Topic

SPATIAL DISTRIBUTION PATTERN OF PEDESTRIAN ROAD ACCIDENTS IN A SOUTH ASIAN CITY:

A CASE STUDY OF CHENNAI

Karthikeyan Baskar

Importance: Need of Research

1. How pedestrian friendly are our streets?

- Each year more than one fifth of the people killed on the road Accidents.
- In India 10% of road death are pedestrian.

2. How children's friendly are our streets?

- 31 children die in road crashes in India everyday. As per annual report on Road Accident Deaths in India, 2019.

3. Nearly one third of all daily trips in New Delhi are made on foot.

- Though pedestrians and public transport users together form the largest group of road users, pedestrians have the largest share in road traffic fatalities, varying between 45% and 51%

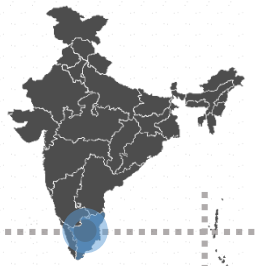
Source:
- Annual report on Road Accident Deaths in India, 2019.
- Ministry of Road Transport and Highways, Road Accidents in India 2016.
- GLOBAL STATUS REPORT ON ROAD SAFETY 2018.

City Overview

2022

Area : 426 Sq. km2

Population : 56 Lakhs
(333 Gross density Persons/hectare)
Source: Chennai Master plan 2026



INDIA

City Level

Critical Analysis of Pedestrian Accidents

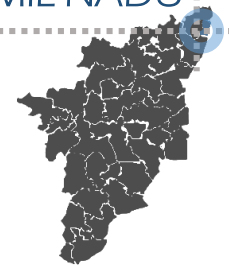
Using cities past five years Accidents.

- Fatal Accidents (2017 -2021)
- Victim and Accusers Analysis

Spatial distribution of pedestrian accidents

- Specific Accused vehicle
- Working days & Weekends
- Age-wise Analysis
- Peak and off-peak hours

TAMIL NADU



Greater Chennai Corporation - GCC

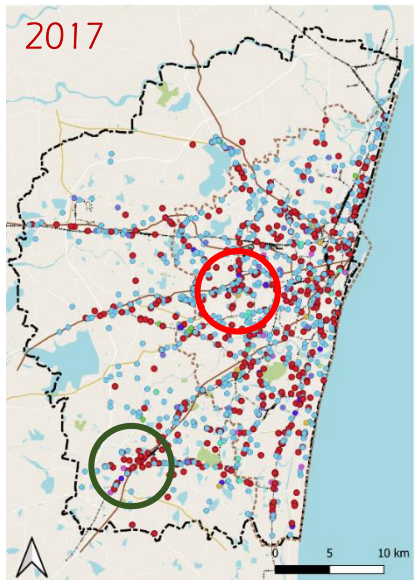
Why Chennai ?

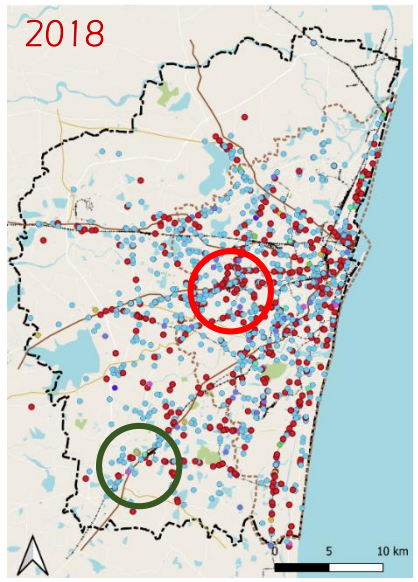
Chennai stands First with **9.1%** of total road accidents reported in 53 mega cities followed by Delhi City (8.1%)

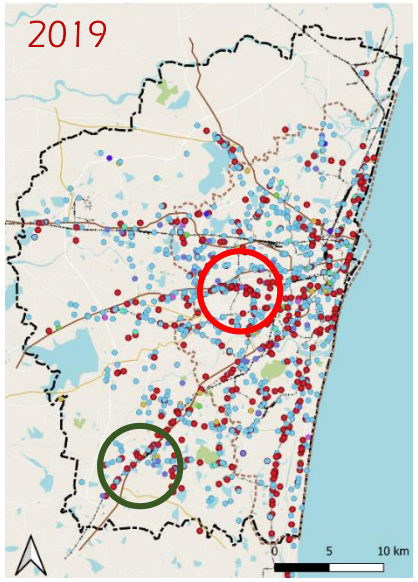
Chennai stands second in road accident *fatalities*, with **deaths,** among the metro cities, following Delhi.

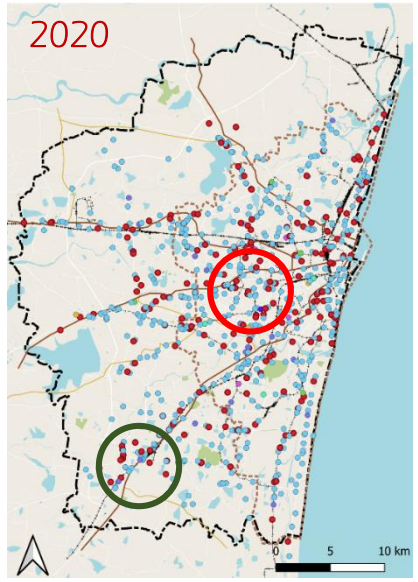
As per CMP 2019, in Chennai **of surveyed roads** lack requisite pedestrian facilities.

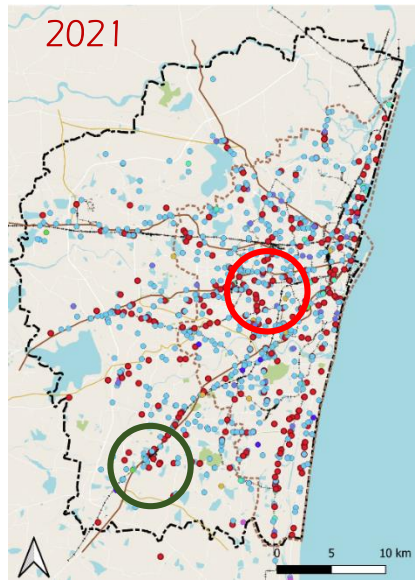
Fatal Accidents – Categorized by Type of Accidents









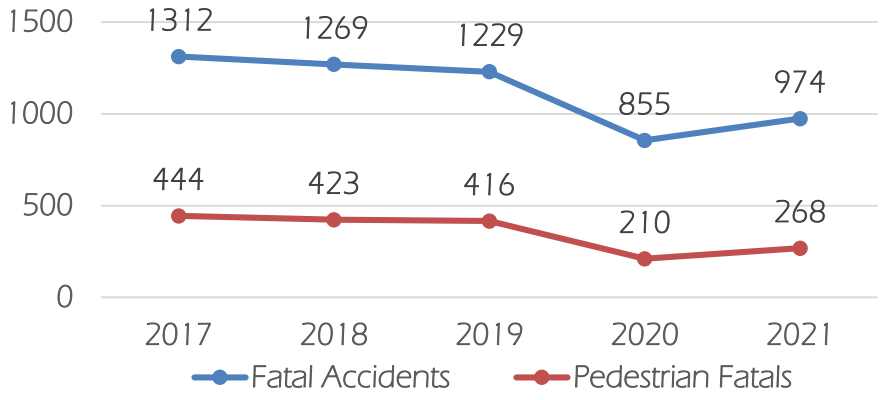


Legend

fatal accidents (5 years) CSV
Pedestrian
Cyclist
Motor Cycle
Auto Driver
Auto Occupant
Bus Passenger
Car Driver
Car Occupant
Municipal Boundary
National Highway
MRTS & Metro Line
State Highway
CMA_Boundary

Sources: Author

Comparison of Fatal and pedestrian fatal



Inferences:

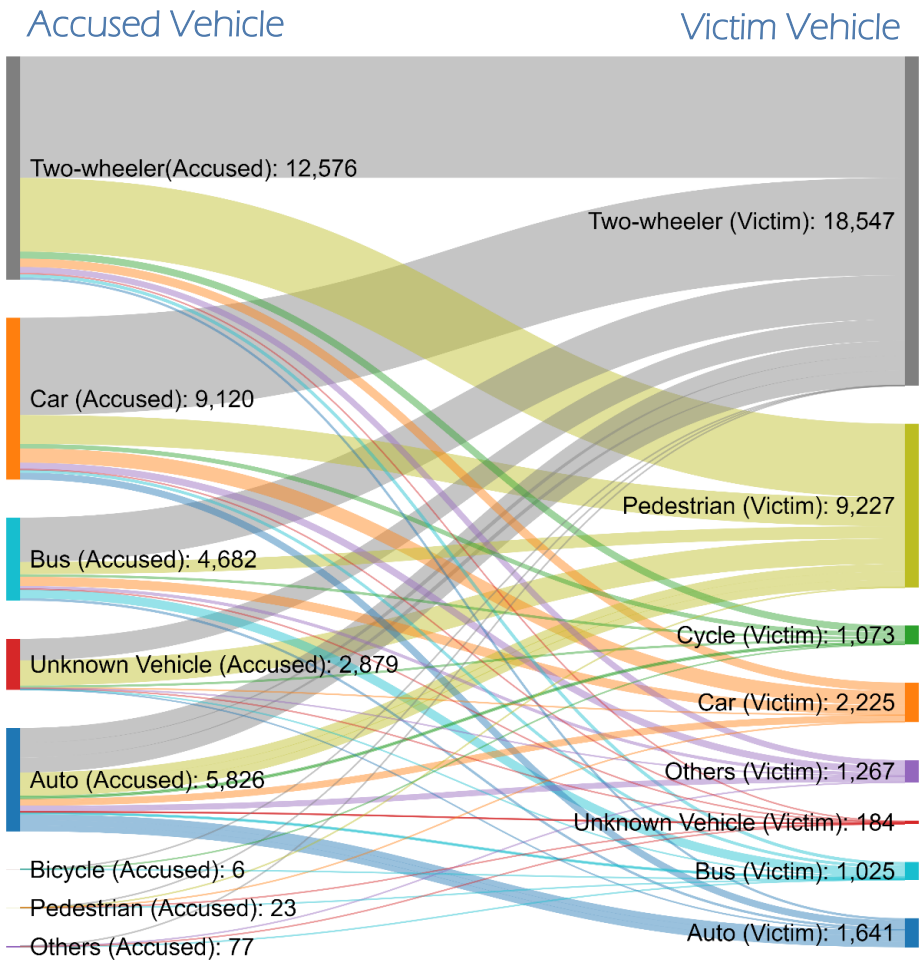
- Chennai stands second with regard to fatal accidents only behind the national capital Delhi.
- The 1/3 of the total fatal accidents are pedestrian fatals in Chennai.
- Since 2020's pedestrian fatal accidents has resisted around 25% may be because of Covid 19 Lockdowns.
- In 2021 its 28%, even though City unlocked in 2021, still Schools, Colleges and IT Companies are in online mode.
- It is observed that the City is highly vulnerable for pedestrians.

