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Infrastructure Planning for TOD Zone of Chikkabanawara of Sub-urban Station, Bengaluru

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Abstract: One of Karnataka, India's cities with the fastest population growth is Bengaluru. Inadequate walking and cycling infrastructure made people choose personal vehicles over sustainable transport options more often while the city focused on infrastructure to reduce traffic. By 2035, the Comprehensive Mobility Plan (CMP) Bengaluru (2020) seeks to expand public transportation's mode share from 42% to 70%. In order to reach this goal, it is crucial to guarantee that more people have easy access to public transport options in addition to increasing the mass transit infrastructure, as increased access to PT tends to encourage more people to utilise it rather than their own motorised vehicles. To this end, the city of Bengaluru has developed a Transit Oriented Development (TOD) policy. Walkability, Cyclability, Quality of Public Transport Infrastructure, Safety Infrastructure at Junctions, Quality of Intermediate Public Transport, and Public Amenities that Support the Uptake of Sustainable Mobility Modes are the parameters taken up as part of. The study region of Chikkabanawara is situated on the outskirts of the city of Bangalore and has the distinctive feature of greenfield development with prominence of educational institutions, commercial businesses, residential areas, and high-rise flats in the 500-meter buffer zone.

17.8 km of roads make up the Chikkabanawara study area's overall road network, with a ROW of 6–9 m on one-third of those roads. A ROW of 9–21 metres is present on all major roadways. Most roads have a carriageway of 3-6 metres. Only 6.08 kilometres of the 17.8 km overall road network are good for walks. The majority of the existing footpath network, which is made up of about half of them, is only 1-2 metres wide and is only found on major highways; internal roads are not equipped with footpaths. Out of the whole 6.09km footpath network that is now in place, there are only 1.47km of decent and usable footpaths. Especially on the major roadways, around one-third of the existing sidewalks are uneven and broken apart.

Keywords: TOD, Walkability and Non-motorized transport

I. INTRODUCTION TO PARAMETERS

the criteria used to establish a region for an infrastructure. Since NMT was the main topic, pertinent parameters were chosen to determine the current state of the chosen locations. The currently assigned infrastructure will serve as a general indicator of the station's current infrastructure quality.

A. Carriageway

The carriageway is the portion of the road that is open to automobile traffic. An asphalt, white-topped (concrete), or unmetalled (kutcha road) roadway surface are all options. This parameter takes into account the number of lanes, the flow direction, and the median widths.

B. Footpath Infrastructure

The presence of a distinct pedestrian path, whether it be a covered drain or paved paths, is referred to as footpath infrastructure. The parameter evaluates a continuous path's width, curb height, and condition and records problems with the walking surface, obstruction of the path by trees, protruding tree roots, etc., and discontinuous paths caused by property entrances and exits. Additionally, the criteria look for ramps and tactile pavement that permit universal accessibility.

C. Footpath Encroachment

Once the presence of footpath is established, the footpaths are further surveyed to check for any external disturbances in the form of construction debris, signages, street vendors, transformers etc., that obstructs a clear and continuous pathway.

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D. Junctions
Junctions are points of contact between different roads. Data pertaining to junctions, number of arms, level of control and surveillance are collected. Pedestrian crossings and availability of ramps are also examined to understand the walkability of the junction.

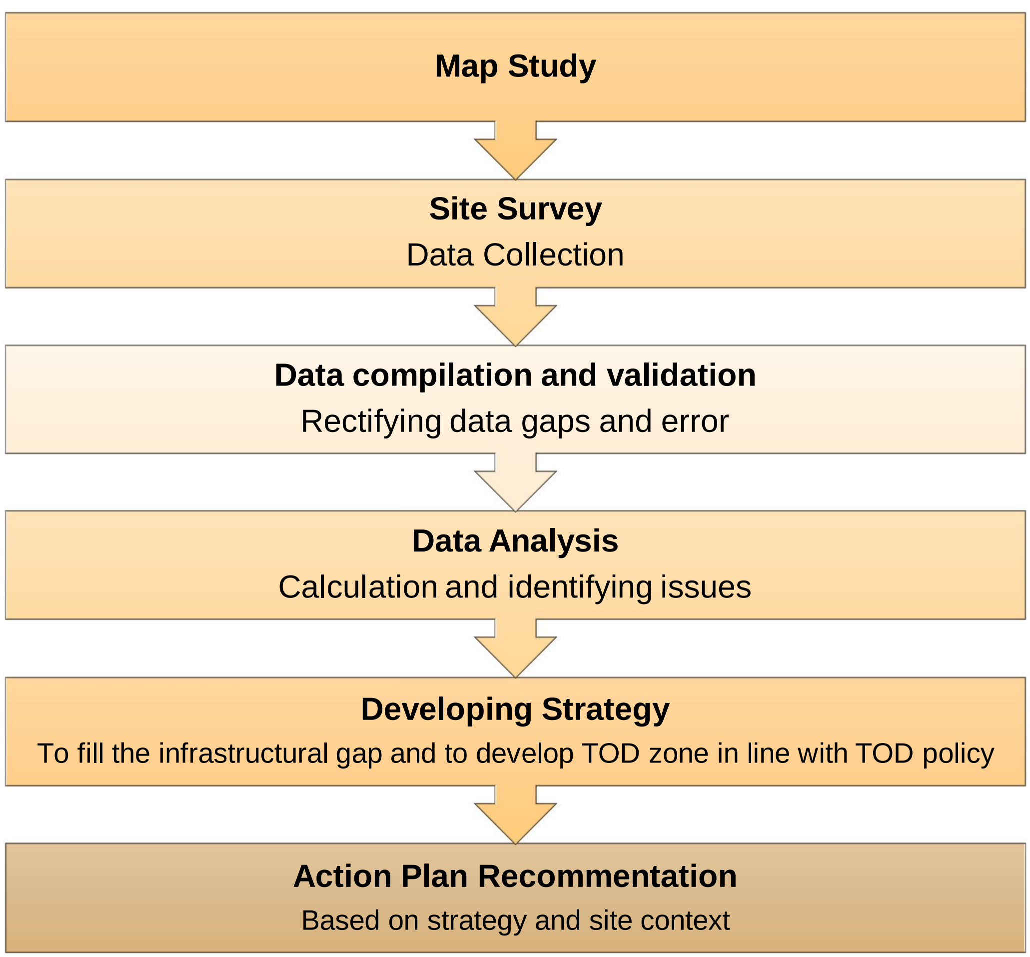
E. Amenities
Two amenities such as public toilets and dustbins are mapped and recorded for the entire demarcated area. The quality of services of public toilets and segregation of dry and wet solid waste in dustbins are also recorded.

