

Correlating The Quality of Public Transportation System and The Effectiveness of Transport Policies: Basis for Proposal of a Transport Management Strategy in The City of San Fernando, Pampanga

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Abstract: - Service quality is crucial in transportation, as it can affect the overall experience of commuters. Effective transportation policies, on the other hand, create sustainable and efficient transportation systems. This study aimed to assess the quality of the public transportation system, specifically jeepneys, and the effectiveness of transport policies in the City of San Fernando, Pampanga. The researchers utilized a descriptive correlational research design to determine the extent of the relationship between the two variables. Lastly, there is the proposal for suitable transport management strategies based on the findings of the study. Quantitative and qualitative investigations were used in order to answer the research problems. The research instruments used were survey questionnaires and structured interviews. A total of three hundred (300) respondents, which were divided into three subgroups, namely: one hundred eighty (180) commuters, one hundred (100) jeepney drivers, and twenty (20) traffic enforcers, answered the survey questionnaire. The quantitative data were analyzed using Quantitative Descriptive Statistics, the 4-Point Likert Scale, Range of Means, Percentage Distribution, and Spearman's Rank Correlation Coefficient. On the other hand, qualitative data were transcribed, contextualized, and classified in order to obtain relevant information. Commuters were identified as somehow satisfied with the overall quality of public transportation systems and the effectiveness of transport policies. However, notable indicators such as vehicle condition, relevant performance, and environmental impacts acquired a "Poor" rating. Conversely, responses gathered from jeepney drivers and traffic enforcers displayed a consistent positive rating. Furthermore, it was found out that the quality of the public transportation system has a positive monotonic relationship with the effectiveness of transport policies in the City of San Fernando, Pampanga. The researchers, therefore, proposed the adaptation of Pedestrian-Oriented Development to address the current and emerging traffic issues in the city.

Key Words: — *Public Transportation, Service Quality, Transport Policies, Correlation, Transport Management Strategies.*

I. INTRODUCTION

Transportation plays a vital role globally through the movement of goods and people by air, land, and sea. According to Rodrigue (2020), most developing countries struggle with

serious transportation-related problems, including a lack of policies, poor accessibility, unreliable transport system, an unsystematized road network hierarchy, and reasonably priced transportation options, particularly for rural residents. While utilities, infrastructures, and facilities are the primary focus in developing policies and strategies, recent years have seen a better balance because of the inclusion of human capital issues or the societal role or standing of people. There is a clear correlation between the amount and quality of transportation infrastructure and the degree of economic development. In the Philippines, though most people rely on public transportation, there is still evidence that people are not that

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satisfied with the current situation of public transportation. Although different modes of transport services are available, such as taxis, which were the go-to transport vehicle for people who wished to have a more comfortable ride to their destination, tricycles, which are motorized cabins enough to carry at least 4-5 persons each trip and are usually used by people whose point of destination is not on the regular route of jeepneys, and finally jeepneys which are the most dominant and cheapest option for commuters and became the trademark of transportation in Philippine roads, however, innovations and improvements are still being made to serve commuters (Beldad, 2022). The commuters choose transport modes that offer flexibility in routes that are much safer, such as private vehicles, private-hire cars, and taxis, which were ranked first to third accordingly. In this regard, according to the Japan International Cooperation Agency (2022), the government is planning to develop the public transport network to encourage a modal shift from private-centered transport to the utilization of public transportation.

To address the urgent transport demands and requirements of the national economy, the National Economic and Development Authority recommended that policy adjustments and reforms that can be administratively implemented under current legislation be enacted and put into place. The lack of a single comprehensive policy document for the transportation industry has resulted in several recurring problems, including, among others, a poorly coordinated and disorganized network of transportation; overlapping and incompatible roles of transportation agencies; worries about the safety and security of transportation; and inadequate transportation infrastructure, particularly in conflict-affected and underdeveloped areas (National Economic Development Authority, 2020).

In 2017, the Local Government of San Fernando conducted the first traffic summit which aims to identify the causes and effects of the rising volume of vehicles in the city and get recommendations from all stakeholders involved. Among the cited problems during the summit were the insufficiency of parking spaces in commercial spaces, obstruction of ambulant vendors on major roads, and the lack of discipline of public utility vehicle operators (Communications Technology Office (CICTO), 2017). From a more recent study by Celso et al. (2022), these problems continue to exist which indicates ineffective implementations, initiation of policies and solutions. These are caused by unauthorized and disorganized activity on the city's roadways, including illegal parking, boarding and alighting, and poor road conditions in various city

areas. Celso et al. (2022) concluded that the conduct of road users, the state and features of the road infrastructure, and the rising numbers of cars are the main elements determining the efficiency of the city's existing traffic management system. If people are unable to identify the root causes of inadequate transportation, the system will undoubtedly become unusable and unworkable. Therefore, a comprehensive plan through a series of policies and regulations supporting the development of roadside facilities would provide an improved and organized operation of road-based transportation, specifically the flexible modes of public transportation, which most commuters greatly benefit from, and would offer mobility, creating more employment, community resources, medical care, and recreational opportunities while providing safety, security, and eliminating social disparities.

Transportation planning is concerned with the efficient execution of transportation policies. The objective of transportation policy is to allocate transportation resources in an efficient manner, including the administration and regulation of current transportation operations (Rodrigue, 2020). There is a need to address the arising public transportation problems to provide quality service. This will help ease the burden on public transport users. In light of the falling usage of public transportation, the sharp rise in private vehicle use, and the rising social, economic, and environmental cost of traffic congestion, urgent improvements are required. Considering the dominance of paratransit services that are largely provided by the Public Utility Jeepneys (PUJ) in the city, the study revolved around this view.

