

## A Conjoint Analysis of the Design Irregularities and Public Realms of a National Highway in Bangalore

Varuna M. \*, Rajesh Gopinath \*\*, and Fathima Samana S. \*\*\*

\*Assistant Professor, Dept. of Civil Engineering, R.V. College of Engineering, Bangalore 56.

\*\* Assistant Professor, Dept. of Civil Engineering, Acharya Institute of Technology, Bangalore 107.

\*\*\*Assistant Professor, Acharya's N.R.V. School of Architecture, Bangalore 107.

### ABSTRACT

A 40m stretch along National Highway (NH4) is considered, which is located on either side of an unmanned exit from Yeswanthpur Railway station. This stretch of pedestrian walkway was extremely congested, with an average pedestrian count of about 4000/hour. This also led to pedestrian spillover and jaywalkers on the main carriageway. The absence of guardrails and the encroachment of footpath by street-hawkers aggravated the problem. Hence, the disruption of smooth pedestrian movement raises the accident rate and causes traffic delays. The width of the existing footpath is only 1.2m, while the ideal width should have been at least 4m, as per standards. A high blank wall, demarcating the station and footpath, aggravated the persisting problem, by cutting the possible visual connection between them. This stimulated the abuse of the walkway by pedestrians. The dilapidated walkway and the unaltered footpath width continue to be a distress, with the level of service being 'F'. The remedial measures must incorporate proper design of walkways, ensuring transparency and fenestrations in the barricades, to establish a visual access between them, and thereby enhancing the urban public realm of 'seeing' and 'being seen'.

**Keywords** - Walkway, pedestrian, urban, jaywalkers, transparency.

### I. INTRODUCTION

With the advent of urbanisation, Bangalore has witnessed an exponential rise in its population, due to its natural growth and influx of migrants for better opportunities. Globalisation and industrialisation have been the driving forces behind the changing landscape of Bangalore city. One such feature, which is being impacted due to rising urbanisation, is the pedestrian walkway (footpath).

### II. CURRENT STUDY

The study analyses the pedestrian walkway with respect to design factors and public realm in the current urban scenario. Primarily, the land-use pattern was studied to comprehend

potential and frequent users. Then, the footpath was analysed for its design characteristics. This was accompanied by a 10 hour survey to determine the pedestrian count, further followed by a 24 hour survey to ascertain the traffic volume. Public realm studies were later carried out to infer its possible influence.

### III. LAND-USE ANALYSIS

The study has been carried out at a walkway in one of the most congested and developed area – Yeswanthpur (figure 1) in Bangalore West, where NH4, connecting Mumbai and Bangalore passes alongside. While the area to the west of the walkway encompasses Yeswanthpur Railway station (figure 2) and residential outgrowth, the eastern side comprises of Peenya Industrial Area.

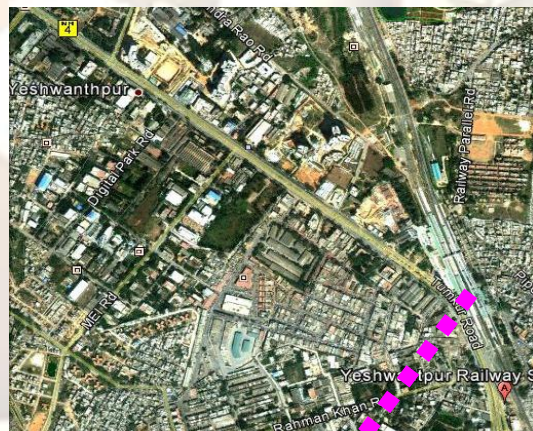


Fig. 1: Bird-View of Yeswanthpur.



Fig. 2: Bird-View of Stretch under Scanner.

#### IV. SITE CHARACTERISTICS

The study basically visualizes 40m of the walkway adjacent to an unmanned exit (figure 3) from the Yeshwanthpur Railway station. The visual access from the walkway to the rail terminal is interrupted by a large blank wall. The walkway also comprises of fruit vendors and other street hawkers, luring the potential customers entering and leaving the railway station.

The survey confirmed that the walkway did not comply with the IRC standards, as its width was only about 1.2m (figure 4) and also lacked guardrails, compulsory requisite for all National Highways. The level of service for the walkway was found to be 'F', which is the lowest rating, as per Highway Capacity Manual (HCM) 2010. The stretch parallel to the walkway also houses a petrol bunk, an auto-rickshaw stand and an unsheltered bus-stop, adding to larger agglomeration of public. Under the current circumstances, with less width and high pedestrian density, people often tend to walk on the road to save time and avoid collisions with other people, sharing the same space. This causes pedestrian spillover onto the main carriageway.



Fig. 3: The unmanned exit from railway station.



Fig. 4: The walkway under investigation.

#### V. PEDESTRIAN AND TRAFFIC ANALYSIS

As an intercity rail transit terminal, the area is a major hub for people of all ages, classes and occupations. In the survey conducted between 8:30AM–6:30PM on a weekday, the walkway was found to be extremely congested with a maximum pedestrian count of about 4000, and the pedestrian walking speed reduced to as low as 0.54m/sec during the peak hours. Even the space occupied by the pedestrians dwindled from 0.18 to 0.08 m<sup>2</sup>/person, forcing spillover and jaywalkers (figure 5) with a disturbing hourly average pedestrian flow of 26. The high frequency in usage may be attributed to the fact, that apart from the railway station, people from the surrounding residential and industrial sectors also used the stretch to board and alight from the buses. The pedestrian density was found to vary from 5.3 to 11.42 person/m<sup>2</sup>, around the peak hours.



