

REVITALIZING DAILY  
TRAVEL  
MUMBAI, INDIA



# REVITALIZING DAILY TRAVEL

## MUMBAI, INDIA

Saanika Lokre

Thesis submitted to the faculty of the Virginia Polytechnic Institute and State University in partial fulfillment of the requirements for the degree of Master of Science in Architecture.

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# **Revitalizing Daily Travel**

## **Mumbai, India**

Saanika Lokre

Cities are a way of life. They are an amalgamation of cultural background and urbanism, which determine the quality of life, environmental sustainability, social behavior and economic well-being. Since the ancient times, cities have been the way to define the growth and development. The development of the cities depended upon availability of resources for a better livelihood and the way humans utilize the resources. Even today as cities develop, people hope for better living conditions.

Urbanism plays a major role in the development of cities, being a combination of cultural and urban living. Urbanism has brought various downfalls along with progress. Has urbanism made development a monotonous concept?

These days, cities are urbanizing at a fast rate not considering their future consequences. Having lived in Mumbai, I have seen it grow into a megacity. The countless problems that urbanism has brought to accommodate the massive amount of people migrating into the city has affected the quality of life of people immensely. However, is it for the better or worse? People all over the country want to have a piece of Mumbai, the city of dreams. This growth in the population has overpowered the city.

Mumbai is famous for its railway system. It is the lifeline of the city. However, due to the amount of people using this system, the travel is more of a chaos. Every railway station has a main access road filled with hawkers and commercial storefronts. People in Mumbai are always in a rush, so these hawkers and commercial stores are a necessity to their daily life. People shop for their daily necessities while returning home to save time. However, these streets are extremely chaotic and crowded. My thesis focuses on how this space can be utilized by three consumers - the traveler, the shopper and the one who does both. It aims to decongest this main street and make travelling by local trains convenient. The site I have chosen is located in the heart of Mumbai city and is one of the most important railway station on the Western Suburban railway system. It is known as Dadar railway station. More than 500,000 people use this railway station daily. With the maximum number of incoming pedestrian traffic, my design can be used as an example for other railway stations throughout Mumbai.

# **Revitalizing Daily Travel**

## **Mumbai, India**

Saanika Lokre

Cities are a combination of culture and development. As a city develops, the infrastructure of the place changes. These days, cities are developing at a very fast pace. This development along with the positives has brought numerous negatives. I come from a city in India called Mumbai which thrives on this development. Within the last decade, it has turned into a Megacity. Being the financial capital of India, large number people migrate to Mumbai daily in search of employment. The population is increasing at a fast rate and has reached a point where it's unmanageable. Controlling the population is a long-term project. But can we make the lives of all these people easier?

Mumbai is famous for its railway system, which is the lifeline of the city. The business district is located in the South and the people working here live in the North of the city, due to cheaper housing. The railway system is the fastest and cheapest mode of transportation in the city. However, due to the amount of people using this system, the travel is more of a chaos. Every railway station has a main access road filled with hawkers and commercial storefronts. People in Mumbai are always in a rush, so they shop for their daily necessities while returning home to save time. However, these streets are extremely chaotic and crowded. This Urban design thesis emphasizes on making this street space a convenience rather than a chaos. It aims to decongest this main street and making it user friendly.



A journey is incomplete without support, I would like to dedicate this project and extend my gratitude to all the people who made it happen.

Firstly, my parents **Sameer Lokre** and **Anuja Lokre** for believing in me and my dreams. My grandmother **Anita Lokre** for having blind faith in me and my brother **Shourya Lokre** for existing.

My committee **Susan Piedmont-Palladino**, **Paul Kelsch** and **Elizabeth Morton** for the advice and encouragement.

My friends from home, **Malavika Mohanan** and **Ripanshi Jain** for being my pillars. Last but not the least my WAAC family **Smakshi Singh**, **Marium Rahman** and **Anahita Mostafavi** for being my hardest critiques and my best cheerleaders.

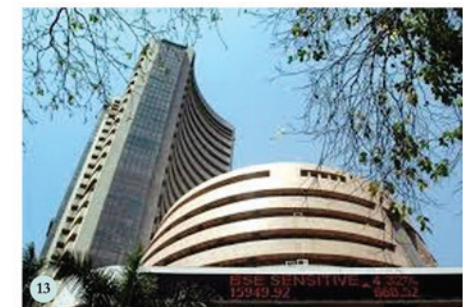
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I moved to the United States of America one and a half year back. It has been a rollercoaster ride all together. I come from the financial capital of India, Mumbai. It is popular for being the city that never sleeps with a population of 11.98 million. In this unplanned city, you will find people in every crevice possible. It is known as the city of dreams. This adds to the population.

The day I reached America, it felt different in a weird way. I was surrounded by people at all times of the day. However, suddenly I was standing on an empty street at 8 o'clock. This was extremely amusing. It got me thinking about the contrast between cities.

So when I had to decide my thesis topic, I felt home was the best place to start. Mumbai is an unplanned concrete jungle and with people migrating in large numbers, in search of employment, it is overcrowded. Being the financial capital of India, it is difficult to control the population growth. However, making Mumbai in to a livable city is possible. How can my thesis help in making life in an unplanned megacity easier?





Cities are a combination of culture, tradition and urbanism, which shape the quality of life, environmental sustainability and economic well-being of the people. As the city advances so does the lives of the city dwellers. Mumbai as a city is a fascinating and exciting place because it is messy and contemporary, chaotic and

expressive, rich and poor but above all it is energetic in a raw manner. It displays hunger to grow and develop at an extremely fast rate, it always has. Being the financial capital of India, it has grown into a megacity. Along with all the positive, the urbanism has given Mumbai the negative that can't be neglected.





15  
34

Bombay islands were captured by the Portugese.



16  
61

The islands were gifted in dowry to Charles II of England.



16  
68

Charles II gave the islands to the East India Company on lease.



17  
08

Bombay became the head quarter of East India Company.



18  
62

The islands were merged into one.



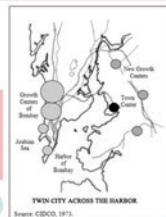
18  
69

Suez Canal was opened and Bombay developed as an international port.



19  
60

Bombay was made the capital of Maharashtra.

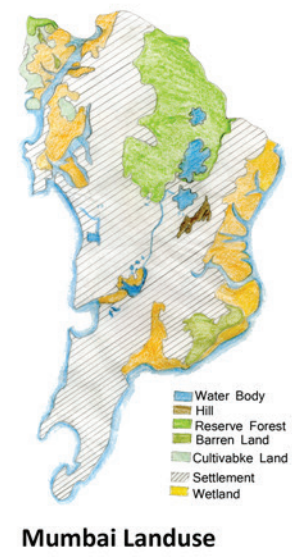
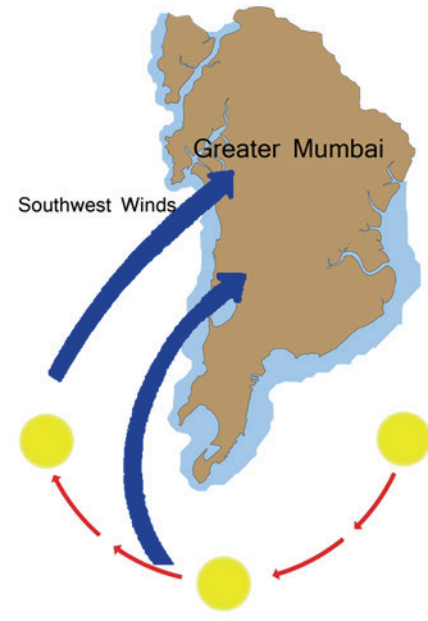


19  
73

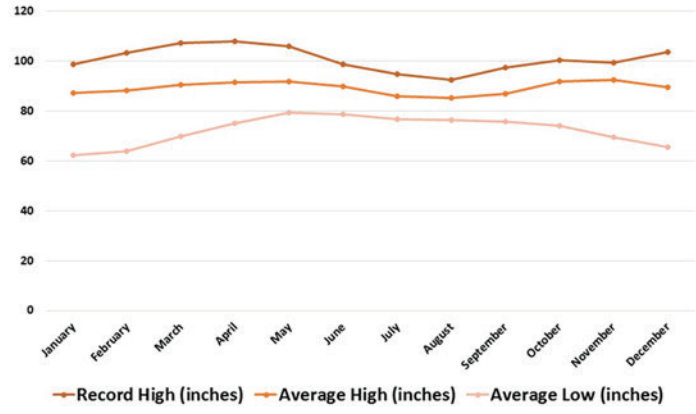
A new planned city was established across the harbor to reduce congestion in Mumbai.

Bombay has gathered pace in the globalizing economy in the last two centuries. It is a union of seven islands and was a series of fishing villages before the Portuguese invaded it. It was further gifted to the British in 1661. Initially the city was just a naval supply location, but during the British era when the East India Company lost its monopoly over foreign trade, they started looking for a port closer to Europe than Calcutta. During this time, it started developing into an industrial and trading hub causing it to become the financial capital of the country. With the cotton growing surroundings and the rising price of cotton in the world, trade with South Asian countries increased. Construction of major roads and railways along with seaport added to the progress of the city. A large number of skilled and unskilled workers started migrating to the city. As years passed, the growth continued. Due to its port and cotton mill industry, by the 19th century it had become the largest commercial and industrial city in India. With the acceleration of the independence movement the domestic market started growing. After the independence in 1947, Bombay started investing in more diverse economic base like chemicals, pharmaceuticals, fertilizers, consumer goods, engineering and car production. After the city's 1948 plan recognized the need to manage the development beyond the island, the city started spreading towards the north along the road and rail network. As the population of Bombay reached two million, the city limits were extended in 1950 and 1957 but still it observed traffic congestion, decrease in open space, emergence of slums and over-crowding in public transportation and housing. The Development Plan of 1964 and the Regional Plan of 1973, proposed the idea of satellite towns to tackle the congestion problem. The city entered a de-industrialization phase from the 1970's. The textile mills industry in the central city on which a major part of the population depended started going out of business. Small businesses started to multiply. Bombay still struggled with its growth amidst all these economic fluctuations. During this time, the new satellite city Navi Mumbai was conceived to cater to the congestion problem. In the 90s, Bombay started experiencing a second wave of globalization. It started to create large scale employment opportunities. With the decrease in rural employment, migrants from different parts of India added to the population. Now Mumbai has become the financial, commercial and entertainment capital of India. This makes it the generator for employment. Large portions of the population of India migrate to Mumbai in the hope of fulfilling their dreams, thus adding to the congestion of the city.

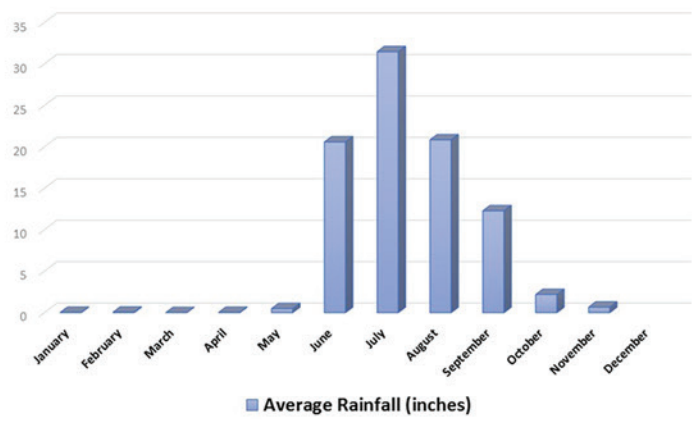




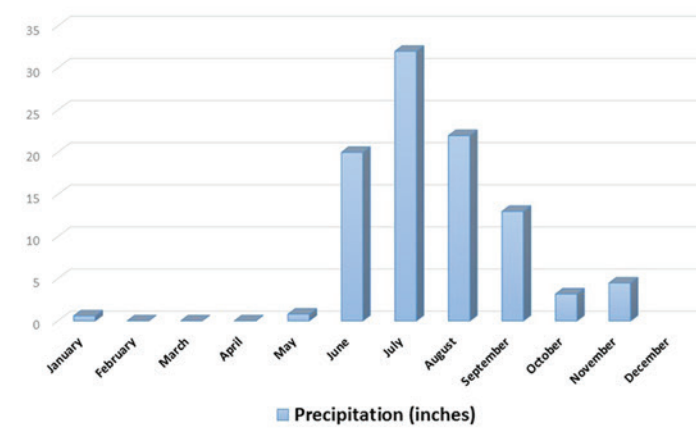
Temperature Data



Average Rainfall (inches)

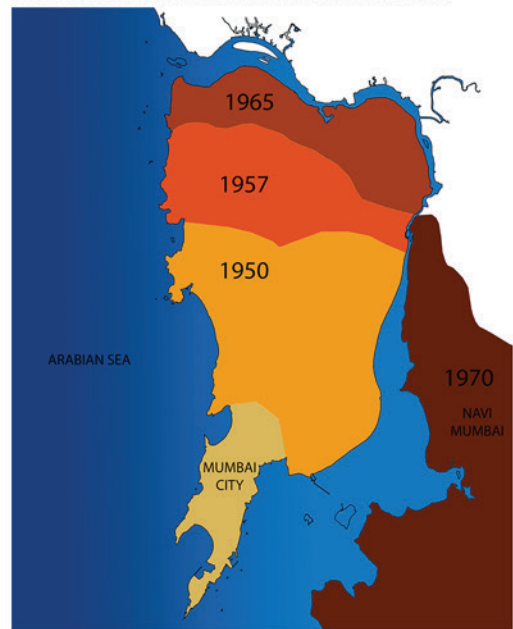


Precipitation (inches)

