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An Intersection under Stress: Diagnosing Layout and Control Issues - A Case Study at Srijana Chowk, Pokhara

Saroj Dhungana[1*]

[1]*Graduate, Institute of Engineering, Tribhuvan University, Nepal, Licensed General Civil Engineer, Nepal Engineering Council,*
dhunganasaroj098@gmail.com

Abstract

Srijana Chowk, a major intersection in Pokhara, Nepal, connects four critical roadways and experiences chronic congestion due to geometric and signal control deficiencies. This research aims to uncover the underlying issues affecting the intersection's performance, focusing on vehicular delay, structural obstruction, and driver frustration. Field data were collected through manual measurements of signal timings, queue lengths during red phases, and a series of perception-based surveys targeting drivers, pedestrians, nearby residents, and traffic police. Observations revealed that the central support pillar of an overhead skywalk exacerbated the obstruction of traffic flow, especially during peak hours. The lack of designated turning lanes, particularly for left turns on the north and south approaches, causes vehicles to block each other, resulting in increased noise pollution and unsafe conditions for pedestrians. Additionally, a curbside bus-stop on the southern approach was found to severely disrupt lane usage and create prolong queuing conflicts. Based on these findings, the study recommends minor geometric widening of approach lanes, introduction of no-horn signage, reconsidering the pillar placement, recessed bus bay further downstream and revision of traffic signal phasing to match observed queue dynamics better. Despite data collection limitations, this research highlights the pressing need for targeted interventions at Srijana Chowk and offers practical, low-cost recommendations for improving intersection control and safety in rapidly urbanizing areas.

Keywords: Signalized intersection, Traffic congestion, Left Turn Conflict, Curbside Bus-stop, Vehicular Delay, Road User Perception.

1. Introduction

Urban intersections are critical nodes within a city's road network, often acting as pressure points where traffic flow either stabilizes or collapses. In the rapidly urbanizing city of Pokhara, Nepal, Srijana Chowk stands out as one such intersection under growing operational stress. Located at coordinates 28.2115°N, 83.9813°E, it connects four key routes: the east-west aligned Prithvi Highway (NH03), a major four-lane national route, and the two-lane northern approach (Ganeshman Singh Marg) and southern route (Rastra Bank Road).

Srijana Chowk holds strategic importance due to its proximity to Prithivi Chowk in the east and 0 KM in the west—both heavily trafficked junctions. It serves as a key passage for long-distance freight, city buses, microbuses, private vehicles, and a dense flow of motorcycles and pedestrians. The intersection also features a skywalk supported by a large central pillar, which impedes traffic flow by reducing effective road space and obstructing sightlines.

Although no official studies have been published on this intersection, both residents and traffic police report frequent minor collisions and near-miss incidents, indicating systemic issues with layout and control. The intersection currently operates with automated timed traffic signals but lacks features such as channelized lanes or turn restrictions that could improve flow. The absence of designated left-turn lanes leads to frequent blocking conflicts among vehicles going straight, turning right, or turning left, particularly along the constrained north and south legs. Pedestrian movement is managed via footpaths and a skywalk, but crossing remains difficult due to a lack of designated at-grade crossings. Additionally, excessive vehicle honking

* *Corresponding author*

during signal delays exacerbates noise pollution, further degrading the intersection's operational environment. With these challenges in view, the intersection demands a closer investigation to understand its geometric shortcomings and to explore possible control improvements.

This data evaluates Srijana Chowk's operational challenges, focusing on geometric constraints, signal inefficiencies, and their impacts on traffic flow and safety. By combining field measurements with stakeholder insights, the research aims to identify actionable solutions tailored to Pokhara's growing urban mobility demands.

1.1 Statement of Problem

Srijana Chowk, a major signalized intersection in Pokhara, is experiencing escalating operational challenges that compromise traffic efficiency and safety. During peak hour typically between 8:00 to 11:00 AM and 3:00 to 6:00 PM, the intersection becomes severely congested, particularly at the north and south approaches. A significant disruption is caused by a bus stop situated close to the southern leg, which leads to queuing conflicts and unpredictable stopping behavior by public vehicles.

The central pillar supporting the overhead skywalk introduces further complications. While intended as a pedestrian facility, its concrete base reduces the effective merging width at the core of the intersection and partially blocks the sightlines for small vehicles. Many road users mistakenly perceive it as a roundabout, adding to confusion and disorganized merging.