F. Bus Stop
Bus stops in and around the TOD boundary are mapped which include details such as the availability of shelter, seating, signages, dustbins, adequate lighting, route information map etc.

II. AIM
To provide the accessibility of the transit stations by creating pedestrian and Non-motorized (NMT) friendly infrastructure to the sub-urban station of Banaswadi and Chikkabanawara.

III. OBJECTIVE
1) The enhances existing public transport systems by providing secure access to the public transport through walking & cycling.
2) To establish a dense road network within the area for safe and easy movement and connectivity of NMT and pedestrians between various uses as well as to transit stations.

IV. METHODOLOGY



A. Site Connectivity

The Yeshwanthpur Railway Station, the Majestic Railway Station, and the Airport are all 36 km, 10 km, and 16 km apart from the Chikkabanawara Railway Station, respectively. Despite having a rail connection to the Yeshwanthpur Railway Station, the Chikkabanawara station is not a significant stop for many passing regional trains. Dasarahalli Metro Station and Nagasandra Metro Station, which are both nearby and are located 4 km and 4.7 km apart, respectively, off from the site.

Many of the buildings in Chikkabanawara are institutional and residential, with access from the 12- to 15-meter-wide Hesarghatta main road. Trees provide shade for major roadways. The northern region of the location is where Chikkabanawara Lake is.

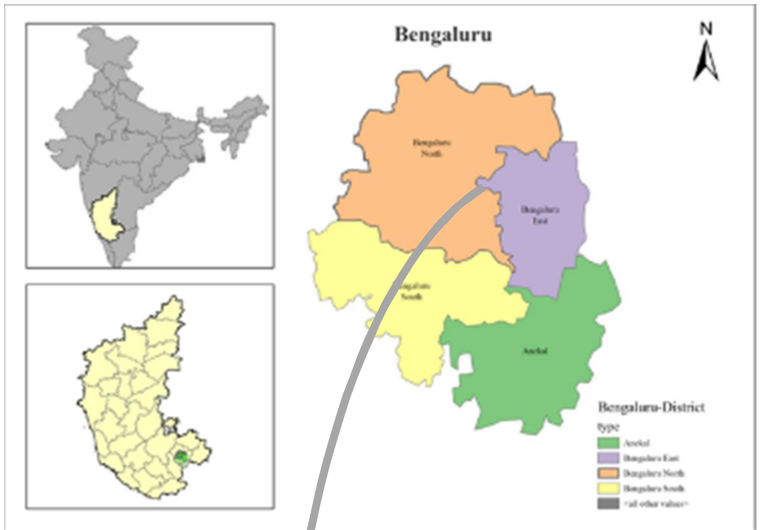


Figure 1:Bengaluru city map
Source: Author

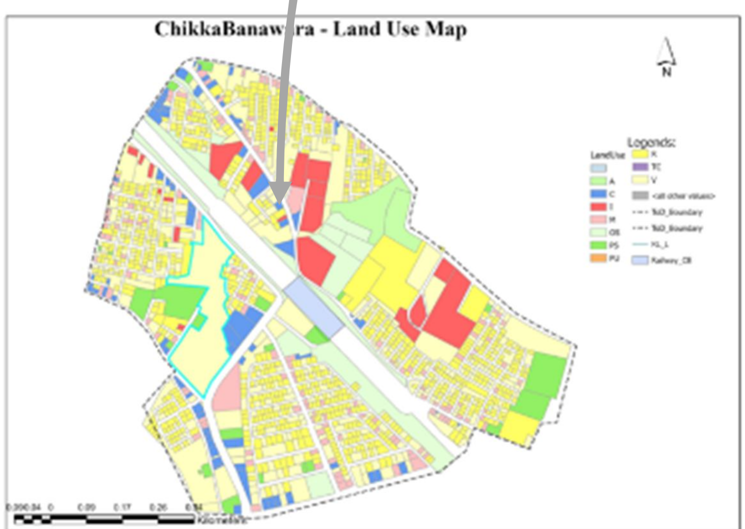


Figure 2:Chikkabanawara Land Use
Source: Author

V. DATA COLLECTION

A. Right of way (ROW)

The total length of the road network is 17.8km. The main roads have ROW in the range of 9-21m. The smaller ROWs of 3-6m width are majorly observed on the Northern side of the railway line. From the audit, it is evident that, around 33% of the total road network have ROW in the range of 6-9m.