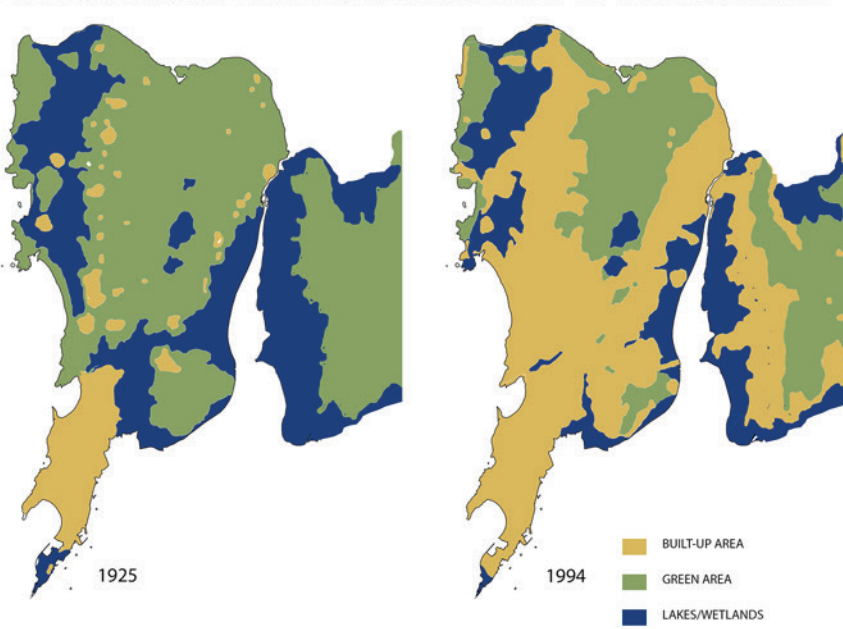




## SUBURBANIZATION IN MUMBAI



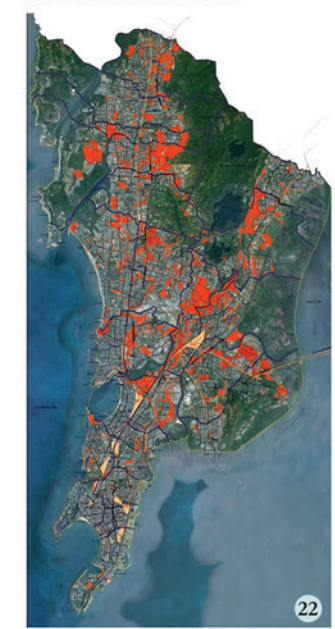
## LOSS OF GREEN SPACE AND EVOLUTION OF BUILT-UP AREA



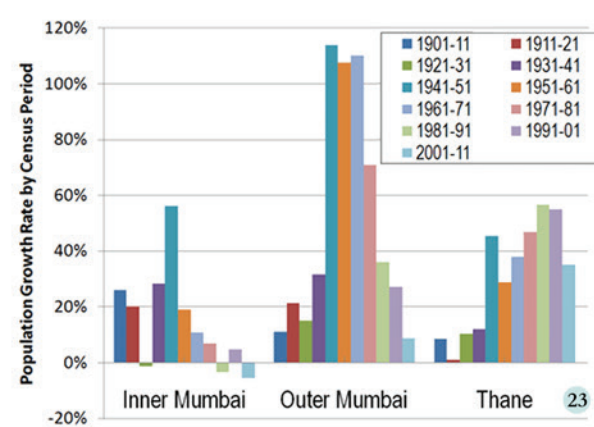
## POPULATION DENSITY



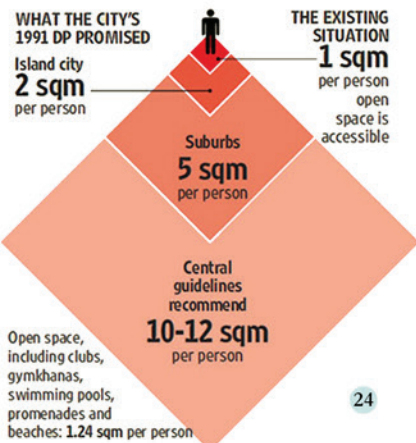
## MUMBAI SLUMS



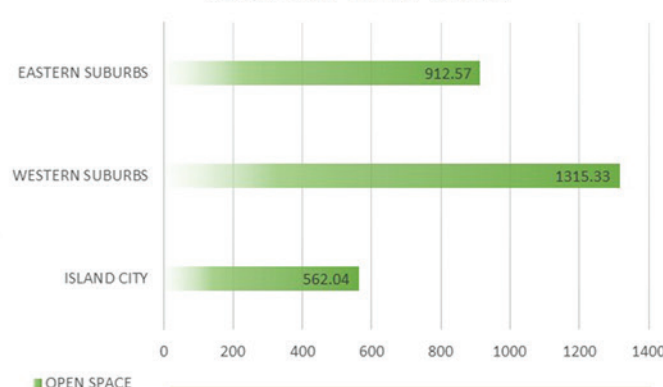
## POPULATION GROWTH



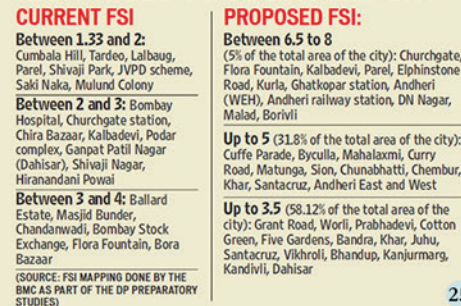
## OPEN SPACES IN THE CITY



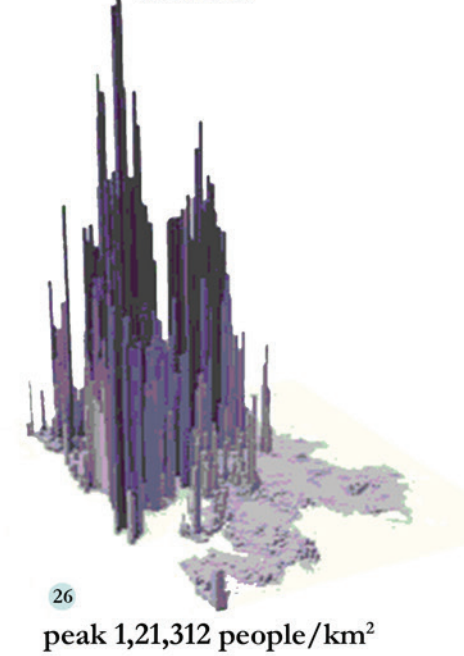
## NEED FOR OPEN SPACE



## HIGH-RISES TO TOUCH THE SKY



## MUMBAI



The vibrant economic growth of the city has been attracting people daily. The city has been developing at a very fast rate. This has given rise to various problems like loss of green space, lack of open space, deforestation, increase in the number of slums, etc. Due to lack of space the city is growing vertically. Recently the floor space index for various parts of the city has changed, which will only add to the concrete jungle.



## Flooding on annual basis due to Monsoons

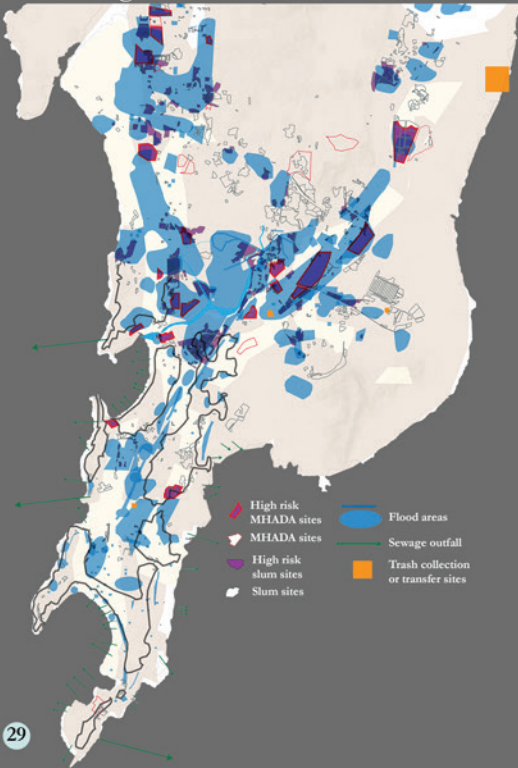
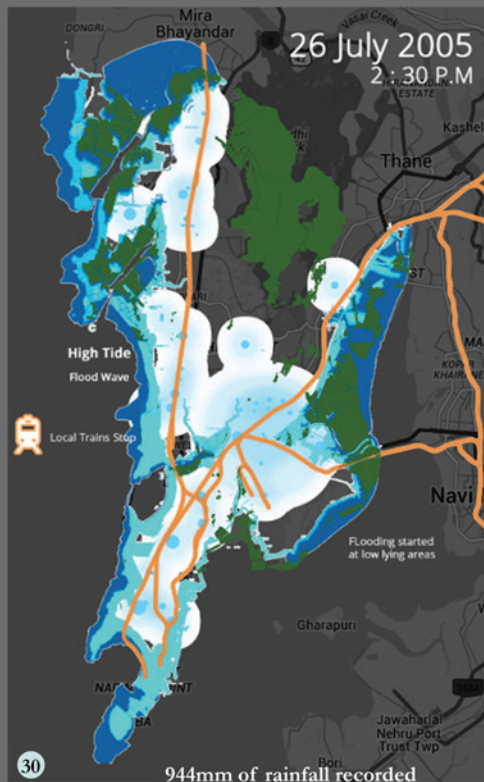
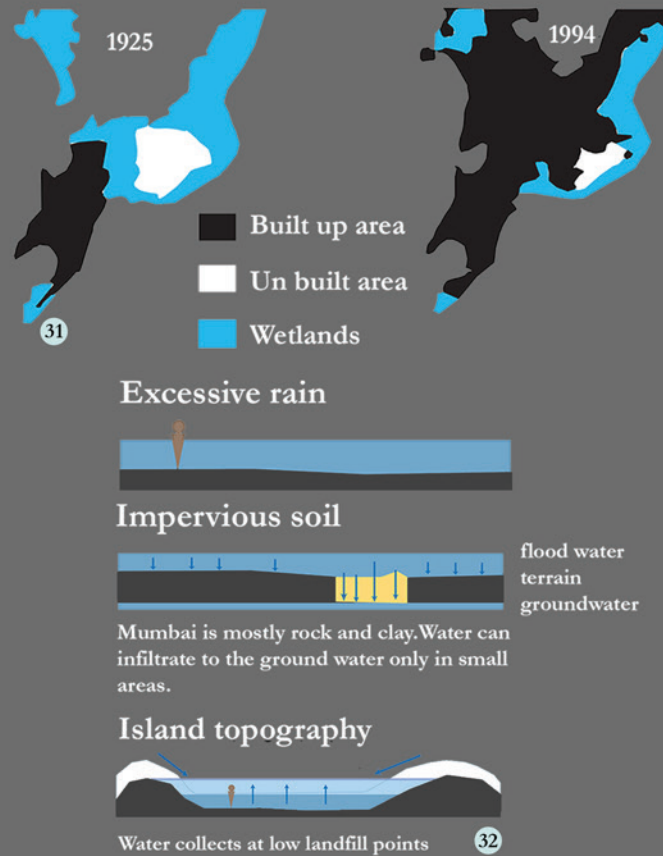


image by Robyn Perkins



## LOSS OF PERVIOUS SURFACES



Mumbai has a tropical climate and receives rainfall from the month of June till September. As the city is unplanned and the drainage system dates back to the British era, it gets flooded during the monsoon season. In addition to this, the city is majorly covered with impervious surfaces. Flooding has become one of the major issues for Mumbai.







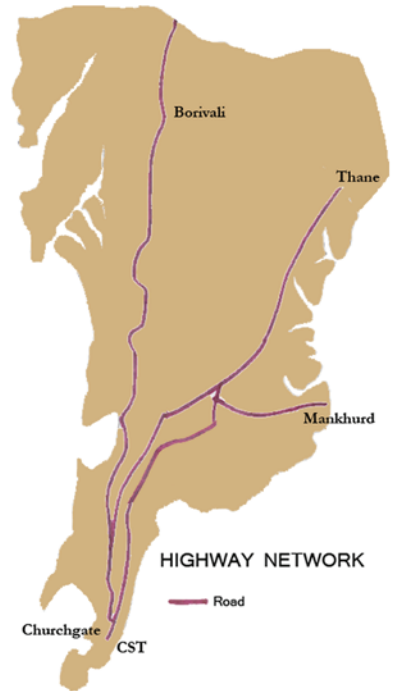
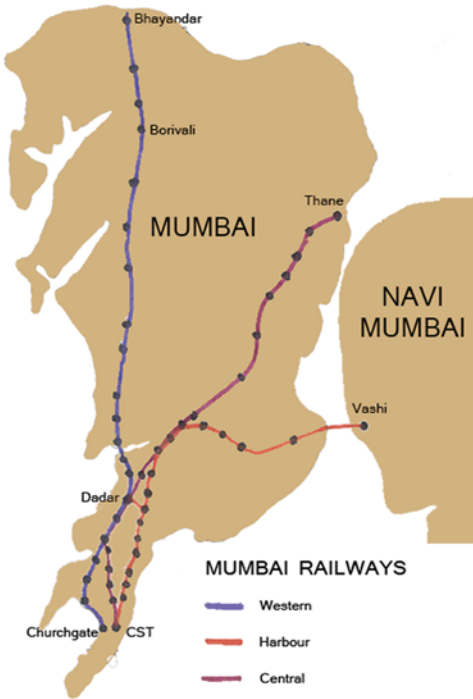
**REGISTERED MOTOR VEHICLES**  
**1,123,562**  
 Includes two-wheelers, autorickshaws, taxis, school buses, tractors, trucks, etc as on March 31, 2003

**BUS PASSENGER TRAFFIC**  
**4,250,000**  
 One way passenger trips originated daily BEST, 2002-03

**SUBURBAN RAILWAY PASSENGER TRAFFIC**  
**5,641,000**  
 One way passenger trips originated daily Western and Central Railway, 2002-03

**OUT OF 22 MILLION PEOPLE IN MUMBAI, 11 MILLION PEOPLE TRAVEL BY PUBLIC TRANSPORT DAILY**

6.3 million travel by train  
 4.7 million travel by bus



The business district of Mumbai is located in the South, while suburbanization has caused it to grow in the North. People travel from the North to the South everyday in large numbers. The railways and the BEST bus system have been the public modes of transport over the years. Recently the development of Metro has added to the means of transport. The most over-used mean of transport has been the railways and hence it is known as the lifeline of the city.