Informal stakeholder feedback from drivers, pedestrians, and traffic police indicates widespread dissatisfaction. Complaints include long delays, excessive honking, turning movement blockages, and a sense of general traffic disorder. Frequent near-miss incidents and minor collisions have been reported, especially during busy periods. The core issues identified are vehicle delays, noise pollution from constant honking, and driver confusion due to geometric and control deficiencies based on both observation and user experience. The combination of poor layout, obstructive infrastructure, and ineffective signal coordination highlights the need for detailed investigation and context-sensitive improvements at this critical urban junction.

1.2 Objectives

This research aims to identify and address key operational deficiencies at the Srijana Chowk intersection in Pokhara through field-based analysis and stakeholder input. The specific objectives are:

1. To analyze the existing geometric layout and traffic signal operation through on-site measurements, focusing on queue lengths and observed turning conflicts.
2. To collect stakeholder feedback—including drivers, pedestrians, local residents, and traffic police—regarding delays, noise, safety, and general traffic experience at the intersection.
3. To propose minor geometric modifications, such as widening approach lanes at the north and south legs to ease vehicle movement.
4. To suggest low-cost, practical solutions such as "No Horn" zones, realignment of the skywalk support, and relocation of bus stops to a strategic distance from the intersection to minimize vehicular interference.

1.3 Limitations

The findings and recommendations of this research are subject to the following limitations:

- Due to limited resources, comprehensive traffic volume counts could not be conducted. The desired 72-hour data collection window was not feasible, and a single-day or peak-hour survey was avoided to prevent misleading or insufficient results.
- The study was conducted without the use of automated traffic counters, pollution sensors, or traffic simulation softwares, which restricted the ability to model or simulate interventions.
- Although noise pollution was clearly noticeable due to excessive honking, the data collected could not quantify noise or air quality due to the lack of appropriate sensors or decibel meters.
- The analysis is based on static observations (layout, queue lengths, visual inspection), without the benefit of dynamic simulations to test how the intersection would perform under modified signal or lane configurations.

2. Literature Review

Intersection delay, poor signal coordination, and geometric deficiencies have been studied extensively in the South Asian context, especially in cities experiencing rapid urbanization and increasing vehicular demand. Zhang & Tong, (2008) found that when the left-turn bay is too short or turning demand is high, blockage and spillback frequently occur, reducing both left-turn and through movement capacities. Their results highlight that optimizing bay length and applying suitable left-turn control strategies can significantly enhance intersection performance, which closely reflects the conditions and improvement needs observed at Srijana Chowk. Mistry et al. (2022), in a study of Kamrej Intersection in India using VISSIM, showed that minor geometric improvements—such as free left-turns and widened lanes—along with a four-phase signal design could upgrade Level of Service (LOS) from F to C. Their work strengthens the case for low-cost geometric interventions at intersections like Srijana Chowk.

The interaction between poor signal control and physical roadside elements has also received attention. Shrestha & Pradhananga (2023), using VISSIM, quantified the effect of curb-side bus stops on intersection delays and concluded that stop placement and dwell time significantly impact vehicular flow. Their findings support the identification of a problematic bus stop on Srijana Chowk's southern approach. Wu et al. (2009) reinforced this further by establishing theoretical capacity loss models for bus stops near intersections, concluding that their distance from the stop line and bus frequency directly influence green-phase effectiveness. This validates the concern that Srijana Chowk's bus stop and lack of a dedicated loading area contribute to recurrent queuing.

Environmental impacts of intersection delay are another growing concern. Parajuli et al. (2025) modeled noise levels at Baneshwor Intersection and found strong positive correlations between traffic volume, vehicle composition, and noise pollution. Noise levels were especially high during red signals due to idling and honking—conditions similarly observed at Srijana Chowk. A comparable study by Yadav et al. (2024) developed an intersection-specific traffic noise model for nineteen intersections in Kanpur, India, and found that traffic volume, honking, and proximity to stop lines significantly increase noise levels near intersections. These findings are relevant to Srijana Chowk, where high traffic density and frequent idling similarly elevate noise, highlighting the need for signal optimization and noise mitigation strategies.

Lastly, Gayah et al. (2015) investigated how physical obstructions such as pillars, parked vehicles, and permanent roadside fixtures reduce intersection discharge capacity. Using kinematic wave theory, they developed simplified formulas to quantify capacity loss from such obstructions. Their findings support observations at Srijana Chowk, where the central pillar of the overhead skywalk reduces merging space and visibility, especially for smaller vehicles, contributing to confusion and potential conflict. Similarly, Tiwari, Thapa & Joshi (2024) conducted a site-specific study at Srijana Chowk to assess the impact of a curbside bus stop on roadway capacity. Based on videographic data and modeling with Greenshield's theory and the Indonesian Highway Capacity Manual, they found that the bus stop led to a speed reduction of 6.23% and a capacity reduction of up to 16.62%. These studies together provide both theoretical and empirical justification for the proposed interventions—relocating the obstructive pillar and redesigning or shifting the curbside bus stop to improve overall intersection performance.

