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TRAFFIC CONGESTION SITUATION IN THE TRICYCLE CAPITAL OF THE PHILIPPINES: ITS CAUSES AND EFFECTS

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ABSTRACT
This study aimed to define the current traffic condition in the central business district of Nueva Ecija—Cabanatuan City. To describe the economic impact of traffic and to analyze the main reasons or the possible causes of traffic congestion in the city and to identify possible courses of actions to deplete the congested traffic in the entire city are the objectives of this study. Moreover, identifying the potential effects is also a key objective of this study to appropriately align and equalize the recommendations. For the methodology, the proponent of the study utilized a descriptive method of research to describe and define the causes and effects of traffic congestion in the said city. To explore research questions that have been established, arranged, and measured, the data that had been gathered were used to construct a well–structured and comprehensive representation of results. Results have shown that poor maintenance is among the four major causes of traffic congestion. It is followed by poor control measures then the third is physical inadequacy and the last is human errors. The study also found out that the most significant consequence of traffic congestion is the interposition of vehicles. The researcher, therefore, recommends that the authorities in charge of road maintenance should have the extra manpower to speed up road construction or repair. It can also be proposed that road construction should be done when there are limited road users which means that road works can be accomplished during night time. Traffic Enforcers are likewise advised to regularly enforce traffic laws and be visible in areas where traffic congestion is likely to occur. Finally, road users should comply with traffic laws and regulations specially by staying on their proper lane and avoiding counter flowing and encroaching to any way possible when traffic congestion occur.

Keywords: causes and effects, human errors, physical inadequacy, poor control measures, poor maintenance, traffic congestion

INTRODUCTION
Industrialization is the outcome of rapid economic escalation, and dramatic rises in the gross domestic product would dramatically improve the economic conditions and well–being of those residing in that particular locale. Industrial growth opens up possibilities for positive externalities which are difficult to measure (Morris and Fessehaie, 2014). Consequently, consumers' standards of living are completely associated with the levels of income (Wen, 2018), which is analogously related to the expenditure habits and disposable income—an increase in income will lead to an escalation of spending habits (Kate4Kim, 2013). Some people say that as customers become wealthier, vehicle acquisition often increases (Green, 1995). Adding to this is the huge

reality that the availability of vehicle loan facility results in more car ownership because people can have easy access to purchase one (Broadstock, 2011).

Putting things into a brighter perspective, automobile dependency has various impacts that affect the economic development of one country (Litman, 1999). This activity is a concrete manifestation of economic escalation because it can contribute to economic growth due to taxes levied from petroleum products by the government. In reality, an increase in vehicle acquisition is one of the major contributors to a state's economic growth (Ross, 2020).

Each day, millions of people travel to and from work, shops, go to sports clubs, or school. Due to this, mobility becomes part of one's society. As a result, transportation becomes an activity of life processes and seeks to provide access to various activities that satisfy the mobility needs of humankind (Arasan, 2012). Transportation revolves around human–type economic and social practices (Harriet, Poku, and Emmanuel, 2013).

Unfortunately, transport in the Philippines is relatively underdeveloped, partly because of the country's mountainous areas and scattered islands and somewhat because of the government's persistent underinvestment in the nation's infrastructure. In recent years, however, the Philippine government has been pushing to improve the transportation system in the country through various projects (Crisostomo, 2002). Rodrique et al, (2009) claim that the eventual effects of inadequate transport facilities, such as road spaces, parking spaces, road signs, and effective traffic management, can be seen as traffic congestion. The downside of this is, it requires a more drastic and optimistic program or plan of the government to reinforce the traffic rules and regulations because of its potential negative impact on the central business district of a certain area both urban and rural.

The goal of every nation is to enhance the social and economic well–being of the citizenry (Harriet, Poku, and Emmanuel, 2013), the researcher as an academician and a faculty member of the Nueva Ecija University of Science and Technology of the College of Criminology and has lived in the city of Cabanatuan has realized the significance of redefining the possible causes of traffic congestion in the what so–called, "Tricycle Capital of the Philippines". Thus, it is significant to determine the causes and effects of traffic congestion in the city to be able to propose some recommendations to lessen the traffic problems in terms of physical inadequacy, poor control measures, human errors, and poor maintenance due to the logarithmic increase of car acquisition wherein identifying the primary sources of the problem or accident is essential to properly address the issues and to formulate an effective action plan.

Hence, the main objective of this study is to determine the causes and effects of traffic congestion in what so–called, "Tricycle Capital of the Philippines"—Cabanatuan City. Specifically, this study aimed to describe the possible causes of traffic congestion within the city to the daily commuters in terms of physical inadequacy, poor control measures, human errors, and poor maintenance. This research is also intended to describe the effects of traffic congestions on travelers. To lessen the negative effects of traffic congestion in the life of the daily commuters, the researchers proposed some recommendations.

