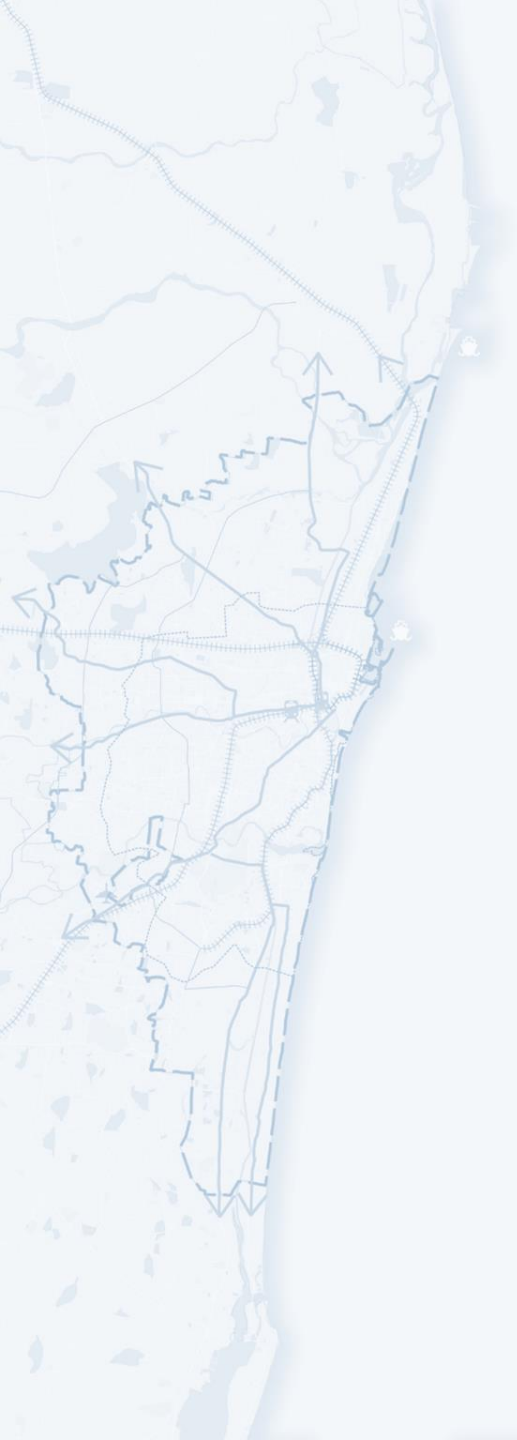


A Methodology for cross-functional and Temporo-Spatial analysis with child pedestrian crashes in Chennai as case study

October 2024

Data Inconsistencies in Road Crash Reporting: MoRTH vs. NCRB

Source	Crashes	Fatalities
Morth	4,61,312	1,68,491
NCRB	4,46,786	1,17,100

Key Insights:

- Differences in crash and fatality data despite the same source (police).
- Inconsistent reporting highlights gaps in crash data supply chain and methodologies.
- Affects the accuracy of road safety policies and interventions.

Call to Action:

- Need for a unified and comprehensive approach to address data discrepancies.
- Critical to improving traffic crash identification and intervention, especially in urban areas.

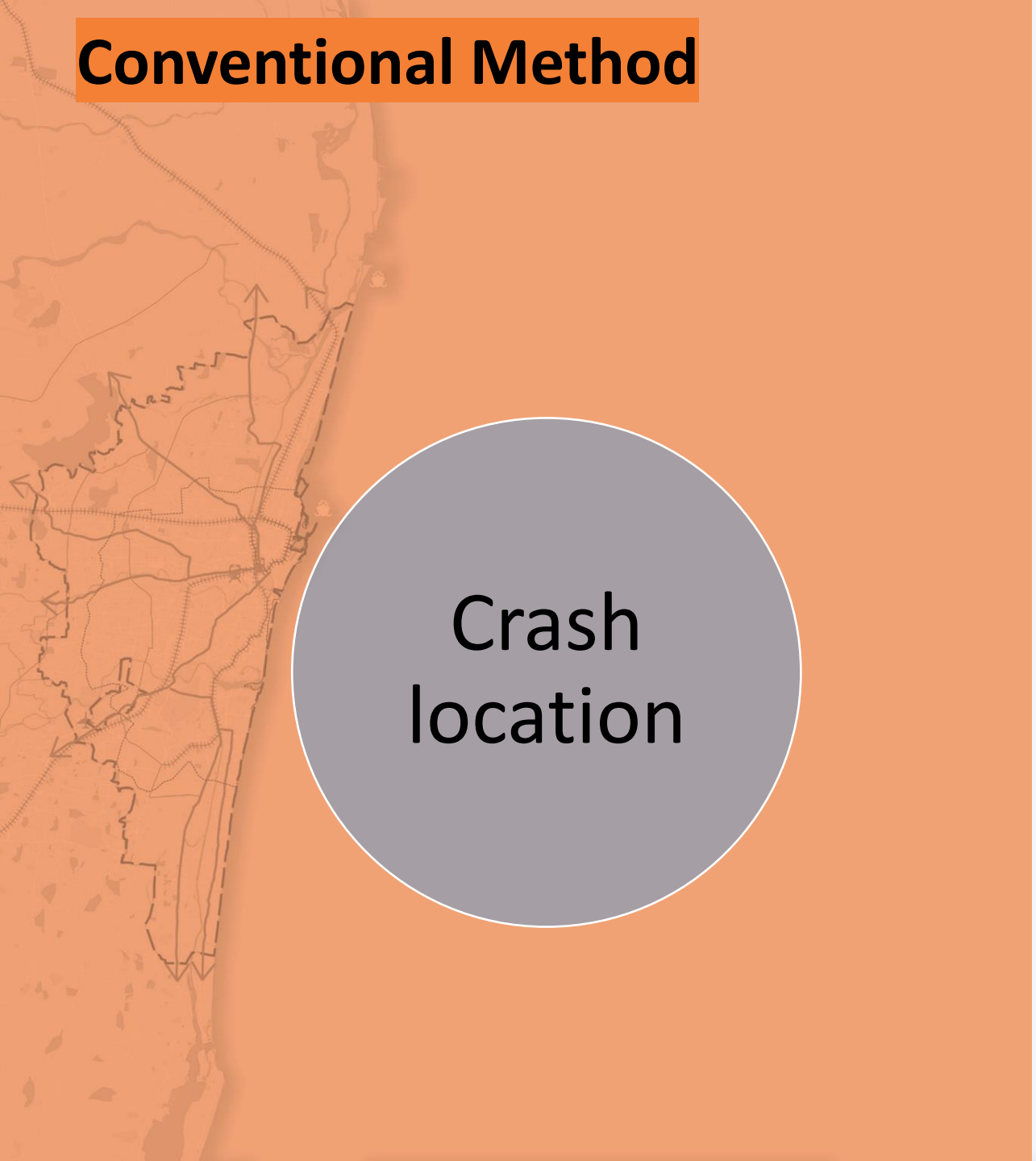
Research Proposal

Our research proposes an alternate approach, leveraging on available open-source datasets to prioritize vulnerable crash hotspots

