

# Evaluation Of Factors Contributing to Traffic Flow Along Jose Abad Santos Avenue, Sta. Cruz, Lubao, Pampanga

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**Abstract:** - Traffic congestion has several unfavorable effects, including decreased productivity, increased vehicle operating costs, environmental pollution, and a negative economic impact. In line with this, the researchers evaluate the pre-identified traffic mobility measures: pedestrian, lack of establishment parking, improper loading/unloading area, and lack of enforcement, which are discussed through a Review of Related Literature (RRL). To determine which of these factors has the most significant impact on traffic flow along Jose Abad Santos Avenue in Sta Cruz, Lubao Pampanga, the researchers use Relative Importance Index to evaluate each of them. The researchers made proposals for solutions and recommendations that will address the problems currently happening in the region.

**Key Words:** — *traffic congestion, pedestrian, parking, loading, and unloading area, enforcement, traffic flow.*

## I. INTRODUCTION

Central Business District (CBD) comprehensively depicts the concentration and distribution of the urban population, land use patterns, and the level and trend of industrialization. The focusing effect can increase business opportunities at lower costs and support the growth of a city's economy. Still, it can also have unfavorable consequences, such as heavy traffic, severe pollution, and a relatively high population density. (Procedia et al., 2014) Road transport has an overriding role in economic growth and activity. It also plays a significant part in regional development and individual quality of life. Transportation is a movement-related activity of individuals or items moving from one location to another to fulfill a person's social and economic demands.

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However, there is a developing issue with traffic congestion. It is rare for a city with a thriving economy to be at liberty of traffic congestion. Congestion has become an unavoidable part of daily life, and it is the responsibility of local officials to design guidelines to cope with congestion efficiently to relieve commuters of the inconveniences caused by traffic congestion. (Harriet et al., 2013a). In general, road traffic congestion has several unfavorable effects, including lost productivity, higher vehicle operating expenses, environmental pollution, and adverse economic impact from the ineffective and erratic delivery and distribution of resources, goods, and services. Countries are learning that traffic congestion is a global issue beyond daily commutes in urban regions. Everywhere, there is congestion. It has an impact on both personal and business travel. Both the flow of people and products to markets are impacted. (Jayapal & Roy, 2016a) Here in the Philippines, in what so-called, —"Tricycle Capital of the Philippines,"— Cabanatuan City is also distressed by traffic congestion. January Jose B. Aydinan (2020), author of "Traffic Congestion Situation in The Tricycle Capital of the Philippines: Its Causes and Effects," brought to light the issue of traffic congestion 2 in Cabanatuan City, one of the busiest cities in the province of Nueva Ecija, Philippines. Based on the outcomes of this study, out of the four key factors, poor maintenance is the leading

cause of traffic jams, followed by inefficient control methods, physical inadequacies, and human errors. It is valid because it produces congestion on routes where road construction is incomplete, or roads are awaiting repair, causing vehicles to become careless and break traffic laws. He also stated that vehicles getting in each other's way is an essential effect of traffic congestion. The same conditions exist at JASA along Sta. Cruz, Lubao, and Pampanga. Since it is the central business district of all the barangay in the Municipality of Lubao, congested traffic is inevitable, resulting in a longer travel pace and hassle excursion. Most traffic congestion in the study area occurs during rush hour, which transpires twice daily, once in the morning and once in the evening. The employees' standardized working hours include going to work in the morning and returning home in the evening. A third peak hour occurs in the afternoon due to the end of the morning school sessions and lunch breaks. During these hours, significant traffic generally takes place near the school. The key objective of this study is to conduct Community Assessment in Sta. Cruz, Lubao, Pampanga (Central Business District) Along Jose Abad Santos Avenue to mitigate traffic congestion. Specifically, this study aimed to identify the possible causes of traffic congestion within the locale/municipality for the well-being of the citizens, commuters, students, and drivers that frequently travel along the selected access road. In addition, the findings of this study were analyzed and interpreted to generate recommendations that can be used to improve traffic flow.