Percentage of pedestrian fatal (%)	2017	2018	2019	2020	2021
	34%	33%	34%	25%	28%

Source: Traffic wing, Chennai Commissioner office.

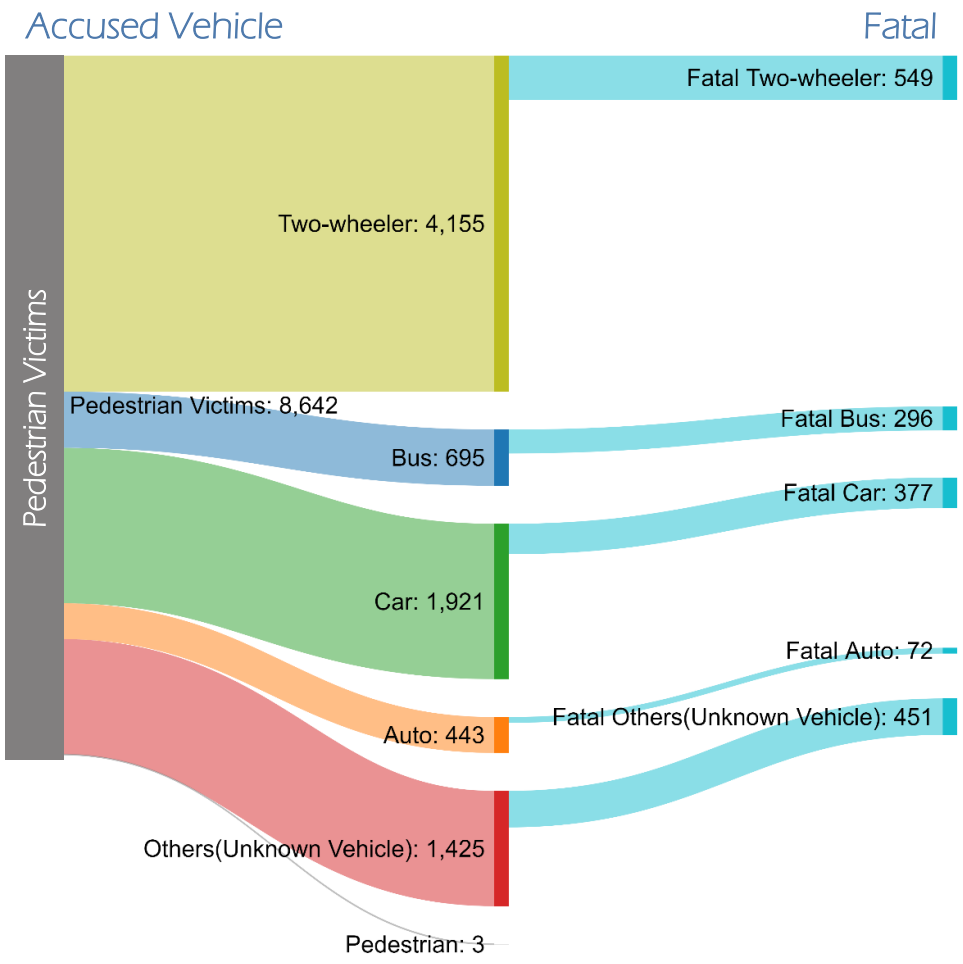
Victim and Accusing Vehicle Analysis

Accidents (2017 -21) Total No. - 31606



Sankey Diagram represents the Accused Vehicle and Victim Vehicle

Pedestrian Accidents (2017 -21) Total No. - 8642

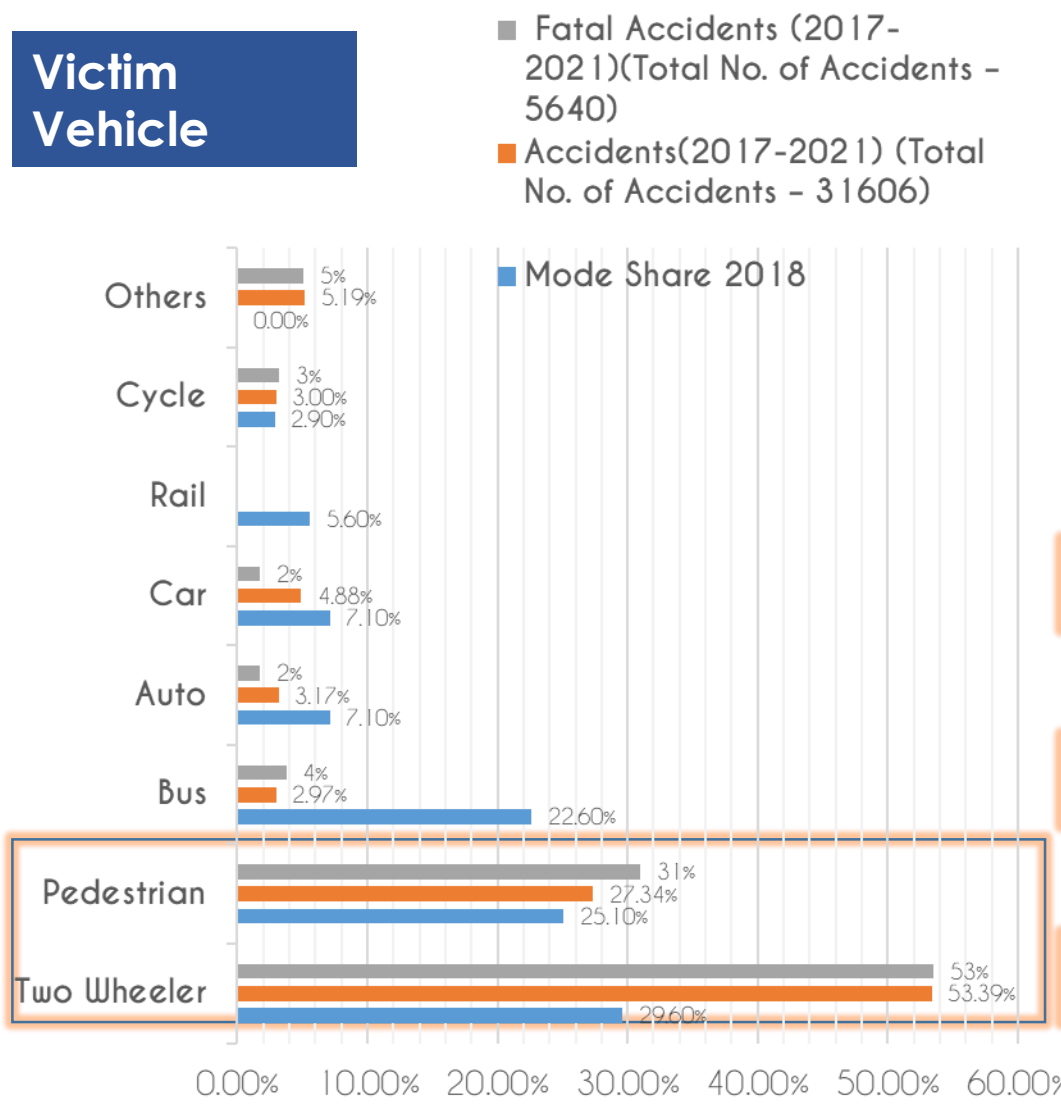


Sankey Diagram represents the Pedestrian Accused

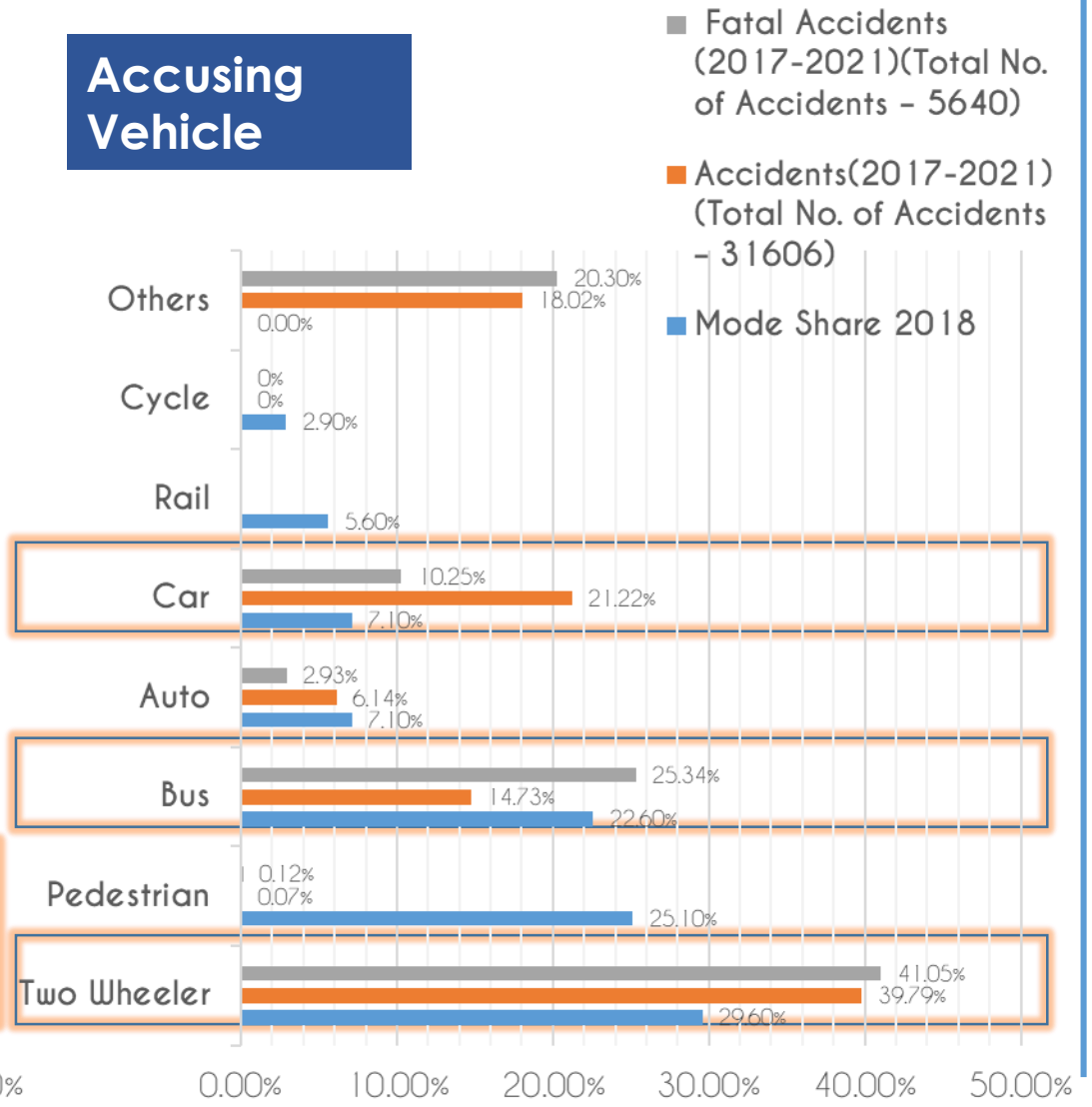
Sources: Author

Comparison of Mode Share, Road Accidents and Fatal Accidents

Victim Vehicle



Accusing Vehicle



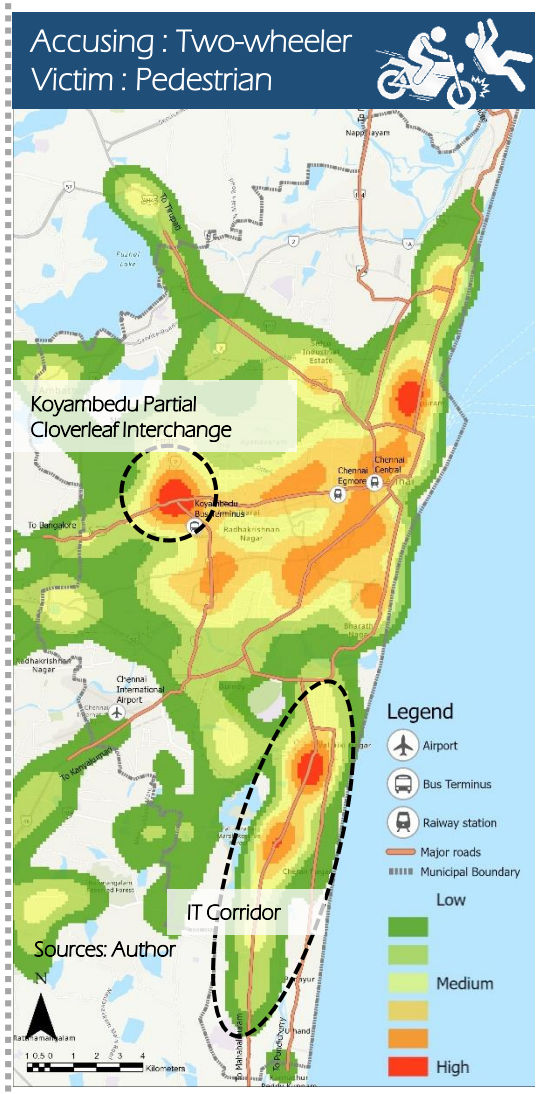