3. Methodology

This research follows a field-based methodology to assess the traffic performance and structural issues at Srijana Chowk, Pokhara. The focus was on collecting real-world data through manual observations, direct measurements, and stakeholder engagement. All methods were designed to suit local conditions and resource constraints while still capturing meaningful and actionable insights.

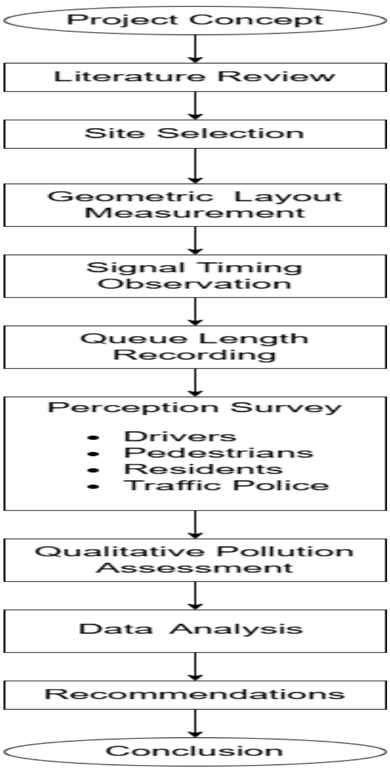

Figure 1. Flowchart

4. Data Collection

The data collection process was carried out manually on typical workdays—Tuesday, 13th and Wednesday, 14th May 2025—during peak traffic hours (8:00–11:00 AM and 3:00–6:00 PM). The geometric layout of the intersection was measured using measuring tapes, with permission from on-duty traffic police. Signal timing cycles, including green, red, and amber durations, were recorded using a stopwatch. Satellite imagery of the intersection was obtained from google maps to aid in geometric analysis. Perception surveys were conducted with a minimum of 10 participants from each stakeholder group, including drivers, pedestrians, local residents. A brief focused discussion was conducted with two traffic police officers stationed at the intersection to understand operational difficulties from an enforcement perspective. The data collected was later compiled and analyzed to identify key problems and propose realistic, low-cost improvements.

4.1 Geometric Layout Measurement

A detailed geometric assessment was carried out at Srijana Chowk to evaluate the spatial configuration and physical constraints affecting intersection performance. The survey covered a 100-meter stretch along the southern approach—Rastra Bank Road—identified as the most geometrically constrained leg, and 60-meter stretches along the northern (Ganeshman Singh Road), eastern (towards Prithivi Chowk), and western (towards Zero KM) approaches. The southern approach features a total roadway width of 9 meters, inclusive of shoulders, and is bordered by a 7-meter-wide footpath on the left and a 4-meter-wide footpath on the right, when facing north. Notably, a curbside bus stop is situated 40 meters downstream from the intersection along this leg, contributing significantly to congestion and turning conflicts during peak traffic periods.

On the northern approach, Ganeshman Singh Road has a roadway width of 8 meters and is flanked by footpaths measuring 5 meters and 6 meters on the respective left and right sides (facing north). In contrast, both the eastern and western approaches are substantially wider, each with an 18-meter carriageway and 5-meter footpaths on either side, allowing for smoother traffic dispersion. Although a bus stop is also present 35 meters east of the intersection, it does not adversely affect flow conditions due to the ample width of the roadway in that section.

