

# “Link In Park”, Exploring the Possibilities of Adapting the Park Connector Model of Singapore in DHVSU - SM Pampanga route: A Correlational Study between Road Condition and Traffic Experience

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**Abstract:** - Traffic is a significant problem in the field of transportation. As a developing province in the north, Pampanga experiences dilemmas in traffic congestion along highways and intersections. The Municipality of Bacolor, and The City of San Fernando, the capital of Pampanga, are urbanized areas with colossal traffic volume observed daily. This study aimed to explore the factors of an individual’s perception and experience in commuting for consideration of active transport and propose a possible route according to the data gathered by adapting the Singapore Park Connector Network. Using the results of a survey questionnaire administered to 385 students of DHVSU Main Campus Bacolor, Pampanga, the collected data were analyzed to examine the correlation between traffic experience and road conditions, and evaluated the consideration of active transport. Models were generated using ArcGIS, AutoCAD, SketchUp. Local Government Unit, and other secondary data were also gathered in performing this study. Features and other public-necessities are also included to help smoothen the experience of commuters.

**Key Words:** — *Bike lanes, road conditions, traffic experience, Pearson’s correlation.*

## I. INTRODUCTION

The Philippines is indeed one of the fastest developing countries, yet the country is also facing a huge problem bottlenecking the improvement of the economy and innovation in the country: traffic. The Philippines is the worst country among the six countries in the Association of Southeast Asian Nations (ASEAN) regarding traffic management. It has the worst traffic in ASEAN and is ranked ninth worst traffic on a

global scale (Martinus, 2021). Based on the report, the 81 different countries were evaluated based on the average time spent in traffic, the amount of carbon dioxide released in traffic, and the overall inefficiencies of the current traffic system. In Manila, the average one-way trip takes roughly 45 minutes, according to the evaluation. The economy of the Philippines continues to improve in services and industrial aspects, apart from rural agriculture. More than 60% of the population opts to live in cities, and it is undeniably expected to continue to increase relentlessly. Aside from that, the effect of massive urbanization is the result of rapid development contributing to the degradation of urban management, such as the uncontrollable traffic congestion due to a lack of management and planning. Similarly, local cities in the country may need help comprehending traffic planning, theories, and measures. About three in four Filipinos have missed or been late for appointments, job interviews, and weddings because of traffic. It is also said that Filipinos will spend a little over 16 days stuck

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in traffic in a year. That translates to 100,000 pesos in lost productivity each year (Dancel, 2017). Specifically, Pampanga is where people visit because of the beauty it brings to their eyes. Also, there are many places to visit but less access because of the road congestion. In this study, the Park Connector Network is used as a model to analyze Singapore's experience and how it dealt with the country's rapid urbanization and population growth, and then apply this experience to one of the provinces of the Philippines, which is Pampanga.

In Singapore, they have a system called the Park Connector, where they link parks or places to visit for the entire country (Zhang et al., 2018), and it helps lessen the pollution and traffic congestion in the country. The system is a greenway that allows people to go places without consuming energy and to avoid traffic while enjoying their trip. It also provides a road for people who like to jog, ride a bike, and walk. Active transportation is commonly seen as a crucial objective for boosting engagement in aerobic exercise and enhancing well-being. It also tackles pollution and climate change by decreasing the amount of motor vehicle emissions (National Library Medicine, 2021) It is a primary mode of transportation that can benefit individuals and communities, including improved physical and mental health, reduced air pollution and greenhouse gas emissions, and increased accessibility and mobility for all users. The notion of mobility is recognized as a fundamental human right, as affirmed by the United Nations Human Settlements Programme in 2013. To improve and expedite mobility, a multitude of innovations have been implemented. However, this quest for enhanced mobility has contributed to the proliferation of motorization, which, in conjunction with other urbanization factors, has led to a decline in walking and the utilization of non-motorized transportation (NMT) modes. In response to the adverse consequences of motorization, transport policies have sought to promote the adoption of sustainable modes of transportation. Nationally Environmentally Sustainable Transport Strategies (NESTS) have been devised by the United Nations Centre for Regional Development in order to address these concerns.

