International Journal of Engineering Research & Technology (IJERT)
ISSN: 2278-0181
Vol. 10 Issue 11, November-2021

Case Study of Traffic Congestion in Vientiane Laos

Sane Souvanhnakhoomman
Mechanical Engineering Department,
De la Salle University

Abstract: **Traffic congestion has been a global problem for decades, wasting time and energy and polluting the environment. This article discusses the subject of traffic congestion in Vientiane, Laos, and suggests various solutions. The study discusses a variety of topics, including definition, congestion classification, characterization, and congestion management. The concept of public transportation (Bus rapid transit), its infrastructure, its effect, and the government's plan to confront BRT technology are all shown.**

Keywords: Traffic congestion, Traffic congestion problem, Bus rapid transit (BRT),

I. INTRODUCTION

Congestion is a common occurrence in the transportation industry, particularly in cities. Congestion is one of the issues that arise while driving on a highway. Typically, network congestion arises in the land transport sector, namely on highways.

In Vientiane City, Lao PDR's capital, the number of vehicles and motorcycles has been expanding in lockstep with population growth and family income increased due to recent economic progress. Following an average yearly rise of 11% in private automobiles over the previous decade [1], the total number of registered vehicles in Vientiane has doubled in the last five years. Each year, this has exacerbated traffic congestion throughout the city. Due to the increasing rise of private motorized vehicle usage, the city is experiencing congestion and associated accidents, decreasing local air quality and greenhouse gas emissions. Congestion and attendant worries about local air quality, travel times, accidents, and a deteriorating urban environment put Vientiane's transportation growth on an unsustainable course.

Vientiane's road user population continues to rise each year, and road building has been unable to keep up with the rising army of automobiles. Due to the fast economic development seen during the 1990s, the Lao People's Democratic Republic is well on its road to motorization. Particularly in Vientiane, which has a population of 693,000, automobile registration has expanded dramatically from around 80,000 in 1990 to over 220,000 in 2004. This tendency is likely to continue. Vientiane's traffic is dominated by two-wheelers, which account for around 65 percent of all vehicles. Additionally, recent years have seen an upsurge in four-wheel vehicles [2]. As a consequence, Vientiane's major trunk routes are congested with a variety of vehicle kinds.

The Vientiane Public Works and Transport Department announced earlier this year that the city has a total of 661,612 registered automobiles. With 850,000 residents, this indicates that moreover 70% of the population has a car of some form [3]. Over the last four or five years, traffic loads have increased dramatically, with the workday rush hours (7:00-8:30) being particularly problematic. However, several significant thoroughfares are now quite packed on Saturdays and Sundays as well.

II. IMPACT OF TRAFFIC CONGESTION

Road traffic congestion is a severe issue in most Laotian cities, owing to a poorly constructed road network and the prevalence of tiny vital areas that are frequent hotspots for congestion [4]. Congestion has several negative consequences, one of which is the wasting of necessary time. The time that is squandered may be better spent on productive activity [1]. Slowing vehicle speeds or abrupt stop-and-go driving patterns in traffic result in increased fuel consumption and polluting gas emissions [1]. Noise pollution is inversely proportional to traffic congestion. It exceeds 90dB during business hours, which is hazardous to our health.

III. REASON FOR TRAFFIC CONGESTION

This study attempts to pinpoint the root reasons for peak-hour congestion. Congestion is a local issue, not a universal one; the causes vary from case to instance and are closely tied to the route under examination. Because the causes differ from location to location, not all reasons and remedies can be generalized even within the same city or nation. Indeed, all of the factors listed below contribute to traffic congestion.

IV. CAUSE OF CONGESTION

Congestion occurs on road networks when the physical usage of the route by cars rises. It happens when the road network becomes incapable of supporting the amount of traffic that they generate and is characterized by sluggish speeds, lengthy journey times, and heavy vehicular congestion.

- **Inadequate city development planning:** The Growth Plan is responsible for the long-term planning of the city's development. However, this planning is flawed. Often, it is seen that some individuals have unlawfully discontinued roadside land use, however owing to the ambiguous development plan, these types of actions are futile.
- Increasing growing population in Vientiane capital, rapidly growing population by birth and migration facing an unexpected congestion on road. Better

International Journal of Engineering Research & Technology (IJERT)
ISSN: 2278-0181
Vol. 10 Issue 11, November-2021

facilities like-communication system, medical facilities, educational institution leads to heavy traffic.

- Illegal Parking: Illegal parking is one of the main causes of traffic congestion in Vientiane city. Illegal parking's are mostly done in front of bus stop, petrol pumps and footpaths etc. Due to this traffic flow is interrupted and slows down the speed of vehicle until the wrongly parked vehicles are removed.

Figure 1: Displays illegal parking [4].