To further delve into this matter, the study aims to assess the quality of the public transportation system and the effectiveness of transport policies based on the different perspectives of stakeholders and at the same time, find out how transport policies affect the quality of service in the City of San Fernando, Pampanga. Consequently, mobility management strategies will be carefully reviewed, and discussions with the concerned local government officials will be administered prior to the proposal of strategies that may help in addressing the current issues of public transportation through this study.

II. METHODOLOGY

2.1 RESEARCH DESIGN

The study applied a mixed-method approach employing both quantitative and qualitative investigations to further answer the

research problems. The study utilized a descriptive correlational research design to determine the extent of a relationship between two or more variables. This type of research recognizes trends and patterns in the data and seeks to describe the current status of identified variables, but cause and effect are not the basis of this type of observational study. Correlation does not imply causation, thus eliminating directionality and third-variable problems (Bhandari, 2021). Specifically, to determine the relationship between the quality of the public transport system and the effectiveness of transport policies from the perspective of commuters, jeepney drivers, and traffic enforcers as a basis for the proposal of a transport management strategy supporting sustainable development and facilitating public transportation.

The quality of public transportation was measured in terms of the service quality indicators, namely: vehicle condition, reliability, stop's condition, customer care, information, convenience, and availability. In comparison, the effectiveness of transport policies was assessed through the investigated parameters, which are accessibility, relevant performance, and environmental impacts. The indicators and parameters used in this study were deliberated from related studies and obtained from careful analysis and investigation of various endeavors. On the other hand, different transport management strategies were reviewed and discussed with the concerned city officials under related local government units in a structured interview. The proposal of a Transport Management Strategy commenced after data gathering procedures, statistical treatment, and data analysis. The most suitable mobility management strategy was selected in accordance with the lacking features of the current public transport system in the city and was determined from the assessed variables. Moreover, the integration, modification, or combination of multiple strategies is under consideration in the study. Furthermore, it must be the best mobility management strategy that will potentially resolve the recurring issues identified from the discussion with the city officials and is relevant to the planning objectives and management capacity of the City of San Fernando, Pampanga.

2.2 Respondents of the Study

The study utilized G*Power Software to determine the required number of respondents. G*Power Software is a tool that computes statistical power analyses for a variety of tests (including t tests, F tests, 2 tests, z tests, and some exact tests), as well as for effect size calculations and the graphical

presentation of power analysis results (Kang, H., 2021). A minimum sample size of 252 was computed using G*Power in an F-test one-way analysis of variance (ANOVA), setting the effect size at 0.25, the significance level at 5%, and the actual power at 95%. However, to further minimize the effect size and increase actual power, the researchers adopted 300 as the total sample size for the three subgroups, namely Commuters, Jeepney Drivers, and Traffic Enforcers.

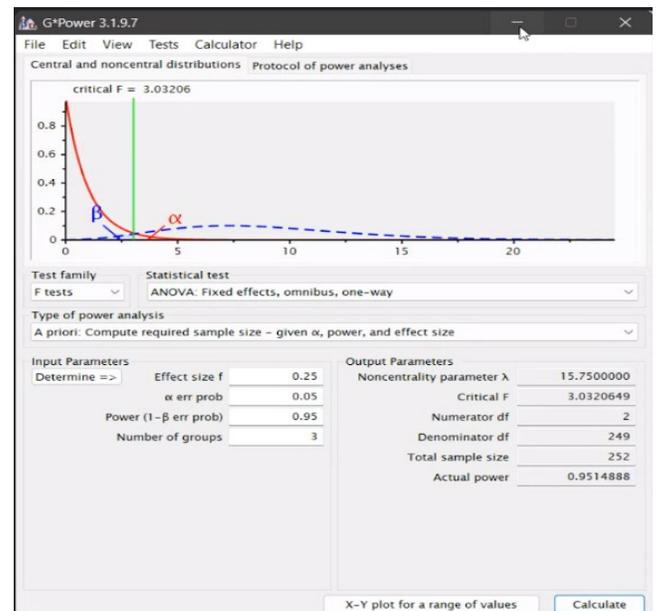


Fig.1. Calculation of Total Sample Size using G*Power Software

Commuters who frequently travel within the city were chosen as one of the subgroups. On the other hand, based on the updated list of jeepneys with franchises that were obtained in coordination with the Land Transportation Franchising and Regulatory Board, 508 jeepneys were considered in the study. The 508 jeepneys' routes were all within the vicinity of the City of San Fernando, Pampanga. Among the 508 jeepneys, 91 circles along San Fernando (Palengke) - SM City, Robinsons via Dolores, 84 Bulaon - San Fernando, 60 San Fernando - San Isidro via San Agustin, 50 San Agustin - San Fernando, 49 Palawe - SM City, Robinsons via San Fernando (TP), 45 Dolores - San Fernando, 39 San Fernando - Northville, via Bulaon - Del Carmen, 30 Dolores - SM City, Robinsons via OG road, 15 GOVCNTR-Lazatin-Capitol-SFTP-SMP GOVCNTR, 14 Palawe - San Fernando via Capitol Boulevard, 14 Palawe - SM City via Gapan - Olongapo Road, 8 Dolores (SFC) - SM City, Robinsons, 8 San Jose - San Fernando, and 1 University

of Assumption - San Fernando. Finally, the total number of traffic enforcers in the city was 109 personnel which was obtained from the City Public Order and Safety Coordinating Office of the City of San Fernando, Pampanga.