Despite these initiatives, achieving a substantial modal share for walking and NMTs remains a challenging objective within the country. Studies conducted in Metro Manila have revealed that approximately 35% of destinations can be reached within a 15-minute walk or bicycle trip. Nevertheless, the majority of short-distance trips are predominantly undertaken using jeepneys, tricycles, and even cars, as documented by Leather et al. in 2011. Curiously, despite the evident undesirable direct and indirect effects associated with car ownership and usage,

there exists a persistent allure towards private vehicle ownership among individuals. According to Mangubat (2020) Iloilo City, renowned as the Bike Capital of the Philippines, has actively pursued measures to enhance its existing infrastructure and promote sustainable transportation practices. The city presently boasts an extensive 11-kilometer network of dedicated bicycle lanes, collectively known as the Iloilo City Network. Notably, the local government remains committed to augmenting this network by pursuing expansion efforts, concurrently implementing no-parking zones to safeguard the integrity and unobstructed accessibility of the bike lanes. By conducting a comprehensive analysis of temporal progression, it becomes evident that the prevalence of cyclists within the city has witnessed a notable upsurge, particularly as the construction of its cycling infrastructure network nears completion. The advent of the Covid-19 pandemic also exerted a catalyzing influence on the proclivity towards bicycle usage. However, noteworthy observations indicate that individuals who initiated cycling practices from the year 2020 onward displayed a tendency to maintain their newfound habits consistently over time.

The substantial investment in road infrastructure in the Philippines poses a potential threat of induced demand. Research has demonstrated that newly constructed roads may be entirely absorbed by induced traffic at rates of 50 to 100 percent within as little as three years. Since there is a direct correlation between motorized vehicles and road capacity, congestion levels could eventually become insurmountable. Thus, it is advisable to explore alternative modes of transportation that are supported by specific infrastructure. Moreover, current motorized vehicles in the Philippines emit greenhouse gases, contradicting the progress of other nations in achieving environmental and urban development goals outlined in the Sustainable Development Goals. As a result, the development of transportation in its current form runs counter to the objectives of sustainable development.

Furthermore, the Covid-19 pandemic has accelerated the adoption of cycling as a preferred mode of transportation. Survey data indicates that a majority of respondents who regularly cycle began doing so in 2020 and 2021, resulting in a 41.89 percent increase in cyclist numbers in 2020 alone. This figure increased by a further 12.38 percent in the first four months of 2021. While the pandemic served as a catalyst, we expect the habit of cycling to persist, as cyclists have invested in their bikes, and the infrastructure is in place to support cycling. Since the pandemic, using public transportation (buses, Jeeps, and tricycles) has become a struggle. Plenty of operators

stopped their business and caused congestion for commuters. According to NEDA (2021), 12.5 percent of Filipinos use private cars to make their way to work, while others have no means to get there. In addition, they believe that expanding the capacity and supporting active transportation will provide mobility for people to go to their workplaces. In 2020, Sen. Pia Cayetano filed the Safe Pathway Network Bill, which aims to provide safe and convenient pathways for those who prefer to walk or use non-motorized vehicles to get to their usual destinations. Further, these pathways must be physically separated from main roads through barriers, or they may be elevated or constructed separately from the main road. In Metro Manila, commuters would likely spend 20% of their income using motorized public transportation, according to Nebrija (2016). The documentary "Kadena" by Robert-Durand et al. shares the story of Roger, who bikes daily to work to save almost PHP 3,000 a month on public transportation fares. He also stated that he saves more time by not commuting, which takes 1-2 hours of travel time. The city of San Fernando shows the importance of infrastructure for active transportation (Arcellaz, 2021). They implemented bike lanes, which are legally established to protect them while on the road. On the Bacolor road to SM Pampanga, considering that roads in these areas frequently experience heavy traffic, the researchers came up with the adaptation of Singapore's Park Connectors to ease traffic congestion.

## II. METHODOLOGY

Quantitative research as well as qualitative research can be used to study the feasibility of proposing a park connector along the roads from DHVSU Bacolor to SM Pampanga. This type of research can help to identify the potential benefits and drawbacks of the proposed park connector and can provide valuable information that can be used to make decisions about whether or not to move forward with the project. A non-experimental study is a type of quantitative research used to describe a scenario or phenomena exactly as it is, or describing a relationship between two or more variables, all without any intervention from the researcher. In the context of proposing a park connector along the roads from DHVSU Bacolor to SM Pampanga, a correlational study could be used to compare the road conditions and the road traffic experience of potential samples. The results of the study could then be used in consideration of allotting a road for non-motorized transportation.