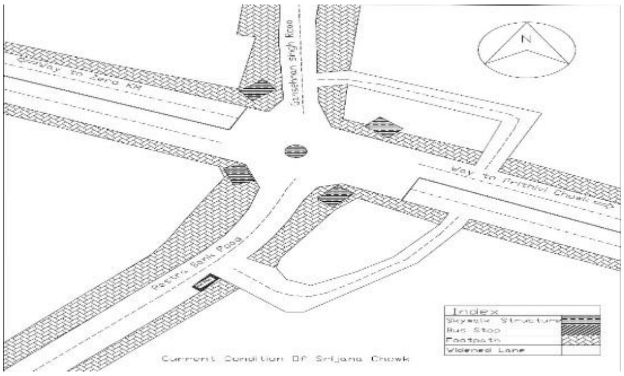

Figure 2. AutoCAD Traced Map of Sijana Chowk

Figure 3. Google Satellite Image of Srijana Chowk

A prominent geometric constraint is introduced by the centrally located pillar of the overhead pedestrian skywalk, which is a circular steel truss structure with a diameter of 4.5 meters. This pillar not only occupies valuable space at the heart of the intersection but also restricts sightlines for drivers, particularly those in smaller vehicles. Additionally, each corner of the intersection is occupied by staircases providing access to the skywalk. These stair structures each measure approximately 4.5 meters by 6.3 meters and further encroach into the intersection's operational envelope, particularly during turning movements. The combined effect of the central pillar and corner staircases results in reduced effective turning radii, tighter merging space, and increased interaction conflicts—contributing to operational inefficiencies and driver confusion during signal transitions.

Table 1. Geometric layout details of the intersection

Approach	Road Details			
	Road Width	Footpath Width		Bus Stop Presence
		Left	Right	
South *(Rastra Bank Road)*	9 m	7 m	4 m	Yes – 40 m from intersection
North *(Ganeshman Singh Road)*	8 m	5 m	6 m	No
East *(To Prithivi Chowk)*	18 m	5 m	5m	Yes – 35 m from intersection
West *(To Zero KM)*	18 m	3 m	5 m	No
Central Obstruction	**Details**			
Skywalk Pillar (Center)	Circular Concreted Base and Rectangular steel truss pillar, 4.5 m diameter			
Staircase Structures (4 sides)	Each 4.5 m × 6.3 m			

4.2 Signal Timing Observation

Signal phase observations were conducted at Srijana Chowk on Tuesday, 13th May 2025, during morning, noon, and evening peak periods. A total of five signal cycles were recorded during each time block using a stopwatch. The recorded timings were later verified with the traffic police stationed at the intersection for consistency and accuracy

According to traffic police, signal timings are manually configured based on observed traffic conditions each day. The signals operate without automatic coordination and reset whenever there is a power outage, requiring manual reprogramming by on-duty personnel. The green phase follows a fixed order: east → west → south → north.

From the recordings, the eastern and western legs were found to have a green phase of 35 seconds, a yellow phase of 5 seconds, and a red phase of 90 seconds. In contrast, the northern and southern legs had significantly shorter green phases of 20 seconds and longer red phases of 105 seconds, indicating a potential mismatch between signal phasing and observed queue lengths. The uniform yellow/amber time across all legs was 5 seconds.

Table 2. Traffic signal phase time of the intersection

Leg	Red Time (s)	Green Time (s)	Yellow/ Amber Time (s)
East	90	35	5
West	90	35	5
South	105	20	5
North	105	20	5

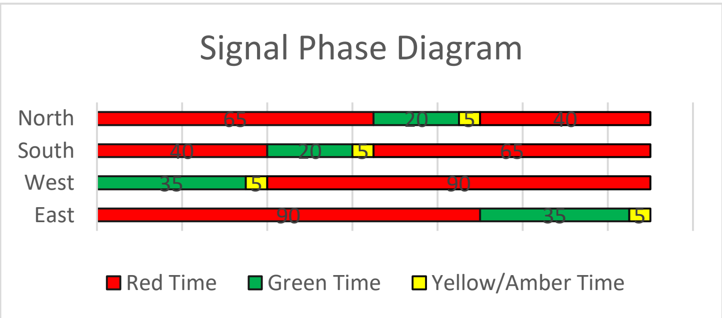

Figure 4. Traffic signal phase diagram

4.3 Queue Length Recording

To assess the operational performance of the intersection under peak traffic conditions, manual measurements of vehicle queue lengths were conducted for all four legs of Srijana Chowk on Tuesday, 13th May 2025. Observations were made during both morning (8:00–11:00 AM) and evening (3:00–6:00 PM) peak periods. Queue lengths were recorded visually by the surveyor using reference points along the curb and adjacent structures, noting the maximum queue length and estimating average values throughout the observation period.

The southern leg, Rastra Bank Road, experienced the longest queue buildup, with a maximum queue length of 70 meters during the morning peak hour and an average of 35 meters throughout the day. This is attributed to its relatively narrow width (9 m), the presence of a curbside bus-stop only 40 meters from the intersection, and turning conflicts caused by blocked left-turn movements. The northern leg (Ganeshman Singh Road) showed a maximum queue of 40 meters, with a daily average of 25 meters. The eastern approach, though wide, observed a maximum queue of 35 meters, likely due to signal timing issues and right-turn movement delays, averaging 20 meters over the day. The western approach recorded a maximum of 45 meters, averaging 25 meters, likely influenced by combined through and right-turn movement delays near the signal cycle's end.