2.2.1 Sampling Method

Sampling Techniques enable researchers to infer information about a population based on the results of a subset of the population, rather than having to investigate every individual. The researchers derived the number of respondents within a subgroup considering the sample size using Quota Sampling. Quota sampling is a non-probability sampling technique that is used to get representative data from a group. The use of quota sampling guarantees that the sample group reflects specific features of the population that the researcher has chosen (Aprameya, 2019). Moreover, the three (3) subgroups were composed of one hundred eighty (180) commuters, one hundred (100) jeepney drivers, and twenty (20) traffic enforcers. The number of respondents from each subgroup was merely derived from the ratio and proportion of each group in the total population.

Particularly, the jeepney drivers were chosen to be one of the subgroups of respondents since traveling by jeepney as a mode of transportation represents the majority of the Philippines' public transportation services, as is the case in the City of San Fernando, Pampanga. Additionally, traffic enforcers were included as respondents to have a broader view from a wider perspective of the traffic situation in the city.

2.3 Research Instrument

The implementation of the study was done through a self-formulated survey questionnaire that obtained the respondents' insights into various service quality indicators and policy effectiveness parameters, as well as a structured interview with the involved local government officials in the city. The survey questionnaire was structured based on the factors aforementioned in this chapter. The researchers utilized the Likert Scale, allowing the respondents to rate the quality of service of the public road-based transport system as well as the effectiveness of policies from 'Very Poor' to 'Very Good' under each category.

The questionnaire is a simplified, self-explanatory checklist in order to comfortably gather responses in a dynamic environment where respondents only have an ample amount of

time to engage with the researchers. Since the researchers conducted roadside surveys, the responses were acquired randomly from the sample size that was divided into subgroups to ensure proper representation.

The first part of the survey questionnaire asks for the demographic information of the respondent, including the name (optional), age, gender, address, status, contact number, and category of response, after ensuring a data privacy agreement is met between the researchers and the respondent. The survey questionnaire comprises two sections. The first is the assessment of the quality of public transportation in terms of service quality according to the seven (7) indicators derived from the study of Tiglao et al., (2020). The items under these indicators were obtained from the adopted survey questionnaire shown in Figure 5 but were compressed to further simplify the questions and eliminate overlapping contexts. The second section is the assessment of the effectiveness of transport policies in terms of the parameters proposed in the evaluation framework from Diana & di Torino (2010). The questions were formulated based on how each parameter was investigated and defined in the study. A 4-Point Likert Scale was utilized, allowing the respondents to rate every item under each section, assigning Very Poor (1), Poor (2), Good (3), and Very Good (4).

The Perception of Service Quality among Paratransit Users in Metro Manila using Structural Equations Modelling (SEM) Approach

*Rank the following UP jeepney vehicles by frequent use:

Iloilo Katipunan Pantranco Philcoa SM North Toki

*Currently, how do you rate the quality of UP jeepney transport service?

Very Poor Poor Neutral Good Very Good Not Applicable

PART 1: Rate the UP jeepney vehicles on the following attributes	Very Poor	Poor	Neutral	Good	Very Good	NA
101 Seat condition						
102 Ease of entry and exit						
103 Personal space						
104 Internal cleanliness						
105 Smoke emissions						
106 Produced ambient noise						
107 Noise inside vehicle						
108 Temperature inside vehicle						
PART 2: Rate your experience with the journey						
201 Travel time is fast						
202 Route passes through desirable areas						
203 Travel is smooth						
204 Travel feels generally safe from crime						
PART 3: Rate your experience with payments						
301 Payment method is easy						
302 Fare is affordable						
PART 4: Rate your experience with the driver						
401 Driver talks to passengers respectfully						
402 Driver demonstrates excellent driving skills						
403 Driver follows traffic rules and regulations						
404 Driver respects other road users (pedestrians, cyclists, drivers)						
PART 5: Rate the service regarding general condition of stops						
501 Stops are visible						
502 Stops are safe for people from crimes						
503 Stops are accessible to pedestrians						
504 Stops are accessible to PWD, senior citizens, pregnant women, and children						
505 Stops are known						
PART 6: Rate the service on accessible information						
601 Operator details are visible (i.e. beside jeepney, through ID, etc.)						
602 Information on the available routes are well-known						
603 Signages on jeepneys are visible						
PART 7: Rate the service on network reliability and availability						
701 Availability on weekdays is adequate						
702 Availability on weekends/holidays is adequate						
703 Availability in the daytime (7AM to 5PM) is adequate						
704 Availability in the evening (5PM onwards) is adequate						
705 Waiting time is short						
706 Arrives frequently						
707 Have sufficient capacity						

*At this point, how do you rate the quality of the UP Jeepney transport service?

Very Poor Poor Neutral Good Very Good Not Applicable

Fig.2. Service Quality Questionnaire Basis for Formulation of the Study's Survey Questionnaire

2.4 Statistical Treatment

The study utilized several statistical approaches to analyze the acquired data in a systematic manner. The following statistical instruments were used to show data based on the responses of the study’s participants:

Quantitative Descriptive Statistics. Quantitative descriptive statistics was used to analyze the data collected from the respondents' scaled responses to the survey questionnaires. According to Creswell (2009), Descriptive statistics are used to describe quantitative data sets. When researchers present large amounts of data and need to summarize aspects of quantitative findings in a concise manner, descriptive statistics can come in useful. Graphical summaries can be used to illustrate descriptive statistics. Researchers can use tables, figures, and infographics to not only simplify data but also to tell compelling research stories.