43 Queue at ticket counter



44 Climbing the stairs to get to the platform



45 Waiting to board the train on the platform



46 Getting in the train



47 Getting through the crowded main street



48 Leaving the station



49 Getting down at your stop



50 Travelling in the train

Travelling in Mumbai is a tedious process. You have to pass through various levels of crowd at every stop you make. The pictures above show this process. When you reach the station you have to stand in line to buy a ticket, from there you move through the crowded stairs to reach the platform which is as crowded. Then getting into a local train is like being in a fight club, which takes you the same crowded platforms and stairs. Finally, you will have to pass through the main street, which is extremely crowded because of the pedestrians, vehicles, commercial stores and hawkers. Railways being the lifeline of Mumbai, all this cannot be avoided. Can this daily activity be made easier?

*Travelling in Mumbai's locals can be a daunting task when one considers the sheer volume of commuters it transports everyday. To put things into perspective, consider this – Mumbai locals transport the entire population of Hong Kong every single day.*

*That's roughly 7.5 million commuters travelling in a city roughly half it's size.*

*No wonder, only a Mumbaikar can truly understand that despite the crowd, the lack of facilities and service, Mumbai's local trains are indeed the city's lifeline.*

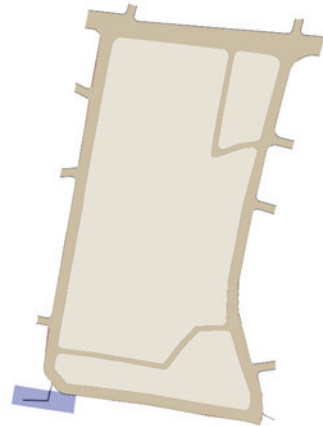
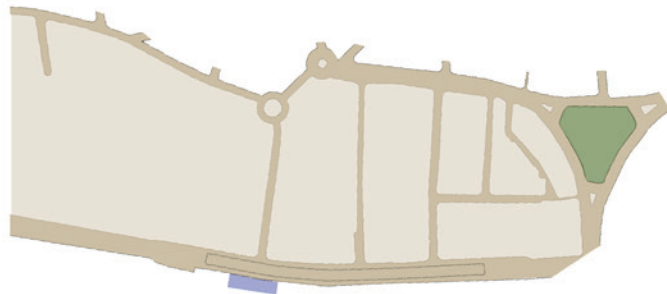
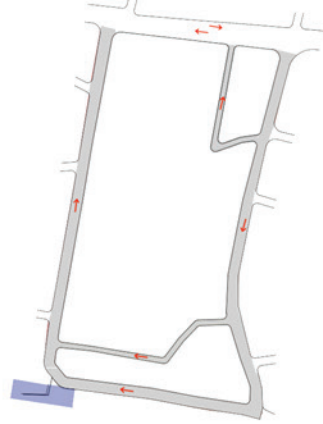
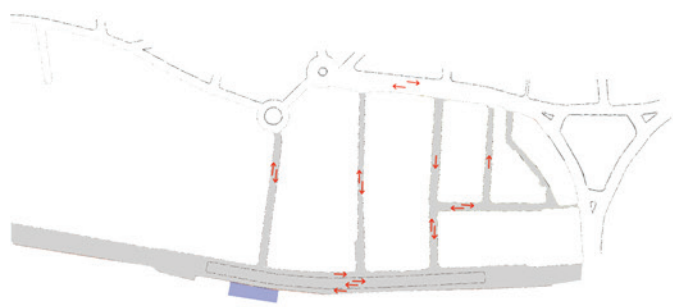
-In Picture: A Mumbai local train jugaad

Written by Local Press Co Staff on May 14, 2016, [localpress.co.in/2016/05/picture-mumbai-local-train-jugaad](http://localpress.co.in/2016/05/picture-mumbai-local-train-jugaad)



ROAD NETWORK

RAILWAY STATION MAIN ENTRANCE/EXIT

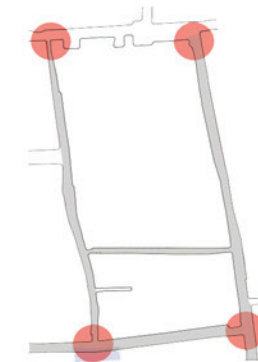
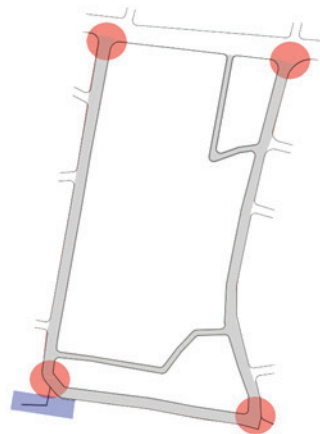
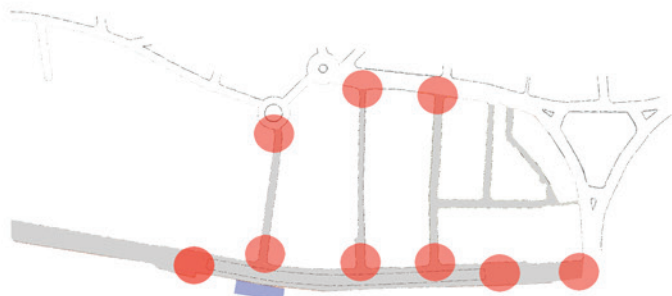


IMPERVIOUS STREET SURFACES

IMPERVIOUS PLOT SURFACES

PERVIOUS SURFACE

RAILWAY STATION MAIN ENTRANCE/EXIT



RAILWAY STATION MAIN ENTRANCE/EXIT

MAJOR NODES



AVERAGE NUMBER OF DAILY COMMUTERS AT EACH STATION

DADAR RAILWAY STATION

SANTACRUZ RAILWAY STATION

GOREGAON RAILWAY STATION



- COMMERCIAL
- RESIDENTIAL
- MIXED-USE
- EDUCATIONAL
- RELIGIOUS
- RAILWAY STATION MAIN ENTRANCE/EXIT



- RAILWAY LINE
- MAIN STATION ROAD
- BUS STOPS



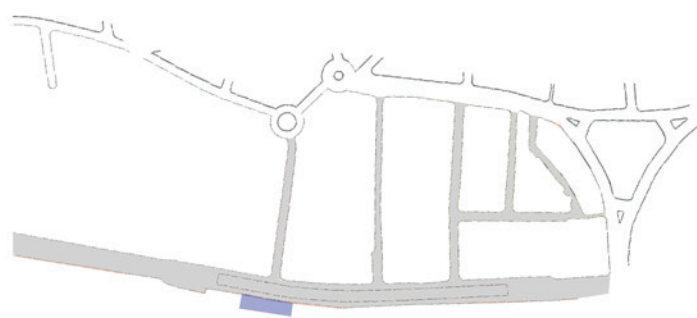
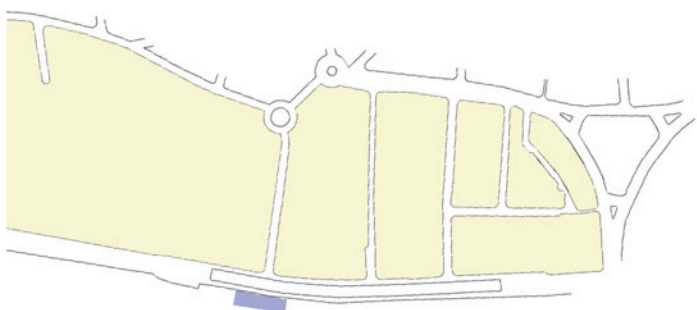
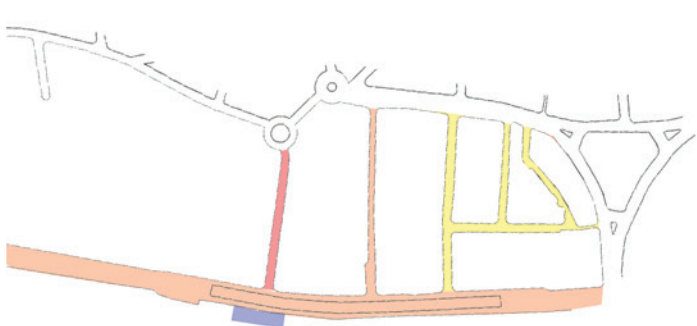
- RAILWAY LINE
- MAIN STATION ROAD
- TAXI/RICKSHAW STAND

DADAR RAILWAY STATION

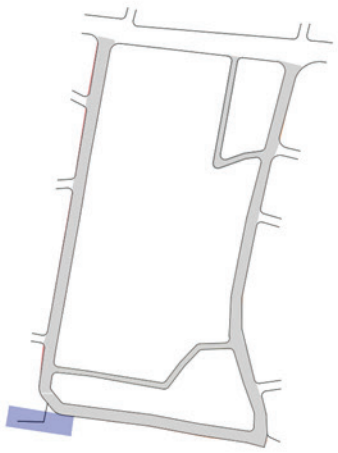
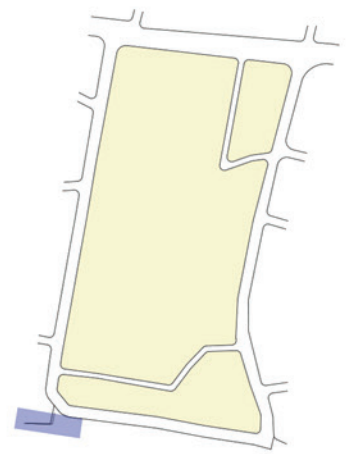
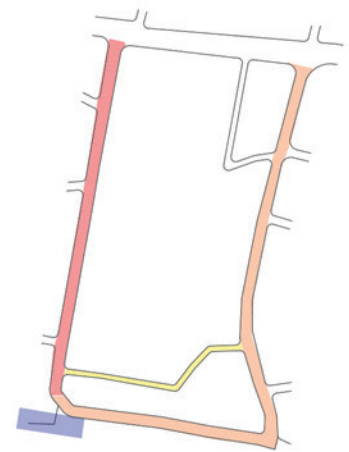
SANTACRUZ RAILWAY STATION