- Increasing motorbike: In Vientiane capital the amount of number using motorbike more than cars on the road especially students came from difference area alive in Vientiane using motorbike transit to education

Figure 2: People used Motorbikes in Vientiane Capital [5].

- Narrow roads: which cannot be widened because they are tightly packed with buildings
- Passage of heavy vehicle on narrow roads: Traffic congestion is also caused due to passage of heavy vehicle through narrow road in most of the cases huge traffic is stuck for a longer duration. Generally, this happens due to the diversion of traffic.
- Public Bus Stop to pick up and take off people

VI. SOLUTION TO CONTROL TRAFFIC CONGESTION

4.1. Bus Rapid System (BRT)

Bus rapid transit (BRT), also called a busway or transitway, is a bus-based public transport system designed to improve capacity and reliability relative to a conventional bus system [6]. Typically, a BRT system includes roadways that are dedicated to buses, and gives priority to buses at intersections where buses may interact with other traffic; alongside design features to reduce delays caused by passengers boarding or leaving buses, or purchasing fares. BRT aims to combine the capacity and speed of a metro with the flexibility, lower cost and simplicity of a bus system.

Figure 3: TransJakarta in Jakarta, Indonesia. With a length of 251.2 km [7].

The location of the segregated busway within a specific roadway is a design decision that offers more options than might be immediately apparent. Busway configuration, also known as alignment, is critical to achieving fast and efficient operations by minimizing the potential conflicts with turning cars, stopping taxis, and unloading delivery trucks. Because of this,

The BRT Standard awards the highest points to those configurations that minimize those conflicts that happen at the curb the most: two-way busways in the central verge of the roadway, two-way busways that run adjacent to an edge condition like a waterfront, and bus-only corridors, like a transit mall. A two-way busway that runs on the side of a one-way street is awarded fewer points. The reason for the point drop is a concern for safety as pedestrians are unlikely to expect traffic to come from the opposite direction. One-way busways in the median of a one-way street are awarded even fewer points and one-way busways that run alongside the curb of a one-way street fewer still. Virtual lanes are awarded the least point.

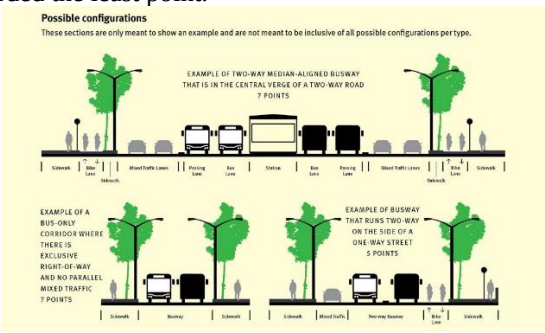

Figure: Examples of different BRT roadway configurations from The BRT Standard. *ITDP* [8].

a. The impact of BRT

- Travel time impacts: Several design elements of high-quality BRT systems can help to quicken passenger boarding and alighting times, reducing overall travel times
- Environment impacts**:** Reductions in vehicle emissions can be achieved in several ways, Including reducing vehicle kilometres travelled (VKT) and improving the fuel efficiency and technology of the buses. And Passengers shifting from single-occupancy vehicles to

International Journal of Engineering Research & Technology (IJERT)
ISSN: 2278-0181
Vol. 10 Issue 11, November-2021

high occupancy BRT buses reduce overall VKT in the city.

- Public health impacts: Bus rapid transit systems also provide valuable public health benefits to society in three key ways: reduced road fatalities and injuries, reduced personal expose to harmful air pollutants and increased physical activity for BRT users
- Urban development and property impact: Extensive research has confirmed that urban properties respond positively to transportation improvements. This typically takes the form of higher property values and, if zoning allows, land-use intensification. In the short term, benefits of transportation infrastructure investments get capitalized in land values, while over the longer term, land uses may change
- Land value change**:** The reductions in travel time and the improvements in quality of service associated with the implementation of a new transit line often get capitalized into land values, as residents and businesses are willing to pay a premium to be closer to transit stations. The magnitude of the impact tends to vary considerably with market dynamics, property types, and across different regions of the world.
- Employment impacts**:** Construction, operation and maintenance of BRT systems can create jobs. This may result in a net increase in the number of employed people, or merely a shift of workers from one job or sector to another. In many cases, BRT systems create new jobs in the formal economy that replace informal jobs from the existing traditional transport system.
- Crime impacts: By providing well-lit stations staffed with security personnel, security cameras on buses and in stations and pedestrian-scale lighting around stations, BRT systems can create a safer environment in those areas they serve

VII. PREPARATION OF GOVERNMENT

7.1. Preparation

a. Political vision: An initial vision statement from the political leadership marks an important first step in the making the case of improved transit to the public.