Inferences:

The two-wheeler has the maximum mode share of nearly 30%. Where else the two-wheeler victim in the road accidents are 53%.

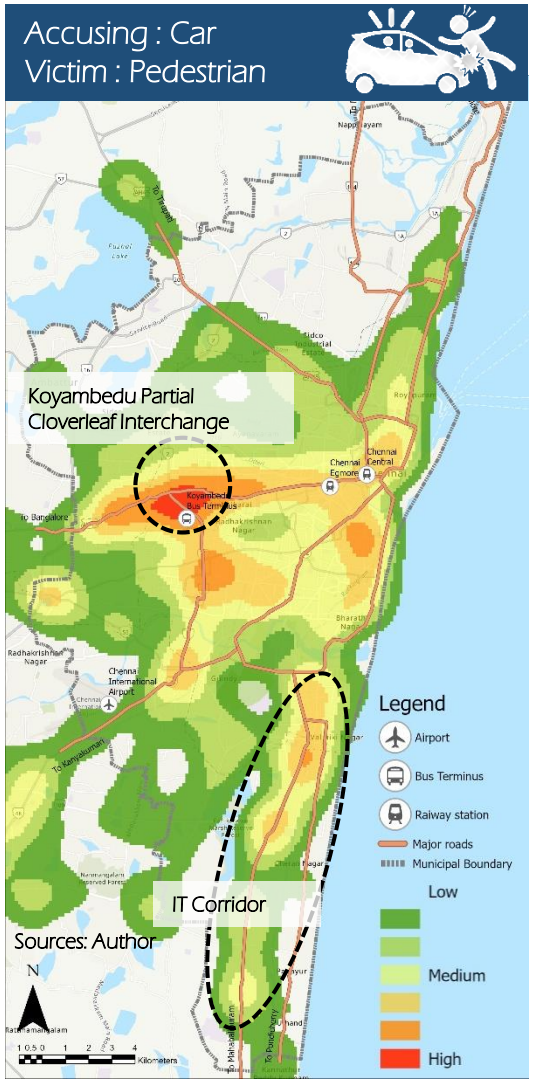
The pedestrian is second highest mode share od 25%. Where the accident are 27% and fatality rate is 31%. Pedestrians are highly vulnerable in roads. Almost 95% of pedestrian accidents are converted to fatal.

Looking at Accusing vehicle two-wheeler has maximum and next car and bus. Interestingly bus has the maximum fatal accidents then car.

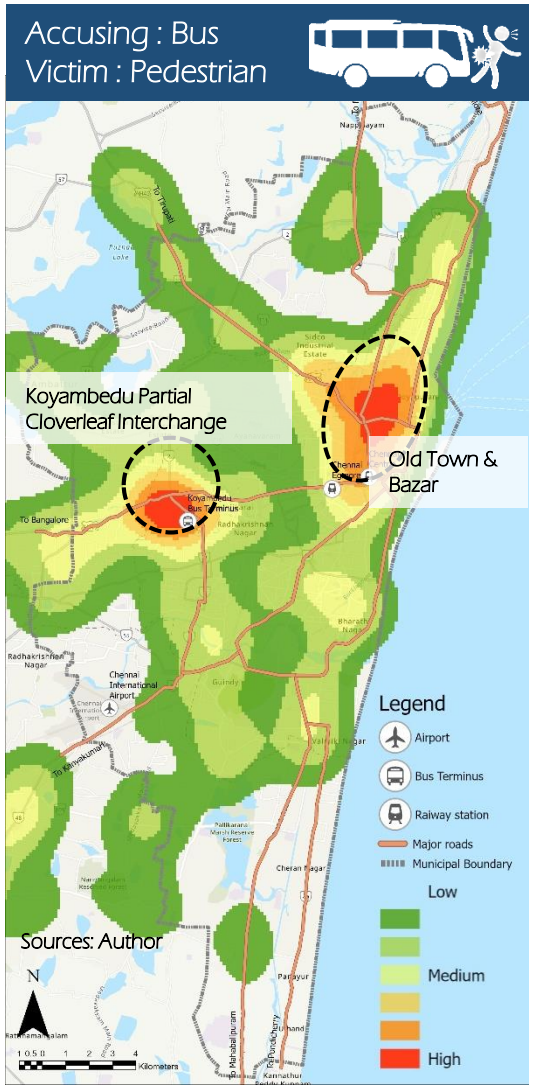
Spatial distribution of Pedestrian road accidents related to specific Pedestrian Accusers