### 1.1 Traffic Congestions

Traffic congestion is the most apparent consequence of the interaction between transportation, travel patterns, and land uses in extensive urban areas, leading to various transportation issues. Congestion of vehicular traffic is an everyday occurrence in the vast majority of rural and urban areas across the globe. (Kanyepe et al., 2021).

The traffic situation is congested most of the time in the current setting of urban areas, notably in the industrial and market zones, especially during peak business hours. People encounter numerous issues at the prominent traffic locations in these commercial towns due to the growing populations and the number of vehicles. The pollution that automobile fuels generate delays travel and contribute to environmental damage and health risks (Rath, 2018).

Traffic congestion occurs when more vehicles are on the road than can safely fit on it, causing vehicles to move at slower rates. This results in longer travel times and longer queues,

sometimes referred to as traffic congestion. One of the main problems most metropolises face is traffic congestion. Choosing effective mitigation strategies is mainly associated with the identification of congestion. Congestion affects how people move, both in reality and perception. Congestion in traffic is inefficient and harmful to the environment. (Kolte et al., 2017)

Road transport has an overriding role in economic growth and activity. Moreover, it plays a significant part in regional development and individual quality of life. Transportation is a movement-related activity of individuals or items moving from one location to another to fulfill a person's social and economic demands. However, there is a developing issue with traffic congestion. Congestion factors can be categorized as recurring or nonrecurring. Recurring congestion is the predicted delay brought on by many cars using the road at essential points and throughout the same daily periods (such as rush hour, holidays, or special events) (intersections, interchanges, major long-term construction areas, or toll plaza areas). (Jayapal & Roy, 2016) Planning any roadwork requires an understanding of the traffic demand. There is no rational basis to put complex procedures in place to improve traffic flow if demand is consistently far lower than the available capacity. Conversely, if demand is equal to or more than the available capacity, solutions must be identified to reduce the likelihood of traffic delays (Schwietering & Feldges, 2016).

Under the effect of various circumstances, such as different days of the week, holidays, weather, etc., urban traffic congestion has various distinctive characteristics. When conducting a macroscopic study on the causes of traffic congestion in detail, it is vital to establish the linkages between traffic congestion patterns and those affecting aspects. The two main factors that cause traffic congestion are macro-level factors like land use patterns, car ownership trends, and regional economic development, as well as micro-level factors like the high number of people using the roads at a given time and the overflow of vehicles on the constrained road space. Moreover, both result in congestion (Tilak et al., 2016).

Road congestion has become a significant issue worldwide, affecting economies, societies, and cultures. South Asian countries are particularly adversely affected. Due to rising demand and a lack of network infrastructure, traffic congestion is a significant problem on a worldwide scale. The elements that could contribute to traffic congestion include complex traffic structures, uneven traffic flows, and unknown events like traffic accidents. Travel delays, higher travel costs, increased accidents, and possible air pollution are all effects of traffic

congestion. Many strategies have been created and put forth to address these issues. Traffic signal limits, congestion pricing, turning restrictions, and traffic routing are a few of them. (N. Isa, M. Yusoff and A. Mohamed, 2014)

According to Congestion Control and Demand Management | FHWA. (2014), developed nations around the globe are learning that snarled traffic is now a global problem that extends beyond daily commutes in cities. There is traffic everywhere. Both business and personal trips are impacted. It impacts both the flow of people and goods to markets. Among other factors, incidents, maintenance tasks, detours, and traffic on tourist routes hamper traffic in rural and intercity corridors. Congestion costs the traveler wasted time, missed opportunities, irritation, and personal resources. Congestion results in decreased labor productivity, delivery delays, and higher expenditures for the company. Congestion increasingly impacts the speed, dependability, and cost of intercity and urban freight movements both domestically and internationally.

### 1.2 Community Assessment

Typically, a needs assessment or asset mapping is the first step in community development. To analyze what a community needs, one must first establish what problems or concerns exist there. In turn, these "needs" form the foundation of a long-term strategy (Phillips & Pittman, 2014). They also claim that community organizers engage residents to seek new resources, knowledge, and expertise or to persuade local governments to solve the problem. Residents are expected to take action to correct perceived flaws in their area or community. Organizers expect that by addressing problems, locals would develop a sense of efficacy, which will help them create confidence to address future challenges.