4-Point Likert Scale Model. A ranking system providing respondents with a range of answers was used. When a user's opinion on a certain topic is important but not neutral, market researchers employ a four-point Likert scale, such as "good", "very good", "poor", or "very poor".

Range of Means. The difference between the lowest and highest values in a set of variables reflects how well the median value illustrates the values.

Table.1. Verbal Interpretation of Mean of Levels

Unit weight	Range of Mean	Level of Reactions
4	3.26 - 4.00	Very Good
3	2.51 - 3.25	Good
2	1.76 - 2.50	Poor
1	1.00 - 1.75	Very Poor

$$Range\ of\ Mean = \frac{HW - LW}{n}$$

where HW = the highest weight of values, whose value was four (4), LW = the lowest weight of values, whose value was one (1), and n = the number of Likert Scale weights, whose value was four (4).

Percentage Distribution. Percentage Frequency Distribution was used to illustrate the relative frequency of the resulting

data. It is widely used to indicate the relative frequency of survey responses and other data. Percentage frequency distributions are typically represented as bar graphs, pie charts, or tables.

$$P (\%) = \frac{Sum\ Total\ of\ Responses\ per\ Choice}{Total\ Number\ of\ Responses} \times 100$$

Spearman's Rank Correlation Coefficient. The Spearman's Rank Correlation Coefficient was utilized in the study to properly comprehend the data gathered and to assess the strength and direction of the monotonic association between the quality of public transportation system and the effectiveness of transport policies. It is a nonparametric version of the Pearson product-moment correlation, which on the other hand, measures the strength and direction of the linear relationship between two variables (Laerd Statistics, 2018).

The Spearman correlation coefficient, r_s or ρ , can take values from +1 to -1. A ρ of +1 indicates a perfect association of ranks, a ρ of zero indicates no association between ranks and a ρ of -1 indicates a perfect negative association of ranks. The closer r_s is to zero, the weaker the association between the ranks.

Table.2. Spearman's Rank Correlation Coefficient Strength of Association

Correlation Coefficient	Interpretation
0.00 - 0.09	Negligible
0.10 - 0.39	Weak
0.40 - 0.69	Moderate
0.70 - 0.89	Strong
0.90 - 1.00	Very Strong

There are two methods to calculate Spearman's correlation depending on whether: (1) your data does not have tied ranks or (2) your data has tied ranks.

- (1) The formula for when there are no tied ranks is:

$$\rho = 1 - \frac{6\sum d_i^2}{n(n^2 - 1)}$$

where ρ = Spearman's rank correlation coefficient
 d_i = Difference between the two ranks of each observation, and

n = Number of observations

(2) The formula for when there are tied ranks is:

$$\rho = \frac{\sum_i (x_i - \bar{x})(y_i - \bar{y})}{\sqrt{\sum_i (x_i - \bar{x})^2 \sum_i (y_i - \bar{y})^2}}$$

where i = paired score

III. RESULTS AND DISCUSSION

3.1 Results

To present the findings of the study more effectively, this chapter utilizes tables and graphs to visually illustrate the results obtained from the data analysis. The chapter is divided into ten (10) sections, each focusing on a specific indicator of the study, thus providing each section with an analysis of results and discussions. The indicators of the study include vehicle condition, reliability, stop condition, customer care, information, convenience, availability, accessibility, relevant performance, and environmental impact. Moreover, an assessment of the quality of the public transportation system and the effectiveness of transport policies based on the data gathered from the respondents was presented in this chapter. The means of the responses of commuters, jeepney drivers, and traffic enforcers were illustrated to further emphasize the differences among each subgroup's perception. The average responses of the participants were verbally interpreted utilizing Table 1 - Verbal Interpretation of Mean of Levels, which categorizes the reaction into four levels: "Very Poor", "Poor", "Good", and "Very Good".

3.1.1 City of San Fernando, Pampanga's Quality of Public Transportation in Terms of Service Quality Indicators

Table.3. City of San Fernando, Pampanga's Summary of Responses – Commuters, Jeepney Drivers, and Traffic Enforcers' Assessment of the Quality of Public Transportation in Terms of Vehicle Condition

1. VEHICLE CONDITION									
	COMMUTERS			JEEPNEY DRIVERS			TRAFFIC ENFORCERS		
Question	1.1	1.2	1.3	1.1	1.2	1.3	1.1	1.2	1.3
Very Poor (1)	17	8	32	0	0	0	0	0	0
Poor (2)	77	70	97	2	1	1	0	1	4

Good (3)	82	93	41	53	48	48	17	14	10
Very Good (4)	4	9	10	45	51	51	3	5	6
Total	180	180	180	100	100	100	20	20	20
Weighted Mean	2.41	2.57	2.16	3.43	3.50	3.50	3.15	3.20	3.10
Average	2.38			3.48			3.15		

Table 3 shows the results of the three subgroups, namely commuters, jeepney drivers, and traffic enforcers, in their assessment of the quality of public transportation in terms of vehicle condition. The commuters of the city suggest that the condition of public transportation vehicles may not be up to the expected standard, gathering a poor rating of 2.38 out of 4, where 4 is the highest score. On the other hand, the jeepney drivers scored the condition of public transportation vehicles at a good level with a mean score of 3.48 over 4. Lastly, the traffic enforcers of the city, who have a role in ensuring the safety and compliance of public transportation, may have a more objective perspective on the condition of vehicles by storing a mean score of 3.15 out of 4, considered as a good level.