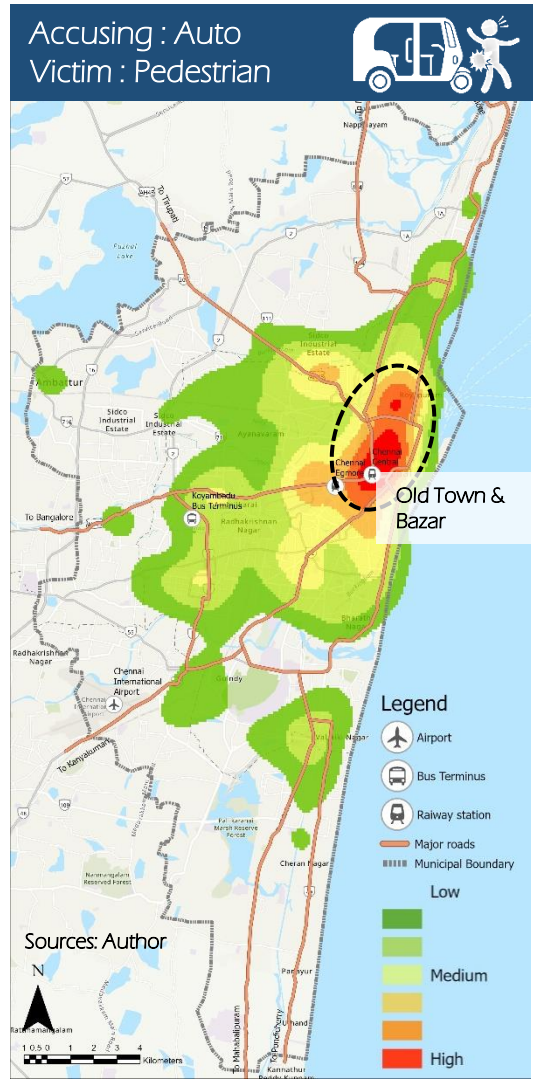
No . of Accidents - 4255 Nos.



No . of Accidents - 1921 Nos.



No . of Accidents - 695 Nos.



No . of Accidents - 443 Nos.

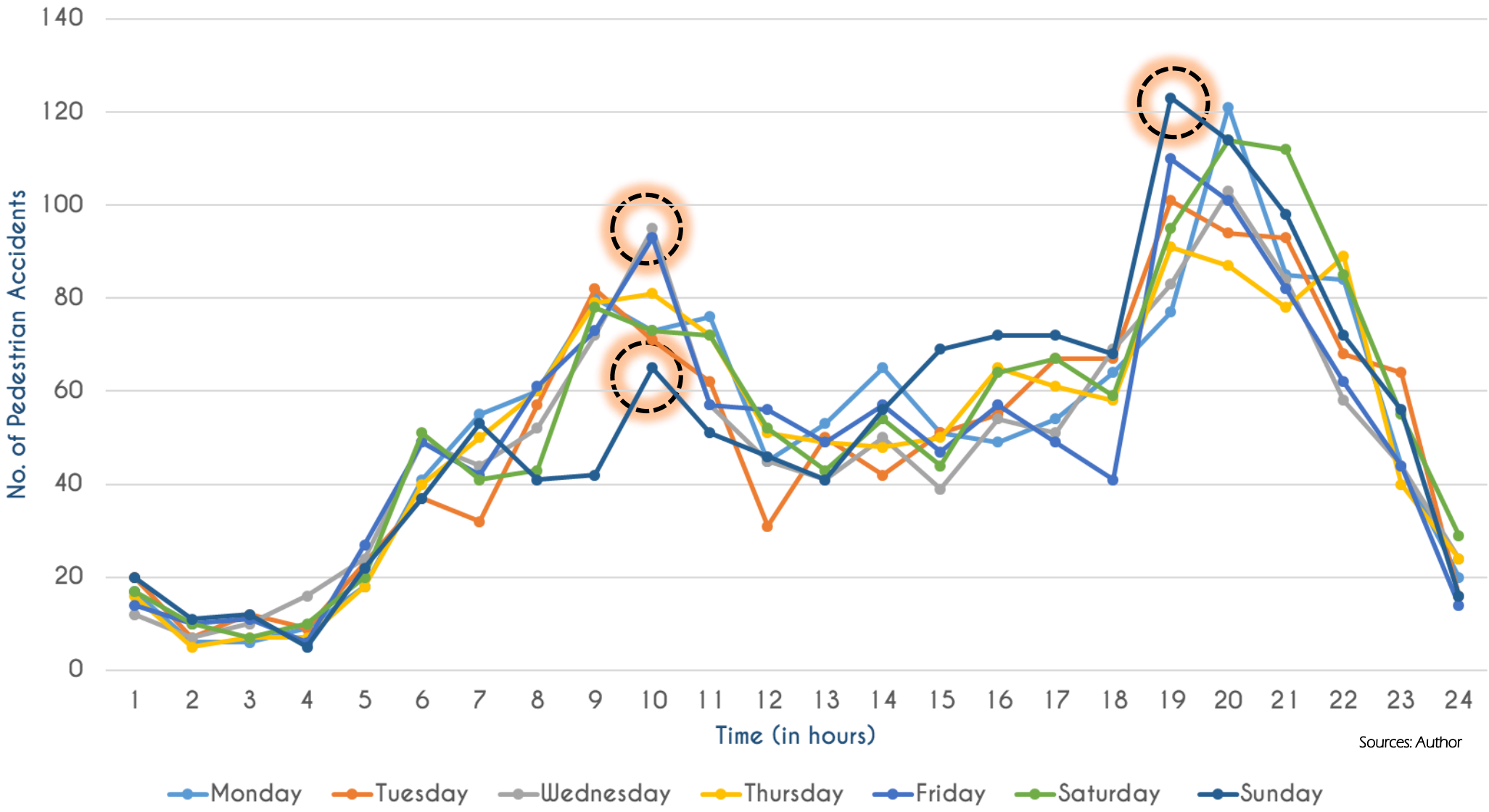
Inferences:

The Koyambedu partial cover leaf interchange is observed as highly critical area for Two-wheeler, car & Bus hitting the pedestrians.

The OMR road which leads to Pondicherry has witnessed high number of pedestrian accidents because of Two-wheeler & Car. This is an IT Corridor and consists of Bar and pubs.

The old town has maximum number of Auto hits pedestrian Accidents.

Hourly distribution of Pedestrian road accidents by working days, weekend days



Sources: Author

Inferences:

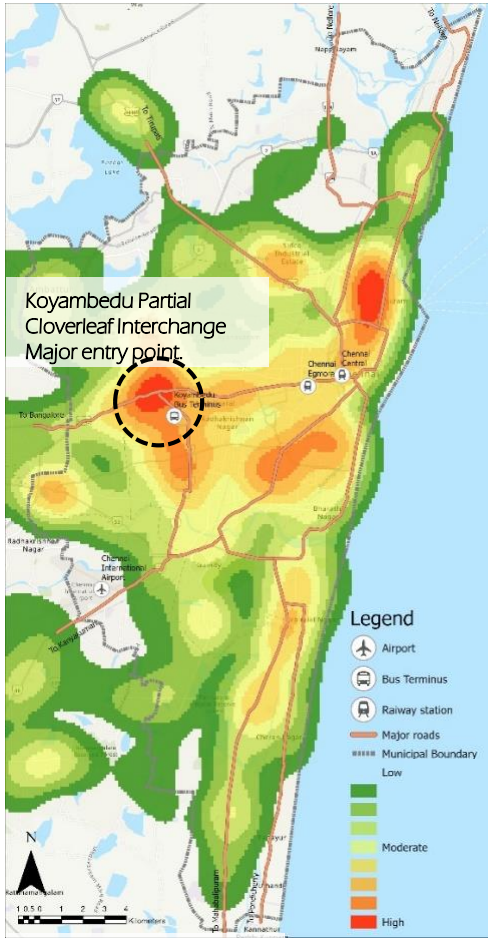
The peak hours of morning from 9 -11AM and evening 5-7 PM witnessed maximum number of accidents.

In weekends the accident is gradually increasing in forenoon and attain peak at 7PM.

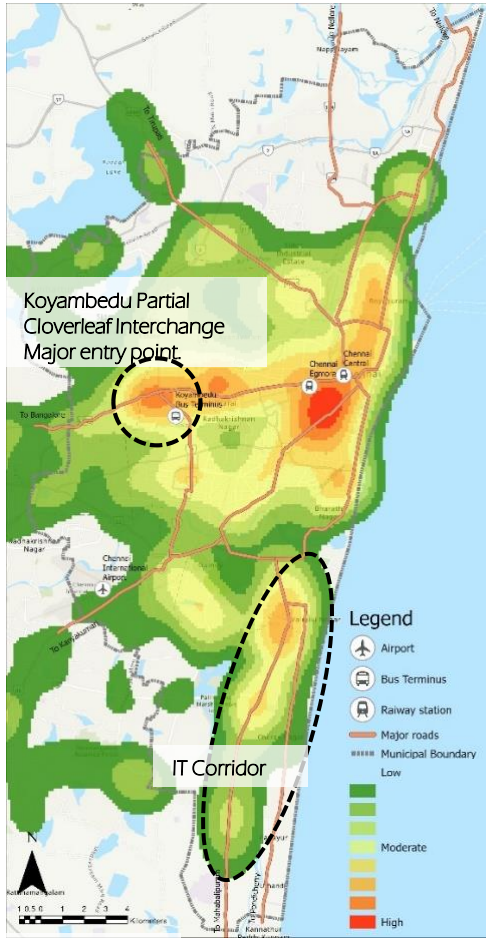
Out of all, the maximum accident happened on Sunday 7pm.