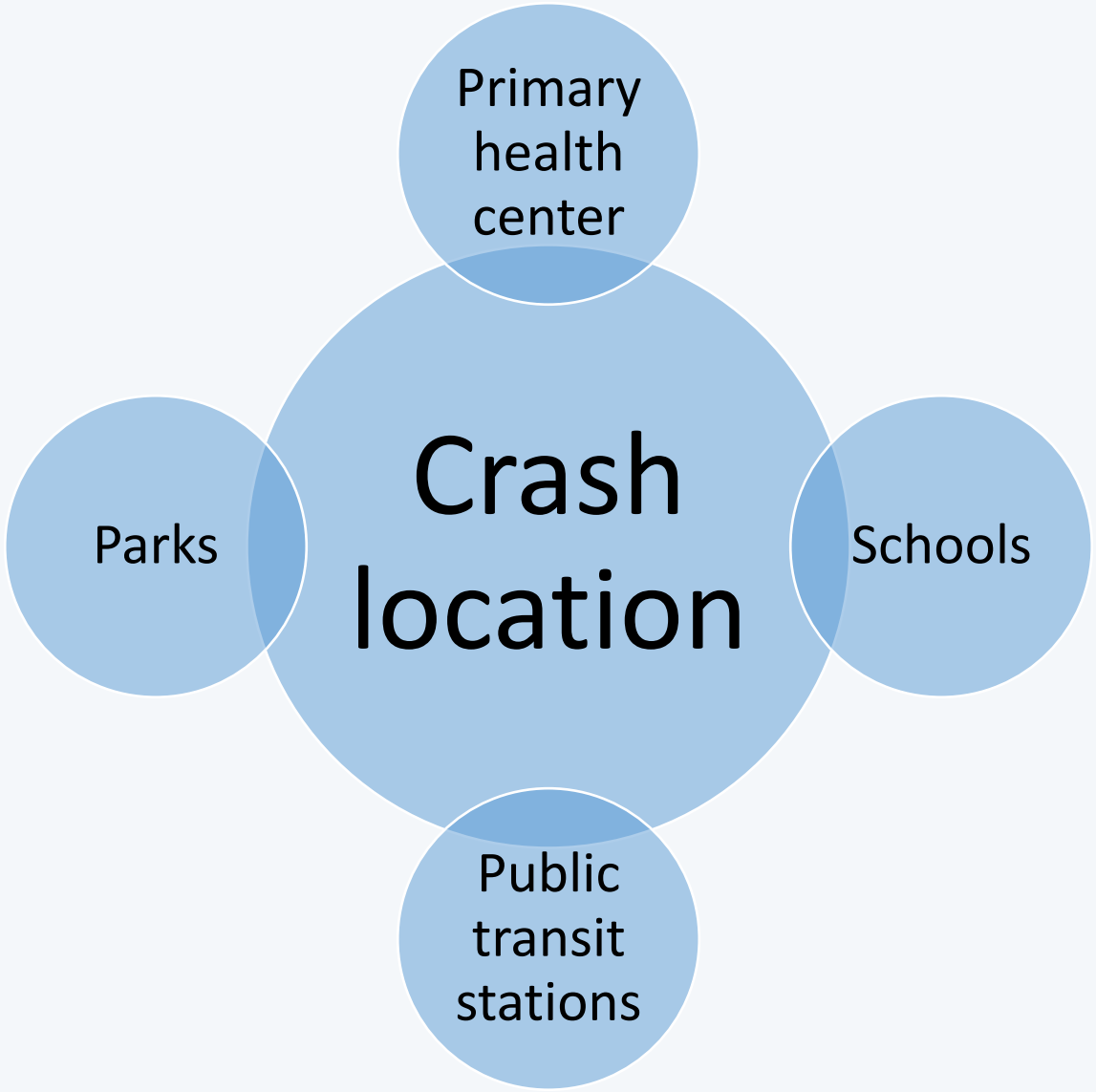
The approach involves a cross-functional, temporo-spatial analysis, demonstrated with crash data from Greater Chennai Corporation.

The proposed approach can be extended to various use cases, allowing it to be adapted for use in other cities and tailored to the specifics of Elderly, Women, Children & Disabled (EWCD) and other vulnerable road users.

Conventional Method



Cross-functional and Temporo-Spatial analysis



Spatial data influencing specific road user groups

Road user type	Religious center	Recreational space	Residential Area	Hospital	Office Space	Central Business district (CBD)	School	College	Public transit Stations
Elderly	✓	✓	✓	✓					✓
Women	✓	✓	✓		✓	✓	✓	✓	✓
Children	✓	✓	✓				✓		✓
Disabled		✓	✓	✓	✓				✓
Two-wheeler	✓	✓	✓	✓	✓	✓	✓	✓	✓
Three-wheeler	✓	✓	✓	✓	✓	✓	✓	✓	✓
Four-wheeler	✓	✓	✓	✓	✓	✓	✓	✓	
Truck				✓	✓	✓			

The analysis : using additional spatial points to prioritize

Data set	Description	Relevance in road safety	Data Source
Child pedestrian Accidents data	The child pedestrian crash points throughout the Greater Chennai Corporation	Occurred Accident points	**Traffic wing, Chennai police Commissioner ate**
Administrative jurisdiction in Chennai metropolitan area	Administrative units of CMA such as Municipal Corporations, Municipalities, Town panchayat & Panchayat unions.	Urban and rural local bodies and its influences in road crashes	**Open Street Map**
Schools	Location of Schools in the Greater Chennai Corporation	Major commute place for child pedestrian	**Open Street Map**
Parks	Location of parks in the Greater Chennai Corporation	Major commute place for child pedestrian	**Open Street Map**
Primary Health Centre	Location of parks in the Greater Chennai Corporation		**Open Street Map**
Mass Public transit stations (Suburban, MRTS & Metro)	Location of public transit stations	Mode of commute	**Open Street Map**

Why Children?

0 – 18 years

Children are more vulnerable to accidents in urban areas due to increased traffic, limited safe spaces for play, and insufficient supervision.
Metro cities pose a higher risk of accidents for children, such as pedestrian-vehicle collisions, falls, and injuries from a **lack of playgrounds**.