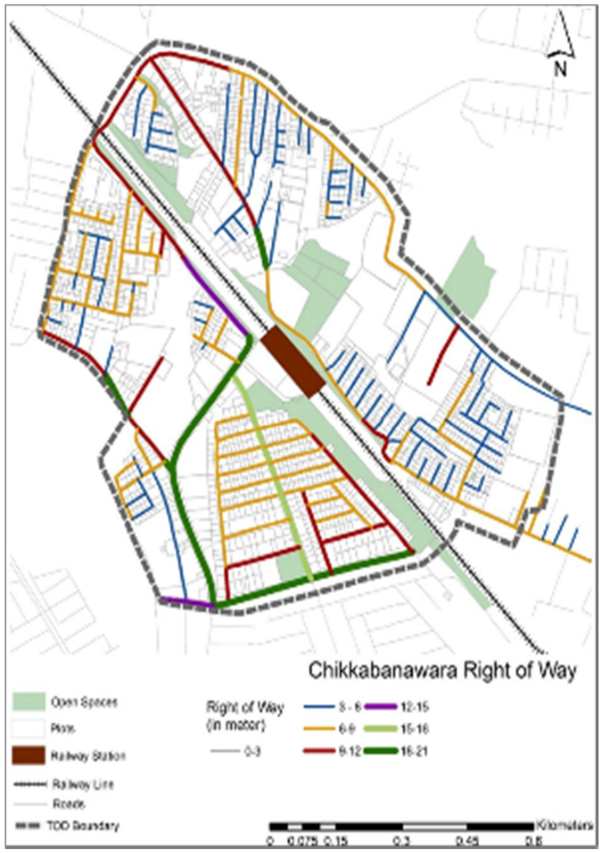


Figure 3: Chikkabanawara Right of Way map
Source: Author

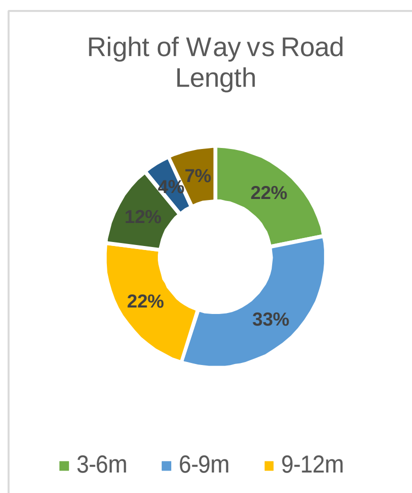


Figure 4: varying Right of Way width along the network
Source: Author

Figure 5: Right of Way width vs Road Length
Source: Author

B. Carriage Way

The total road network length is 17.8km. Out of which, 62% of the roads have carriage ways in the range of 3-6m, which coincides with the ROW of 6-9m. Distinct hierarchy of streets can be observed with respect to road widths.

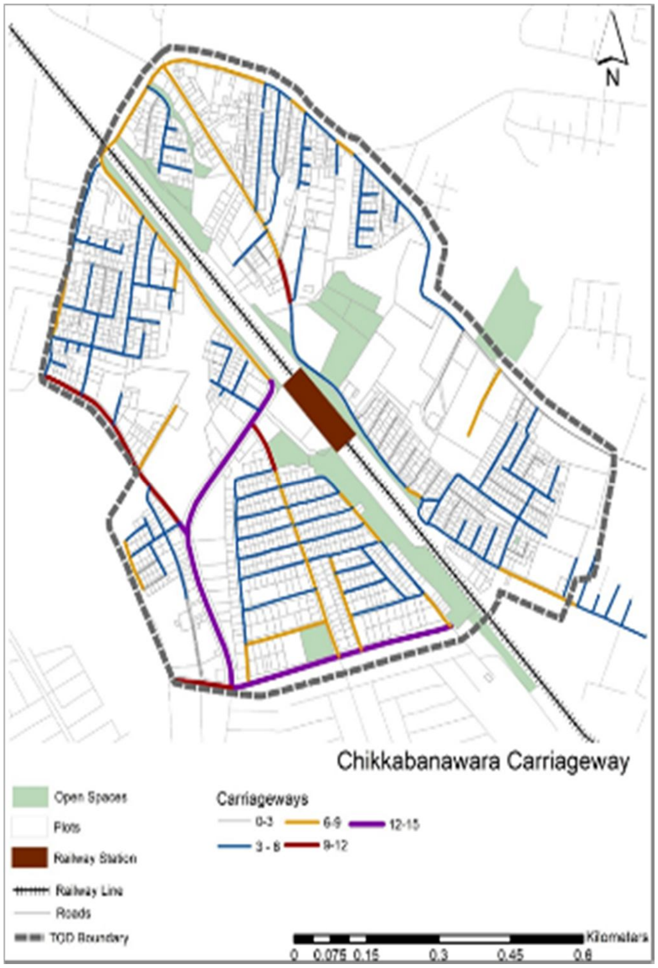


Figure 6: Chikkabanawara Carriageway Map
Source: Author

Figure 8: Herarghatta Main Road
Source: Author

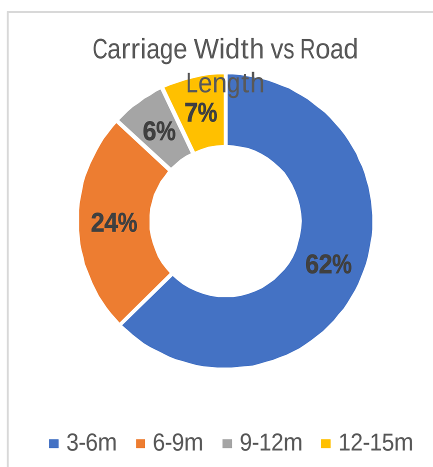


Figure 7:Carriageway Width vs Road length
Source: Author

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Volume 11 Issue V May 2023- Available at www.ijraset.com