Figure 5. Long Queue Length in Southern Leg

Figure 6. Short Queue Length in East Leg

Table 3. Queue Length on four legs of intersection

Approach	Max Queue Length (m)	Average Queue Length (m)	Contributing Factors
South *(Rastra Bank Road)*	70	40	Narrow width, blocked left turns, nearby bus stop (40 m)
North *(Ganeshman Singh Road)*	40	25	Turning movement conflicts, no channelization
East *(To Prithivi Chowk)*	45	20	High Traffic in Highway
West *(To Zero KM)*	45	25	High Traffic in Highway

5. Perception Survey

A structured perception survey was conducted among three key stakeholder groups—drivers, local residents/pedestrians, and on-duty traffic police—at Srijana Chowk, Pokhara. The objective was to gather experiential insights into the geometric and operational constraints at the intersection. Thematic areas explored included lane width and congestion, bus stop placement, structural issues related to the skywalk, lane markings, and a brief probe into user attitudes toward noise disturbances. Responses were recorded informally during site observation hours and later categorized for analysis.

5.1 Lane Width and Congestion

Drivers and traffic police were unanimous in stating that the southern approach (Rastra Bank Road) is significantly under-designed for the current volume of traffic. According to their perception, this stretch ought to function as a four-lane road rather than its existing two-lane configuration. Residents echoed this view, noting that frequent congestion causes discomfort and confusion, and in some cases, forces motorcycles onto footpaths. While the eastern and western legs were generally regarded as adequately dimensioned, the northern leg was considered somewhat congested, though manageable due to lower traffic volume. All three groups agreed that if widening interventions are to be made, they should ideally target both the north and south approaches for balanced flow. Traffic police specifically pointed out that managing lane discipline under such constrained geometry remains challenging, with even minor widening—on one side alone—potentially offering meaningful operational relief.

Figure 7. Left Turn Blocked in Southern Leg

Figure 8. Left Turn Blocked in Northern Leg

5.2 Bus Stop Placement and Impact

The bus stop located on the southern leg, serving southbound buses, was widely perceived as a major contributor to traffic disruption. Drivers and traffic police reported that public vehicles from at least six different routes converge at this location, leading to one of the two lanes being consistently blocked. Residents highlighted the same issue, noting that buses often stop beyond designated areas and for extended periods, compounding congestion during peak hours. All groups strongly recommended relocating the stop farther downstream and converting it into a recessed bus bay or pocket to separate waiting vehicles from the moving traffic stream. The consensus was that the current arrangement is incompatible with the intersection's operational demands.

Figure 9. Bus-Stop Causing Blockage

5.3 Skywalk Structure and Visibility Issues

Perception of the overhead skywalk was largely unfavorable. Drivers expressed concern that the central steel pillar obstructs visibility—especially for microvans and motorcycles—while also creating confusion during turning movements. Vehicles approaching from the west and intending to turn south were particularly affected, with many unsure whether to maneuver around the pillar or initiate their turn in front of it. Residents questioned the necessity of the skywalk altogether, suggesting that appropriately marked zebra crossings would be more user-friendly. The staircases, particularly on the southwestern side, were also criticized for encroaching upon the footpath, reducing walkable space. Traffic police noted that despite the skywalk's intent, most pedestrians continued to use at-grade crossings, further questioning the functional utility of the structure.

Figure 10. Skywalk Structure at Intersection

5.4 Lane Markings and Turning Conflicts

All stakeholders pointed out the poor visibility or near-complete absence of lane and stop markings at the intersection. Drivers reported confusion during signal transitions, especially on the northern and southern approaches, as they were unsure where to halt their vehicles. Residents corroborated these observations, citing erratic vehicle positioning and inconsistent turning behavior. Traffic police emphasized that while minor violations could be penalized, widespread disregard for lane discipline—exacerbated by faded or missing markings—was difficult to control manually. The lack of clearly defined lanes contributes to turning conflicts and unpredictable movement, particularly during peak congestion.