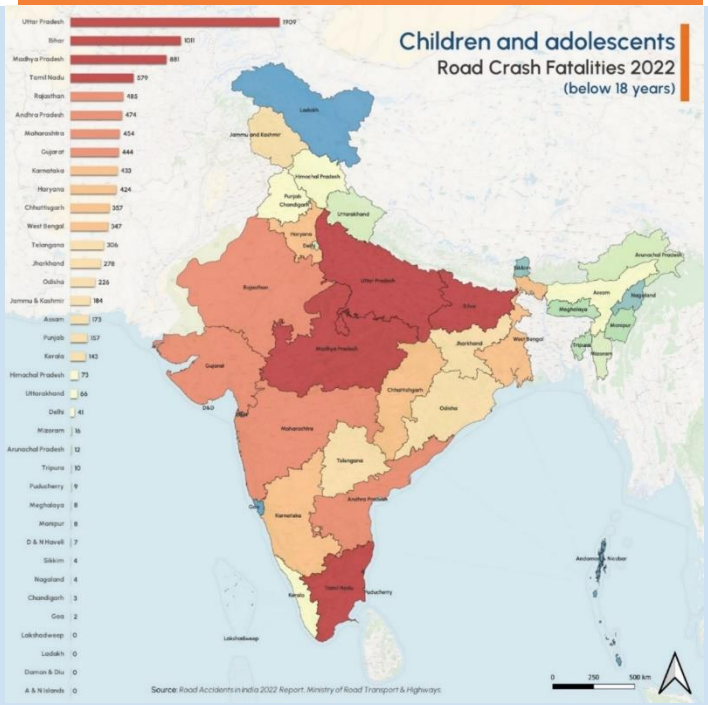
Note: *0-18 years was defined based on the*
1. Convention on the Rights of the Child ARTICLE 1 (UNCRC)*Article 1 defines the child as a human being who is below the age of 18 years.*
2. Children as defined by Child's Right Act (2003) is any person under the age of 18

Need of the Study

How children's friendly are our streets?

31 children die **in road crashes in India every day as** per the annual report on Road Accident Deaths in India, 2019.

National Level



9,528 children under 18 died in road crashes, making up **5.7%** of total road fatalities in India.

Male deaths rose by 23.4% (from 6,137 in 2021 to 7,576 in 2022), while female deaths increased by 20% (from 1,627 to 1,952).

Tamil Nadu remains among the top states for road crash incidents involving children.

Crashes in Chennai

During the five years period, there were **22,597 crashes** resulting in **3,699 fatalities**

6,422 (28%) pedestrian crashes were recorded, of which **447** crashes involved **children under 18 years of age**.

Child Pedestrian Crashes

6.5% of the total pedestrian accidents are **Child pedestrians** in Chennai

Child pedestrian defines, person who falls under the 0- 18 years and also defined as pedestrian in the accident register traffic department.

Source:

1. *Traffic wing, Chennai Commissioner office.*
2. *Accidental deaths & Suicides in India 2021, National Crime Records Bureau Ministry of Home Affairs.*

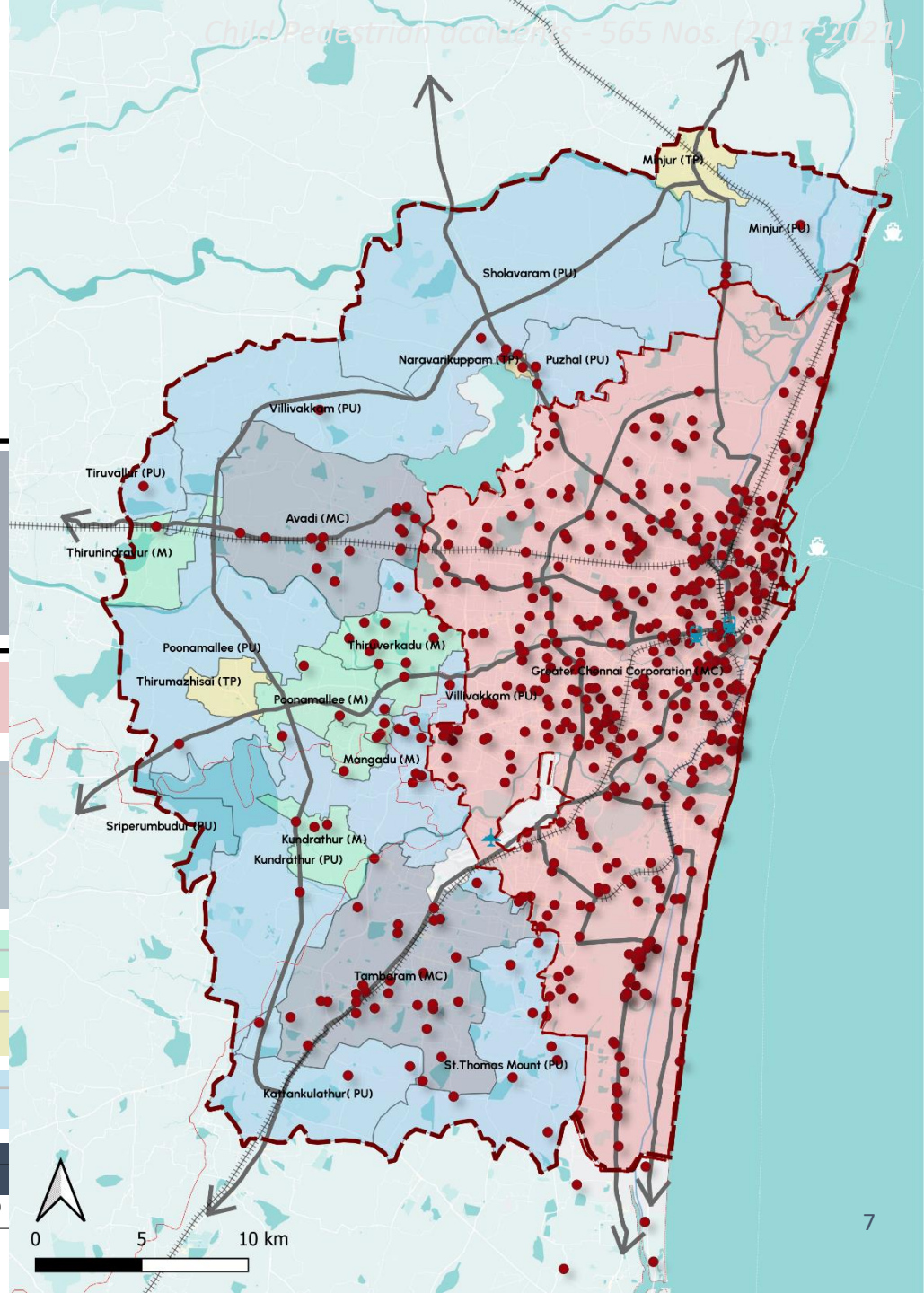
DATA: 2021

CMA ADMINISTRATIVE UNITS

79% of child pedestrian accidents occur within the **Greater Chennai Corporation** limit.