C. Footpath

Widths 17% of the total roads have footpaths, which is about 6.09km. 48% of the footpaths have widths in the range of 1-2m. It is majorly seen on the main roads, while the internal roads lacked the presence of footpath.

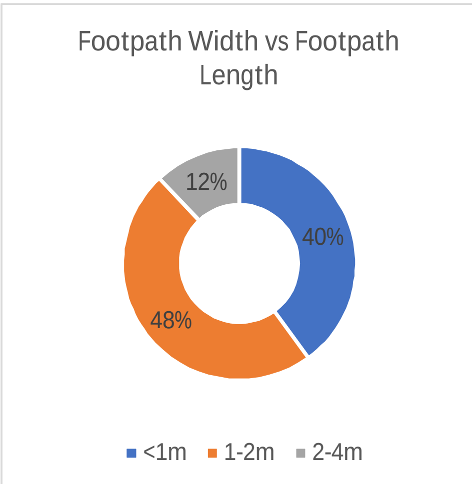

Figure 9:Footpath Width vs Footpath Length
Source: Author

Figure 10:Drain covering as <1m footpath
Source: Author

Figure 11:Chikkabanawara Footpath Width map
Source: Author

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D. Footpath Condition

The total length of good and useable footpath is 1.47km, out of 6.09 km total footpath length. 29% of the footpath length is discontinuous due to breaks for entry/exit of residential and commercial establishments. It is observed that majority of the footpaths along the main roads have uneven surfaces.

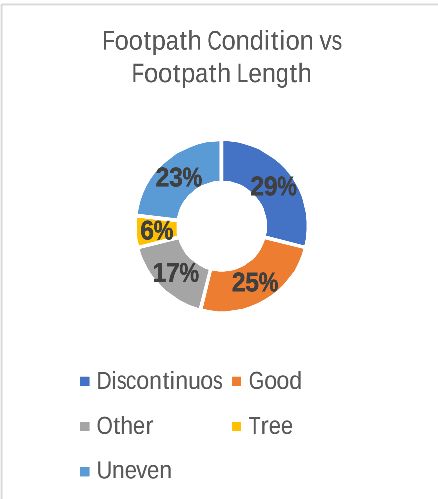

Figure 12; Footpath condition vs Length
Source: Author

Figure 13: Good & Useable footpath Condition
Source: Author

Figure 14: Chikkabanawara Footpath Condition map
Source: Author

E. Footpath Encroachment

The total length of footpath encroachment is 1.21km, which is 25% of the total footpath length. Vehicular parking constitutes to 40% of the total footpath encroachment. A majority of the encroachments are on the Southern side of the Railway line.

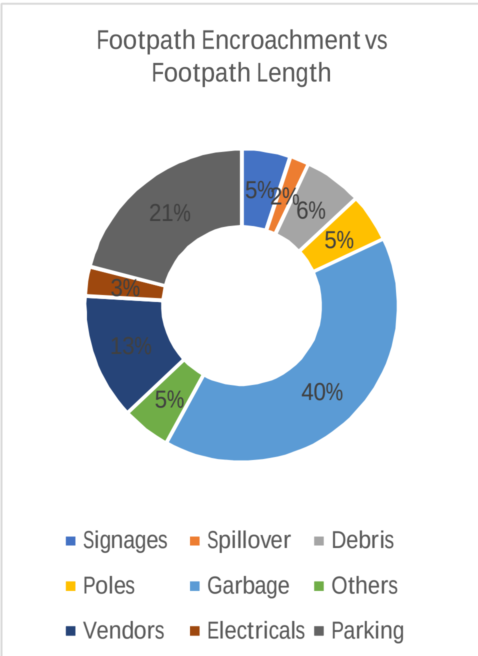

Figure 16:Footpath Encroachment vs Length
Source: Author

Figure 15: Vending shops of encroachment footpath
Source: Author

Figure 17: Chikkabanawara Footpath Encroachment map
Source: Author

F. Junctions

There are three major junctions in Chikkabanawara. The Sapthagiri junction in the south is a three-arm junction which also has a private road leading to Sapthagiri Medical College and hospital. Jana Priya junction is three-armed, one of which leads to the railway station and Sathe Beedi is a 5-armed junction. Although the Sapthagiri junction and Sathe Beedi junction are signalized, both of them are not functional.