Figure 11. Confusion due to Faded Margins

Figure 12. Lane Violations Due to Faded Margins

Figure 13. Lane Violations Due to Absence of Median in Western Leg

5.5 Noise Perception

Although detailed noise analysis is discussed in a separate section, initial responses indicated that the intersection is perceived as particularly noisy during peak hours. Drivers acknowledged that unnecessary use of the horn is common, often triggered by blocked movements or impatience. Residents described the area as audibly stressful, especially during the morning and evening commute windows. Traffic police further noted that horn use increases sharply when vehicles hesitate at green signals or during turning conflicts—adding to the chaotic impression of the intersection.

6. Qualitative Pollution Assessment

A qualitative assessment of traffic-related noise at Srijana Chowk was conducted on Tuesday, 14th May 2025, during the busiest travel periods—specifically from 8:00 to 11:00 AM and 3:00 to 6:00 PM, corresponding with typical office and school commute hours. The methodology involved three components: (1) direct observation by the surveyor, (2) manual recording of sound-emitting vehicle behavior, and (3) perception surveys involving drivers, pedestrians, local residents, and shopkeepers. The observation focused on capturing when and why noise-inducing behavior occurred. Rather than being uniformly distributed, the disturbances were concentrated at specific signal phases—particularly just before the red light, during the early seconds of the green phase when leading vehicles hesitated, and when left-turning vehicles were blocked by ongoing straight or right-turn traffic. Motorcycles and private cars were found to be the most common contributors in these situations.

To quantify this, a manual frequency count was conducted every 15 minutes during the observation window for each leg of the intersection. The southern approach exhibited the highest rate of disturbance, reaching a maximum of 36 instances per minute with an average of 21. The northern leg followed (peak 27, avg. 13), then the eastern (peak 21, avg. 8), and finally the western leg (peak 11, avg. 5). These values highlight how physical layout and conflict points—especially at the southern and northern legs where turning movements intersect—correlate strongly with increased sound-producing driver reactions. The triggering situations included impatience at slow movement, blocked left turns, abrupt lane intrusions by motorcycles, and temporary vehicle halts due to technical faults or driver hesitation.
The perception survey involved structured interviews with drivers, pedestrians, shopkeepers, and nearby residents. Questions were designed to extract experiential insights into both the causes and effects of traffic noise. Drivers were asked why they use the horn at this intersection, whether they feel pressured to do so when others do, whether such action is necessary or avoidable, and how they perceive the overall noise level compared to other locations in Pokhara. Respondents cited urgency during green signals, blocked turns, and unpredictable motorcycle behavior as major triggers. While a few drivers viewed horn use as occasionally necessary, most admitted it was often a reflexive or imitative act. The phenomenon of chain reaction where one vehicle's horn triggers other was frequently mentioned.

Pedestrians and residents were asked whether they felt disturbed by the noise, which types of vehicles they found to be the noisiest, how it affected their health or daily routine, and how Srijana Chowk compares to other intersections in the city. Many reported feeling noticeably irritated during peak hours, citing motorcycles and city buses as the primary sources of acoustic disturbance. Though the effects were not described as medically harmful, respondents mentioned discomfort during high-traffic periods. Interestingly, even though Prithivi Chowk and 0 KM are busier intersections, many felt Srijana Chowk seemed louder and more chaotic—possibly due to its confined geometry and more disorderly flow. Intersections like Mahendrapool, Bagar, and Birauta were similarly ranked as congested and noisy.

7. Data Analysis and Key Findings

The collected data from Srijana Chowk highlights several interrelated operational and geometric inefficiencies contributing to congestion, reduced flow efficiency, and environmental disturbance. Among the most pressing issues are imbalanced signal phasing, insufficient lane width, obstructive infrastructure, and poor traffic discipline—each exacerbated by unregulated public vehicle behavior and ineffective pedestrian infrastructure use.

From a geometric standpoint, the southern approach is severely undersized given the volume and types of traffic it accommodates. This narrow corridor experiences significant pressure from both private and public vehicles, particularly due to a curbside bus stop located near the intersection. The bus stop obstructs one full lane, resulting in queuing conflicts, extended dwell times, and lateral lane shifts that disrupt downstream flow. In contrast, although the northern leg is similarly narrow, its slightly lower traffic volume results in relatively milder congestion, though it too requires future attention. The central pillar of the skywalk, located directly in the middle of the intersection, presents another critical bottleneck. Its placement compromises visibility—especially for motorcycles and microvans—and creates driver confusion, with some unsure whether to maneuver around it or initiate turning movements prematurely. The surrounding staircases further constrict usable turning and merging space at all four corners. These structural constraints, combined with the already limited lane space, reduce the intersection’s operational capacity.