b. Legal basic: A statutory of legal mandate need to create prior to the project being officially recognised then allows public funds to be disbursed toward the planning process as well as permit planning

c. Project team and structure: The organization and selection of a dedicate BRT planning team is a fundamental step towards planning the system

d. Work plan and timeline: should be revisited and revised from time to time during the planning process

7.2. Analysis

a. Background analysis: Understanding woven into the existing demographic, economic, environmental, social, and political conditions enable the BRT planner to better align the prospective public transit system with the local realities.

b. Stakeholder analysis: Existing transport operators, and operators' and drivers' associations (formal and informal), Customers, Traffic and transit police, non-governmental organisations and Community-based organisations.

c. Data collection: The data collected on current transport supply and demand will serve as a major input into determining the design characteristics of the system

d. Modelling: Modelling helps project future transport growth as well as allows planners to run projections across many different scenarios.

7.3. Communication

a. Public participation: Incorporating public views on design and customer service features will also help ensure that the system will be more fully accepted and utilised by the public

b. Communications with existing transport operators: Exchange the idea and working together with BRT project

c. Marketing plan: Creating the right marketing identity helps create the right image in the customer's mind.

d. Public Education plan: To prepare the public for BRT, an educational campaign will be necessary. this plan is in part designed to secure support and approval for BRT but also to better prepare the public on how the system will be used.

7.4. Business and regulatory structure

a. Business structure: Existing business structures in developing cities: Public systems, Private sector systems and Mixed systems (public and private roles)

b. Institutional structure: The supporting institutional and regulatory structure can either create an environment of efficiency and transparency or lead to misplaced incentives and even corruption

c. Incentive for competition: The right set of financial incentives can encourage contractors and concessional firms to operate a BRT system at the highest levels of quality and performance

7.5. Infrastructure

a. Conceptual study and detailed study: The level of detail in the infrastructure plan will evolve as the BRT project progresses. In the first stage, conceptual designs will be developed in tandem with the emerging operational plan. More detailed engineering analyses will follow once the conceptual study and the initial cost estimates warrant a commitment towards a particular design: Busways, stations, Terminal, depots, Control center, utilities and Landscaping

7.6. Technology

a. Vehicle's technology: Private procurement of the vehicles also permits public investment to be focused on high-quality infrastructure. Additionally, by keeping public officials away from the bus purchasing process, there is less likelihood of corruption and misappropriation of public funds.

b. Intelligent transport system: (ITS) refer to a range of information technologies that provide more choices and better quality for the custom. Real-time information displays are one application of ITS that can alleviate concerns over the reliability of a service.

c. Technology procurement: To achieve this environment of competitiveness, the procurement specifications should be sufficiently rigorous to meet system requirements while also permitting bidding firms the ability to innovate (cost, experience, quality, etc.).

7.7. Modal integration

The BRT system does not end at the entry or exit door of the station, but rather encompasses the entire client capture area.

International Journal of Engineering Research & Technology (IJERT)
ISSN: 2278-0181
Vol. 10 Issue 11, November-2021

If customers cannot reach a station comfortably and safely, then they will cease to become customers.
Other transport options such as walking, cycling, driving, taxis, and other public transport system should not be seen as competitors with the BRT system

VIII. CONCLUSION

Overall, in Vientiane capital traffic problems are caused by an overreliance on private transport and a failure to keep up with the rapidly expanding population however, the city has shown it can solve problems in the past, and I am confident that it can reduce traffic congestion in the future. Overall, too many cars for too few roads have led to severe congestion in the city. However, if the municipal authorities encourage residents to use public transport system (Bus rapid transit). I am sure lao people will continue to be a pleasant city to live in future.

REFERENCE

[1] The Ministry of Public Works and Transport for the Asian Development Bank. Initial Environmental Examination. August 2014. LAO: Vientiane Sustainable Urban Transport Project
[2] Government of the Lao PDR, MCTPC and the Japan International Cooperation Agency (JICA). 2008. The Study of Master Plan on Comprehensive Urban Transport in Vientiane in Lao PDR. Vientiane
[3] J&C Group – Your Trusted Partners in Laos: https://jclao.com/overpass-mulled-as-solution-to-vientianes-traffic-snarls/
[4] J&C Group – Your Trusted Partners in Laos: https://jclao.com/vientiane-cracks-down-on-illegal-parking/
[5] http://environmental-issues-vientiane.blogspot.com/2014/
[6] "What is BRT?". Institute for Transportation and Development Policy: https://www.itdp.org/library/standards-and-guides/the-bus-rapid-transit-standard/what-is-brt/
[7] Bus rapid transit – Wikipedia: https://en.wikipedia.org/wiki/Bus_rapid_transit
[8] https://brtguide.itdp.org/branch/master/guide/roadway-and-station-configurations/roadway-configurations#figure:examples-of-different-brt-roadway-configurations-from-the-brt-standard