Public markets were once an essential part of the urban landscape, and they are once again. Markets serve multiple social, political, and economic functions, so planners looking for multipurpose development tools will be attracted to public markets. Markets can aid various objectives, including place-making, employment, and entrepreneurship (Morales et al., 2013).

Rural community development is a process carried out by members of the community. It is a process in which residents can create more jobs, income, and infrastructure and assist their community in becoming fundamentally more capable of managing change (Cavaye, 2016).

The proposed locating commercial areas and high-speed roadways (i.e., highways and arterials) on the neighborhood's

outskirts using curvilinear local streets to reduce through traffic and to ensure low traffic speed and pedestrian safety. In such a neighborhood, traffic around schools is mainly limited to school and other within-neighborhood trips, aided by pedestrian infrastructure. It is away from high-speed traffic, making it relatively safe (Yu et al., 2016).

Hundreds of neighborhood development initiatives that meet the criteria for comprehensive community initiatives have evolved over the past decade. The profiles of numerous recent neighborhood ventures emphasize the traits that distinguish these efforts and indicate why experts have designated them as the next generation of urban revitalization techniques. However, because the projects are new and complex to judge with so many different parts, little information is available about them. The profiles offered here are primarily based on program descriptions provided by the projects. Even though they tell us a lot about the nature and scope of each project, they need to give us a solid base for a more in-depth look at the strengths and weaknesses of the comprehensive community initiative model. (Smock et al., 2015)

### 1.3 Pedestrian

Interactions between pedestrians and vehicles frequently result in safety conflicts, traffic congestion, and priority or right-of-way issues. In the past, pedestrian and vehicle interactions usually solved these problems by building bridges, tunnels, traffic lights, and other barriers that made it harder for people and cars to move around together. Shared space is a different approach that tries to solve the same problems by creating a less structured and defined environment that relies more on human interaction and perception. (Frosch et al., 2019a)

To properly analyze a traffic scene on the road, one must consider the flow of cars and the impact that pedestrians have on the situation. According to Billones et al. (2019), the road context is also essential in detecting vehicles and pedestrians. Vehicle and pedestrian foot traffic are critical components of road traffic scene analysis. People's social and behavioral actions, like crossing pedestrian lanes, getting on and off public transportation, and interactions between drivers and pedestrians, affect traffic flow.

Pedestrian convenience and safety in large cities like Metro Manila should be considered the main concerns while controlling any developments' accessibility. About 70% of shopping trips in Metro Manila are generated by public transportation. Many customers must board and exit the system at stations or bus stops. Poor accessibility impedes pedestrian

flows and causes the accumulation of passengers to exceed the capacity of the terminal facility. In such a scenario, people may trespass into the carriageway, clog up the traffic, and increase the risk of accidents. (Verzosa & Miles, 2016)

#### 1.4 Lack of Parking Spaces

There has been a dramatic rise in cars and trucks in recent decades. Because of this, more cars will need a reliable parking facility. According to (Dineshkumar Soni., et al., 2018), the mishandling of parking places is a significant contributor to urban traffic congestion. Composing parking management is essential for keeping these things in check. Parked vehicle owners can see where spaces are available. Approximately 30 percent of city traffic is caused by drivers and vehicles.

Market liberalization has made transportation much more efficient, but it has also led to more traffic that sits still all over a city. Especially in cities, parking spaces for big trucks can be hard to find because there is insufficient room or the infrastructure is old. Rest areas are primarily constructed on motorways in the Czech Republic because regional plans for positioning truck parking lots have yet to be created. In order to find other places to park, drivers are forced onto other roads, which puts the safety of the goods being moved at risk. Drivers are compelled to violate the European Agreement Concerning the Work of Crews of Vehicles Engaged in International Road Transport since there are no such parking spaces (AETR). (Lizbetin, J., & Bartuska, L. 2020).