GOREGAON RAILWAY STATION





DADAR RAILWAY STATION



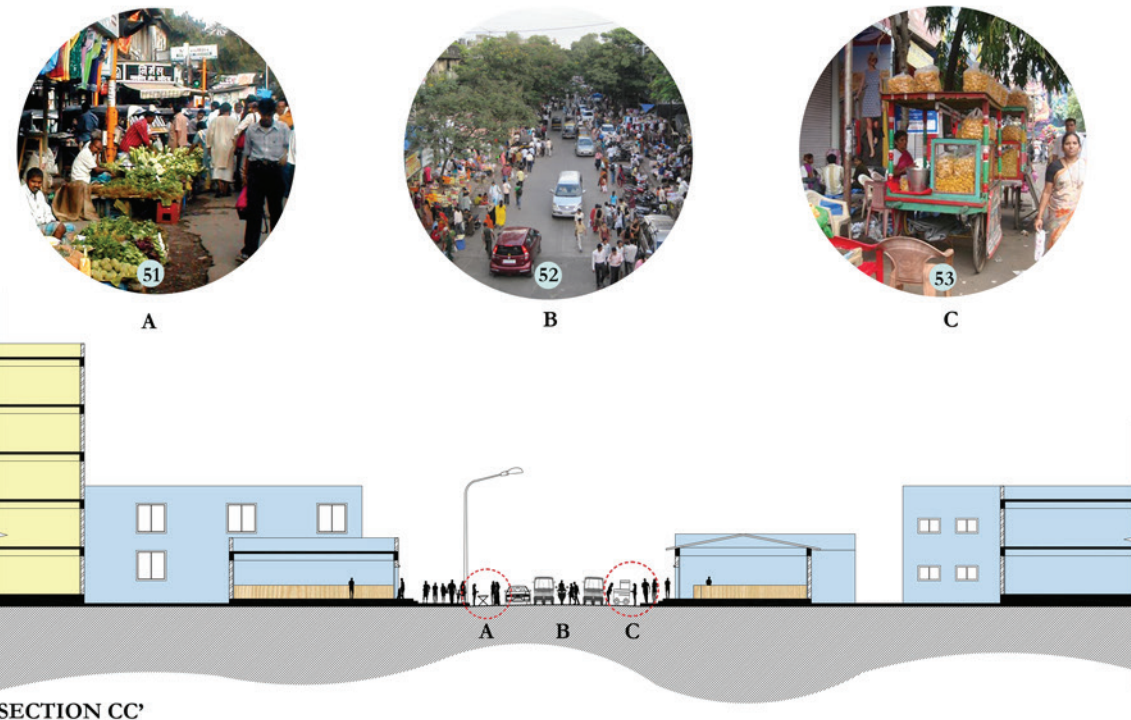
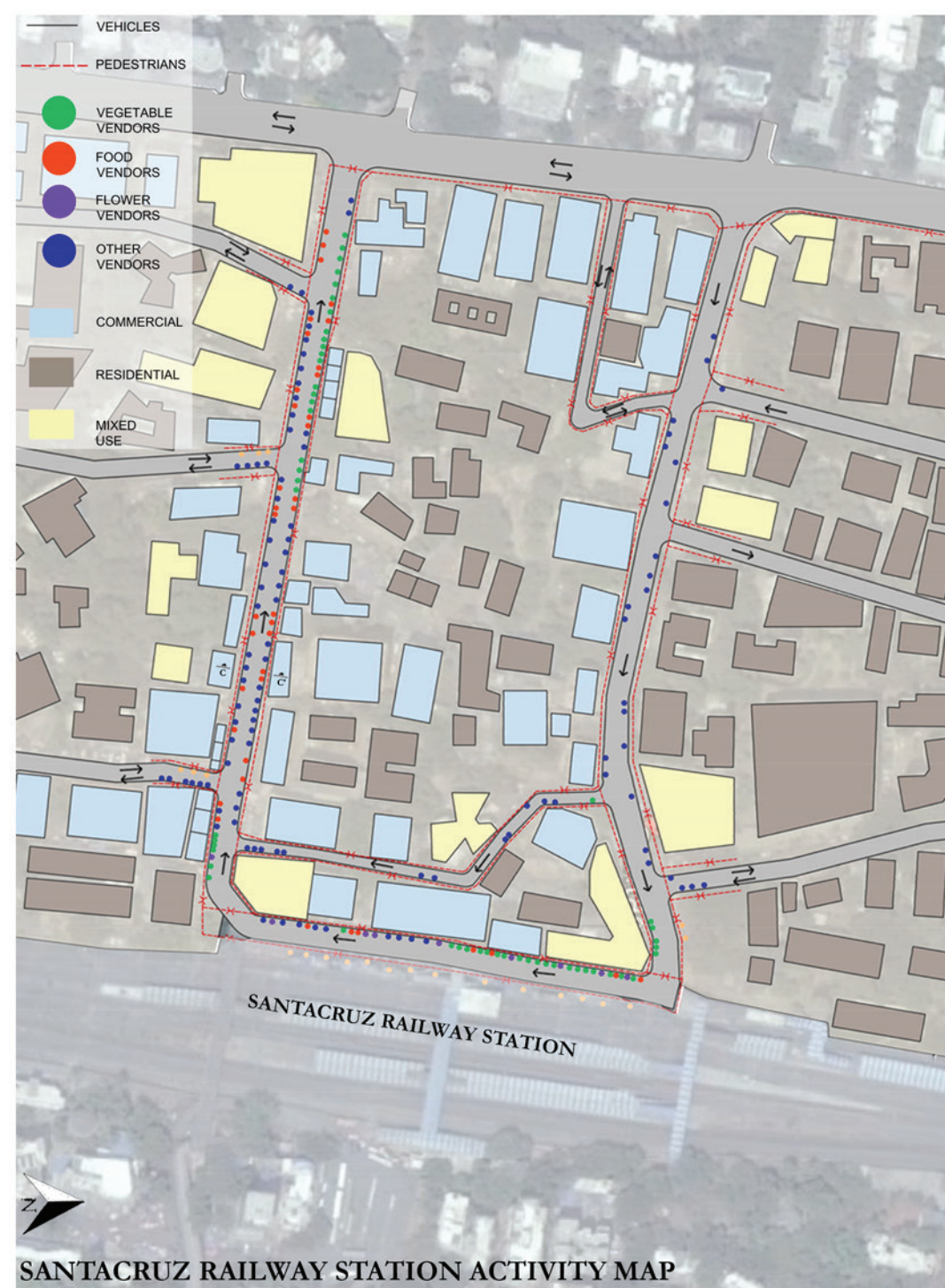
SANTACRUZ RAILWAY STATION



GOREGAON RAILWAY STATION

- HAWKERS ACCORDING TO DENSITY
- 
- 
- RAILWAY STATION MAIN ENTRANCE/EXIT
- PEDESTRIAN LEVEL COMMERCIAL STORE ZONE
- RAILWAY STATION MAIN ENTRANCE/EXIT
- STREET PARKING
- RAILWAY STATION MAIN ENTRANCE/EXIT



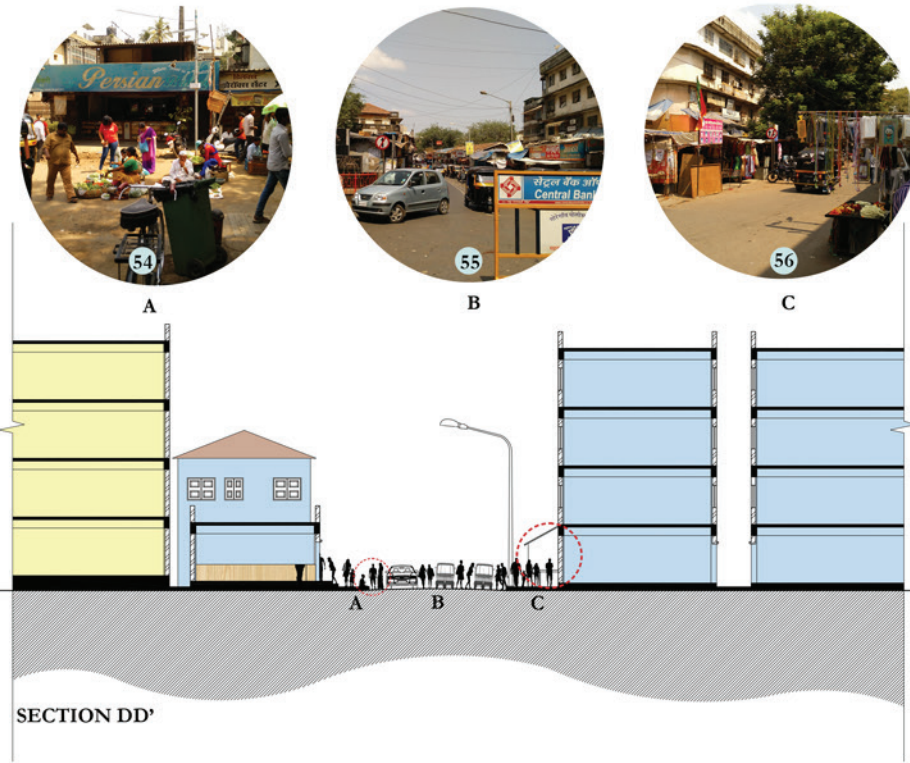


*With new modes of transport such as the Monorail and Metro coming up and more stations being added to Mumbai's map, a plan for smooth vehicle and pedestrian movement outside every major station has now become even more important.*

*Hawkers have to be accommodated. It is something that will not improve capacity, but it will improve the quality.*

- Madhav Pai, director of Embarq India.





*Exiting any major railway station in the city is a hellish experience, with autowallahs scouting for commuters, approach roads clogged with traffic and a sea of people jostling to find their way.*  
 - Manasi Phadke & Priyal Dave - The big battle for a way out, The Indian Express.





DADAR RAILWAY STATION ACTIVITY MAP





A



58

B



59

C



60

A



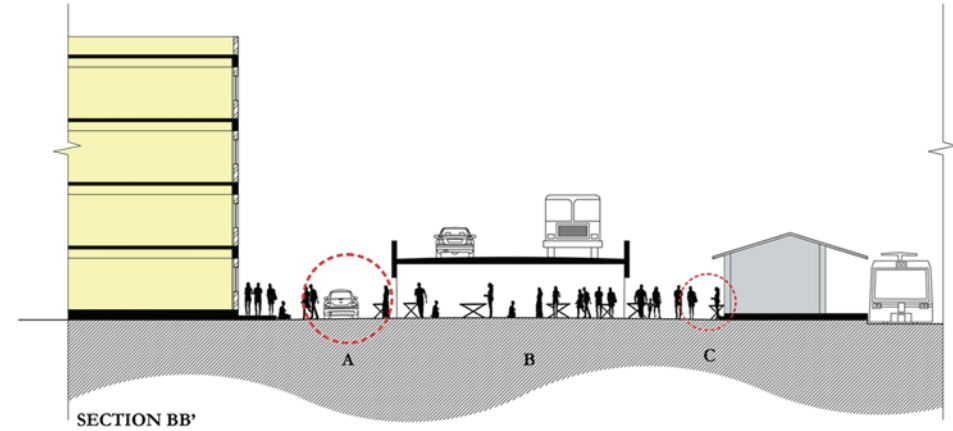
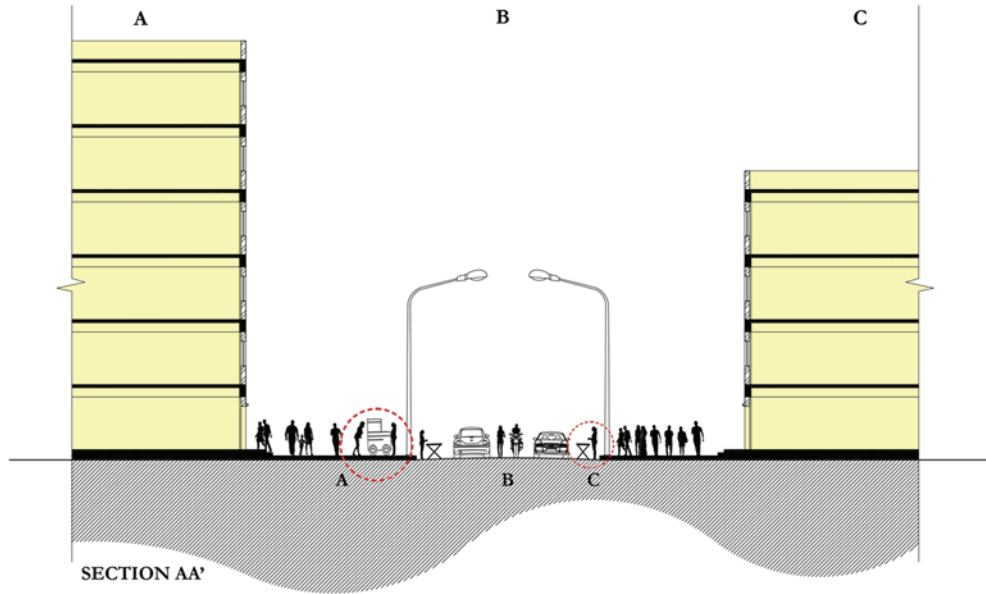
61

B



62

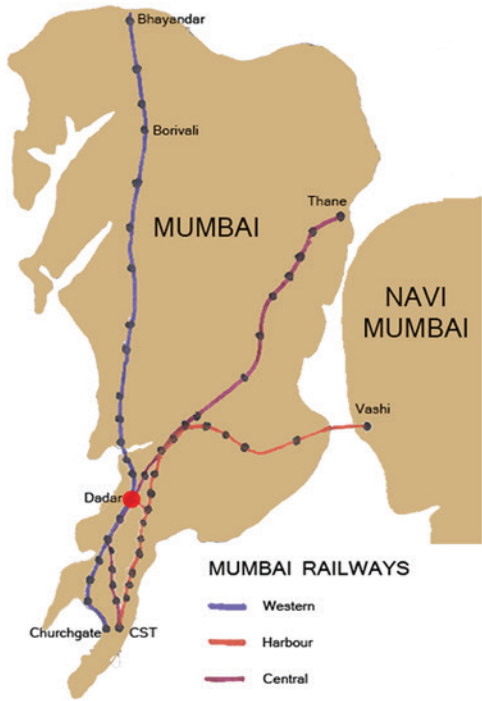
C



*A typical daily traveler spends anytime from 2 to 6 hours daily in this trains just to go and come back from the job, say it Central, Western or Harbour railway route. So this 4 hours daily means 16% time of daily life spent in this local trains full of crowd for 24 hours.*

- Deven Jadav, Middle Class Job Life – Mumbai City.