Spatial distribution of Pedestrian road accidents related to specific period of time

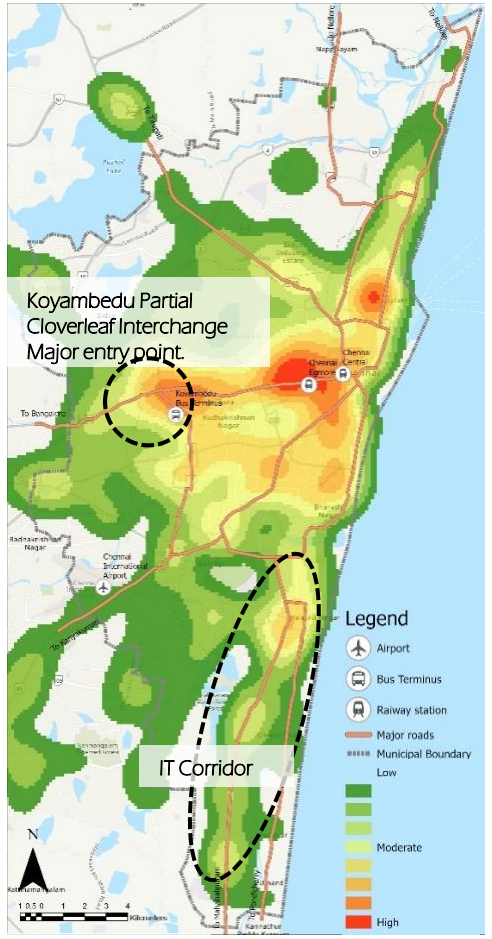
OFF PEAK HOURS	PEAK HOURS	OFF PEAK HOURS	PEAK HOURS	NO DAY LIGHT HOURS
06:01 - 09:00	09:01 - 11:00	11:01 - 17:00	17:01 - 19:00	19:01 – 06:00



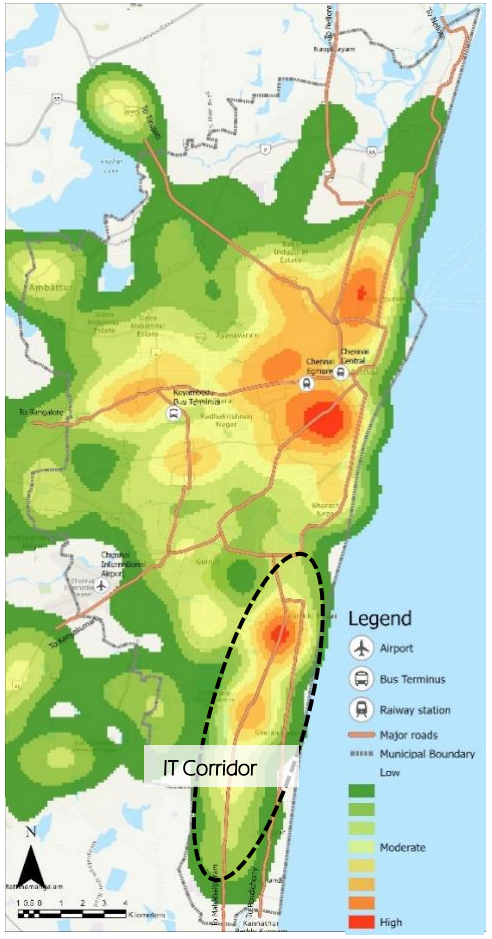
1198 Nos.



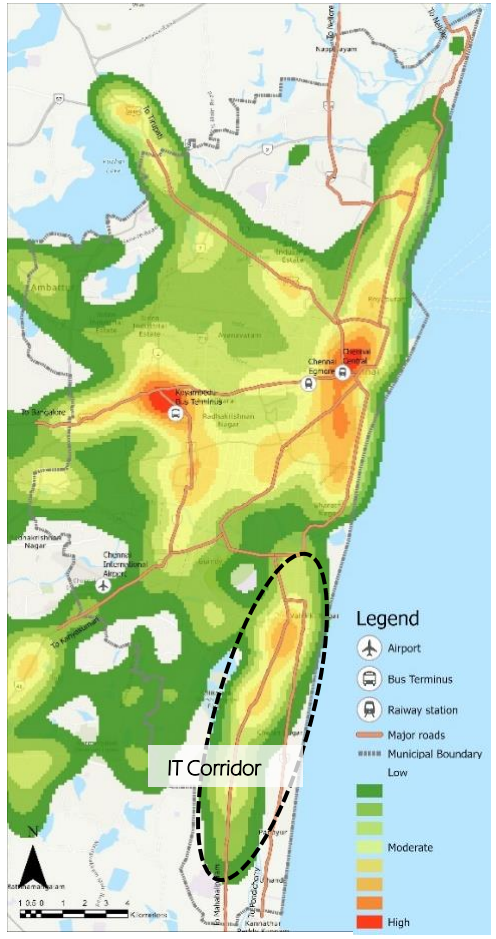
999 Nos.



2213 Nos.



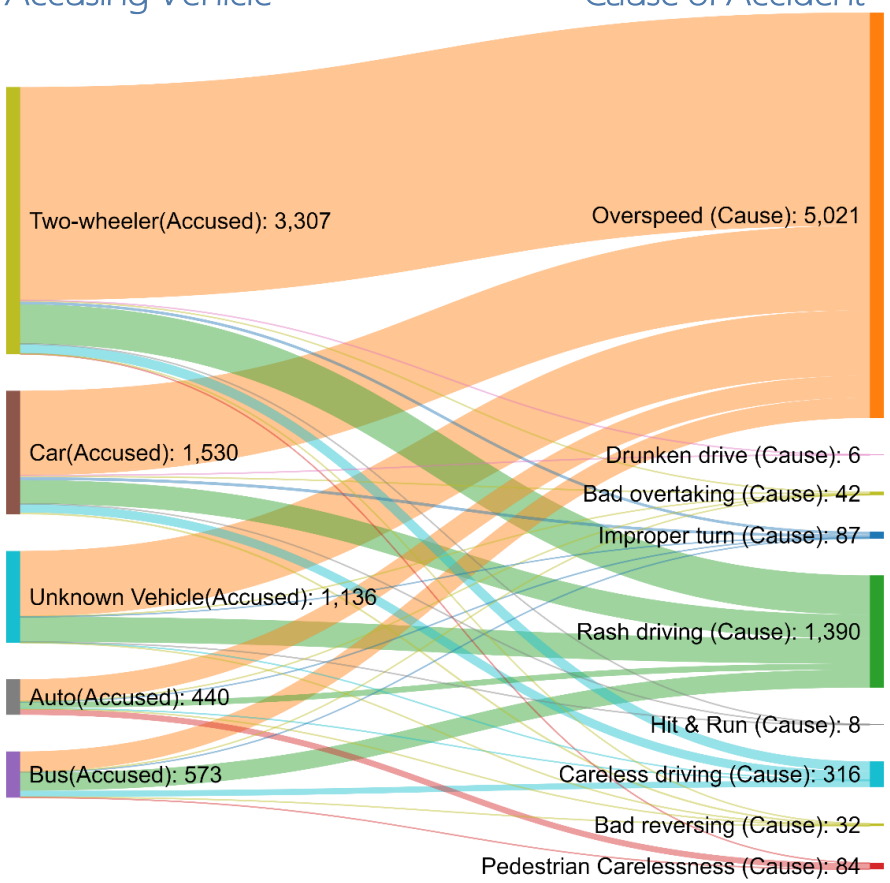
1106 Nos.



3130 Nos.

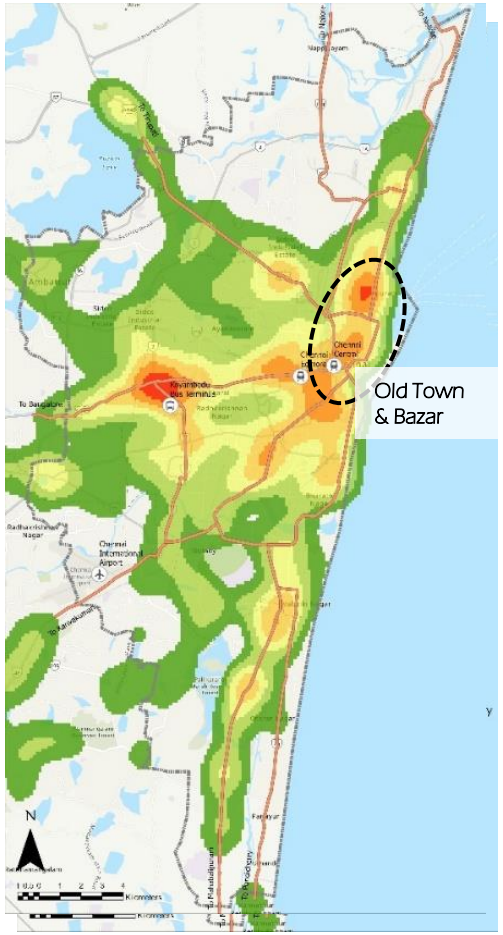
Spatial distribution of Pedestrian road accidents related to SPECIFIC CAUSE