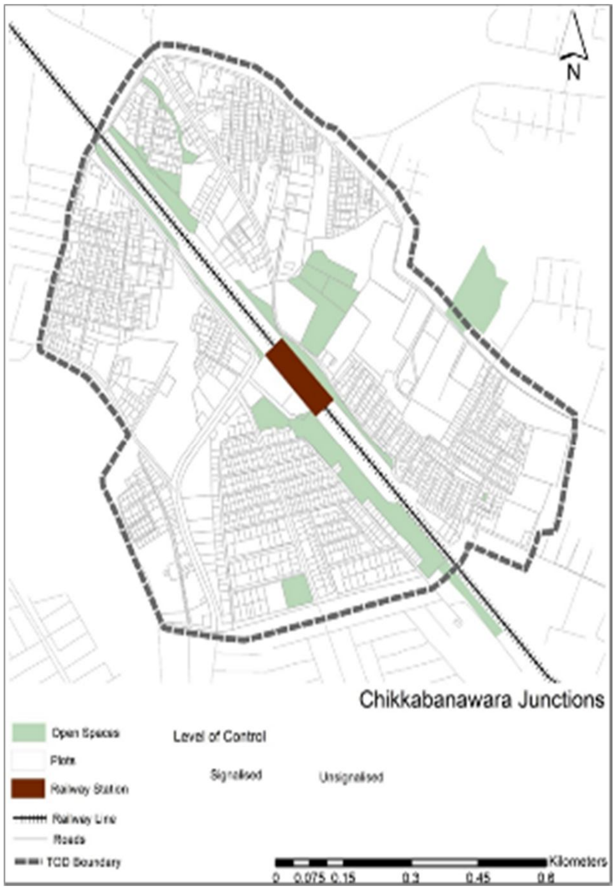

Figure 18:Chikkabanawara junction location map
Source: Author

Figure 20: Sapthagiri junction
Source: Author

Figure 19: Sentha beedi junction
Source: Author

G. Pedestrian Crossings

All the junctions are unsafe for pedestrians due to poor pedestrian crossing facilities. The zebra crossing in Sathe Beedi junction is interrupted by the median. The foot over bridge present inside the Railway station is a connectivity between the southern and northern side of the railway line.

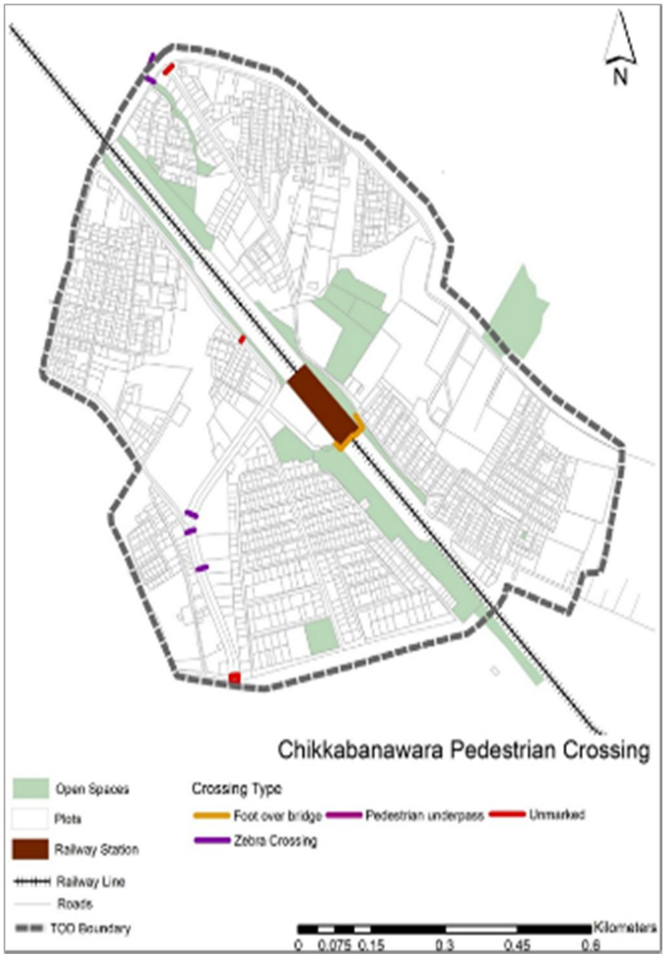

Figure 21: pedestrian crossing
Source: Author

Figure 23: Santhe beedi discontinuous zebra crossing
Source: Author

Figure 22: Foot over bridge in railway junction
Source: Author

VI. CONCLUSION

With regard to road widths, a distinct hierarchy of streets is seen. Only 66% (14.5km of 21.9km) of the network's overall length is covered by footpaths. 70% of the footpaths—10.1 km of the 14.5 km—are encroached, with parking making up the majority. The pedestrian network, which includes walkways and crossings, is unfinished and disjointed, particularly at intersections. Poor facilities for pedestrians are indicated by the absence of amenities like public restrooms, trash cans, and benches. At bus stops, there is a lack of cover, signage, benches, and lighting.

Figure 25: Discontinuous footpath
Source: Author

Figure 24: Garbage dump on footpaths
Source: Author

Figure 26:Incomplete Pedestrian Network
Source: Author

VII. STRATEGIES

1) Creating an accessible and integrated transit infrastructure integrating and layering the sub-urban station with other public transport options to create a network for sustainable mobility.
2) Preparing for busy streets constructing a network of bicycle and pedestrian paths in the central area of the TOD that will improve the condition of the streets and provide a strong, universally accessible link between the demand zones and the sub-urban stations.
3) Improving security and safety through junction design, lighting, and readable wayfinding signs, among other things. By using safe junction designs, well-lit streets, and readable wayfinding signage, we can create a safe and secure infrastructure for pedestrians.