In choosing respondents for the survey, the researchers used Non-Probability Sampling Technique in which they select samples based on their judgement. Thus, researchers must assume that the selection should represent the whole population (Statistics Canada, 2021). Respondents were chosen, using Convenience Sampling, to be students from DHVSU for the survey. Through observation, it is obvious that they had been struggling with transportation within the study area during the time of study. Due to the large population of students in the university, this sampling method used to select the easiest for the researchers to access stated by Fleetwood (n.d). To determine the sample size needed, the researchers use Raosoft Sample Size Calculator. This formula was used:

$$x = Z \left( \left[ \frac{c}{100} \right] \right)^2 r(100-r)$$

$$n = \frac{Nx}{(N - [1E]^2 + x)}$$

$$E = \sqrt{\frac{(N-n)X}{n(N-1)}}$$

Where N is the population size, r is the fraction of responses,  $Z(c/100)$  is the critical value for the confidence level c (Raosoft, 2004). With 5% margin of error, the researchers came up with total of 385 respondents among students in DHVSU.

The researchers used a Structured type of questionnaire which includes a fixed set of response options for each question, such as a Likert scale. This type of questionnaire is designed to ensure that all respondents are answering the same questions in the same way, and is well-suited for collecting quantitative data (Babbie, 2017). An 18-item questionnaire is used to gather data from students in DHVSU Bacolor. It is composed of two (2) major parts. Part 1 focused on the demographic profile of the respondents. The questions include name, age, gender, and program. Part 2 composed of questions about personal experiences on the road and divided into three (3) sub-parts which are about road conditions, traffic road experience and their willingness. Questionnaires were formulated using Likert-type of questions set on a 4-point scale. To sum up the survey, researchers consider adding questions about features that participant's want for the project. The researchers also conducted interviews using semi-structured questions which are often open-ended and it allows flexibility (George, n.d). Information from the interview helped the researchers to get first-hand information on the current traffic problem, road condition and plans about active transportation along the roads from DHVSU Bacolor to SM Pampanga. Lastly, researchers used Geographic Information System (GIS), AutoCAD, Sketchup to plot a map for the proposed project. These softwares were used in this study to create the final output which is the

map and routings including the features of the Park Connector. Researchers measured the correlation between road condition and traffic road experience using Pearson’s Correlation by means of SPSS which is a software used for analyzing statistical data (WhatIs.com, 2018). The data from the interview were analyzed using Thematic Analysis. It is a method used for analyzing qualitative data stated by Caulfield (n.d). The data are carefully analyzed by the researchers with a view to identifying the theme, topic, idea and pattern of meaning which appear repeatedly. The park connector routes are chosen based on several factors, including the feasibility and potential impact of the proposed routes, as well as feedback and support from participants. The researchers conducted a survey and gathered secondary data to determine where particularly roads from DHVSU Bacolor to SM Pampanga are highly congested by traffic and the points that are the source of this dilemma.

### III. RESULTS AND DISCUSSIONS

Based on the results, the primary mode of transportation of the respondents is public transportation, with 88.6%, being the highest. Out of 385, 36 respondents answered by personal vehicle while eight (8) answered by walking or biking. According to Asian Development Bank (ADB) (2012), transport is an important industry in the Philippines, connecting population and economic centers across the islands. Improving transportation infrastructure is crucial for improving the investment climate and economic growth. By far the most important subsector is road transport, which accounts for 98% of passenger travel and 58% of freight traffic. Therefore, no matter the mode of transportation, commuters are affected by traffic congestion, especially those who are taking public transportation as their mode of commute.

The majority of the respondents spend 1 to 2 hours traveling from home to school and vice versa. Out of 385, 155 respondents spend 1 to 2 hours which is equivalent to 40.3%; 153 respondents spend 30 minutes to 1 hour which is equivalent to 39.7%; 55 respondents spend less than 30 minutes which is equivalent to 14.3%; and only 22 respondents spend more than 2 hours which is equivalent to 5.7%. It is important to consider the factors that can affect the length of time spent commuting from home to school and vice versa including the distance, time left home or school, possible road accidents, and common time of traffic jams. Korchagin, Y. (2017) mentioned that if nothing changes about the condition of traffic in the Philippines, billions of losses will happen. Due to budgetary constraints, there are no clear time limitations for implementing the plans, and the

number of newly proposed railways is still insufficient for the magnitude of the city. Given the city's size, it goes without saying that future upgrades to the public transportation system should be made across the metropolis. The only solution is not to build more roadways, but to establish a more efficient mass transit system and to massively upgrade road infrastructure to encourage walking and cycling.