Pedestrian Accidents (2017 -21) Total No. - 8642

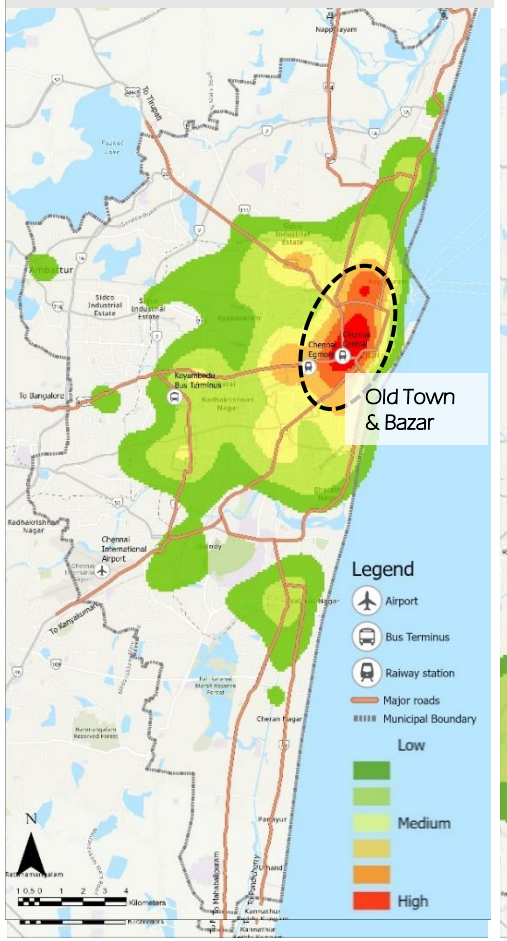


Sankey Diagram represents the Accused Vehicle and Cause of Accident

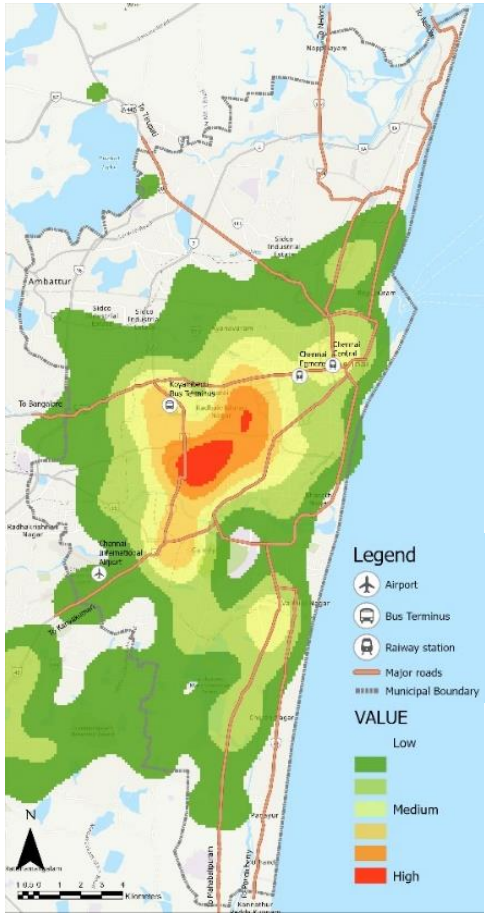
Over Speed



Accusing : Auto
Victim : Pedestrian

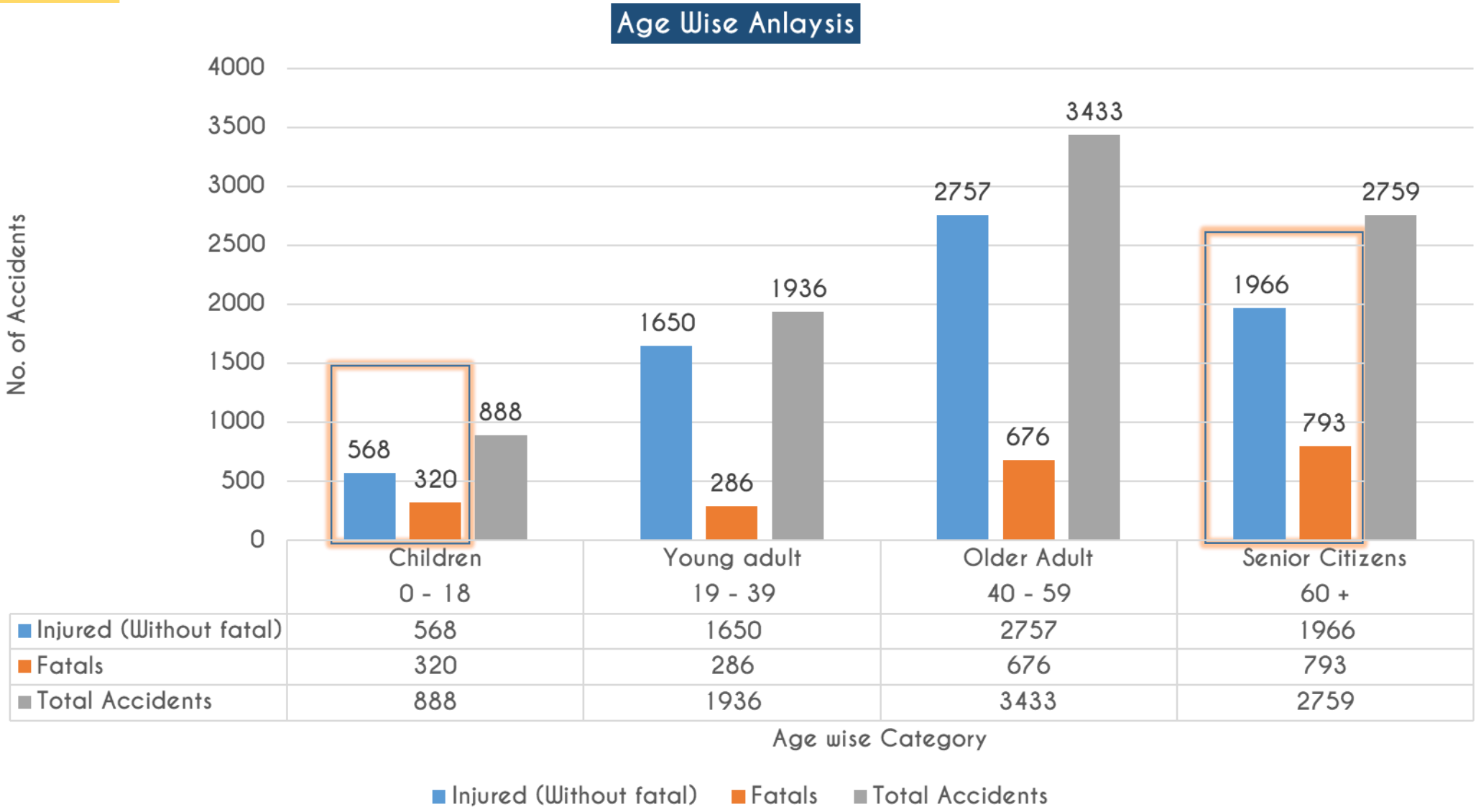


Careless Driving



Sources: Author

Age wise distribution of Pedestrian road accidents by Injured, Fatal & Total Accidents

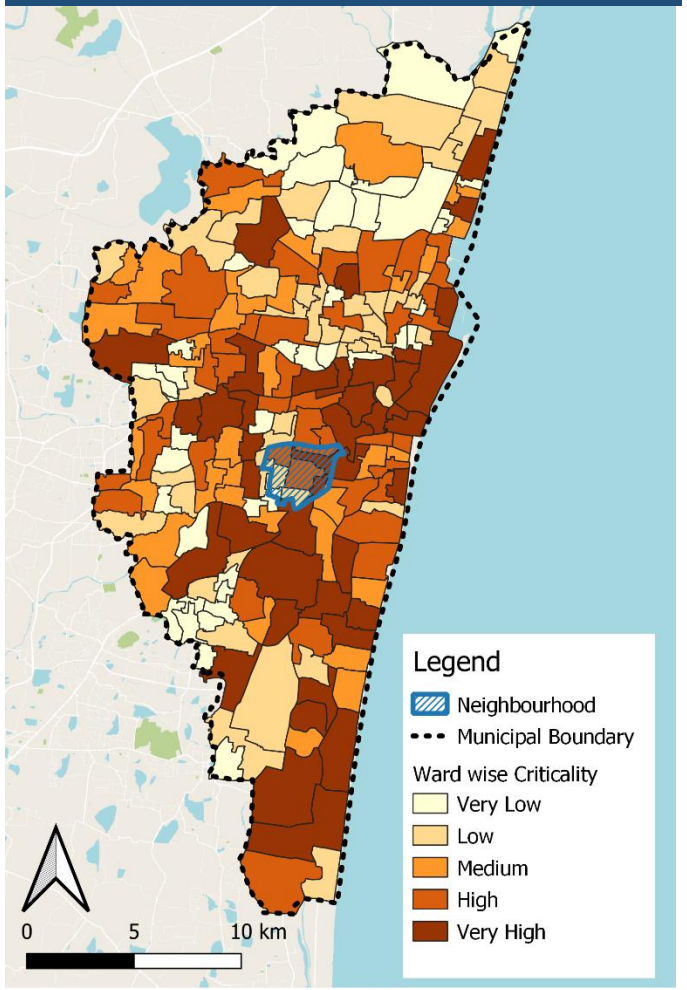


Inferences:

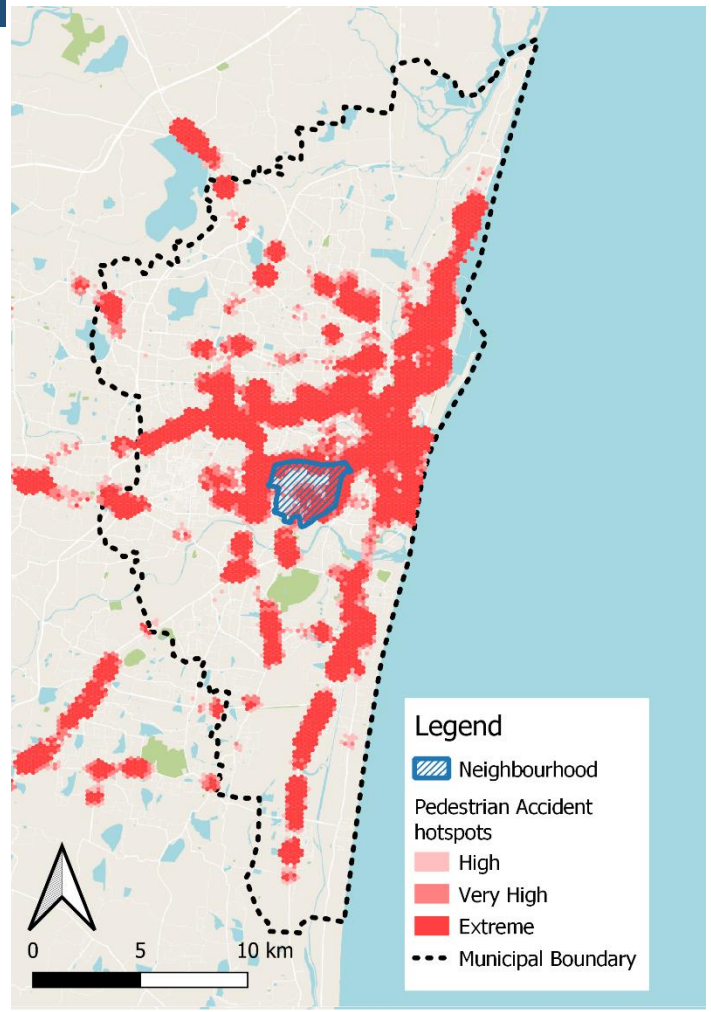
- The fatality rate is high in Children and Senior citizen category.
- High injured accidents spotted in Older Adult category, Comparatively they have less amount of fatal rate.
- Out of all young Adult category has less fatality rate.
- The children and senior citizen are highly vulnerable in terms of fatality and senior adults are vulnerable in terms of Accidents.

Delineation of Neighborhood

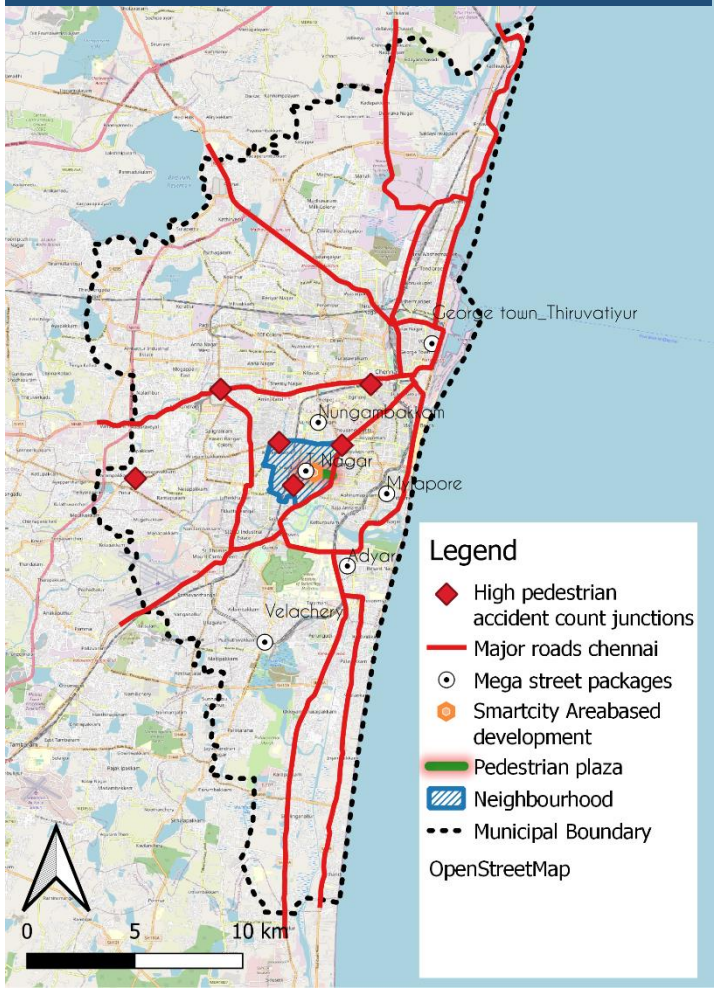
Ward wise Pedestrian Accidents Map



Pedestrian Accident hotspot Map



Other parameters considered for delineation of Neighbourhoods

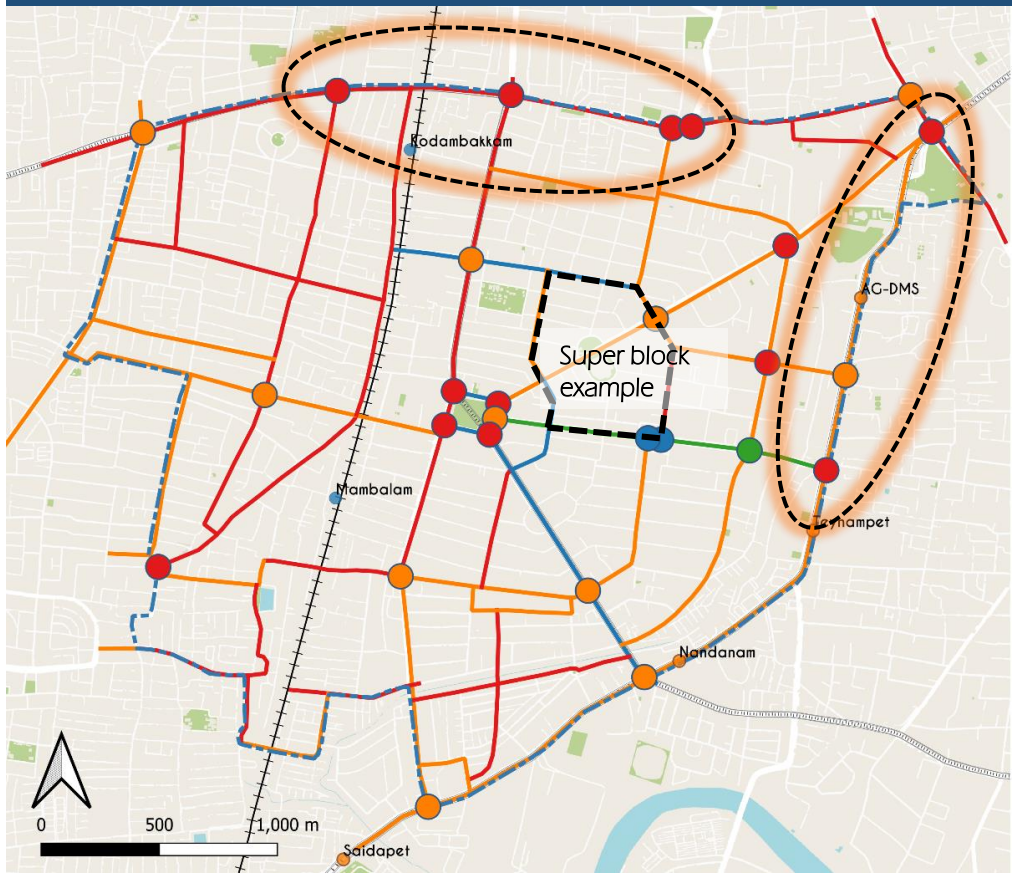


Inferences:

After analyzing all the city level accident data. The findings from analysis are used to delineate the neighborhood.