- Southern approach (Rastra Bank Road) width: 9 m; inadequate for current volume.
- Skywalk pillar: 4.5 m diameter, centrally placed, obstructs visibility and flow.
- Staircases (each 4.5 m × 6.3 m) encroach on turning radii, especially at southwest corner.
- Drivers confused about routing around or before the central pillar.
- Microvans and motorcycles most affected by visibility issues.

The bus stop on the southern approach significantly interferes with lane usage and turning movement. It lacks a proper setback and creates unpredictable stopping patterns that interrupt flow.

- Located 40 m from the intersection; blocks one of two lanes.

- Serves buses from six routes, creating prolonged dwell times.
- Buses often stop outside designated zones, affecting adjacent through lanes.

Signal timing data shows an imbalanced phase distribution. The east and west approaches receive 35 seconds of green time and 90 seconds of red, while the north and south approaches receive only 20 seconds of green with 105 seconds of red. This mismatch is particularly problematic for the southern leg, where physical and behavioral constraints already result in maximum queue lengths of up to 70 meters. The short green phase for this approach is insufficient to clear queued vehicles during peak hours, leading to frequent signal spillover.

- East & West Legs: 35 s green, 90 s red, 5 s amber.
- North & South Legs: 20 s green, 105 s red, 5 s amber.
- Maximum Queue Lengths:
    - South: 70 m (avg. 35 m)
    - East: 35 m (avg. 20 m)
    - North: 40 m (avg. 25 m)
    - West: 45 m (avg. 25 m)

Noise pollution was also examined qualitatively. Manual sound frequency counts revealed high rates of horn use especially during the start of green signals or when turning movements were obstructed. Stakeholders commonly associated these acoustic disturbances with stress and confusion during high-volume periods.

- Southern leg: up to 36 sound events/min.
- Northern leg: up to 27 sound events/min.
- Horn use highest when:
    - Signal is about to change.
    - Left turns are blocked by straight/right movements.
    - Buses or bikes stall near stop lines.

Lack of clear markings adds confusion, especially during signal changes. Unregulated turning behavior causes conflicts between movement types.

- Most lane markings are faded or fully erased.
- Drivers unsure where to stop; no visible stop lines on northern and southern legs.

Figure 14. Confusion on Turning due to Pillar and markings

Absence of dedicated turning lanes leads to overlapping and merging errors.

- Traffic police report difficulty enforcing discipline without markings.
- Manual control is insufficient to manage frequent minor violations.

Stakeholder perceptions strongly supported the observational findings. Drivers and traffic police emphasized the need for lane widening on the southern leg, better-defined lane markings, most of which are faded or absent, and if possible, reconfiguration of the skywalk infrastructure. Residents and pedestrians echoed concerns over noise and the lack of clear turning guidance, noting that intersections like Prithivi Chowk—though busier—felt less chaotic due to better spatial design and lane discipline.

Sound disturbance was assessed qualitatively and by manual frequency counts. Peak disturbance coincides with signal transitions and blocked turning movements.

8. Recommendations

Based on the field observations, stakeholder feedback, and analysis of geometric and operational data at Srijana Chowk, the following recommendations are proposed to improve traffic efficiency, reduce congestion, and enhance safety:

8.1. Geometric Improvements

It is recommended that the left-side lanes of both the northern and southern approaches be widened to accommodate smoother turning and merging movements. Specifically:

- The northern approach should be widened by 3 meters over a stretch of 40 meters.
- The southern approach should be widened by 3.5 meters over a length of 50 meters.

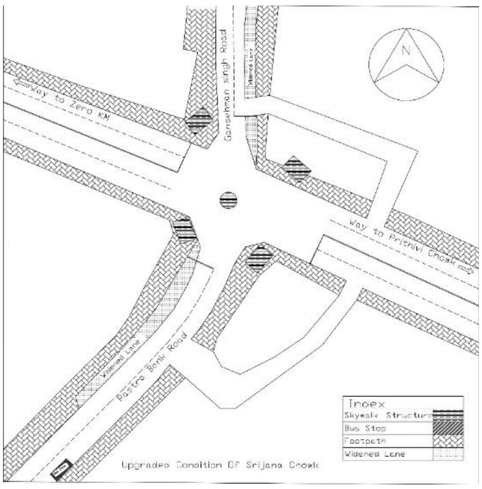

Figure 15. AutoCAD Traced Proposed Updated Map of Srijana Chowk

Although this widening may require a partial reduction in footpath width, the current pedestrian volume can be managed safely due to the adequate width of remaining footpaths and the availability of alternate pedestrian routes. Observations also indicate that most pedestrians prefer using zebra crossings rather than the overhead skywalk, further justifying a reallocation of space in favor of vehicular movement.