AREA	AREA (SQ.KM.)	Population 2021(in lakhs) as per Second Master plan projected population	Child Pedestrian Accident per lakhs	CHILD PEDESTRIAN ACCIDENTS (0 – 18 YEARS)	%
Greater Chennai Corporation	426	55.40	8	447	79.1 %
Municipal Corporations (Tambaram & Avadi)	152			47	8.3%
Municipalities	72			20	3%
Town Panchayats	18			1	0.1%
Panchayat Unions	519			39	7%
Total CMA	**1189**	**112**	**5**	**565**	**100%**

Source:
1. *Traffic wing, Chennai Commissioner office.*
2. *Second Master Plan (2006 – 2026), Chennai Metropolitan Area.*



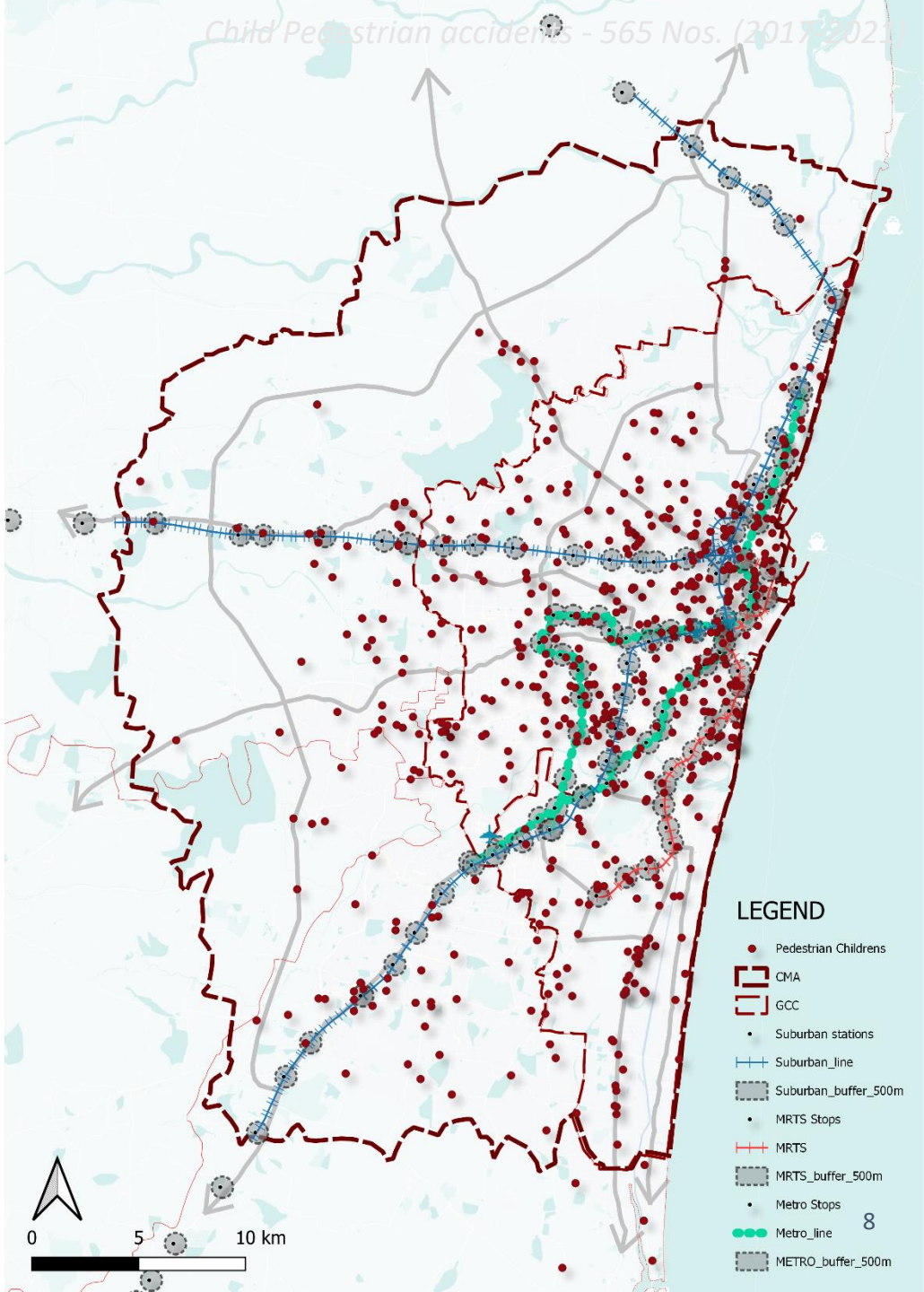
PUBLIC TRANSIT STATIONS

22.5% of child accidents occurred within 500 meters vicinity of **Public transit Stations**

10% within the vicinity of 500 meters vicinity of **Metro Stations**

TRANSIT NETWORK	CHILD PEDESTRIAN ACCIDENTS (0 – 18 YEARS)	PERCENTAGE %
Suburban Rail		
In the 250m vicinity	9	**1.6%**
In the 500m vicinity	42	**7.4%**
MRTS		
In the 250m vicinity	9	**1.6%**
In the 500m vicinity	28	**5%**
Metro		
In the 250m vicinity	17	**3%**
In the 500m vicinity	54	**10%**