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VIII. PROPOSAL ON LEGENDS

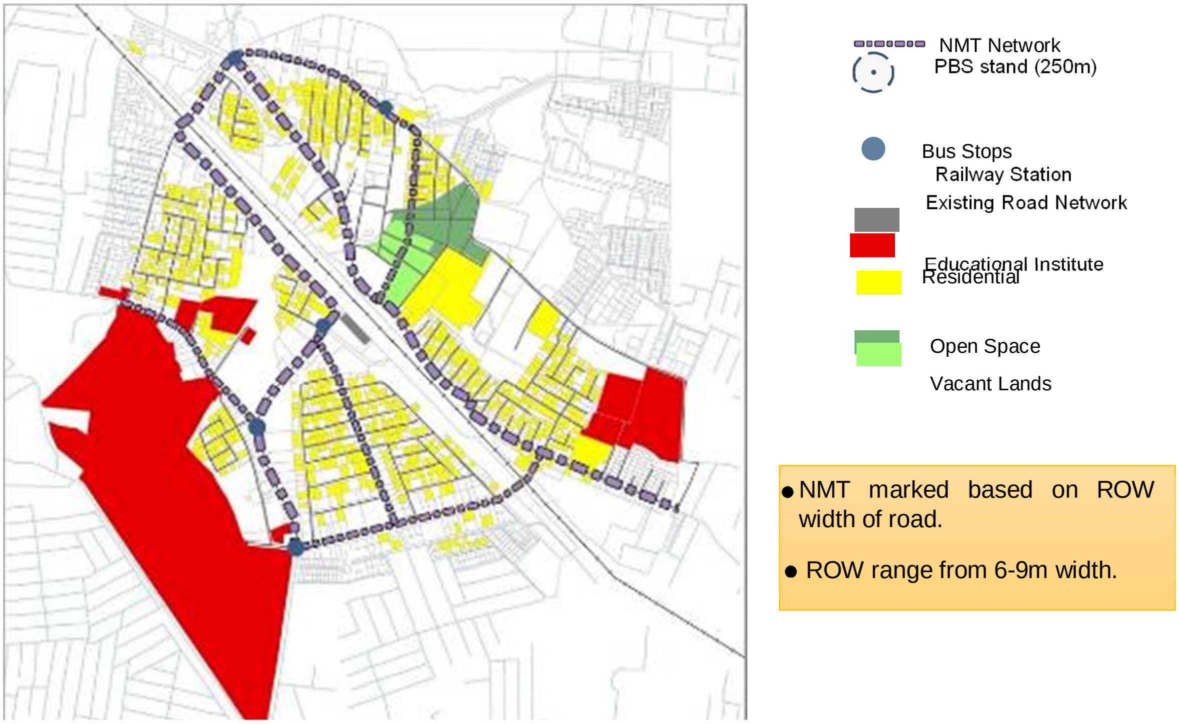

Figure 27: NMT network is proposed to connect the PT stops, residentials areas and educational institutions with the sub-urban station.
Source: Author

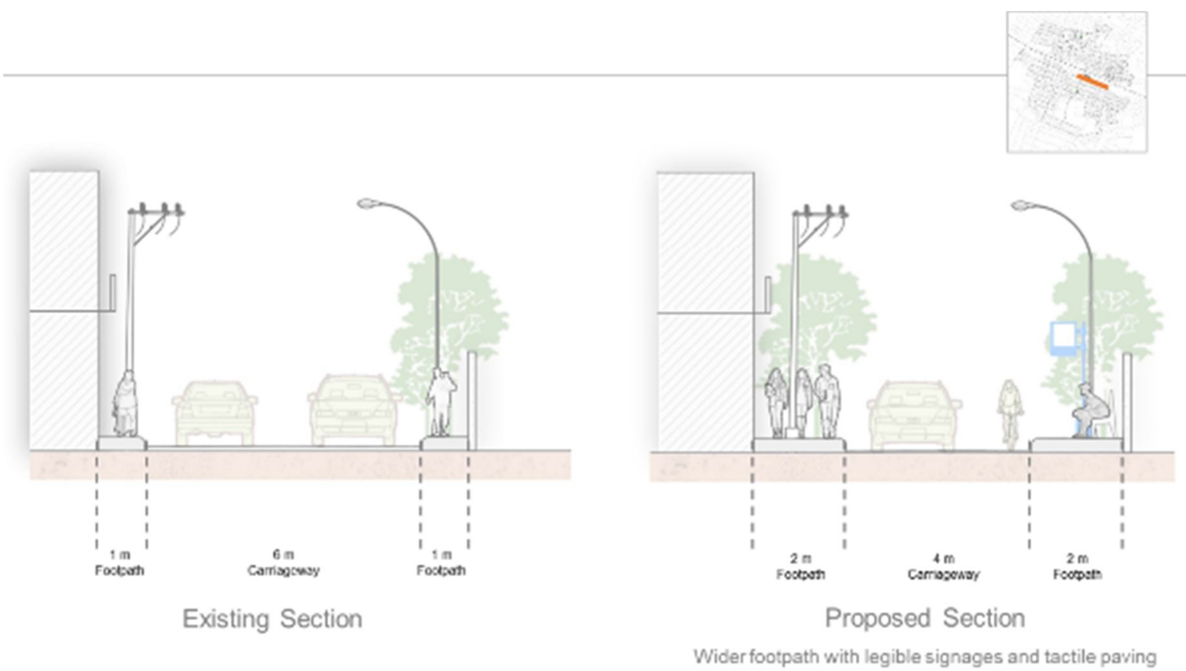

Figure 28: Cross section of Hesaraghatta Main Road near Sapthagiri Junction.
Source: Author