METHODS AND MATERIALS

To attain the objectives of this study, the researcher used the descriptive method of research. According to Fox and Bayat (2007), descriptive research is "aimed at casting light on current issues or problems through a process of data collection that enables them to describe the situation more completely than was possible without employing this method." Polit and Beck (2004) assumed that the utility of descriptive research increases the analysis of relations between the phenomena necessary for this type of analysis while Loeb, Dynarski, McFarland, Morris, Reardon, and Reber (2017) believed that descriptive analysis can also be used to diagnose issues that warrant the immediate attention of policymakers, practitioners, and researchers.

This method was used by the researchers to explore queries that have been established and arranged and measured the data that had been gathered to construct a well–structured and comprehensive representation of results. This aimed to explain the current position of a particular number of samples that represents the whole population following one or more variables. In this study, the researcher decided to use a structured survey questionnaire as the primary measuring instrument. The use of a structured questionnaire has a close relationship with quantitative analysis (Converse and Presser, 1986). A total of 100 survey questionnaire was administered to the different workers in the city and after the data had been studied and presented, an analysis was conducted to establish an interpretation which would result to the attainment of answering the objectives of this study.

The data collected related to the causes of traffic congestion in terms of physical inadequacy, poor control measures, human errors and poor maintenance as encountered by commuters were computed using a weighted mean. The rating scale of the close–ended questionnaire and corresponding verbal description were presented in the table below:

Ranges	Rate	Causes of Traffic Congestion
4.20–5.00	5	Strongly Agree
3.40–4.19	4	Agree
2.60–3.39	3	Moderately Agree
1.80–2.59	2	Disagree
1.00–1.79	1	Strong Disagree

On the other hand, to determine the effects of traffic congestion, the Relative Importance Index was used. To assess the relative importance of the different causes and effects of delays, the Relative Importance Index approach is used (Desai & Bhatt, 2013). The RRI was computed using the formula below:

RII = Sum of weights (W1 + W2 + W3 + ……+ Wn) / A x N

where W = weights given to each factor by the respondents and will range from 1 to 5 where '1' is less significant and '5' is extremely significant. A = highest weight (i.e. 5 in this case), and N = total number of respondents.

RESULTS AND DISCUSSION

This section provides for the presentation of data relevant to the objectives of the study. The related evaluation and interpretation of the presented data were discussed using the statistical tools cited above.

Table 1. Physical Inadequacy as a Cause of Traffic Congestion

No.	Item Statement	Weighted Mean	Verbal Description
1	The lack of roads causes traffic congestion	3.46	Agree
2	The narrow roads causes traffic congestion	3.78	Agree
3	The lack of warning signs causes traffic congestion	3.50	Agree
4	The absence of road markings cause traffic congestion	3.36	Moderately Agree
5	The lack of safety barriers causes traffic congestion	3.46	Agree
	Total Average Weighted Mean	**3.51**	**Agree**

From the above results, it can be noted that the commuters strongly agreed that the traffic congestion in the town was caused by the narrow roads in the town. According to Jain, Sharma, and Subramanian (2012), road congestion can occur due to the narrow and poorly constructed roads and roads that are inefficient in managing various types of vehicles, resulting in the inability of the government to manage traffic effectively creating bottlenecks that last for long periods. If the truth is to be told, in developing countries, roads tend to be narrow and poorly made (Kwikiriza, 2016). Besides, the travelers agreed that the lack of warning signs causes traffic congestion. A collection of road and warning signs that are responsible for transmitting driving rules, maintaining traffic control, and directing drivers along roads and highways should monitor and regulate roadways across the country (Industry Today, 2020). Moreover, the respondents also agreed that the lack of roads causes traffic congestion. Kwikiriza (2016) noted that as cities grow in an ad–hoc fashion, there is no provision for scaling road capacity, eventually resulting in multiple bottleneck roads, which remain congested for long periods. For secure and efficient transport, but also to reduce the intensity of a car crash or prevent a major accident and also to reduce traffic congestion, safety road barriers are very necessary (Green, 2014). Median barriers, for example, prohibit and are commonly used by vehicles from entering an approaching traffic lane. From the results above, it can be stated that lack of physical highway features can contribute to traffic congestion especially in a busy city like Cabanatuan.

Table 2. Poor Control Measures as a Cause of Traffic Congestion

No.	Item Statement	Weighted Mean	Verbal Description
1	The ineffective mechanical controlling devices cause traffic congestion	3.50	Agree
2	The ineffective traffic enforcers cause traffic congestion	3.50	Agree
3	The poor implementation of traffic rules cause traffic congestion	3.65	Agree
4	The lack of traffic enforcers cause traffic congestion	3.65	Agree
5	The poor traffic equipment cause traffic congestion	3.60	Agree
	Average Weighted Mean	**3.58**	**Agree**

It can be gleaned from the above data that the commuters agreed that traffic congestion was exacerbated by the weak enforcement of traffic laws and the absence of traffic enforcers.