Source:
1. *Traffic wing, Chennai Commissioner office,*
2. *Open Street Map.*



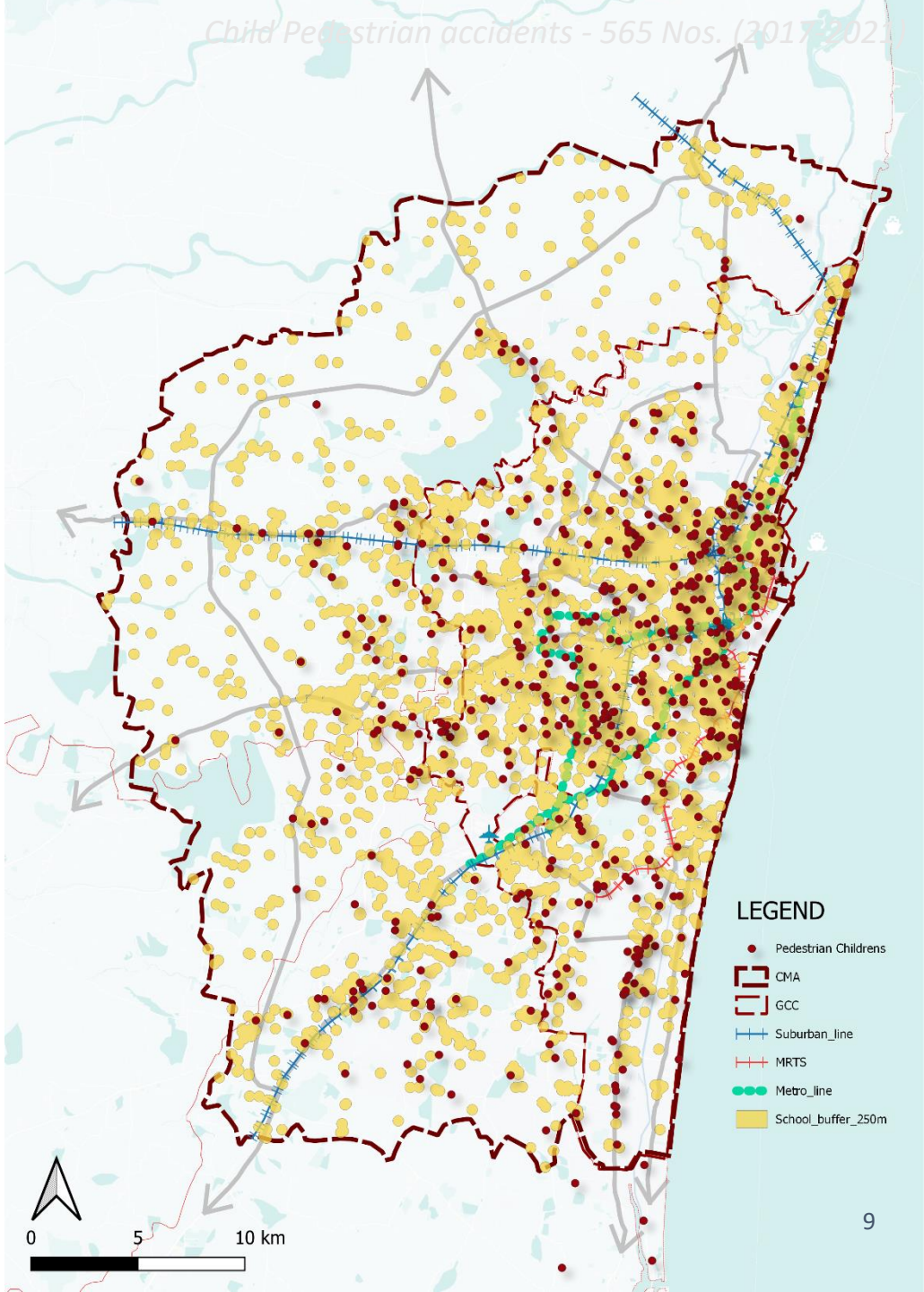
SCHOOL ZONE CRITICALITY

70% of accidents occurred within 250 meters vicinity of **Schools.**

25% within the vicinity of 100 meters vicinity of **Schools.**

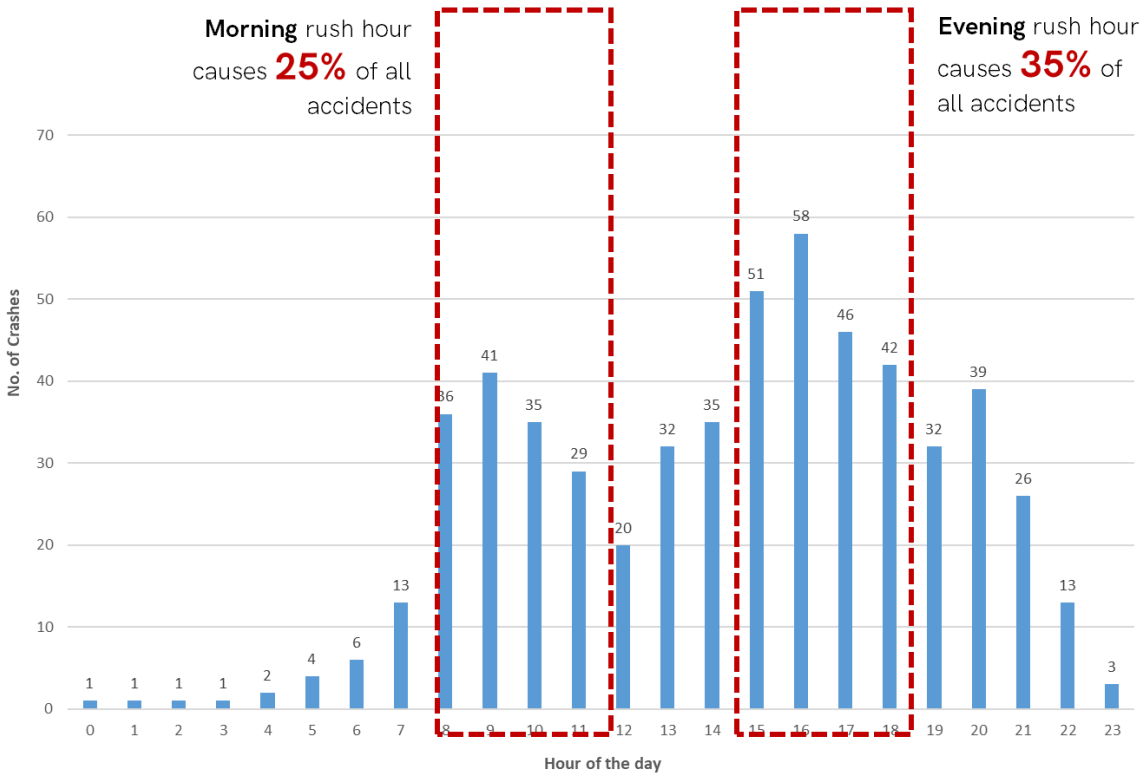
Area	CHILD PEDESTRIAN ACCIDENTS (0 – 18 YEARS)	PERCENTAGE %
Schools		
In the 100m vicinity	139	**25%**
In the 250m vicinity	391	**69.2%**

Source:
1. *Traffic wing, Chennai Commissioner office.*
2. *Tamil Nadu GIS Portal.*



TIME OF OCCURRENCE

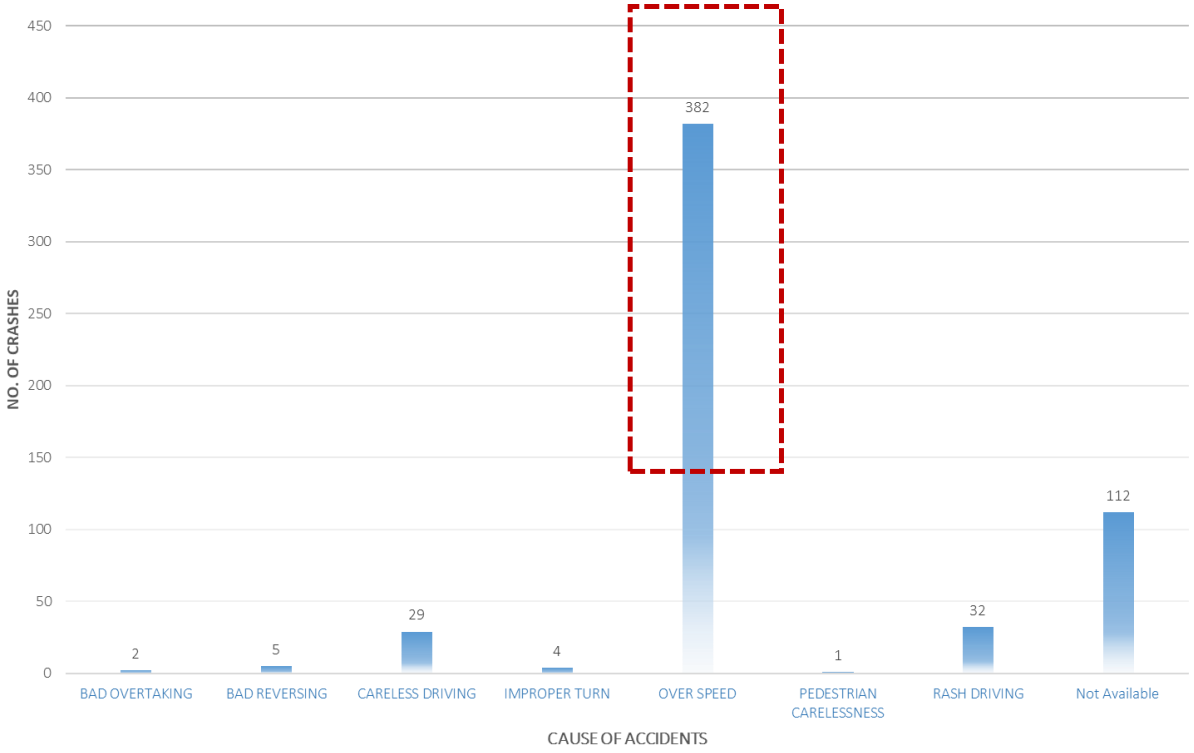
60% of all accidents occurred during **peak congestion time** for **School Commute**