The study of Bacero and Vergel (2009) stated that, compared to the height of the drivers and passengers, the standard jeepney's service door is much lower. Passengers had trouble entering and exiting the jeepney. It is possible that these issues affected the commuters' perception of the vehicle condition, while the jeepney drivers and traffic enforcers' ratings may have been influenced by their familiarity with the vehicles and their objective roles in ensuring compliance and safety. Therefore, addressing these design flaws and discomfort factors may improve the overall perception of the vehicle condition among commuters.

Table 4. City of San Fernando, Pampanga's Summary of Responses – Commuters, Jeepney Drivers, and Traffic Enforcers' Assessment of the Quality of Public Transportation in Terms of Reliability

2. RELIABILITY			
	COMMUTERS	JEEPNEY DRIVERS	LAW ENFORCERS
Question	2.1	2.1	2.1
Very Poor (1)	17	0	0
Poor (2)	58	4	2

2. RELIABILITY			
Good (3)	88	91	15
Very Good (4)	17	5	3
Total	180	100	20
Weighted Mean	2.58	3.01	3.05
Average	2.58	3.01	3.05

Assessing the quality of public transportation in terms of reliability is an essential aspect of ensuring efficient and reliable travel experiences for the public. As shown in Table 4, a good average rating for the public transportation’s level of reliability was obtained from the commuters, which is 2.58 out of 4. Furthermore, the jeepney drivers answered that the city’s public transportation is somehow reliable by assessing the consistency of travel times at a mean rating of 3.01 out of 4, interpreted as a good level. On the other hand, the traffic enforcers scored the consistency of travel times of public transportation at a mean score of 3.05 (good) out of 4.

The assessment results indicate that the public transportation system in the city is performing well in terms of reliability, which can have a positive impact on users' overall travel experience. The results of the evaluation align with USDOT's (2019) recommendations for improving the reliability of transportation systems. By continuing to address factors that affect travel time reliability, the city can further improve its public transportation system for the benefit of commuters and other road users.

Table 5. City of San Fernando, Pampanga’s Summary of Responses – Commuters, Jeepney Drivers, and Traffic Enforcers’ Assessment of the Quality of Public Transportation in Terms of Stop’s Condition

3. STOP'S CONDITION						
Question	COMMUTERS		JEEPNEY DRIVERS		TRAFFIC ENFORCERS	
	3.1	3.2	3.1	3.2	3.1	3.2
Very Poor (1)	26	16	0	0	0	0
Poor (2)	43	70	0	0	1	2
Good (3)	70	75	48	54	11	10

Very Good (4)	41	19	52	46	8	8
Total	180	180	100	100	20	20
Weighted Mean	2.70	2.54	3.52	3.46	3.35	3.30
Average	2.62		3.49		3.33	

The condition of jeepney stops is crucial for the safe and convenient boarding and alighting of passengers. According to the assessment results of the quality of public transportation as to stop conditions presented in Table 5, city commuters’ responses to the condition of jeepney stops resulted in an average rating of 2.62 out of 4, which is considered a good level. Nevertheless, the jeepney drivers rated the quality of stop conditions as very good, scoring an average of 3.49 over 4. Lastly, the traffic enforcers of the city implied a more impartial evaluation of the condition of jeepney stops by considering factors such as inclusivity and safety, which resulted in an average score of 3.33 out of 4, interpreted as very good.

Fukuda et al. (2004) stated that there is a significant requirement to ease street congestion and enhance the transit service in Metro Manila. The study proposed that adopting appropriate policies or design modifications for the jeepney stop could aid in achieving this objective. One possible solution is to establish stopping bays, perform minor road widening at critical loading and unloading areas, segregate stops according to transit type or destination, or create island strips to separate jeepney lanes from the inner lanes to reduce arterial delays. A combination of these measures may be more effective in addressing the problem.

Table 6. City of San Fernando, Pampanga’s Summary of Responses – Commuters, Jeepney Drivers, and Traffic Enforcers’ Assessment of the Quality of Public Transportation in Terms of Customer Care

4. CUSTOMER CARE									
Question	COMMUTERS			JEEPNEY DRIVERS			LAW ENFORCERS		
	4.1	4.2	4.3	4.1	4.2	4.3	4.1	4.2	4.3
Very Poor (1)	11	7	9	0	0	0	0	0	0
Poor (2)	50	53	44	0	0	0	0	2	0
Good (3)	85	98	95	57	43	38	16	8	9

Very Good (4)	34	22	32	43	57	62	4	10	11
Total	180	180	180	100	100	100	20	20	20
Weighted Mean	2.79	2.75	2.83	3.43	3.57	3.62	3.20	3.40	3.55
Average	2.79			3.54			3.38		

The level of customer care provided by public transportation is a crucial aspect of ensuring a positive commuting experience for passengers. The results presented in Table 6 demonstrate the responses of commuters, jeepney drivers, and traffic enforcers regarding the quality of public transportation in terms of customer care. Based on the responses of 180 commuters within the city, customer care may be improved in the city’s public transportation by scoring a mean of 2.79 out of 4, interpreted as good. Otherwise, the jeepney drivers gathered a very good level of customer care at an average of 3.54 out of 4. At the same time, the traffic enforcers may have observed an overall satisfaction level of customer care (3.38 over 4, interpreted as very good) provided by public transportation in the city.

