solutions brings additional resources and expertise to the forefront. Finally, implementing policy reforms, including incentives for off-peak hour travel, regulating population density, and encouraging sustainable transportation options, contributes to long-term solutions. A coordinated implementation of these measures addresses the complexity of overcrowding in Mumbai's local trains, creating a more efficient and commuter-friendly transportation system.

Conclusion

The Railway authorities may work for the betterment of the society but their hardships isn't really effecting the crowd controlling in the railways especially in a populated state like Mumbai where the Mumbai locals are the life of people. There are various ways for the resolution of these overcrowding and it's effect which is collected and mentioned in this research paper. It also reveals how the psychology of a person depends a lot on these factors of crowd and changes the behaviour of a person in different ways. We also studied about how RPF plays an important role in managing the crowd and the people in the railway stations to control the death rates and every other incidents that happen due to such overcrowding. This railway force is also provided with various training in many fields like crowd controlling, mob psychology, how to ride segways, techniques to control crowd, and many such more which helps reducing the crime rates and accidents happening due to excessive crowd. This research paper created a sense of how people react and why do they behave in a certain manner in different situations especially in Mumbai local trains. We analysed people's physical, mental and behavioural changes in a Mumbai local train and how we can resolve or reduce the rate of accidents happening. If one has a comprehensive comprehension of the crowd, the strategies aimed at enhancing the experience of being in a crowd would yield better outcomes and would also decrease the amount of deaths happening.

Reference

- <https://www.grouporttherapy.com/blog/mobmentality#:~:text=Mob%20mentality%20is%20a%20pervasive,actions%2C%20even%20within%20a%20crowd>
- Julien, 2022 <https://www.theguardian.com/world/2013/oct/29/india-mumbai-population-rail-accidents>
- Natasha natu, 2024, <https://timesofindia.indiatimes.com/city/mumbai/25k-lives-lost-in-city-to-railway-accidents-last-year-rti/articleshow/106744805.cms>
- Team mp, 2022 <https://www.millenniumpost.in/nation/railway-protection-force-to-be-trained-in-crowd-control-and-mob-psychology-484601>
- Manthak metha, 2022, <https://timesofindia.indiatimes.com/city/mumbai/central-railways-artificial-intel-to-control-crowds-zero-in-on-criminals/articleshow/74039921.cms>
- Shivani mishra, 2020, <https://www.timesnownews.com/mumbai/agnipath-scheme-row-railway-in-mumbai-on-alert-amid-nationwide-protests-article-92339813>
- Iran siddhique, 2017, <https://mumbaimirror.indiatimes.com/mumbai/other/citys-lifeline-or-shame/articleshow/60521144.cms>
- Rajesh Kumar thakur, 2022 <https://www.newindianexpress.com/nation/2022/Sep/01/railways-records-38-per-centrise-in-accidents-in-2021-shows-ncrb-data-2493613.html>