Source:
1. Traffic wing, Chennai Commissioner office,

CAUSE OF ACCIDENT

67% of all accidents caused by **Over speeding**



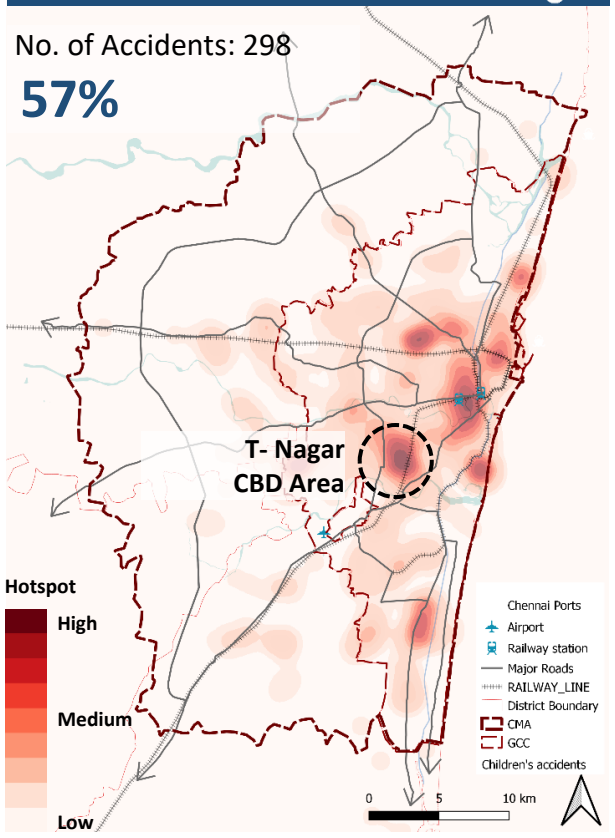
SPATIAL DISTRIBUTION PATTERN

According to observations, T-Nagar and George Town are critical areas for two-wheeler accidents involving child pedestrians, likely due to the high concentration of schools in those areas. The Tambaram South West Gateway of the city has also witnessed many child pedestrian accidents, particularly due to bus-related incidents. In the Old Town area, the maximum number of pedestrian accidents involving autos has been reported.