Kwikiriza (2016) emphasized that lack of law implementation is causing a lot of traffic congestion on the road. Often, drivers and other road users are not truly trained to practice lane discipline. If truth be told, the overcrowded junction situation worsens the effects of poor lane discipline, especially at traffic intersections. All these issues are exacerbated by the lack of proper compliance with the law, so law enforcement should be strict. Additionally, the travelers agreed that ineffective mechanical controlling devices and futile traffic enforcers cause traffic congestion. De Guzman (2020), in his article, stated that traffic enforcers in the Philippines particularly those attached to local government units (LGUs) tend to enforce only convenient rules such as number coding and the ban on trucks, while more dangerous violations such as counter flowing are not consistently understood. According to Rath (2018), during the pre–defined rush times on the lane, the Traffic Control System handles and controls heavy traffic. It uses the video monitoring system to detect excess traffic through a video camera, and when a pre–calculated threshold value is increased by the number of vehicles on a specific route, it alerts the STMS traffic control with an alarm signaling "traffic limit reached" and prevents any other vehicle from entering that path. That being said, it can be established that the respondents agreed that poor traffic equipment causes traffic congestion. For that reason, poor control measures can be considered as a major cause of traffic congestion (Delizo, 2014).

Table 3. Human Errors as a Cause of Traffic Congestion

No.	Item Statement	Weighted Mean	Verbal Description
1	The slow drivers or poor driving habits cause traffic congestion	3.26	Moderately Agree
2	The pedestrians mistake cause traffic congestion	3.05	Moderately Agree
3	The traffic enforcers errors cause traffic congestion	3.14	Moderately Agree
4	The poor planning on traffic management cause traffic congestion	3.44	Agree
5	The poor legislation of traffic laws cause traffic congestion	3.53	Agree
	Average Weighted Mean	**3.28**	**Moderately Agree**

The above data showed that the respondents agreed that poor legislation of traffic laws is a cause of traffic congestion. According to Popoola, Abiola, and Adeniji (2013), the various state governments and federal governments controlling most of these major roads affected by congestion should also promote the use of efficient mass transit buses to minimize the number of vehicles on the highway to encourage the enforcement of traffic laws on road users, and in particular the management of the various religious bodies located along the road. Into the bargain, it was also agreed by the commuters that poor planning on traffic management is also a cause of traffic congestion. Momoh (2011) argues that inadequate transport system planning has contributed to overdependence on motor vehicles, resulting in too many vehicles with associated issues, including traffic congestion. As a consequence of an unplanned city, it can also be concluded that the city suffers from traffic jams (Bobylev, 2009). By the same token, the respondents moderately agreed that slow drivers or poor driving habits cause traffic congestion.

According to Mahmud, Gope, and Chowdhury (2012), as slow and fast–moving speed vehicle variations run through the same lane, slow–moving vehicles make the fast–moving vehicles slowly. This is also one of the important reasons for a traffic jam on the road. Besides, over speeding, texting while driving, drink, and drive, inattentiveness, etc. are to blame (Mhandu and Kazembe, 2012). Thus, many traffic congestions are caused by slow drivers or bad driving habits, pedestrian errors, officer mistakes, poor planning, poor regulations, and traffic accidents often due to human errors (Delizo, 2014).

Table 4. Poor Maintenance as a Cause of Traffic Congestion

No.	Item Statement	Weighted Mean	Verbal Description
1	The unrepaired diggings/canals on the side of the road cause traffic congestion	3.80	Agree
2	The cracked or uneven road pavements cause traffic congestion	3.70	Agree
3	The unfinished road pavement concreting cause traffic congestion	3.99	Agree
4	The inappropriate budget for the maintenance of the traffic facilities cause traffic congestion	3.62	Agree
5	The damaged portion of the traffic way cause traffic congestion	3.86	Agree
	Average Weighted Mean	**3.79**	**Agree**

It can be seen from the data above that the commuters agreed that the unfinished road pavement concreting causes traffic congestion. Road work is known to be a big factor leading to congestion in traffic. Incidents, such as roadwork, cause bottlenecks and injuries to occur, which in turn cause traffic congestion (Schwietering and Feldges, 2016). In the same way, the respondents agreed that unrepaired diggings/canals on the side of the road cause traffic congestion. Equally, the respondents also agreed that cracked or uneven road pavements cause traffic congestion. Tilak and Reddy (2016) mentioned that the uneven road network features prompt road congestion. In the same vein, the travelers also agreed that an inappropriate budget for the maintenance of the traffic facilities causes traffic congestion. According to Wagschal. et al. (2008), tighter and limited budgets, and investments that are required to set up traffic management infrastructures can be a major contributor to traffic congestion. Oftentimes, motor vehicles are stalled in traffic ways because of unrepaired diggings, cracked pavement, or unfinished road pavement concreting which can be attributed to inappropriate budget for the maintenance of traffic facilities (Delizo, 2014).