The local planning commission must create, adopt, and amend a development plan. The recommended land use for residential, recreational, commercial, industrial, and other uses, as well as the recommended population density, are also included in the plan. These objectives draw traffic to the street and highway systems, which can be safely accommodated in specific segments. (Valley H et al., 2013)

A system of main thoroughfares, parkways, bridges, streets, and other public ways may also be recommended by the commission in the development plan so that the commission can address the links and requirements between land use and transportation. Zoning does not establish travel lanes, rights of way, or user control devices, nor control how people behave on the street or highway. Other government agencies are in charge of these. However, it was understood in the late 1920s that the use and development of adjacent or other property and the size and placement of buildings had something to do with a community's need to reduce traffic in the streets. For this

reason, it would be an appropriate, necessary, and constitutional purpose of regulation. (Valley, H., & Officials, C. O. E., 2013) The risk, such as congestion and school-related traffic congestion, positions the well-being of the teachers, students, residents, parents, and motorists in and around school locations is a noteworthy dilemma in communities throughout the United States and abroad. The most prominent cause of traffic congestion around schools is vehicles, and the most significant source of those vehicles is parents' dropping off and picking up their children from school. (La Vigne et al, 2016).

School traffic congestion causes problems for students, school staff, residents in and around schools, and local police charged with enforcing traffic laws and responding to concerns raised by residents and schools. Traffic congestion alone causes trouble to drivers, pointing to lost time from the job, and can escalate to "road rage." More importantly, traffic jams, injuries, and deaths of young pedestrians can all be caused by congestion. High traffic volumes and on-street parking increase the risk of child pedestrian injuries, with kids frequently appearing "masked" behind parked automobiles. (La Vigne et al., 2016).

#### 1.5 Improper Loading/Unloading

According to studies, jeepneys must prepare for the country's rapid development. Issues such as a lack of maintenance systems, assuring the safety of passengers, including jeepney operators and drivers, its detrimental impacts on the environment, and an inefficient loading method and unloading of passengers is a timely issue that typically attracts the attention of the authorities. (Andalecio et al., 2020).

To create a sustainable transport system that satisfies society's economic, social, and environmental requirements, we are faced with the task of addressing the expanding demand for accessibility in the context of growing sustainability concerns. The most pressing priority is to improve the system's overall efficiency and accelerate the development and implementation of innovative technologies that produce win-win situations for all stakeholders. The dilemma in Metro Manila is that public utility vehicles (PUVs) such as buses and jeepneys are operated by private companies whose primary focus is profit. This creates a system where buses compete to serve as many people as possible. Long lines of buses form only to get to loading/unloading zones, causing traffic congestion. Buses that would cut through the enormous lines exacerbate the situation by obstructing additional lanes designated for private automobiles. In the loading/unloading zones, buses would wait indefinitely to load passengers. Buses violate other bus routes'

loading/unloading zones and do not have their zones as indicated by traffic loading signs. Buses would also stop anywhere to load passengers, even if it meant blocking critical junctions and corner streets. (Kardi Teknomo, & Elma P. Arboleras., 2014)

**1.6 Lack of Enforcement**

One of the leading causes of the increasing traffic jams and congestion is the need for more enforcement of traffic laws because the public and the police need to adhere to them. Many rules and regulations are unknown to the majority of us. (Ningthoujam Devi, 2021a)

Due to poor planning and ineffective traffic management, there is an increase in traffic congestion. Basic infrastructure needs to be more robust in Metro Manila, especially transportation. Traffic congestion and accidents have been caused by the public sector's poor and ineffective response to the issues of urbanization. Aspects of planning include highway planning, traffic engineering, and management engineering. There needs to be a mention of transportation planning or traffic management in urban institutional operations. Therefore, this needs to be addressed as a first step before attempting any capacity-building program. The need for more qualified personnel in cities, i.e., that most cities only have qualified technical staff for traffic enforcement is also a factor in this problem. (Lidasan, Hussein Sinsuat, et al., 2014)

Poor enforcement of transport regulations may be among the leading causes of bad traffic conditions in Metro Manila, particularly along its main thoroughfare–Edsa. According to Philippine Institute for Development Studies (PIDS), President Gilbert Llanto (2015) stated that even if the government has reasonable transport regulations, enforcement has been a problem.