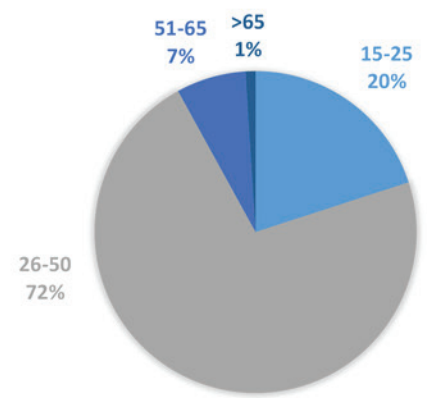
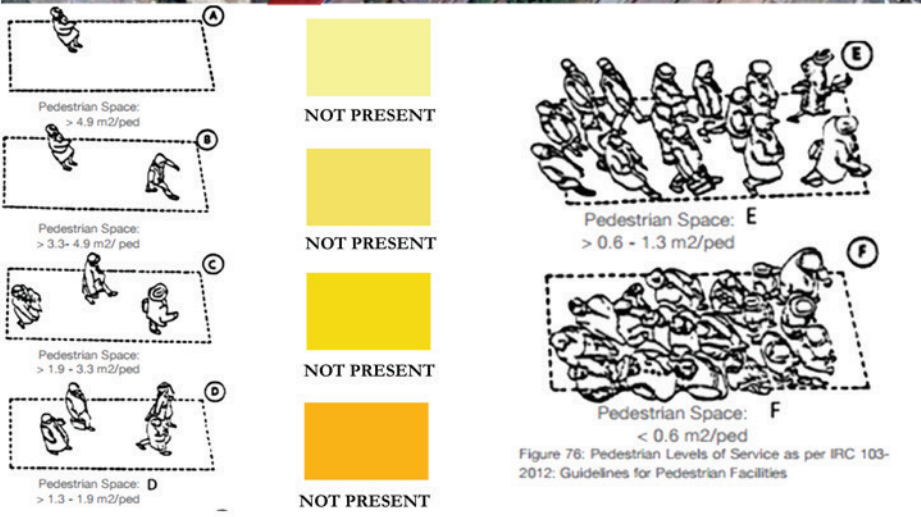


The site I have chosen is one of the major railway stations on the Western and Central line in Mumbai. More than 500,000 people are received at this station. It is famous for its wholesale flower market and due to the amount of people using this station, it is filled with hawkers selling vegetables and other basic products on the surrounding streets. It is one of the stations with maximum pedestrian activity.

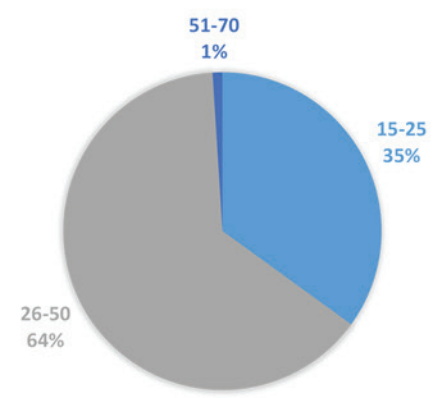




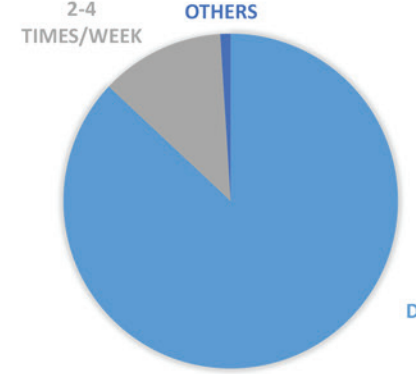
According to the IRC guidelines for pedestrian facilities, the site falls in the densely populated area. In addition to the pedestrians using the main street to access the railway station the formal and informal market adds to the chaos. As per the WRI India study, the pie charts explain the usage of the street and puts light on the issues faced by pedestrians on these streets.



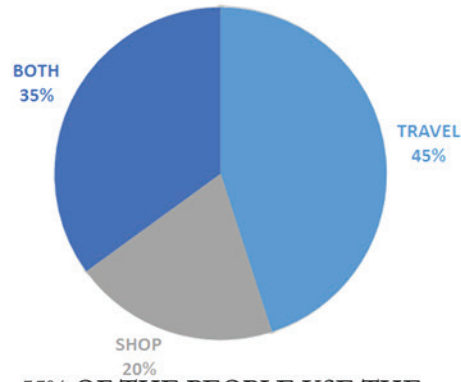
MAJORITY OF THE POPULATION USE THE MAIN ACCESS STREET DAILY



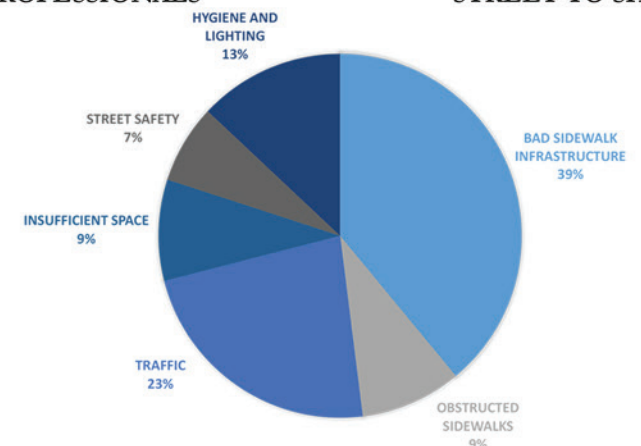
MAJORITY OF THE POPULATION WALK TO THE STATION



MAJORITY OF THE POPULATION GOING THROUGH ARE YOUNG PROFESSIONALS



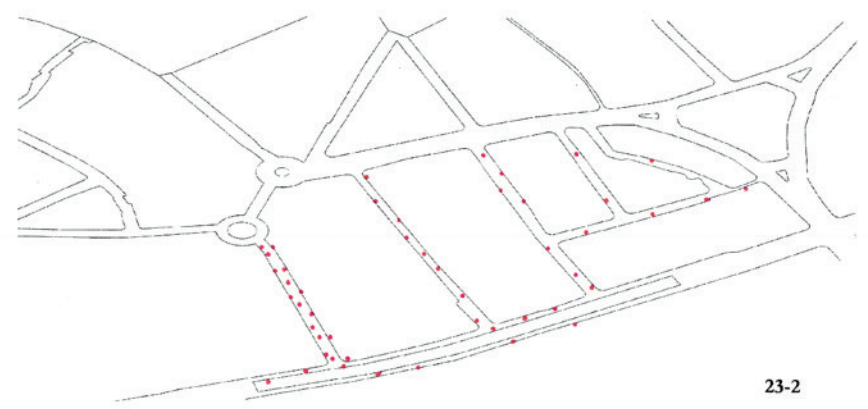
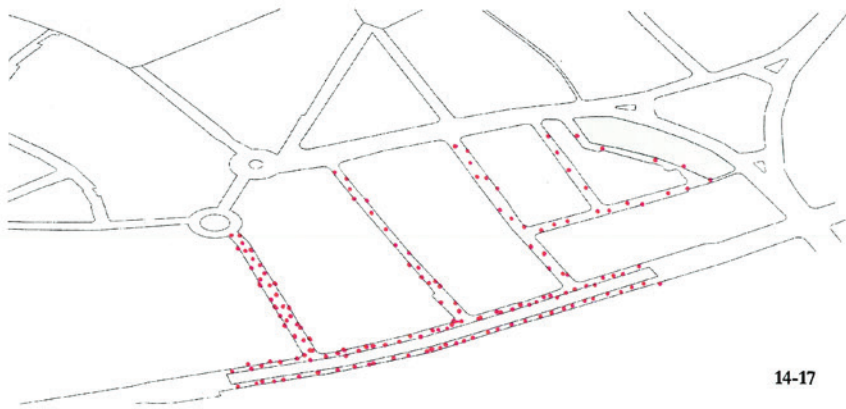
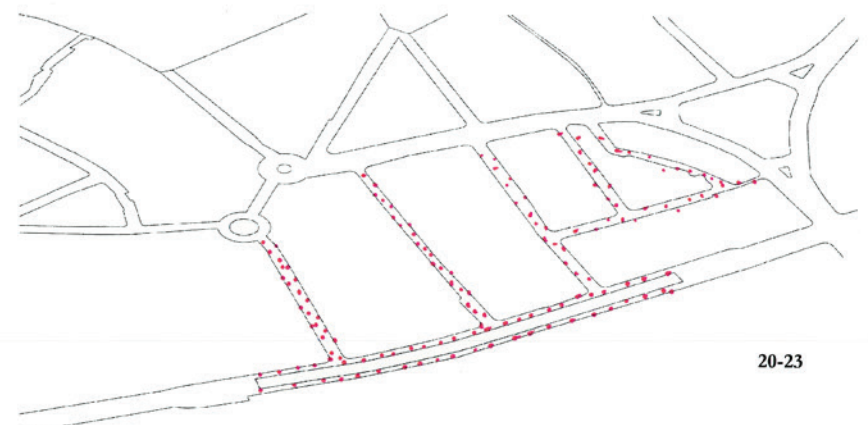
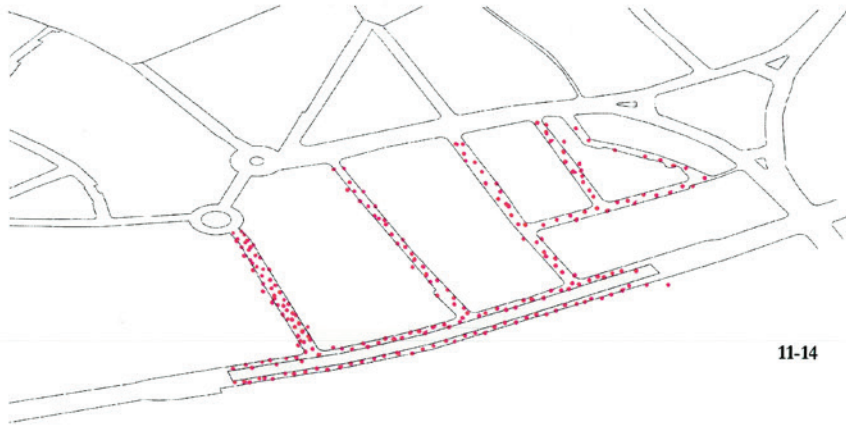
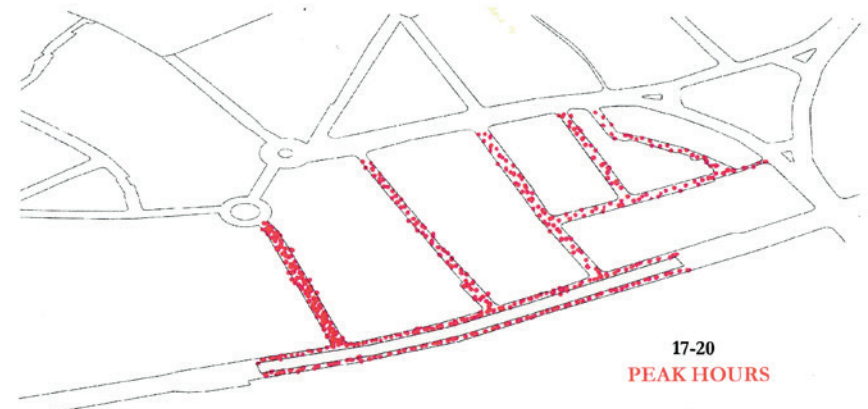
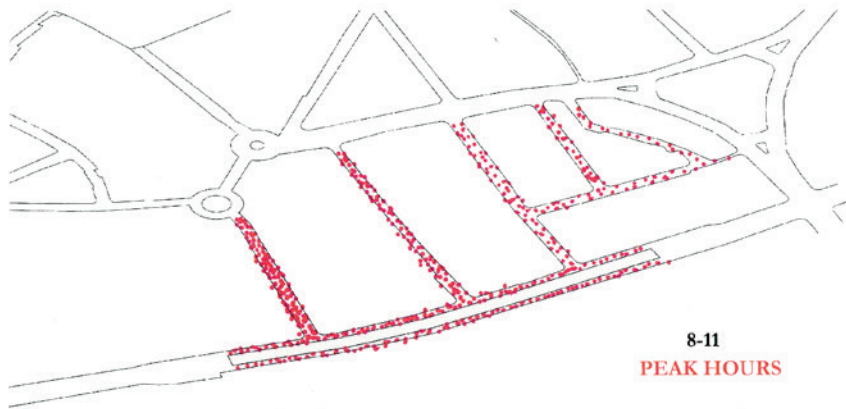
55% OF THE PEOPLE USE THE MAIN RAILWAY STATION ACCESS STREET TO SHOP



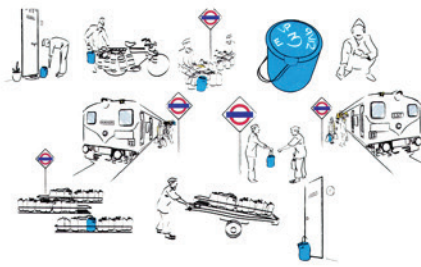
ISSUES FACED BY PEDESTRIANS

Figure 76: Pedestrian Levels of Service as per IRC 103-2012: Guidelines for Pedestrian Facilities

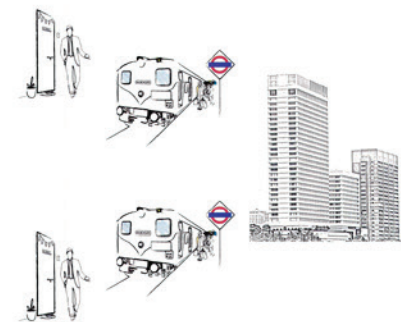




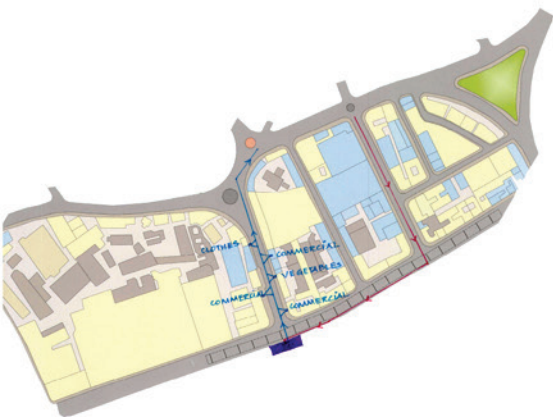
● PEDESTRIAN ACTIVITY  
500000 PEOPLE TRAVEL DAILY



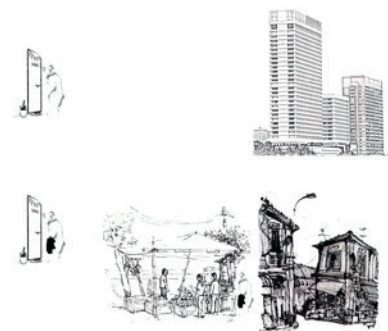
DAILY WAGE WORKER



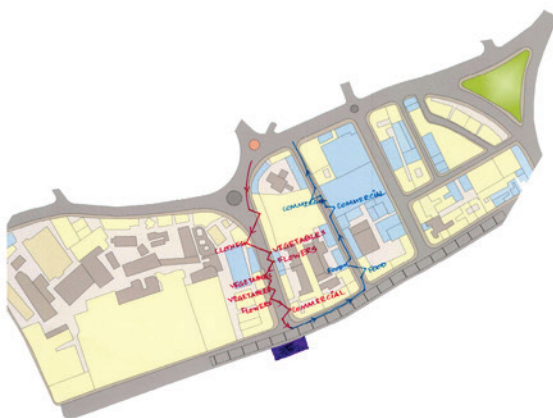
PROFESSIONAL WORKER



STUDENT



PROFESSIONAL WORKER/HOUSEWIFE



HOUSEWIFE

- TO RAILWAY STATION
- FROM RAILWAY STATION
- RAILWAY STATION

This maps the way each user uses the railway station and its access roads.