Accusing : Two-wheeler Victim : Pedestrian

No. of Accidents: 298

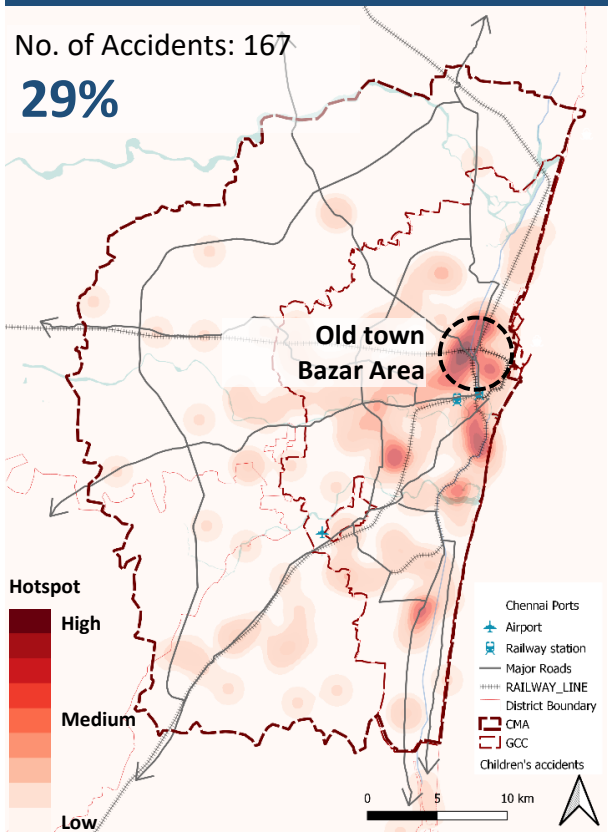
57%



Accusing : Car Victim : Pedestrian

No. of Accidents: 167

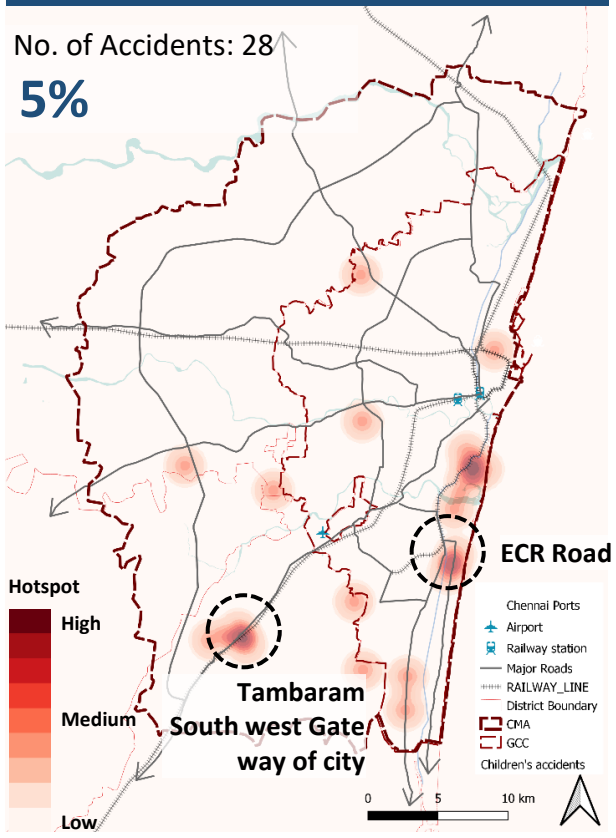
29%



Accusing : Bus Victim : Pedestrian

No. of Accidents: 28

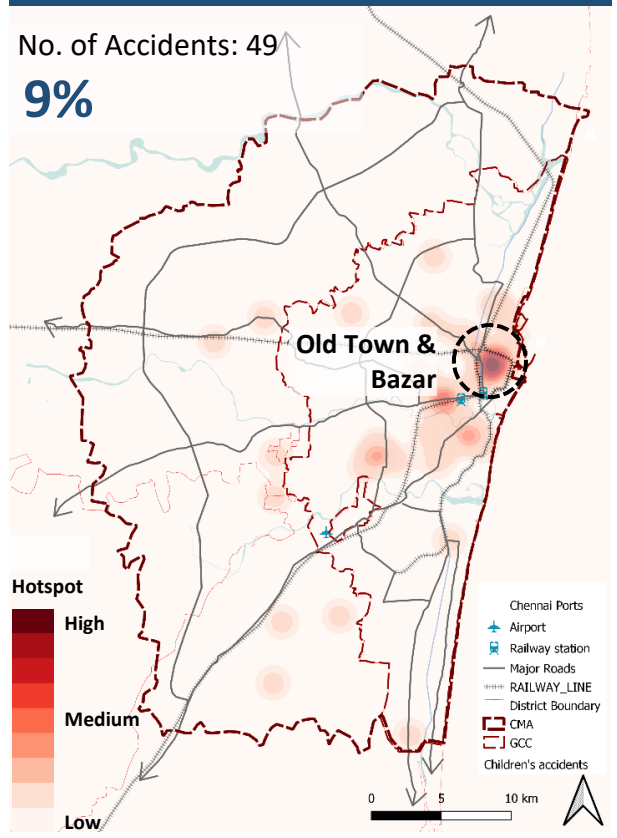
5%



Accusing : Auto Victim : Pedestrian

No. of Accidents: 49

9%

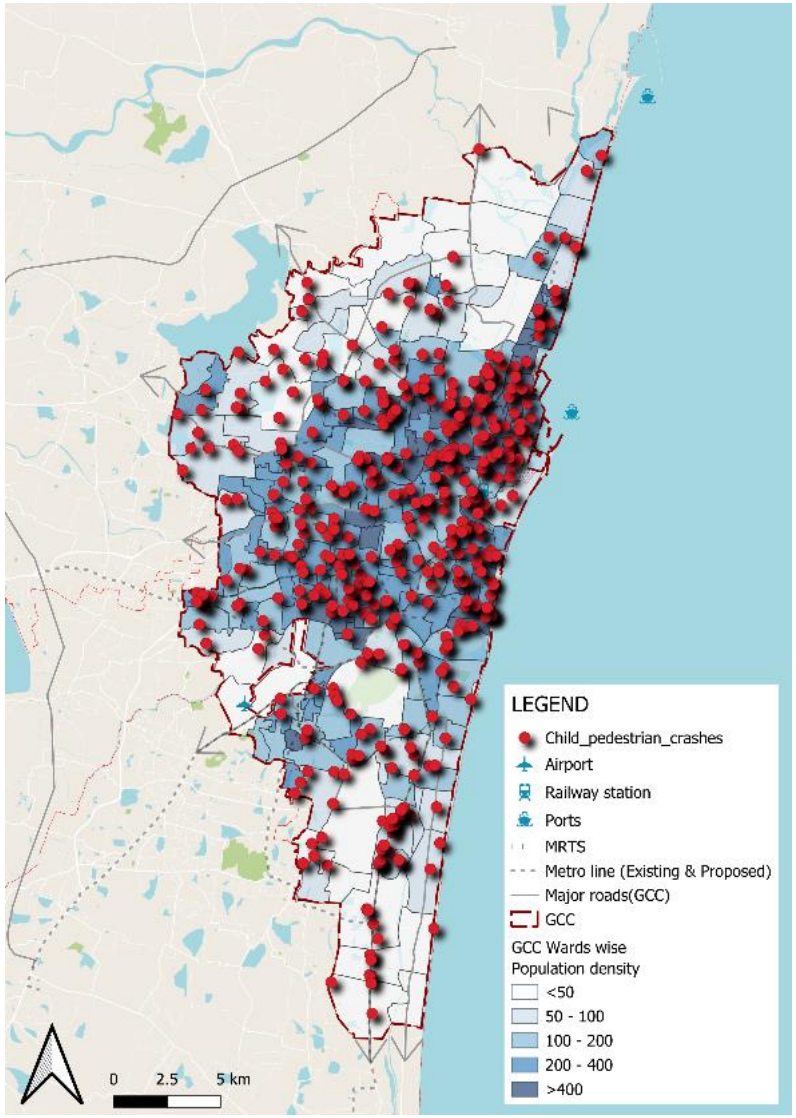


Source:

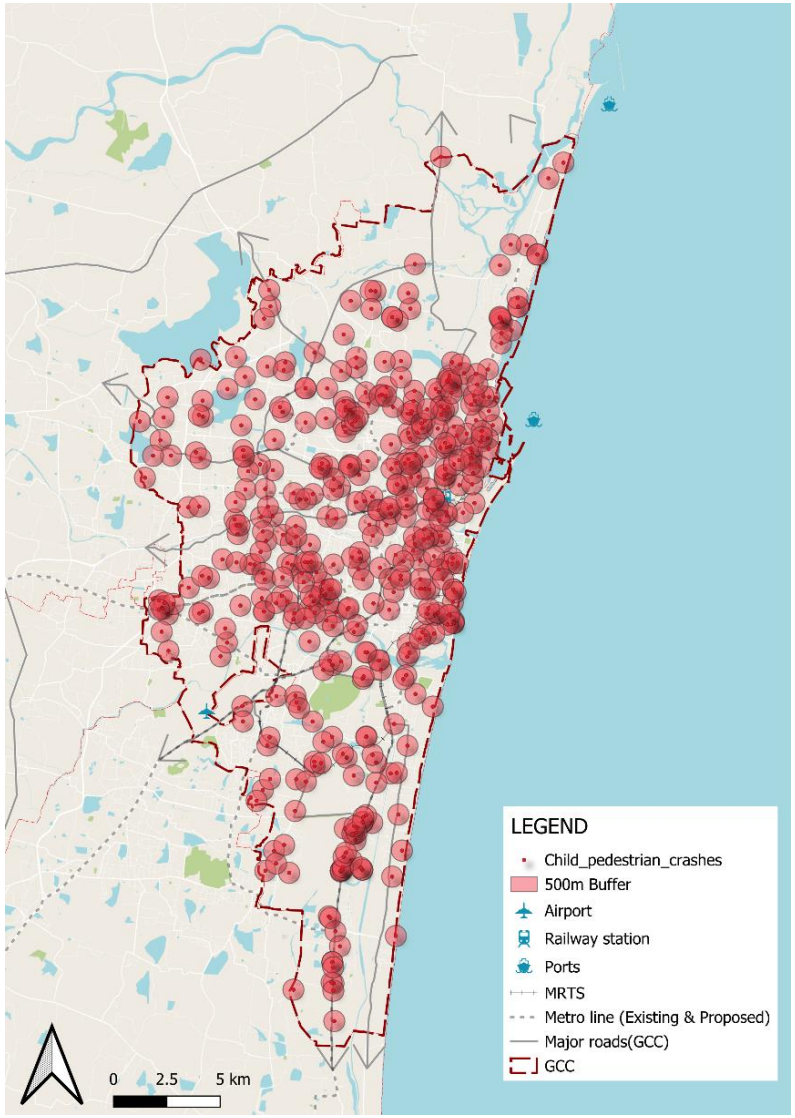
1. Traffic wing, Chennai Commissioner office.