Table.1. Results of Traffic and Road Experiences in DHVSU-SM Pampanga

TRE	STATEMENTS	SA	A	DA	SDA	MEAN	STD	N
1	DHVSU-SM Pampanga is a traffic-free route.	19 (4.9%)	65 (16.9%)	189 (49.1%)	112 (29.1%)	1.98	0.810	385
2	There is a sufficient number of public transport vehicles.	24 (6.3%)	118 (30.6%)	167 (43.4%)	76 (19.7%)	2.24	0.842	385
3	The commuting experience is smooth and fast.	7 (1.8%)	47 (12.2%)	194 (50.4%)	137 (35.6%)	1.80	0.716	385
4	The jeep and bus fares are student-budget-friendly.	21 (5.4%)	185 (48.1%)	145 (37.7%)	34 (8.8%)	2.49	0.750	385
5	There are many options for transportation.	18 (4.7%)	160 (41.6%)	156 (40.5%)	51 (13.2%)	2.37	0.773	385
<b>TOTAL</b>						10.88	3.891	1925
						2.176	0.7782	385

The table indicates the traffic and road experience results in DHVSU-SM Pampanga wherein the study analyzed the five (5) statements regarding TRE, resulting in computed mean and standard deviation. Statement 1 “DHVSU-SM Pampanga is a traffic-free route.” has a mean of 1.98 and a standard deviation of 0.810. Out of 385 respondents, 19 strongly agreed, 65 agreed, 189 disagreed, and 112 strongly disagreed. DA has the highest percentage which is 49.1% while SA has the lowest percentage which is 4.9%. This result indicates that DHVSU-SM Pampanga is not a traffic-free route. Statement 2 “There is a sufficient number of public transport vehicles.” has a mean of 2.24 and a standard deviation of 0.842. Out of 385 respondents, 24 strongly agreed, 118 agreed, 167 disagreed, and 76 strongly disagreed. DA has the highest percentage which is 43.4% while SA has the lowest percentage which is 6.3%. This result indicates that there is a less sufficient number of public transport vehicles. Statement 3 “The commuting experience is smooth and fast.”

has a mean of 1.80 and a standard deviation of 0.716. Out of 385 respondents, 7 strongly agreed, 47 agreed, 194 disagreed, and 137 strongly disagreed. DA has the highest percentage which is 50.4% while SA has the lowest percentage which is 1.8%. This result indicates that the commuting experience is not smooth and not fast. Statement 4 “The jeep and bus fares are student budget-friendly.” has a mean of 2.49 and a standard deviation of 0.750. Out of 385 respondents, 21 strongly agreed, 185 agreed, 145 disagreed, and 34 strongly disagreed. A has the highest percentage which is 48.1% while SA has the lowest percentage which is 5.4%. This result indicates that the jeep and bus fares are student budget-friendly. Statement 5 “There are many options for transportation.” has a mean of 2.37 and a standard deviation of 0.773. Out of 385 respondents, 18 strongly agreed, 160 agreed, 156 disagreed, and 51 strongly disagreed. A has the highest percentage which is 41.6% while SA has the lowest percentage which is 4.7%. This result indicates that there are many options for transportation. Overall, SA got the lowest percentage and most of the time the respondents disagreed with the statements. This set of statements emphasizes the need for a transportation management system. With the cumulative weight of evidence on the significance of conceptualizing and developing a park connector in highly congested areas such as roads from DHVSU-SM Pampanga. In crowded metropolitan contexts with moderately robust economies, two factors are set into action that impact the choice to develop a parcel, and for modeling, they serve to establish a time-lag structure.