Table 5. The Effects of Traffic Congestion

No.	Item Statement	RII	Ranking
1	Traffic congestion can lead to waste of time	0.83	2
2	Traffic congestion can lead to air pollution	0.81	6
3	Traffic congestion is the main reason for accidents	0.77	8
4	Traffic congestion may lead to global warming	0.74	12
5	Getting stocked in traffic consumes a lot of fuel	0.72	13
6	The traffic congestion brings a lot of road damages	0.65	15
7	The traffic congestion affect an individual estimated travel time	0.82	3
8	The traffic congestion is stressful	0.75	11
9	Tardiness and low productivity at work	0.81	5
10	The traffic congestion delay the response time of emergency vehicle	0.79	7
11	Driving late at night because of traffic congestion	0.81	4
12	Seeking of an alternate route due to traffic congestion	0.77	9
13	Traffic congestion prompt others to walk instead of commuting	0.71	14
14	The traffic congestion can lead to road rage	0.75	10
15	The traffic congestion creates interposing of vehicles	0.84	1

The study found out that the most significant consequence of traffic congestion is the interposition of vehicles. Congested traffic also leads to an accident when drivers try harder than others to get through the congested highways (Elisonguo, 2013). Similarly, it was revealed from the data above that traffic congestion can lead to a waste of time. In reality, it can lead to the late arrival of workers to their workplaces, resulting in production delays, missed deliveries, decreased productivity, and limited economic growth (Elisonguo, 2013). Correspondingly, the commuters exposed that traffic congestion affects an individual estimated travel time. Driving conditions are unreliable when roads are congested because traffic flow is impeded, thereby increasing travel time (Vencataya, Pudaruth, Dirpal, and Narain, 2018).

The findings of the survey conducted for this study also revealed that traffic congestion affects people's social lives because they have to begin their journey earlier in the morning and arrive home later than the usual time in the evening to escape traffic (Vencataya, Pudaruth, Dirpal, and Narain, 2018). Traffic congestion can contribute to air pollution as well. Given the fact that air pollution increases as urban car speeds decrease and activity increases as stop and start (acceleration and deceleration), it, therefore, leads to air pollution (Kwikiriza, 2012). Along the same line, the travelers also observed that traffic congestion can delay the response time for the emergency vehicle. According to World Health Organization (WHO), over 3,400 people die on the world's roads every day and tens of millions of people are injured and others are being disabled every year (Kwikiriza, 2012). Traffic congestion has also been expected to induce a high level of stress and dissatisfaction to commuters, even to drivers, as they need to be more attentive and focused while driving in difficult circumstances (Vencataya, Pudaruth, Dirpal, and Narain, 2018). The respondents also uncovered that getting stocked in traffic consumes a lot of

fuel. Choi et al. (2013) and Elisonguo (2013) stipulated that, due to traffic congestion, fuel consumption and car depreciation also tend to rise, leading to more money being spent by travelers on fuel. Various authors have also claimed that the main causes of air pollution are vehicular exhalation, caused by traffic congestion (Chakrabartty and Gupta, 2014; Elisonguo, 2013).

CONCLUSION AND RECOMMENDATION

This study has brought into focus the issue of traffic congestion in the busiest city in the province of Nueva Ecija, Philippines–Cabanatuan City. Based on the results of this study, it can be concluded that poor maintenance is the topmost cause of traffic congestion among the four major causes. Followed by the poor control measures then third is physical inadequacy and last is human errors. This is valid because it generates congestion roads where there are unfinished road buildings or roads awaiting repair, resulting in vehicle queuing that causes drivers to be reckless and violate traffic laws. It can also be concluded that the most significant consequence of traffic congestion is the interposition of vehicles.

Based on the conclusion above, it is recommended that the authorities responsible for road maintenance should have the additional man power to expedite the construction or repairs of roads. It can also be suggested that road construction should be done when there are limited road users that can be accomplished during night time. It is also recommended that traffic enforcers routinely impose traffic laws and be noticeable in places where traffic congestion is likely to occur. Finally, when driving a motor vehicle, it is recommended that drivers should comply with traffic laws and regulations specially by staying on their proper lane and avoiding counter flowing and encroaching to any way possible when traffic congestion occur.

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