Table.7. City of San Fernando, Pampanga’s Summary of Responses – Commuters, Jeepney Drivers, and Traffic Enforcers’ Assessment of the Quality of Public Transportation in Terms of Information

5. INFORMATION			
	COMMUTERS	JEEPNEY DRIVERS	TRAFFIC ENFORCERS
Question	5.1	5.1	5.1
Very Poor (1)	10	0	0
Poor (2)	45	16	0
Good (3)	97	64	18
Very Good (4)	28	20	2
Total	180	100	20
Weighted Mean	2.79	3.04	3.10
Average	2.79	3.04	3.10

The jeepney drivers’ high ratings of customer care can be attributed to their ability to understand and address passenger concerns and prioritize their needs. The study by Angriani et al. (2020) further emphasizes the importance of drivers in building trust and satisfaction among passengers by providing excellent

service skills and ensuring their comfort. Ultimately, improving service quality, including customer care, can directly contribute to passenger satisfaction with urban transport, making it a critical factor for the success of public transportation systems.

Having clear and understandable public transportation information is an essential factor in having quality public transportation since it helps manage the order on the road. Based on the results presented in Table 7, commuters assessed the quality of public transportation in terms of information to be good, with a mean of 2.79 out of 4. Additionally, jeepney drivers scored the above-mentioned matter a good rating, giving it an average of 3.04 out of 4. Lastly, the traffic enforcers may have observed regulations aimed at improving information dissemination related to public transportation services by gathering a good level mean score of 3.10 over 4.

The results presented indicate that the public transportation system is making strides in providing clear and understandable information to its users. The findings are particularly relevant to the study by Lin and Robielos (2022), which emphasizes the importance of knowledge and understanding of transportation signs in promoting safer roads. Clear and easily comprehensible transportation signs contribute to the overall quality of public transportation and enhance road safety, ultimately leading to a better commuting experience for everyone.

Table.8. City of San Fernando, Pampanga’s Summary of Responses – Commuters, Jeepney Drivers, and Traffic Enforcers’ Assessment of the Quality of Public Transportation in Terms of Convenience

6. CONVENIENCE						
	COMMUTERS		JEEPNEY DRIVERS		LAW ENFORCERS	
Question	6.1	6.2	6.1	6.2	6.1	6.2
Very Poor (1)	19	13	0	0	0	0
Poor (2)	64	58	6	1	1	0
Good (3)	80	84	76	66	15	16
Very Good (4)	17	25	18	33	4	4

Total	180	180	100	100	20	20
Weighted Mean	2.53	2.67	3.12	3.32	3.15	3.20
Average	2.60		3.22		3.18	

Convenience is characterized by comfortable routes, smooth sailing trips, travel times, and reasonable fares. The assessment of the results of the quality of public transportation in terms of convenience perceived by commuters, jeepney drivers, and traffic enforcers is presented in Table 8. The commuters within the city responded that the use of jeepneys as a mode of transportation is somehow convenient, garnering a good average rating of 2.60 out of 4. Based on the responses of the 100 jeepney drivers, they perceived their jeepneys to provide a more convenient mode of transportation to passengers, with an average of 3.22 (good) over 4. Moreover, traffic enforcers also responded that jeepneys are convenient as a means of transportation at a good level of mean at 3.18 out of 4.

The results of the survey revealed that jeepneys are perceived as a convenient means of transportation. However, the convenience of using jeepneys varies depending on certain factors, such as travel requirements and trip circumstances. A study by Kaneko et al. (2013) found that jeepneys are generally viewed as a familiar, easy, and affordable mode of transportation suitable for short trips. Nevertheless, people tend to avoid using jeepneys for long trips or when there are inconvenient access options. The convenience of using jeepneys is, therefore, relative and subject to various considerations.

Table.9. City of San Fernando, Pampanga’s Summary of Responses – Commuters, Jeepney Drivers, and Traffic Enforcers’ Assessment of the Quality of Public Transportation in Terms of Availability

7. AVAILABILITY						
	COMMUTERS		JEEPNEY DRIVERS		TRAFFIC ENFORCERS	
Question	7.1	7.2	7.1	7.2	7.1	7.2
Very Poor (1)	13	12	0	0	0	0
Poor (2)	60	53	37	3	1	1

Good (3)	85	92	29	69	16	12
Very Good (4)	22	23	34	28	3	7
Total	180	180	100	100	20	20
Weighted Mean	2.64	2.70	2.97	3.25	3.10	3.30
Average	2.67		3.11		3.20	

Table 9 illustrates the assessment of the quality of public transportation as to availability. Most of the city commuters responded that the availability of jeepneys during peak and off-peak hours may still be insufficient based on the average rating of 2.67 out of 4, which is interpreted as good. Jeepney drivers assessed the quality of public transportation as to availability a good score, rating it an average of 3.11 over 4. Lastly, as presented by the average score of 3.20 out of 4 (interpreted as a good rating) of responses of the 20 traffic enforcers, public transportation, specifically jeepneys, is available during peak and off-peak periods.

A genetic algorithm can be utilized to optimize jeepney operations on busy transit routes to reduce waiting and travel time for passengers and the operating time of jeepneys, as suggested by the results of the study by Abad et al. (2015). The findings of the study provide a potential solution to the problem of insufficient availability as perceived by the commuters in the city by using genetic algorithms to optimize jeepney operations on busy transit routes, which could improve the overall quality of public transportation in terms of availability.