People find it hard to keep order and follow the rules when the roads are congested, and there needs to be more enforcement around. Policy reforms should focus on two main areas to ensure the continued success of public transportation: formalizing the operators and providing them with the training and resources they need to provide a safe and reliable service and improving the sector's institutional and regulatory framework. (Madinda et al., 2013)

The most effective policies for reducing traffic congestion and motor vehicle emissions involve the strict and proper enforcement of traffic rules and regulations along roads in conjunction with complex traffic engineering measures. (Vergel et al., 2018)

**II. METHODOLOGY**

**2.1 Research Design**

This study used a quantitative research design to explain phenomena by collecting quantitative data, which is analyzed mathematically (Sukamolson, 2007). Upon gathering data, the researchers assessed the pre-identified factors, which were (1) pedestrian, (2) lack of parking space, (3) improper loading and unloading, and (4) lack of enforcement.

**2.2 Research Instrument**

The researchers used structured survey questionnaires with a 4-point Likert scale to evaluate and rank the factors affecting traffic flow. The contents of the survey were the (a) demographic profiles of the respondents and (b) questions about the pre-identified factors. The instruments used to collect data for this study were specially created by the researchers, validated, and verified by the research consultants. Close-ended interview questionnaires were utilized in proposing possible solutions. These questions were meant to gauge how respondents felt about the researchers' suggested changes and if they would improve traffic flow.

**2.3 Data analysis**

After collecting, analyzing, and interpreting the data, the researchers can rank the most influential traffic flow factor using the Relative Importance Index (RII). The researchers recommended and presented projects and programs to help improve the traffic flow in the study area.

Table.1. Relative Importance Index of Factors:

Summary of Factors		
Factors	RII	Ranking
Pedestrian	0.77	4
Lack of Parking Space	0.823	2
Improper Loading/Unloading	0.833	1
Lack of Enforcement	0.768	3

**III. RESULTS AND DISCUSSION**

**3.1 Pedestrian**

The relative importance index of pedestrians as a contributing factor to traffic congestion in the Central Business District of Sta Cruz, Public Market Highway. Upon the importance ranking, “Pedestrians do not usually use the designated

pedestrian lane(s) because they see other people jaywalk, they think it is okay to do so.” yields the highest RII of 0.818 as most respondents agreed that pedestrians in the area have a significant effect on traffic. Interactions between pedestrians and vehicles frequently result in disputes over safety, traffic congestion, and priority or right-of-way issues. (Frosch et al., 2019) 23 Moreover, “Pedestrians do not usually use the designated pedestrian lane/s because running across anywhere on the road saves time.” Respondents concurred that it contributes to the problem with governing RII of 0.809. According to (Molyneaux et al., 2021), congestion has an impact on pedestrian traffic in a similar way that it does on vehicular traffic, which can lead to longer travel times, higher costs, and more dangers. Congestion like this should concern the authorities, and they should work to prevent it. As well as the “Jaywalkers interrupt the traffic flow.” which garnered an RII of 0.798, ranked third. “Vehicle operators do not respect the pedestrian lanes” was found to be the fifth most important factor. In contrast, “The pedestrian lane/s is often not accessible because it is blocked by illegally parked vehicles or any kind of obstructions.” was found to be the fourth most important factor, with a relative influence index of 0.779. On the other hand, “Illegal and inadequate traffic signages installed” was ranked sixth. The seventh-placed problem is the “Absence of Traffic Law/Enforcer.”