63



64

**HAWKERS WITH CART**



65

**HAWKERS SITTING ON THE STREET**



66

**HAWKERS WITH MOVABLE TABLES**



67

**RAW FOOD VENDORS WITH BASKET**

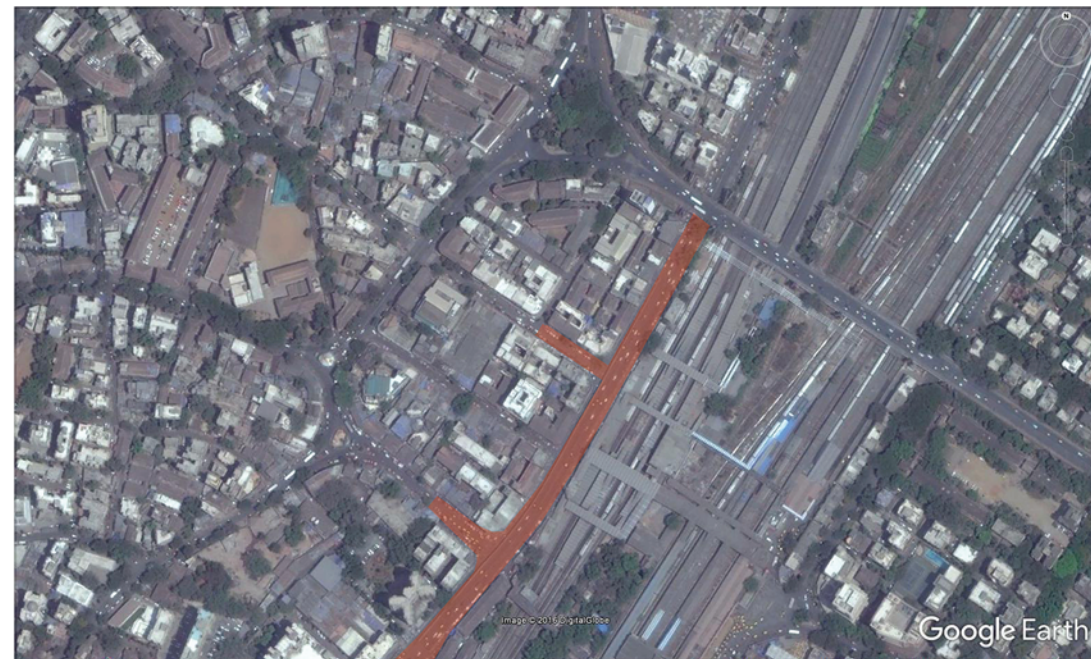




## CURRENT SOLUTION BY BMC



## FUTURE SOLUTION BY BMC

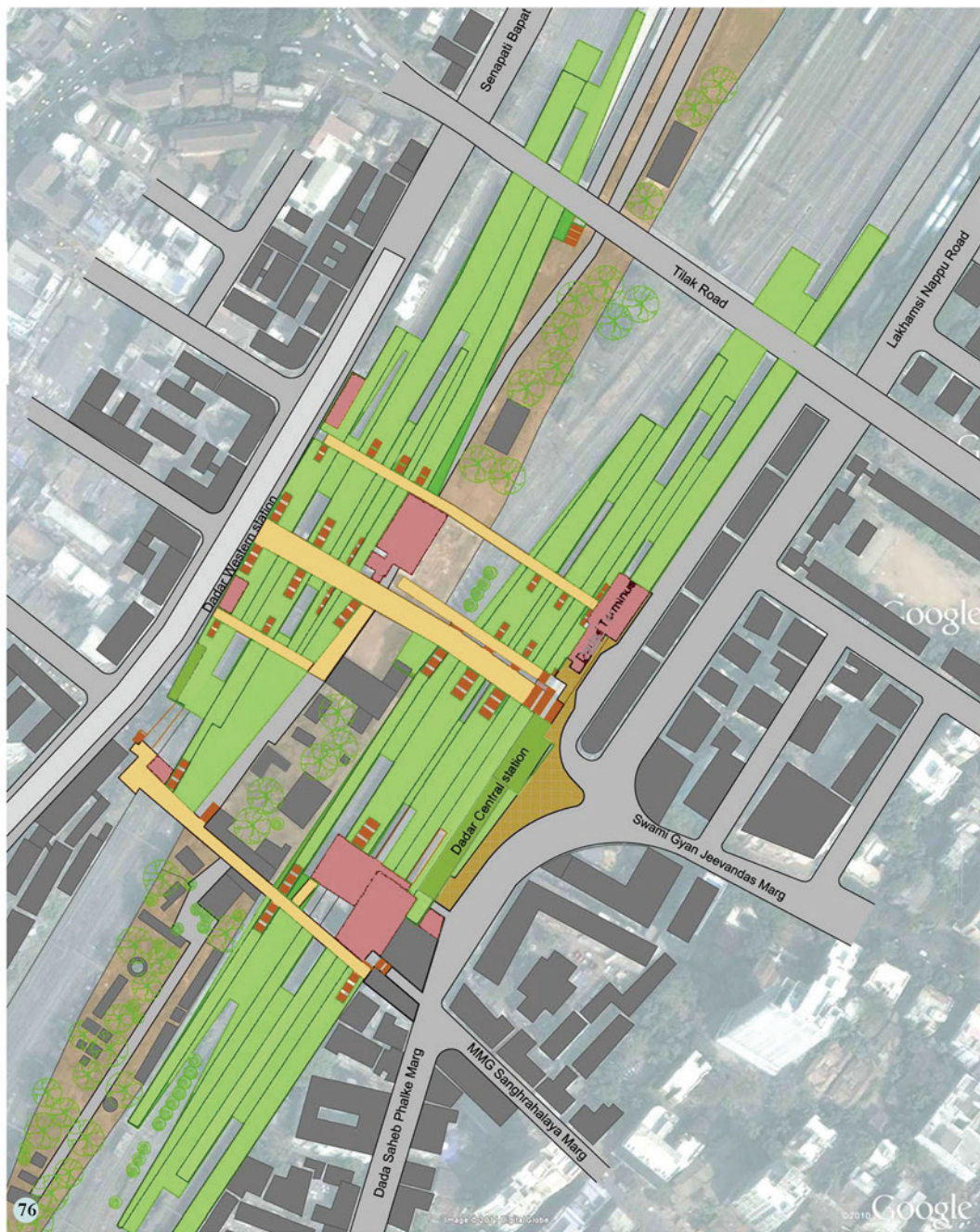


NO HAWKING ZONE (50M FROM RAILWAY STATION)

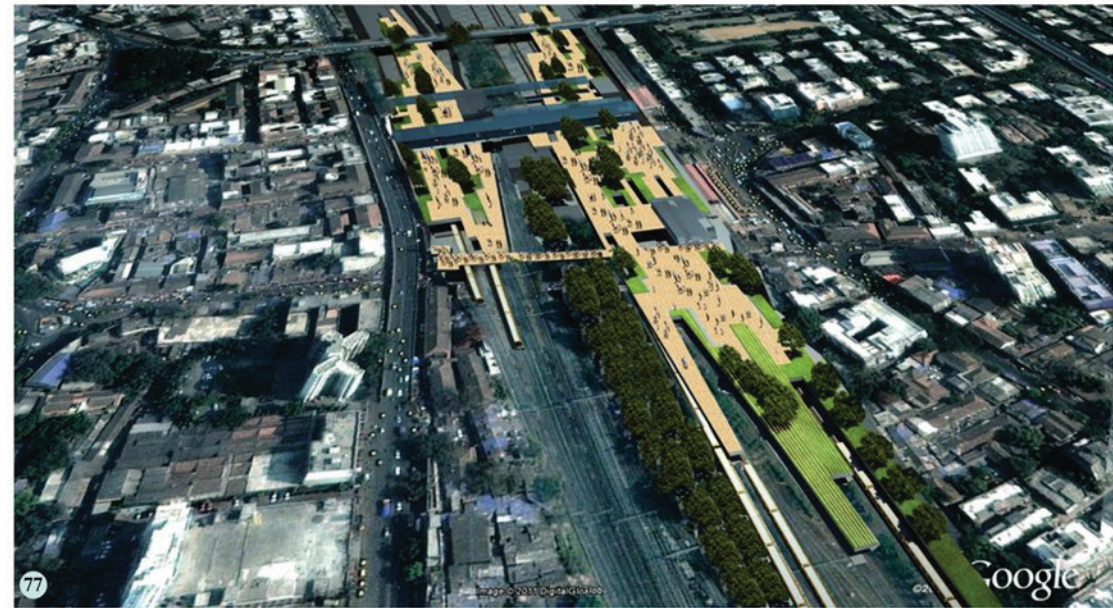
Over the years, the Brihanmumbai Municipal Corporation has tried to come up with various solutions, to solve the problem of overcrowding on the streets leading to the railway stations. They have tried building a hawker's plaza in Dadar, Mumbai at a distance from the station, accommodating all the hawkers here. However, this attempt failed, as people do not go out of their way to shop from these hawkers. They had to be in close proximity to the station for them to sell their products.

According to the new plan, the Municipal Corporation plans to move these hawkers 50m away from the station to reduce congestion. I suspect that this will just increase the congestion at the junctions on the main road, as the amount of hawkers will not reduce. In addition, these hawkers try to make place for them where they will find the most number of customers and this new plan will act as an obstacle for them.





DADAR STATION-PROPOSED



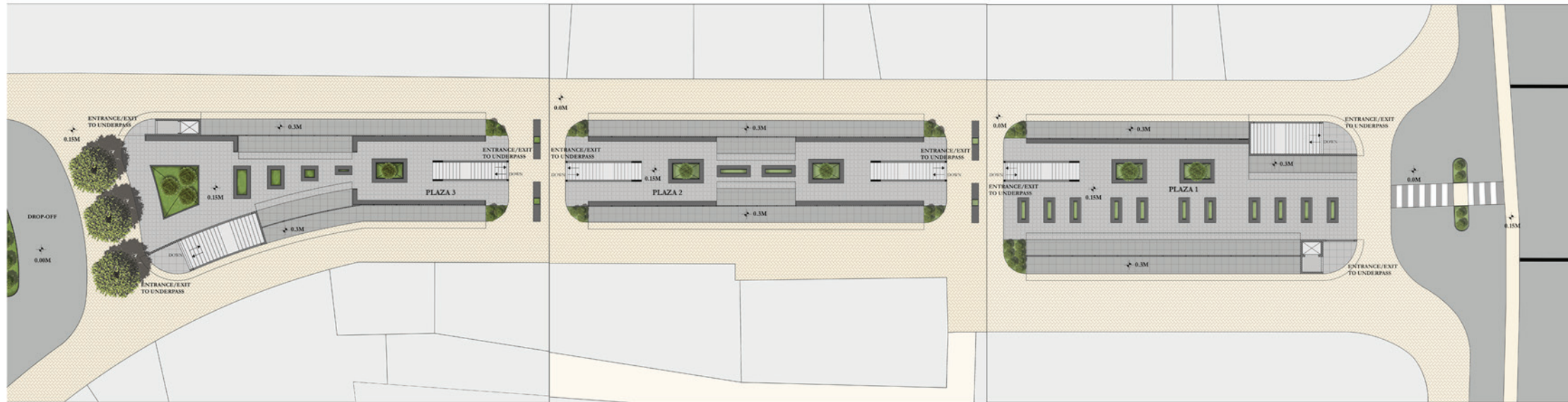
According to the future plans of the city of Mumbai, the roofs of the railway stations are being converted into recreational parks. The above drawings show the future development on my site. It will be complete in the next two years. Considering this to be a part of my project, I have designed the main street accordingly.