Neighborhood Analysis

Intersection and Street Assessed



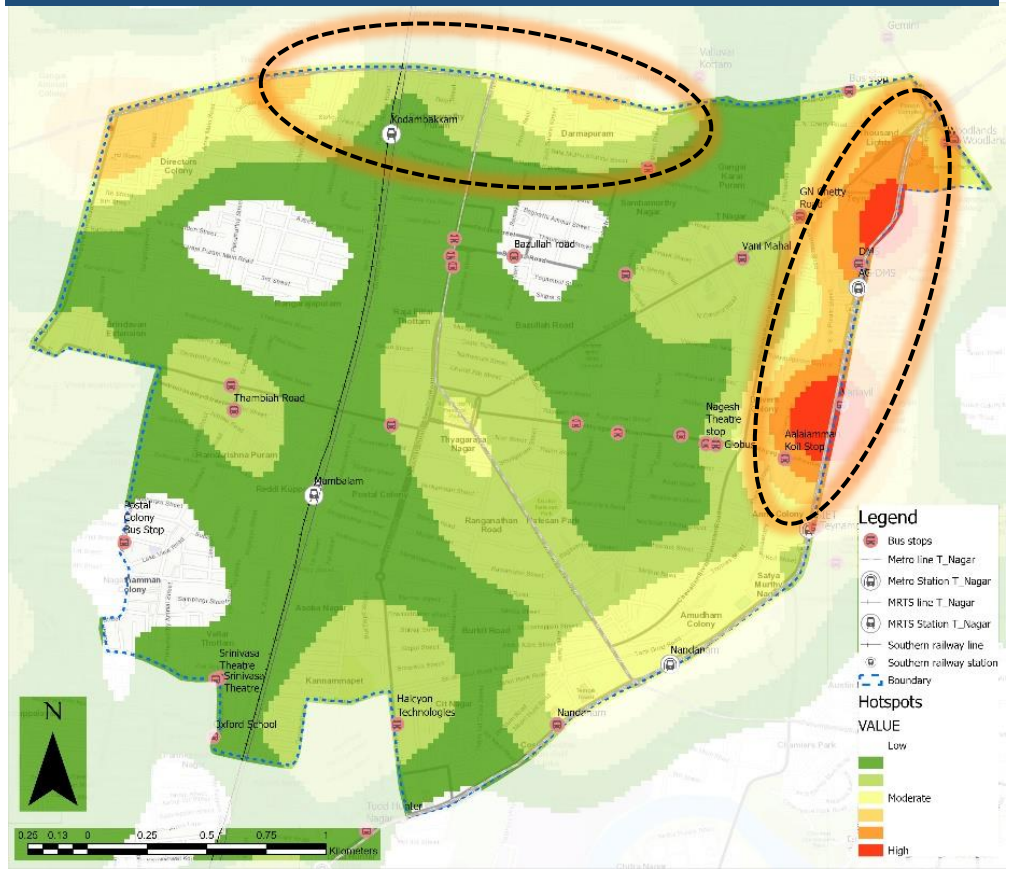
Not suitable for pedestrian

Poor pedestrian condition

Basic pedestrian condition

Reasonable pedestrian condition

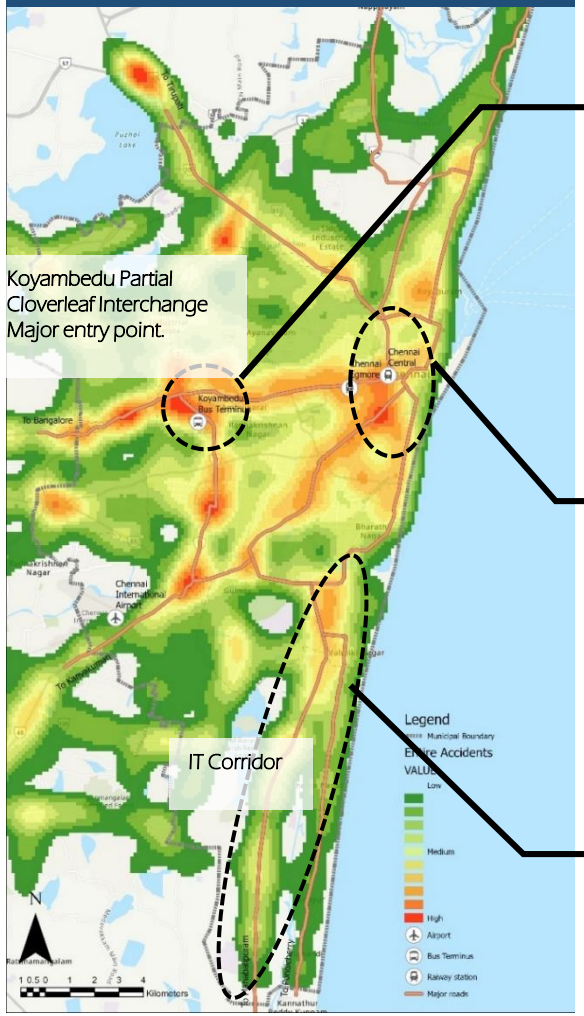
Pedestrian Accidents Hotspots



- Introducing TACTICAL URBANISM in intersection redesign.
- Having potential to incorporate SUPER BLOCK model to enhance Neighborhood Walkability.
- Introduce STREET TRAFFIC CALMING FEATURES to address Over speed and Rash driving.

Address the pedestrian road safety

Pedestrian Accident Hotspots



Issues

Koyambedu Partial Cloverleaf Interchange.

Vulnerable in terms of

- Two-wheeler & Car hitting pedestrian
- During morning peak hours.
- Because of Over speeding

Old town & Bazar area.

Vulnerable in terms of

- Auto hitting pedestrian
- During morning peak hours.
- Because of Narrow streets and bazar area.

OMR Road.

Vulnerable in terms of

- Two-wheeler & Car hitting pedestrian
- During evening peak hours.
- Because of Over speed and rash driving.
- Due to drunk and drive.

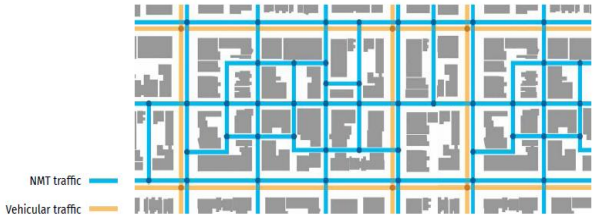
Recommendations

Develop a Strategical intervention to address the site specific issues.

The interventions Such as

- Introducing TACTICAL URBANISM in intersection redesign.

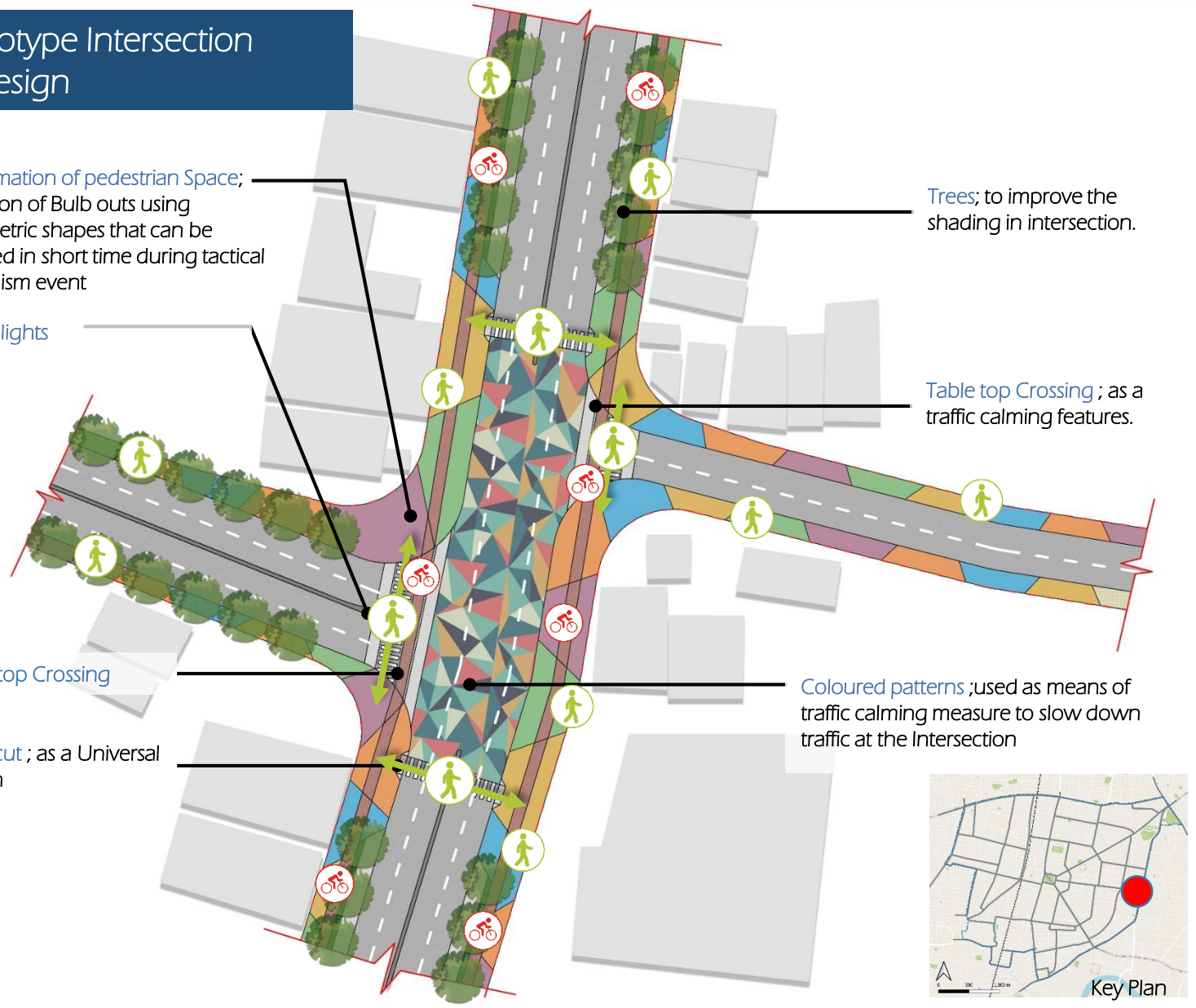
- Incorporate SUPER BLOCK model to enhance Neighborhood Walkability.



- Introduce STREET TRAFFIC CALMING FEATURES to address Over speed and Rash driving.

Street median, Speed tables/bumps , Chicanes & Rubble strips

Prototype Intersection Redesign



- Defining Available Right of way
- Adequate Carriage way leads to streamlined traffic.

7.2m wide two lane carriage way on both side.

- Designated Cycle lane.

1.8m wide on both side.

- Sidewalk.

2.4m wide on both side.

- Vibrant intersection with Tactical measures
- Trees/ Natural shade
- Defining Centerline
- Pedestrian Crossing
- Proposed Elements
  - Reclamation of pedestrian space
  - Avenue trees
  - Table top crossings
  - Street lights
  - Geometric patterns
  - Curb cuts

Findings and Learnings

- Pedestrians are highly vulnerable in terms of road accidents in Chennai.

Out of the total, 35% of fatal accidents are pedestrian fatal.

- This research analyzed the accident reports temporally and established a methodology for highlighting the infrastructure gap

- Further research can develop a dashboard for the city to observe and analyze the road accident data spatially.

THANK YOU

Karthikeyan Baskar