### 3.2 Parking Spaces

The accessibility of parking spaces is an essential factor that drives the number of cars on the road and the congestion level. (Christiansen et al., 2017) It concerns the distribution of moving traffic, which is heavily influenced by parking allocation in urban networks. (Shen et al., 2020). The number 1 on the ranking is that some part of the service road is used as a parking space. The total number of respondents who participated and were computed using the relative important index is 0.836. A portion of the service road used as parking had a relative importance index of 0.834, placing it in second place. In contrast, a vehicle parked next to the service road had a relative importance index of 0.833, placing it in third place. The accessible parking areas that PUVs (tricycles) use as terminals had a relative importance index of 0.8, placing it in fourth place. In contrast, 0.795 important relative indexes computed that operators do not consider private or paid parking an option when it comes to parking, ranked as fifth. Parking issues can lead to an increase in overall traffic volume,

obstructions, and instances of road rage. (Mazelan & Ab Rahman, 2018)

### 3.3 Improper Loading and Unloading

Based on the ranking of importance provided by the respondents, the most significant issue related to loading and unloading is the Vehicles loading/unloading passengers at prohibited zones. This issue received a computed RII of 0.81, the highest score among all the options. The second most important issue was that Private vehicles took a long time to drop off or pick up, with a computed RII of 0.8043, followed by Improper loading and unloading of vehicles causing traffic to be interrupted, with a computed RII of 0.8037. The fourth-ranked issue was commuters’ queues in unauthorized areas, with a computed RII of 0.803. Lastly, the “loading and unloading areas are not enough” was the least important issue, with a computed RII of 0.7891. Essentially, the respondents placed the highest priority on the lack of good loading/unloading areas. The act of loading and unloading might be risky. People can be severely injured by machinery. Working at heights, moving, or toppling vehicles, and heavy weights can all result in harm or death.

### 3.4 Lack of Enforcement

The first on the ranking is that no traffic law enforcement officials are present in the area. The total number of respondents who answered and were computed using the relative importance index is 0.782. There were 0.746 relatively important indexes computed in the Vehicle operators do not respect traffic law enforcers, ranked second. Next is the 0.739 relative important indexes computed that traffic rules, ordinances, or regulations are not followed appropriately, ranked number 3. While a 0.727 relative important index was computed that Enforcers do not perform their duties effectively. Lastly, the 0.719 relative important indexes computed that the area is not equipped with adequate warning, informative, and regulatory signs ranked fifth. These issues are made significantly worse by the fact that traffic law enforcement could be improved, which removes any incentive for drivers to follow the rules of the road. (Mazelan & Ab Rahman, 2018)

### 3.5 Summary of Factors

In summary, it gives us the result for the most significant factor contributor to the traffic dilemma in Sta. Cruz (Central Business

District) was the Improper Loading and Unloading, garnering a 0.833 importance index, followed by Lack of Parking spaces for business establishments and institutions with a 0.823 index. The third factor contributing was the need for more enforcement, as shown in the table, having 0.786. The pedestrian was the minor contributor to traffic, which deliberately got a 0.769 relative index which gives minimal effect on traffic based on the data gathered.

#### IV. CONCLUSION

This research has highlighted the Evaluation of Factors Contributing to Traffic Flow along JASA, Sta. Cruz (Central Business District), Lubao, Pampanga. Based on the results of this study, it can be concluded that improper loading/unloading was the most significant factor among the four contributing mobility factors, followed by the Lack of parking spaces and enforcement, and lastly, the Pedestrian. Allowing public and private vehicles to load and unload only in authorized areas and adding other loading and unloading zones will positively affect the traffic flow. Lack of parking spaces is second to the most significant factor; public places along major thoroughfares, such as churches, schools, and business areas, do not have adequate parking spaces, which is the most common issue affecting traffic flow. The respondents say that allotting more parking spaces and allowing only drop-offs and pick-ups within the establishment influences the traffic flow positively. Strict implementation of rules and regulations is a must for alleviating traffic dilemmas in the area and deploying a sufficient number of enforcers to compensate for the enforcement needs will have a good effect. "Pedestrians do not usually use the designated pedestrian lane(s) because they see other people jaywalking and think it is okay to do so." is another factor that interrupts the traffic flow, but building a footbridge or installing pedestrian traffic lights will improve the traffic condition in the vicinity, according to the vast majority of respondents.

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