Fig. 5: Traffic Disruption by pedestrians.



Fig. 6: Heavy traffic volume.

The width of the two-lane carriageway was found to be 7m with the maximum users being motor-bikes, followed by cars. The traffic volume (figure 6) along the walkway was found to be 38,498 alongside a disturbing hourly average pedestrian flow of 26. As there was no provision of zebra-crossing and median, the unruly crossing speed of pedestrians was found to be around 1m/sec, thereby interfering with the smooth flow of traffic, leading to delays.

For every 1 minute, the vehicles were found to be delayed by an average of 5 seconds, thereby aggravating noise levels and vehicle operating cost.

#### VI. PUBLIC REALM ANALYSIS

To aggravate the persisting problem of jaywalkers and high pedestrian density, the high blank wall demarcating the railway station and footpath, cuts the possible visual connection between the two, stimulating the abuse of the walkways by pedestrians and its encroachment by street hawkers (figure 7). As the other side is not visible, due to the presence of a huge wall along the footpath, the commuters or pedestrians tend to blemish the walkway (figure 8), by disposing garbage, spitting & urinating. Thereby, making the walkway a misfit, failing to actually serve its purpose. The use of walkway by pedestrians may also be biased by factors such as adjacent land-uses, its visual and physical connections with the walkway and the prevailing condition of the footpath. Instead of paintings and sticking pictures of deities on the wall to sensitize public, it is better to ensure cleanliness and hygiene, through transparency and design.



Fig. 7: Encroachment along walkway.



Fig. 8: Public abuse & spillover along walkway.

#### VII. ENVIRONMENTAL ANALYSIS

The solutions, envisaged for the current issue, have incorporated road widening, without any regard or consideration for the roadside elements contributing to the urban landscape. This has severely impacted the natural environment and elevated air pollution levels, compounding the loss of trees, which act as natural air-purifiers. Metro rail project, which has been initiated along this stretch to reduce stress on transportation and environment, has failed too, as it has added to the present congestion. With the commencement of the Metro construction, roads have deteriorated, with the top layer of the tarred road (figure 9) being worn out at several places causing dust pollution. Potholes and bottlenecks, introduced by Metro construction and its barricades have increased the waiting time and crossing time of vehicles, thereby hiking the rate of automobile exhaust.



Fig. 9: Widened Roads near stretch



Fig. 10: Flash Flooding, alongside walkway.

The area presently is a mute witness to Air Quality Index (AQI) of 256, which incidentally falls under the category/rating of 'Severe Air Pollution'. Coincidentally, even the average daily 'maximum' and 'minimum' noise levels have been observed to be above 92 and 62 dB, both being above city tolerance levels. All along this, the stretch is already experiencing flash floods during rainy seasons (figure 10), due to clogged drains, compounded by the fact that it is located at a lower

level than the station. Along with all this, air pollution levels are also further elevated.

### VIII. RECOMMENDATIONS AND DISCUSSION

The existing footpath width is only 1.2m, whereas as per IRC standards, the ideal width should have been at least 4m with provisions of guard rails and zebra-crossing, along with regular maintenance of the road infrastructure. The corrective measures must also incorporate fenestrations in the barricades, to establish a visual access, such that the link between them is enhanced by the urban public realm. Since sky-walkers or foot-over bridge cannot be incorporated with metro being commissioned, an 'I' shaped Subway (figure 11) having a width of 4m and vertical clearance of at least 2.5m, starting from the point of unmanned exit, leading to the other side must be provided. The subway apart from providing structural stability and necessary safety measures for pedestrians must also be pedestrian friendly, promoting its use. The subways, instead of being used solely for crossing can be made more interesting with activities like informal hawking, incorporated in the design itself. Informal hawking in the subway would not only enrich the experience of the pedestrians who use it, but also would help in maintaining the place neat and clean.

walkway, as an outcome of pedestrian abuse and encroachment by street hawkers. Recommendations to counter the current situation, apart from inclusions of corrective designs along with periodic maintenance, also envisages provisions of grade separated pedestrian facilities such as subway, keeping public realm in mind.

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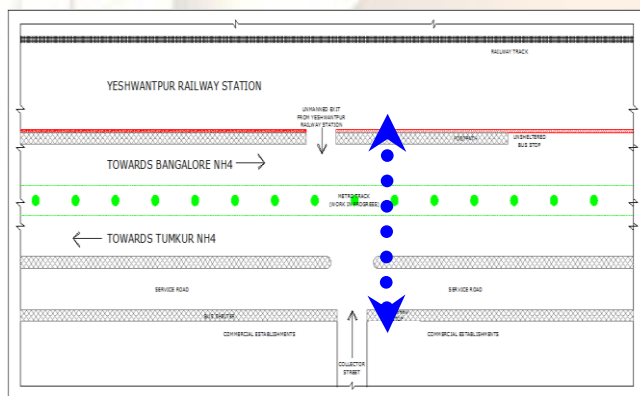


Fig. 10: Proposed Subway.

### IX. CONCLUSION

The study has revealed that the stretch under investigation was inferior in all standards, with respect to the service offered to pedestrians. The high usage factor and the absence of guardrails has further enhanced the problem of pedestrian spillover and jaywalkers, disrupting the smooth flow of traffic movement, raising the accident rate and causing traffic delays by a maximum of 30 seconds per crossing.

The government initiated road widening at the cost of roadside trees; all along with unaltered footpath width has continued to contribute to the spilling over of pedestrians onto the main carriageway, aggravated by the dilapidated state of