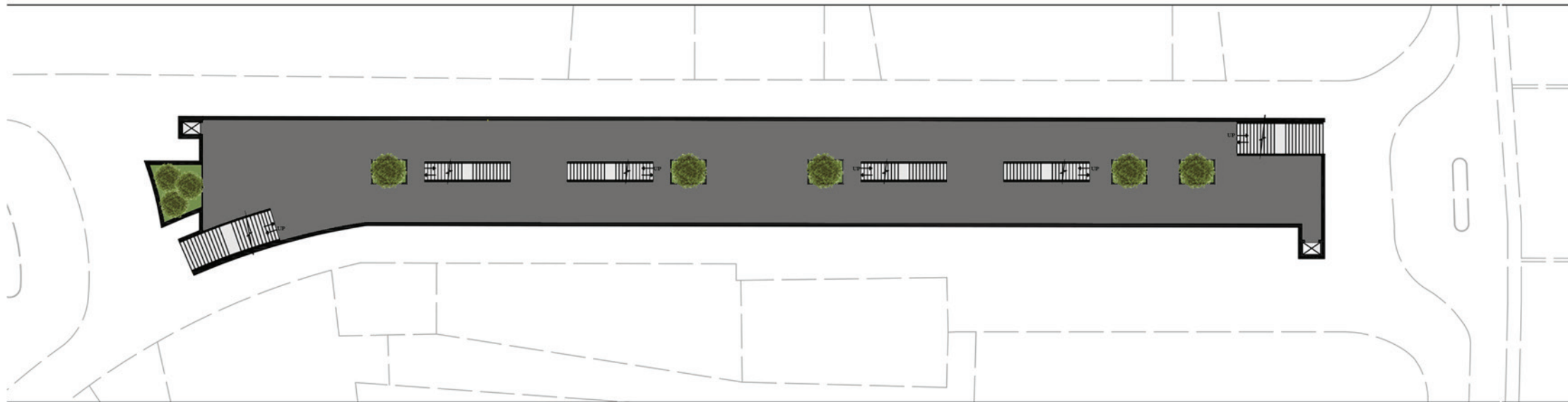


The design divides the main access street to the railway station, into two parts - underground pass which allows free passage from the railway station to the main road and vice versa and the other upper level plazas which accommodate the hawkers and commercial stores. This division decongests the street and proves to be convenient to all kinds of users. It also acknowledges the requirement of the hawkers and commercial stores by allotting proper space for them so as to avoid any conflict between the two. The central openings in the plaza provide daylight to the underpass which also visually connects it to the upper level. The three plazas have three different markets, the flower, vegetable and clothing respectively. Every plaza has an exit and entrance so that it is more accessible.

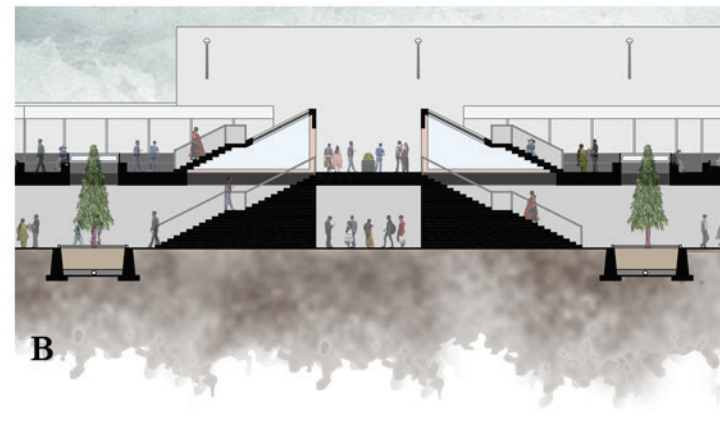
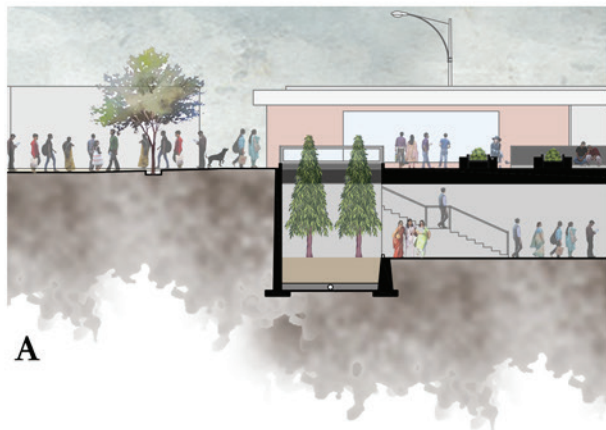
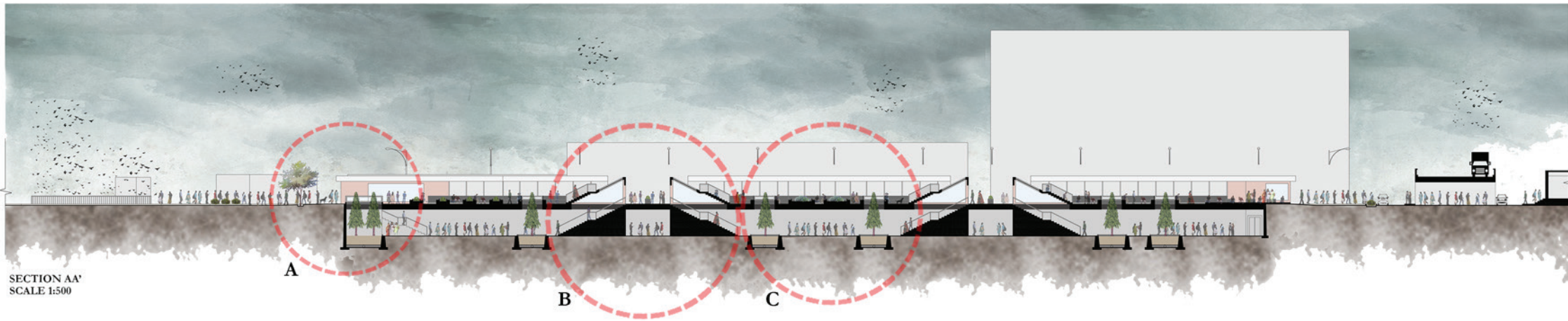




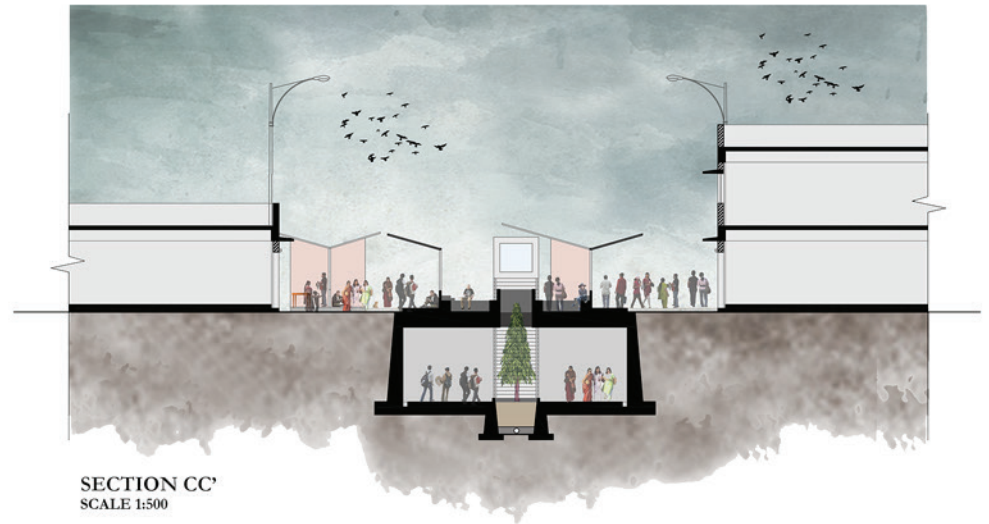
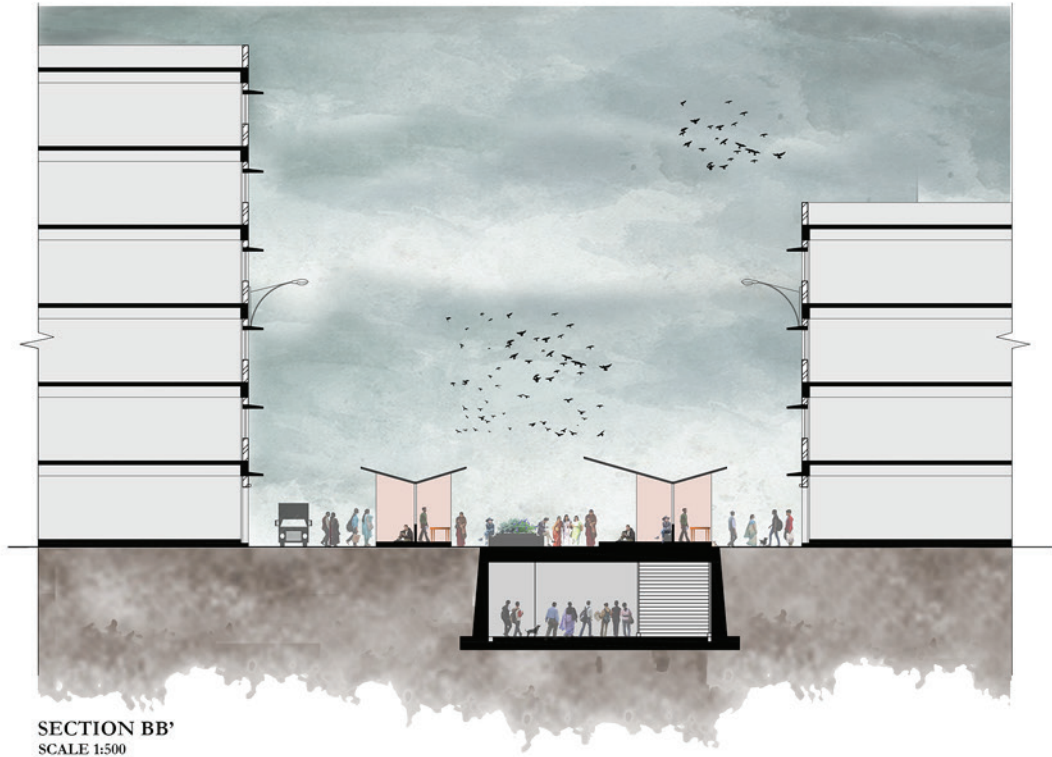
**MAIN STREET PLAN**  
SCALE 1:500