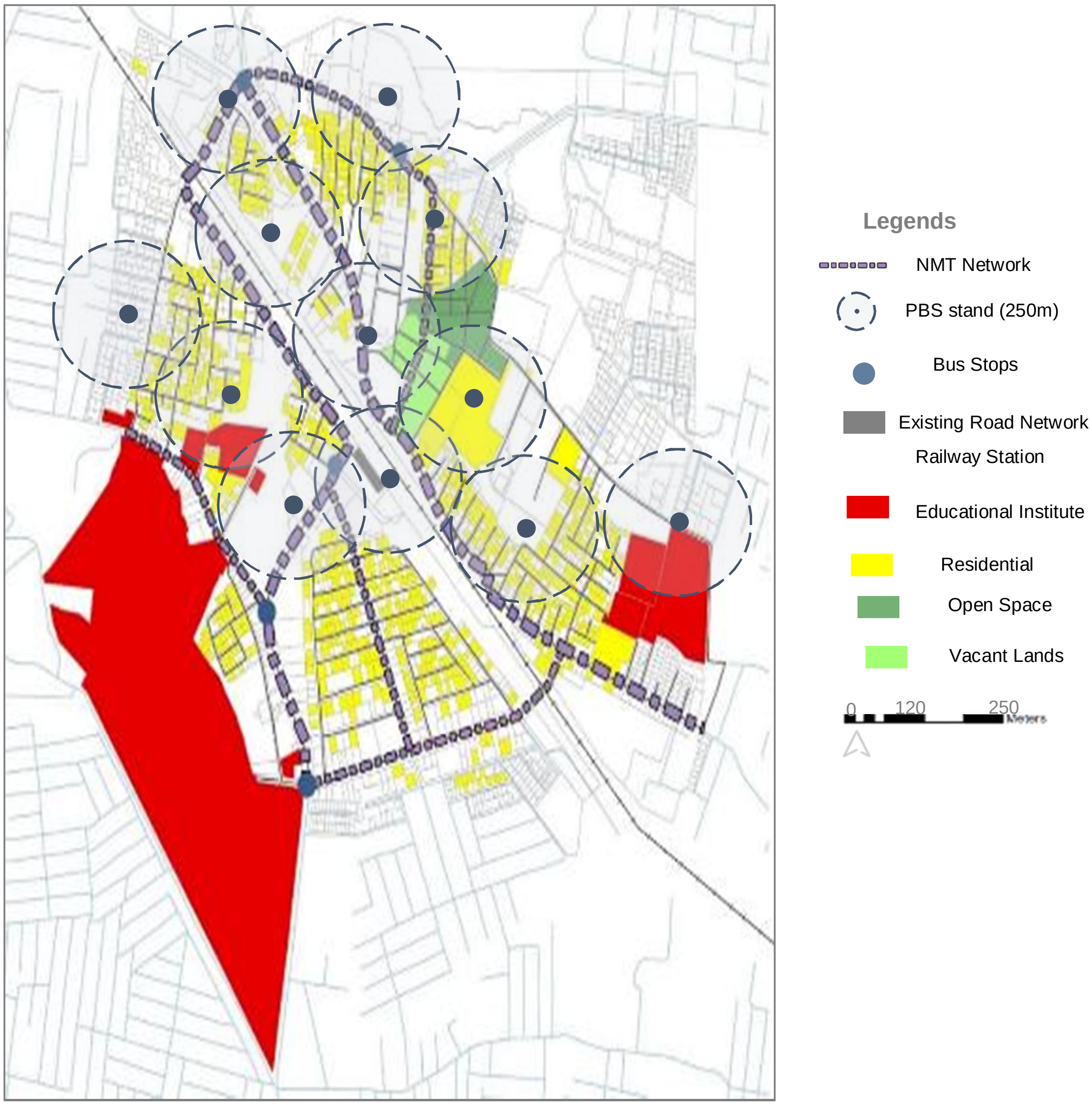

Figure 29:Chikkabanawara – Proposed NMT Network.
Source: Author

Figure 31:Chikkabanawara – Station Road Design (Existing Plan).
Source: Author

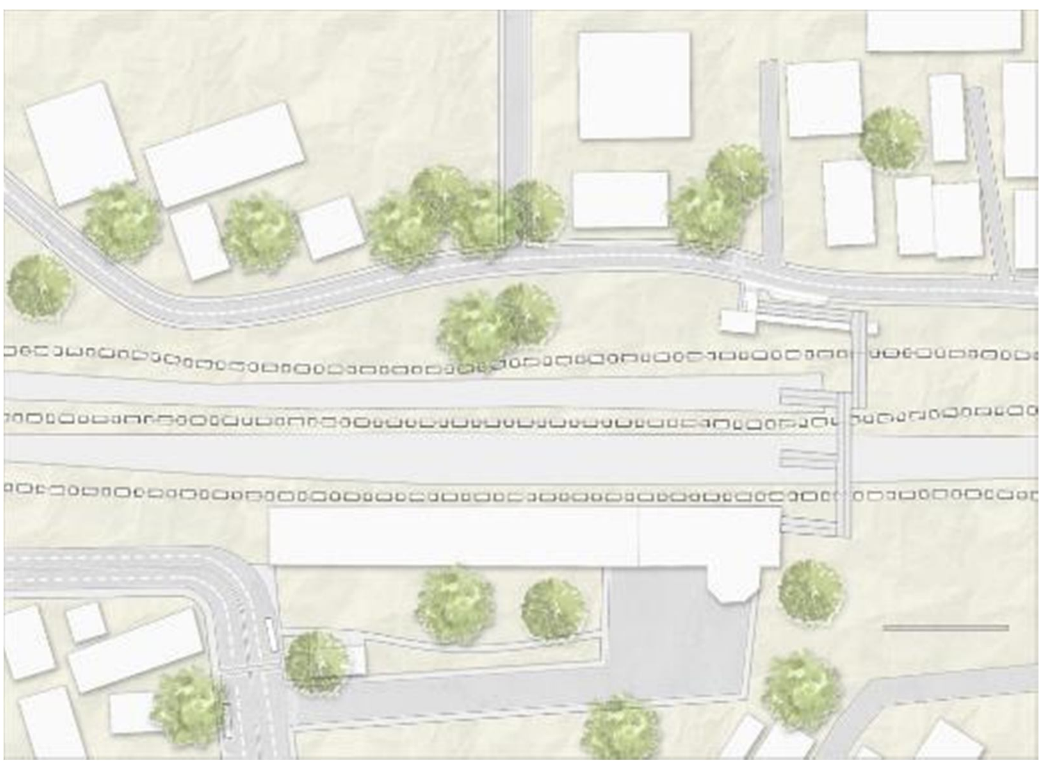

Figure 30:Chikkabanawara – Station Road Design (Proposed Plan).