8.2. Skywalk Reassessment

The central pillar and staircases of the existing skywalk infrastructure significantly obstruct visibility and limit turning movements at the intersection. Therefore, the functional necessity and current design of the skywalk should be critically re-evaluated. Based on feedback from local residents, one recommended option is to remove the skywalk entirely and consider relocating it to Prithivi Chowk, where pedestrian demand and traffic complexity are higher. Alternatively, a suspended or floating skywalk structure—designed without a central pillar—should be explored to eliminate mid-intersection obstruction while still providing safe pedestrian access. Such a redesign would support both vehicular efficiency and pedestrian safety at Srijana Chowk.

8.3. Signal Control and Automation

Currently, traffic signals at the intersection are manually adjusted by police personnel, which can lead to inconsistencies, especially after power outages. A detailed traffic flow study must be conducted to accurately redesign signal phases. Furthermore, advanced technologies should be considered for long-term implementation, including: Video detection systems, Radar and microwave traffic sensors, Adaptive Traffic Signal Control Systems (ATSC), Artificial Intelligence (AI) and Machine Learning-based algorithms

These technologies are widely adopted internationally and could serve as a model for modernizing Pokhara's traffic management infrastructure.

8.4. Public Transport Stop Reconfiguration

The curbside bus stop on the southern leg is a major contributor to lane obstruction and delay. It is recommended to

- The bus stop be relocated approximately 100 meters downstream from the intersection.
- It be converted into a recessed bus bay, preventing blockage of active lanes.

Figure 16. Recessed Bus stop at Ratna chowk, Pokhara (Down the southern leg from Srijana Chowk)

While bus stops on other approaches do not cause significant disruption during normal hours, they contribute to congestion during peak times. These should also be repositioned at least 60 meters away from the intersection to maintain unobstructed flow.

8.5. Traffic Regulation Enhancements

To address the prevalent issue of excessive honking and chaotic lane behavior:

- "No Horn" signage should be installed immediately on all approaches.
- New lane markings must be applied on every leg of the intersection to clearly demarcate stop lines, turning paths, and through lanes.
- Plastic cone medians should be introduced on the west, north, and south legs to guide vehicles, similar to the existing median system on the east leg.

These combined interventions aim to transform Srijana Chowk into a safer, more efficient, and more resilient urban intersection within Pokhara's road network.

Figure 17. Plastic Cones Median Regulating Traffic in Eastern Leg

9. Areas for future study

To refine these recommendations, additional data collection and analysis are necessary, including:

- 72-hour traffic volume counts to validate peak-hour demands.
- Noise level measurements using decibel meters for quantitative assessment.
- Microsimulation modeling (e.g., VISSIM or SIDRA) to test proposed geometric and signal changes.

10. Conclusion

The study of Srijana Chowk reveals a complex interplay of geometric deficiencies, operational inefficiencies, and behavioral challenges that collectively degrade intersection performance. Positioned at a critical juncture within Pokhara's urban transport network, this intersection exhibits symptoms of under-design relative to traffic demand—most notably through insufficient lane widths, obstructive pedestrian infrastructure, and mismatched signal phasing. The presence of a centrally located skywalk pillar and poorly placed curbside bus stop exacerbates congestion and disrupts vehicular movement, particularly on the north and south approaches. These geometric constraints not only limit physical capacity but also induce hesitation and conflict during turning movements.

Signal phase imbalance further compounds these issues. The current timing scheme allocates inadequate green time to the most congested legs, resulting in long queues, reduced throughput, and operational spillovers. Combined with the near-complete absence of lane markings, this leads to unpredictable merging, frequent violations, and increased reliance on manual intervention by traffic police. Qualitative assessments also reveal that driver behavior, particularly related to auditory disturbances such as frequent horn use, is closely linked to structural and procedural inadequacies. Public sentiment gathered through perception surveys corroborates the empirical findings and underscores a strong demand for intersection redesign.

This research establishes the urgent need for low-cost yet impactful interventions—including selective lane widening, reconfiguration or removal of obstructive infrastructure, modern signal control technologies, and the strategic relocation of bus stops. Despite limitations in traffic simulation and pollution quantification, the study provides a robust foundation for municipal authorities to initiate data-driven, context-sensitive improvements that can serve as a scalable model for similar intersections in mid-sized urban center.

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