3.1.2 Performance Indicators for the Effectiveness of Public Transport Policies in the City of San Fernando, Pampanga

Table.10. City of San Fernando, Pampanga’s Summary of Responses – Commuters, Jeepney Drivers, and Traffic Enforcers’ Assessment of the Effectiveness of Public Transport Policies in Terms of Accessibility

8. ACCESSIBILITY						
	COMMUTERS					
Question	8.1	8.2	8.3	8.4	8.5	8.6
Very Poor (1)	18	16	30	5	14	15

Poor (2)	51	53	62	28	37	49
Good (3)	74	82	63	109	93	89
Very Good (4)	37	29	25	38	36	27
Total	180	180	180	180	180	180
Weighted Mean	2.72	2.69	2.46	3.00	2.84	2.71
Average	2.74					
JEEPNEY DRIVERS						
Question	8.1	8.2	8.3	8.4	8.5	8.6
Very Poor (1)	0	2	4	4	0	7
Poor (2)	11	26	59	43	40	47
Good (3)	57	49	31	50	44	37
Very Good (4)	32	23	6	3	16	9
Total	100	100	100	100	100	100
Weighted Mean	3.21	2.93	2.39	2.52	2.76	2.48
Average	2.72					
LAW ENFORCERS						
Question	8.1	8.2	8.3	8.4	8.5	8.6
Very Poor (1)	0	0	0	0	0	0
Poor (2)	0	0	0	0	0	0
Good (3)	13	13	14	17	16	13
Very Good (4)	7	7	6	3	4	7
Total	20	20	20	20	20	20
Weighted Mean	3.35	3.35	3.30	3.15	3.20	3.35
Average	3.28					

The assessment of the effectiveness of the city’s public transport policies as to accessibility for commuters, jeepney drivers, and traffic enforcers is presented in Table 10. Commuters, who are the primary users of public transport,

assessed the effectiveness of public transport policies as to accessibility by having a good rating of mean score at 2.74 out of 4. Furthermore, at a mean score of 2.72 (good) out of 4, the jeepney drivers may have faced similar issues as commuters regarding accessibility. In contrast, the traffic enforcers showed that the policy implementation in terms of accessibility was more successful from an objective standpoint, storing a mean of 3.28 over 4, which is interpreted as a very good level.

The results of the assessment suggest that the city's public transportation policies are effective in terms of accessibility, which can benefit not only people with disabilities but also other groups of passengers, making public transportation more appealing, as stated by Saif et al. (2019). Additionally, the findings are in line with Bęczkowska and Zysk's (2021) emphasis on the importance of accessible transportation for people with disabilities and promoting equality and full participation in society. Therefore, continued efforts to improve the accessibility of public transportation policies can lead to a more inclusive and appealing public transportation system in the City of San Fernando, Pampanga.

Table.11. City of San Fernando, Pampanga’s Summary of Responses – Commuters, Jeepney Drivers, and Traffic Enforcers’ Assessment of the Effectiveness of Public Transport Policies in Terms of Relevant Performance

9. RELEVANT PERFORMANCE						
COMMUTERS						
Question	9.1	9.2	9.3	9.4	9.5	9.6
Very Poor (1)	24	17	31	27	15	17
Poor (2)	66	67	77	59	59	67
Good (3)	74	84	60	78	78	77
Very Good (4)	16	12	12	16	28	19
Total	180	180	180	180	180	180
Weighted Mean	2.46	2.51	2.29	2.46	2.66	2.54
Average	2.49					

JEEPNEY DRIVERS						
Question	9.1	9.2	9.3	9.4	9.5	9.6
Very Poor (1)	0	22	13	3	4	0
Poor (2)	42	54	62	22	2	26
Good (3)	36	20	23	62	62	49
Very Good (4)	22	4	2	13	32	25
Total	100	100	100	100	100	100
Weighted Mean	2.80	2.06	2.14	2.85	3.22	2.99
Average	2.68					
TRAFFIC ENFORCERS						
Question	9.1	9.2	9.3	9.4	9.5	9.6
Very Poor (1)	0	0	0	0	0	0
Poor (2)	0	0	0	0	0	0
Good (3)	15	11	12	15	15	15
Very Good (4)	5	9	8	5	5	5
Total	20	20	20	20	20	20
Weighted Mean	3.25	3.45	3.40	3.25	3.25	3.25
Average	3.31					

Shown in Table 11 are the results from the assessment of public transport policies in the city as to relevant performance. The commuters' assessment of public transport policies as to relevant performance reflected a poor level of average at 2.49 out of 4. On the other hand, the mean score of jeepney drivers' evaluation on the relevant performance was slightly higher at 2.68 out of 4, which is considered a good level. Lastly, the traffic enforcers are satisfied with the public transport policies

and consider them to be effective in regulating public transportation and ensuring relevant performance by displaying an average rating of 3.31 (very good) out of 4.

Narboneta and Teknomo (2016) observed that the public transportation sector in Metro Manila is characterized by disorganization. Even though the LTFRB has designated specific stops for buses and jeepneys, these vehicles often disregard them and stop wherever passengers wish to board and alight. This practice of loading and unloading indiscriminately has been identified as one of the primary causes of traffic congestion, particularly on major routes like EDSA. To address this issue, the government should enforce traffic regulations more strictly to discourage this negative behavior among road transport users.

The evaluation presented in Table 11 and the observations from the study by Narboneta and Teknomo (2016) highlight the need for improvements in public transport policies and their implementation to enhance the performance of public transportation. To address issues regarding the matter, there is a need to enforce traffic regulations more strictly to discourage negative behavior among road transport users and improve the relevant performance of public transportation policies, particularly for commuters.