Source: Author

Figure 32:Existing Condition of Janapriya Junction.
Source: Author

Figure 33: Proposed Janapriya Junction.
Source: Author

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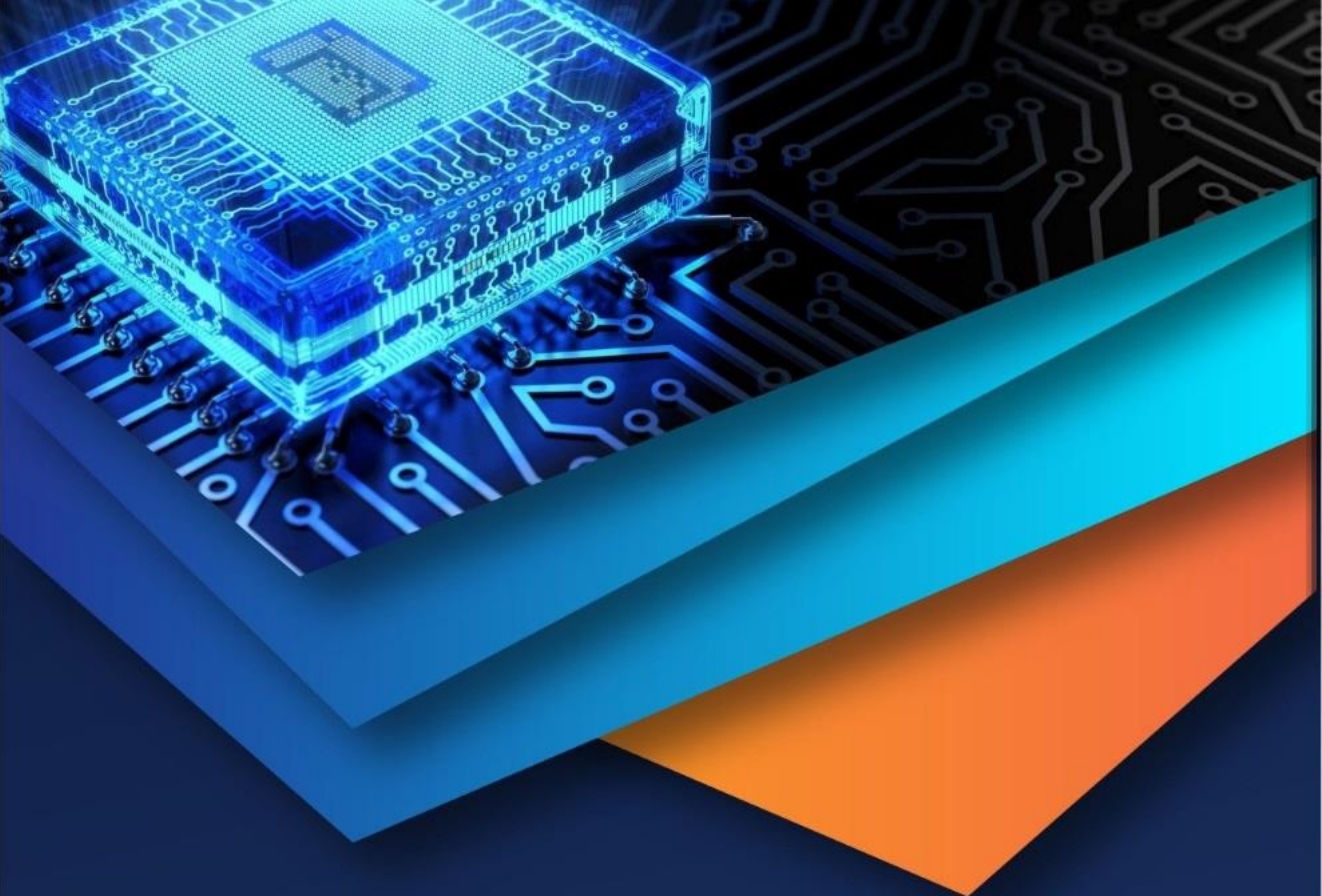

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