Table.2. Results of Road Conditions (Sidewalks/Bike Lanes) in DHVSU-SM Pampanga

RC	STATEMENTS	SA	A	DA	SDA	MEAN	STD	N
1	The sidewalks and bike lanes are in good condition	7 (1.8%)	77 (20%)	234 (60.8%)	67 (17.4%)	2.06	0.662	385
2	The bike lanes does not have chokepoints (example: Tree blocking the pathway)	12 (3.1%)	119 (30.9%)	204 (53%)	50 (13%)	2.22	0.720	385
3	The sidewalks & bike lanes are safe	10 (2.6%)	84 (21.8%)	238 (61.8%)	53 (13.8%)	2.12	0.672	385
4	There are resting sheds and jeepney/bus stops along the sidewalks	17 (4.4%)	117 (30.4%)	202 (52.5%)	49 (12.7%)	2.26	0.736	385
<b>TOTAL</b>						8.66	2.79	1925
						2.165	0.6975	385

The table indicates the road condition results in DHVSU-SM Pampanga wherein the study analyzed the four (4) statements regarding RC, resulting in computed mean and standard deviation. Statement 1 “The sidewalks and bike lanes are in good condition.” has a mean of 2.06 and a standard deviation of 0.662. Out of 385 respondents, 7 strongly agreed, 77 agreed, 234 disagreed, and 67 strongly disagreed. DA has the highest percentage which is 60.8% while SA has the lowest percentage which is 1.8%. This result indicates that the sidewalks and bike lanes are not in good condition. Statement 2 “The bike lanes do not have chokepoints (example: Tree blocking the pathway).” has a mean of 2.22 and a standard deviation of 0.720. Out of 385 respondents, 12 strongly agreed, 119 agreed, 204 disagreed, and 50 strongly disagreed. DA has the highest percentage which is 53% while SA has the lowest percentage which is 3.1%. This result indicates that the bike lanes do have chokepoints. Statement 3 “The sidewalks & bike lanes are safe.” has a mean of 2.12 and a standard deviation of 0.672. Out of 385 respondents, 10 strongly agreed, 84 agreed, 238 disagreed, and 53 strongly disagreed. DA has the highest percentage which is 61.8% while SA has the lowest percentage which is 2.6%. This result indicates that the sidewalks and bike lanes are not safe. Statement 4 “There are resting sheds and jeepney/bus stops along the sidewalks.” has a mean of 2.26 and a standard deviation of 0.736. Out of 385 respondents, 17 strongly agreed, 117 agreed, 202 disagreed, and 49 strongly disagreed. DA has the highest percentage which is 52.5% while SA has the lowest percentage which is 4.4%. This result indicates that there are just a few resting sheds and jeepney/bus stops along the sidewalks. Overall, SA got the lowest percentage and most of the time the respondents disagreed with the statements. This set of statements emphasizes the need for appropriate bike lanes and sidewalks. Given the significance of transportation, transportation development projects frequently have an impact on the local economy and quality of life. For example, the building of a bypass route, as well as the impact of a bypass on the local economy and quality of life, have piqued the attention of citizens in cities set to get a highway bypass. A highway bypass offers an alternate route for automobiles driving through a city to the downtown area.

The total population of the respondents is 385 and the collection for each variable is 385 which means that there is no missing data. Descriptive statistics describe the two main variables of the study – TRE and RC. Results of the descriptive statistics show that the mean for TRE is 10.8883 and RC is 8.6675 which implies that there is a need for the conceptualization of new routes and park connectors. There are 33,000 students from the main campus of Don Honorio Ventura State University and 85 to 90% are using public transportation. The return of face-to-face setup, increase of number of vehicles and road rehabilitations and insufficiency of jeepneys contributes to the delay of travel time. Also, students use other options of transportation like tricycle because of the long queue at terminals but it costs a higher fare. The participants stated that they are supporting non-motorized transportation and have plans about it.

Results shows that there is no traffic on Bacolor, it is only affected by San Fernando. There are also no jeepney routes coming from Bacolor. PUJ only ply along Guagua to San Fernando via Bacolor. It is also stated that bike accidents in San Fernando increased and it caused traffic for bikes using the main road. San Fernando constructed their first bike lane on their “peace zone” (Lazatin blvd) and as a preventive measure they put a line to distinguish bike lanes and remove the obstruction along the path. In addition, one of the participants said that the feasibility and safety of the project is a must.



Fig.1. Park Connector route using ArcGis



Fig.2. Final Output of proposed park connector route with indicated legends

#### IV. CONCLUSION

After analyzing the data, it shows that bike lanes and sidewalks should be modified along the study area to promote active transportation. More public transport is needed to accommodate the demand of people. With the growing population, LGU should give road conditions attention to improve the traffic experience in the City of San Fernando.

With the gathered and calculated data presented in this study as support, the researchers concluded that the Park Connector along the DHVSU-SM Pampanga route is feasible and beneficial for improving active transportation.

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