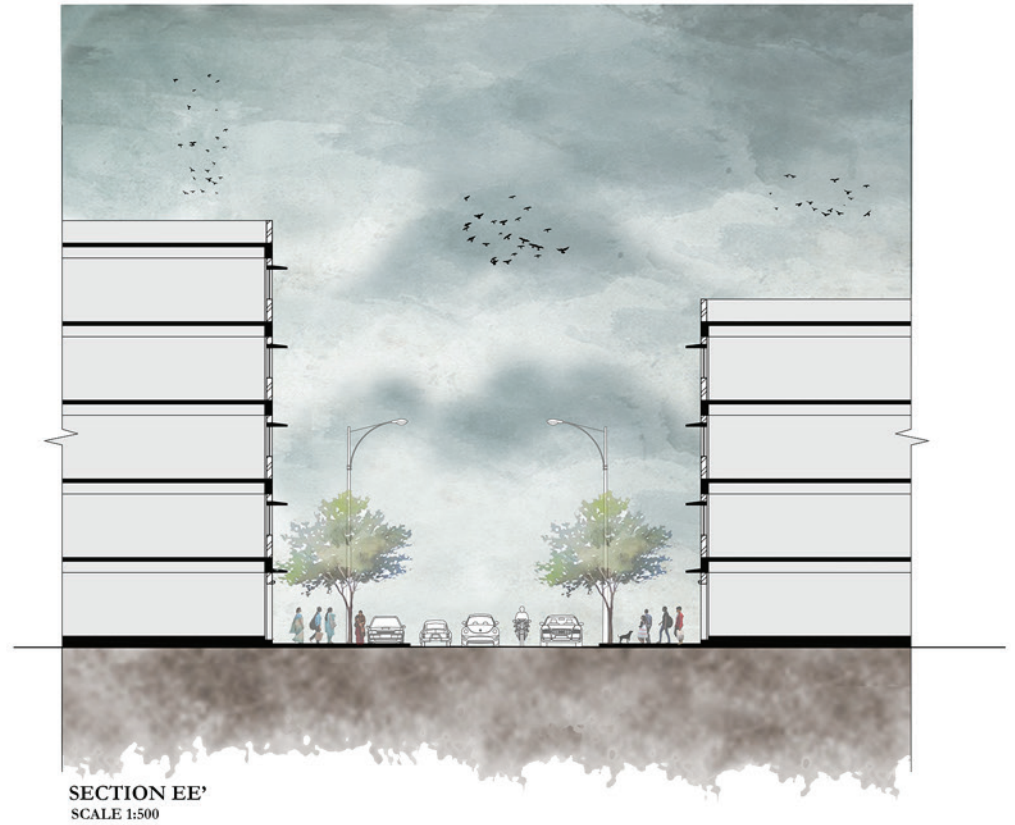


**UNDERPASS PLAN**  
SCALE 1:500













**ENTRANCE TO PLAZA 3**



**ENTRANCE TO PLAZA 2**

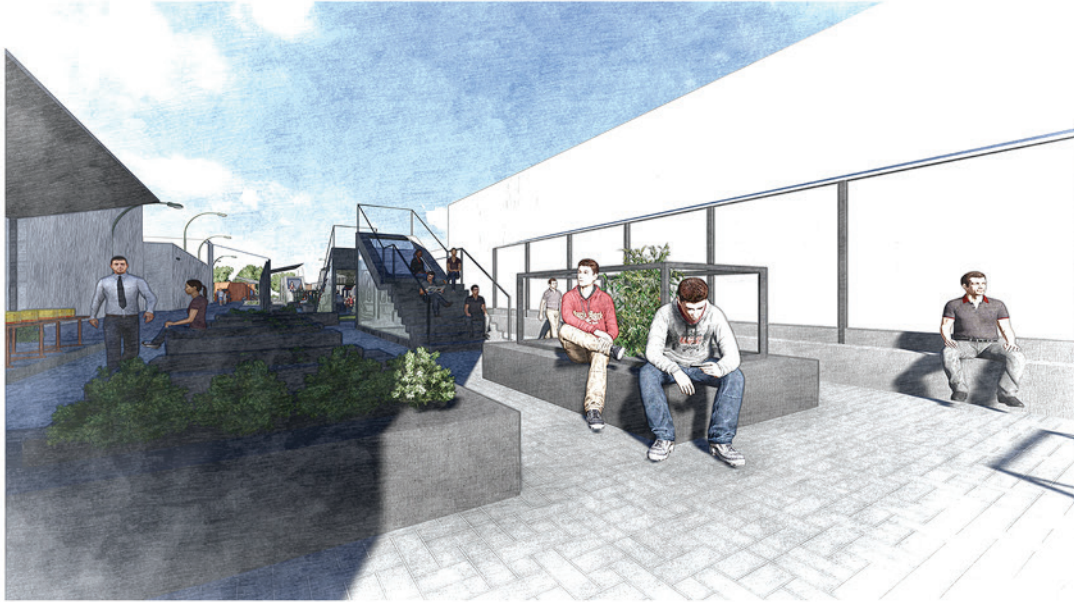


**CENTRAL SEATING AREA IN PLAZA 3**



**FOOD VENDORS IN PLAZA 2**





**VIEW OF PLAZA 2**

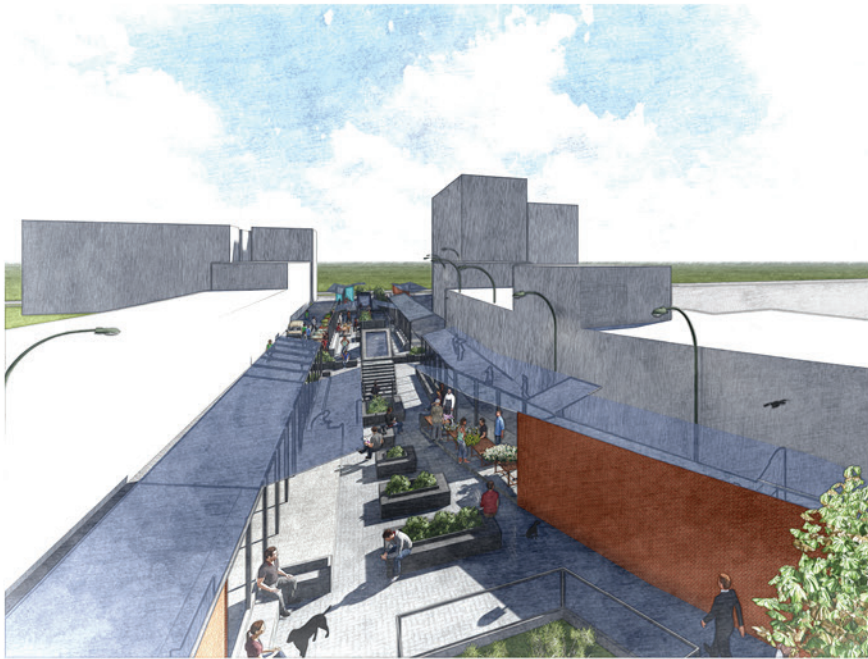


**ENTRANCE VIEW OF PLAZA 1**

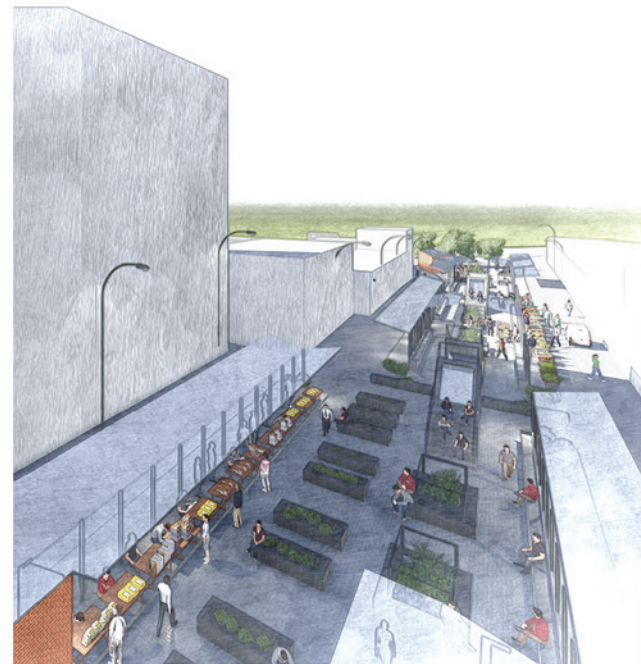


**UNDERPASS VIEW**

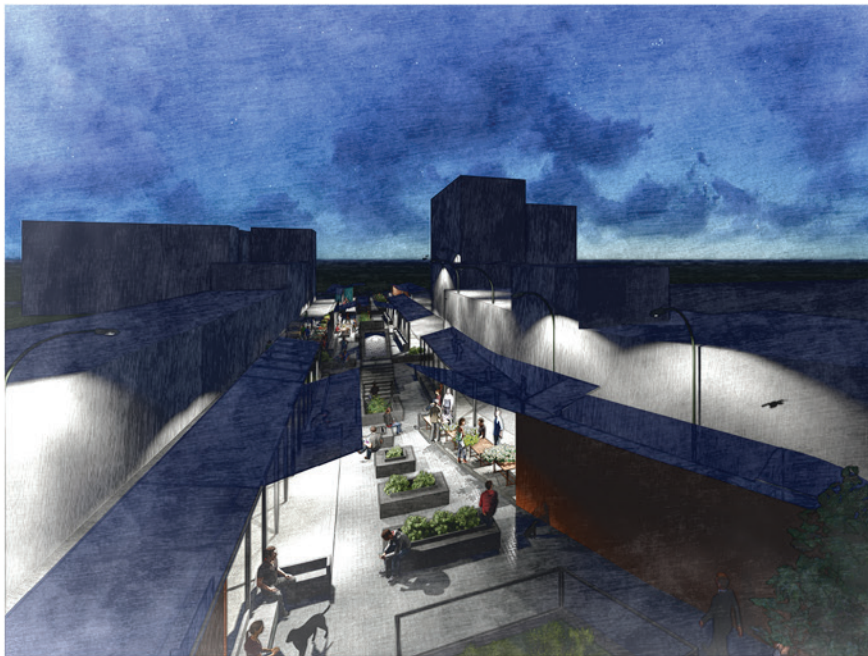




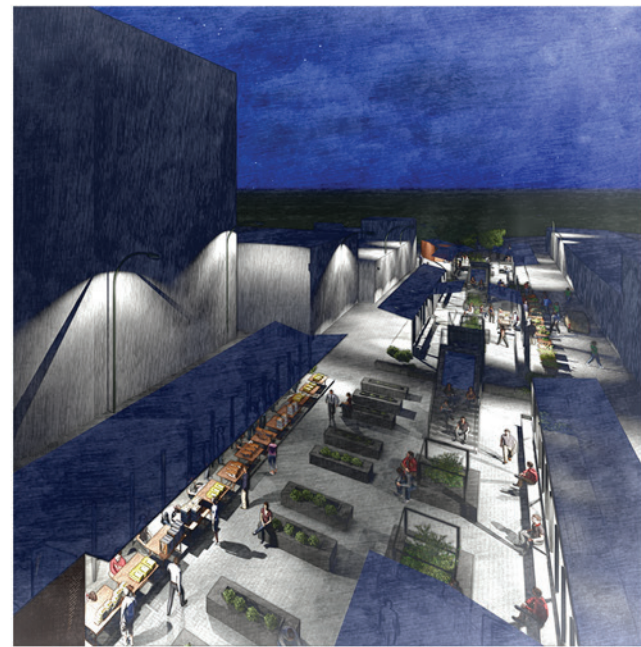
**TOP VIEW OF PLAZA 3**



**TOP VIEW OF PLAZA 2**

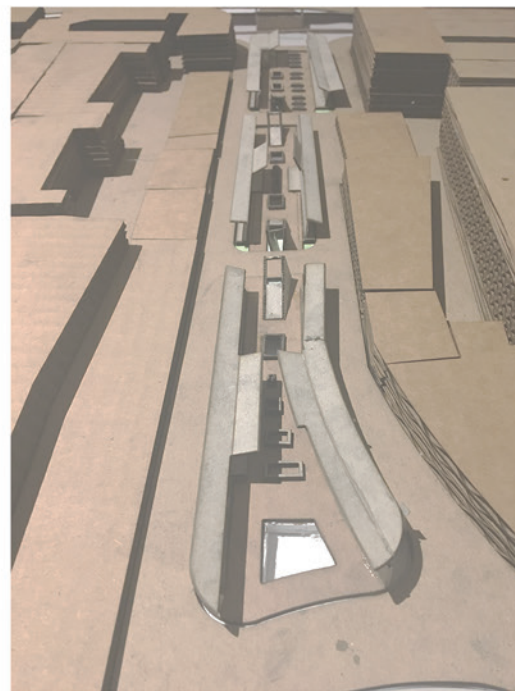
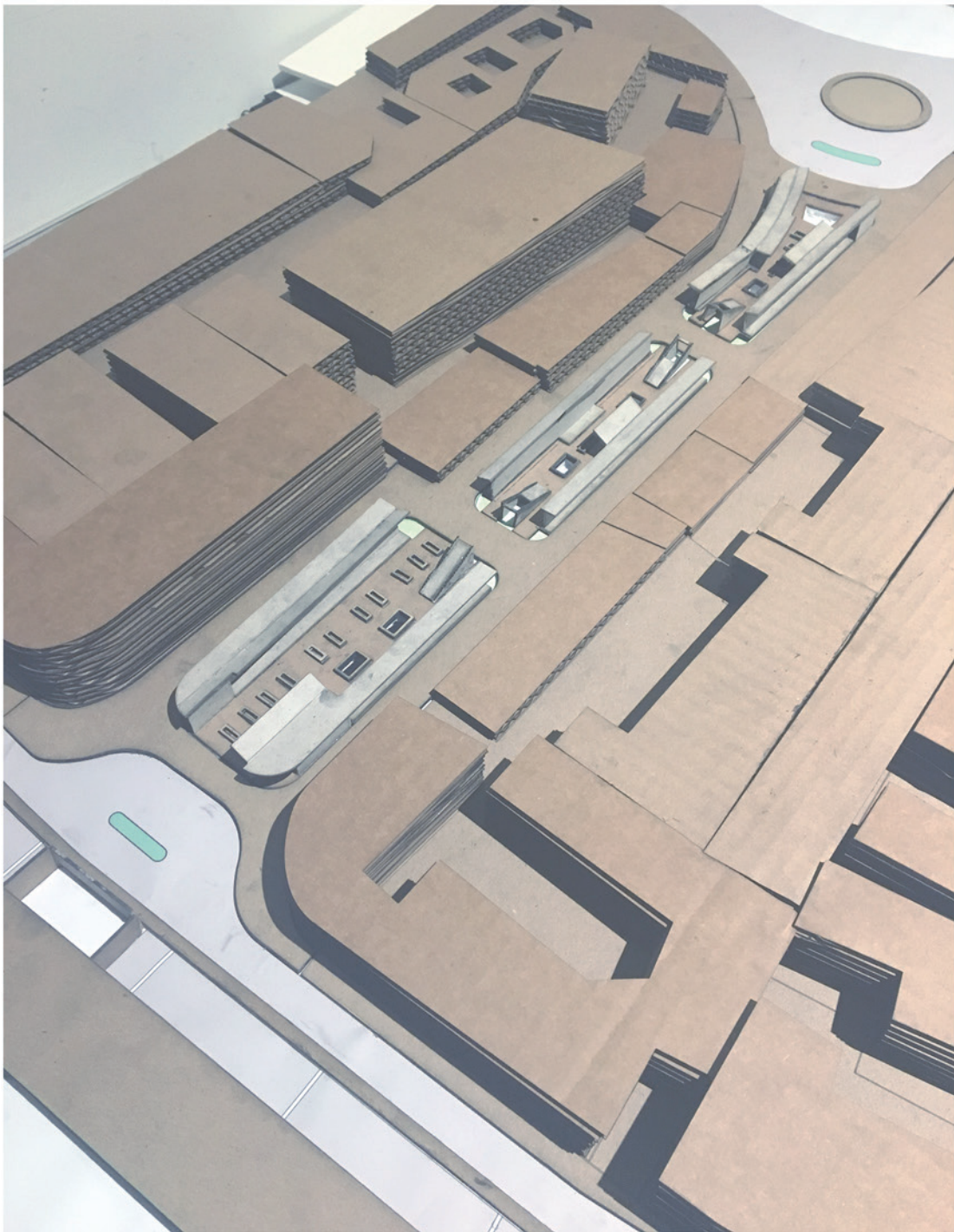


**NIGHT VIEW OF PLAZA 3**



**NIGHT VIEW OF PLAZA 2**









- ENTRANCE/EXIT TO UNDERPASS
- HAWKERS PLAZAS

- RAILWAY STATION

Every station has a main street where the maximum number of hawkers are found, as it has the highest pedestrian activity. As the working of all these main streets is similar, my design can be used as a proto-type for other stations, making the main street in to open hawkers plazas and connecting the main vehicular road through an underpass.



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