Proximity Analysis

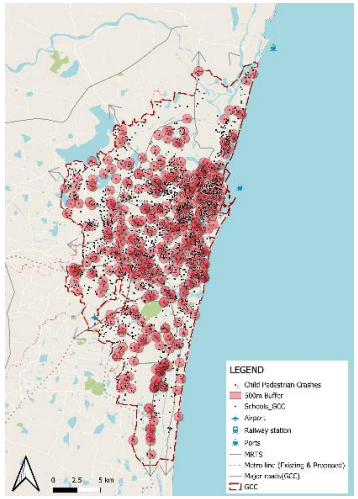
Considering population density



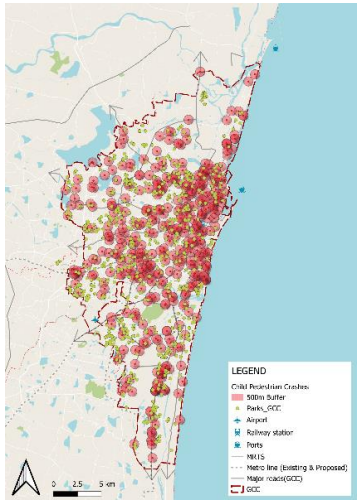
500m Buffer of Child pedestrian



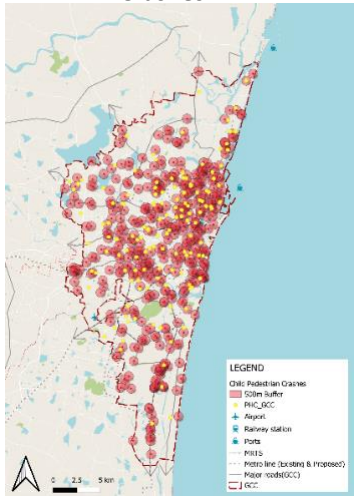
Schools near Crashes



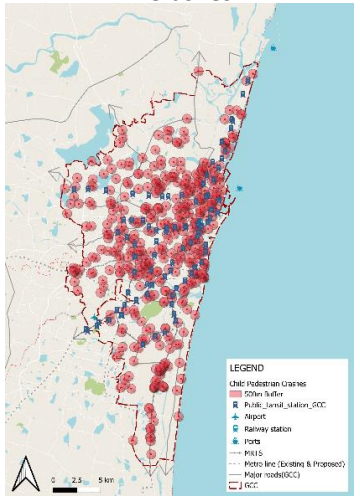
Parks near Crashes



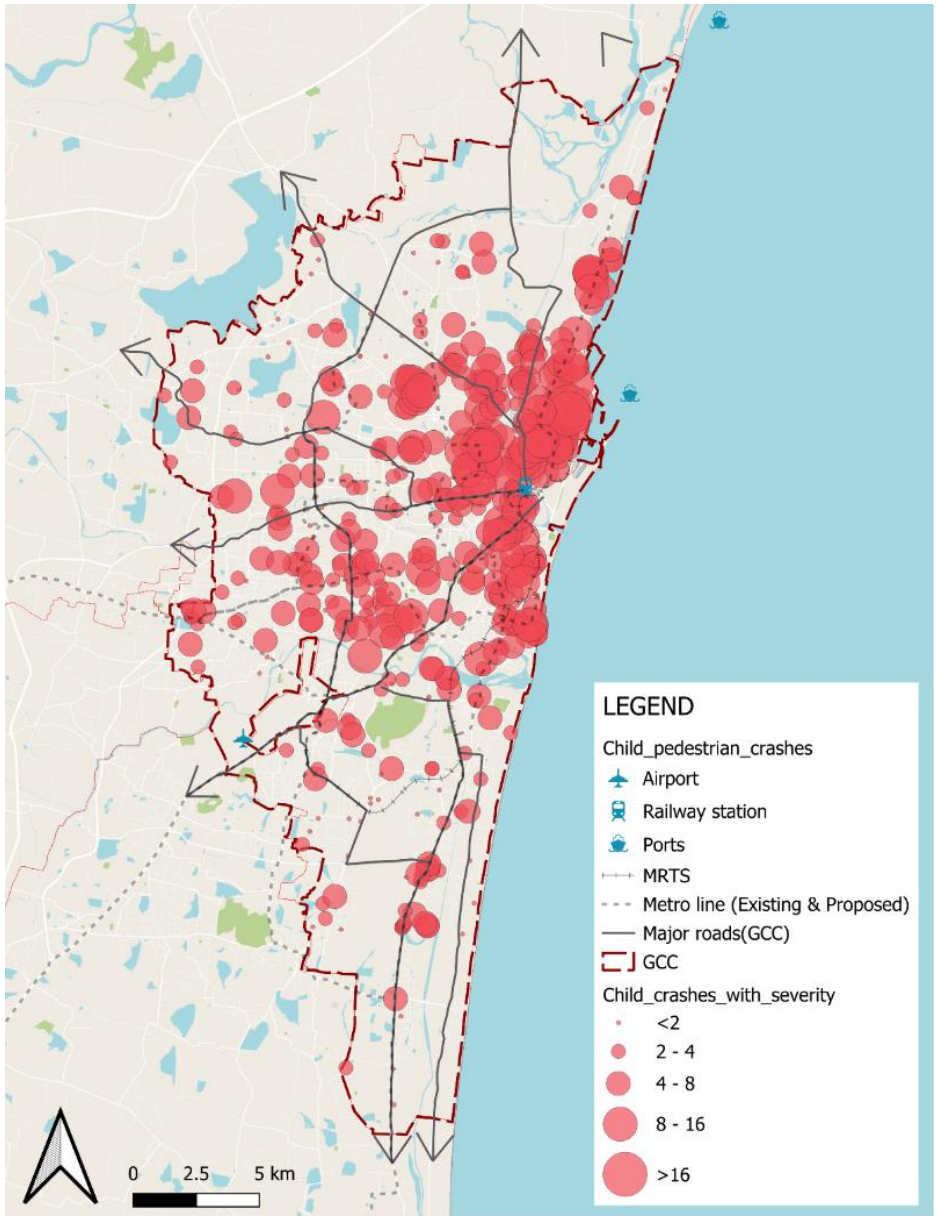
Primary Health Centre near Crashes



Public transit station near Crashes



Findings and Discussion



Key Findings: Child Pedestrian Crashes in Chennai

- **High-Risk Areas**: Densely populated neighborhoods (T. Nagar, Anna Nagar, Adyar).
- **Crash Hotspots**: Near schools, transit stations (Nungambakkam, Guindy), parks (Besant Nagar, Marina Beach).
- **Crash Proximity**: 250 meters from schools and transit hubs had the most accidents.

Urban Planning Implications

- **Traffic Calming**: Priority for school zones and transit hubs.
- **Safety Measures**: Child-safe zones, improved signage, crossings, speed limits.
- **Data-Driven Approach**: Spatial analysis can inform urban planning to enhance pedestrian safety.

Actionable Recommendations

- Implement pedestrian safety infrastructure near major schools and metro stations.
- Use regionally relevant datasets to guide interventions and reduce accidents.