Table.12. City of San Fernando, Pampanga's Summary of Responses – Commuters, Jeepney Drivers, and Traffic Enforcers' Assessment of the Effectiveness of Public Transport Policies in Terms of Environmental Impact

10. ENVIRONMENTAL IMPACT									
Question	COMMUTERS			JEEPNEY DRIVERS			LAW ENFORCERS		
	10.1	10.2	10.3	10.1	10.2	10.3	10.1	10.2	10.3
Very Poor (1)	39	41	32	0	0	1	0	0	0
Poor (2)	80	74	70	12	28	5	0	0	0
Good (3)	53	53	70	76	52	59	15	13	15
Very Good (4)	8	12	8	12	20	35	5	7	5

Total	180	180	180	100	100	100	20	20	20
Weighted Mean	2.17	2.20	2.30	3.00	2.92	3.28	3.25	3.35	3.25
Average	2.22			3.07			3.28		

The assessment of the effectiveness of public transport policies in terms of environmental impacts is crucial in addressing the negative consequences of transportation on the environment. The results presented in Table 12 revealed the mean scores for commuters, jeepney drivers, and law enforcers. The commuters experienced the adverse environmental effects of public transportation by displaying a poor average rating of 2.22 over 4. Conversely, jeepney drivers' responses regarding the effectiveness of public transport policies in terms of environmental impacts resulted in an average rating of 3.07 (good) out of 4. Moreover, the average score of 3.28 over 4 obtained by the traffic enforcers, interpreted as a very good rating, suggests that traffic enforcers could have been implementing policies intended to mitigate the environmental effects of public transportation.

It is evident that there is a need for continued efforts to implement policies aimed at reducing the negative environmental impact of public transportation. Additionally, the results and the study of Andalecio et al. (2020) and Schmutzler (2011) show the importance of considering the environmental impacts of transportation policies and the potential for policy interventions to mitigate negative effects. The government's Jeepney Modernization program and Schmutzler's framework provide instances of potential solutions to address the issue in the city.

3.1.2 Correlation Between the Quality of Public Transportation and Effectiveness of Transport Policies in the City of San Fernando, Pampanga

Table.15. Computation of Mean of the Variables under the Quality of Public Transportation and Effectiveness of Transport Policies in the City of San Fernando, Pampanga

Variable	Derivation	Rationale
Quality of the Public Transport-	The variable is calculated using the formula:	The Quality of the Public Transporta-

ation System	$Quality = \frac{Q1 + Q2 + Q3 + Q4 + Q5 + Q6}{7}$	tion System variable is quantified by taking the overall average of the seven components: <i>Vehicle Condition, Reliability, Stop's Condition, Customer Care, Information, Convenience, and Availability.</i>
	where: <ul style="list-style-type: none"> • Q1 = Vehicle Condition - computed by taking the average of the ratings of a respondent under <i>Comfortability, Condition, and Safety-Environmental Standards</i> statements. • Q2 = Reliability - computed by taking the rating of a respondent under the <i>Travel Time Consistency</i> statement. • Q3 = Stop's Condition - computed by taking the average of the ratings of a respondent under <i>Inclusivity and Safety</i> statements. • Q4 = Customer Care - computed by taking the average of the ratings of a respondent under <i>Reasonability, Safety/Security, and Driver's Competence</i> statements. • Q5 = Information - computed by taking the rating of a respondent under the <i>Comprehensibility</i> statement. • Q6 = Convenience - computed by taking the average of the ratings of a respondent under <i>Travel Experience and Route Accessibility</i> statements. • Q7 = Availability - computed by taking the average of the ratings of a respondent under <i>Peak Period and Off-Peak Period</i> statements. 	

<p>Effectiveness of Transport Policies</p>	<p>$Effectiveness = \frac{E1 + E2 + E3}{3}$</p> <p>where:</p> <ul style="list-style-type: none"> • E1 = Accessibility - computed by taking the average of the ratings of a respondent under <i>Consideration to Persons with Disabilities, Provides Mobility, Provides Signages, Favorability of Routes, Accessibility of Stops, and Loading and Unloading Designation</i> statements. • E2 = Relevant Performance - computed by taking the average of the ratings of a respondent under <i>Sufficient Number of Jeepneys, Modal Shift, Traffic Flow, Jeepney Travel, Jeepney Terminals, and Jeepney Usage</i> statements. • E3 = Environmental Impacts - computed by taking the average of the ratings of a respondent under <i>Public Transport's Aid in Negative Impacts of Greenhouse Gases, Regulation of Vehicle Usage, and Aid in the Effects of Congestion</i> statements. 	<p>The Effectiveness of Transport Policies variable was measured by getting the average of the three components: <i>Accessibility, Relevant Performance, and Environmental Impacts.</i></p>
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In taking the correlation of the two variables, the null and alternative hypothesis state that:

H_0 : There was no significant (monotonic) relationship between the quality of public transportation system and the effectiveness of transport policies in the City of San Fernando, Pampanga.

H_a : There was a significant (monotonic) relationship between the quality of public transportation system and the effectiveness of transport policies in the City of San Fernando, Pampanga.

Table.16. Spearman's Rank Correlation Coefficients of the Quality of the Public Transportation System and the Effectiveness of Transport Policies in the City of San Fernando, Pampanga

Correlation of the Quality of Public Transportation System and the Effectiveness of Transport Policies			
Test Used	Correlation Coefficient (ρ)	p-value	Level of Significance (α)
Spearman Rank-Order Correlation	0.651 (moderate)	< 0.0001	0.05
		p-value < α	

Table 16 shows the Spearman's Rank Correlation Coefficients of the Quality of the Public Transportation System and the Effectiveness of Transport Policies in the City of San Fernando, Pampanga. It presents the Test Used, Correlation Coefficient (ρ) computed by using Spearman's Rank Correlation formula and interpreted according to the corresponding strength of association, p-value, and Level of Significance (α).

Based on the result of the correlation analysis, the paired variable has a p-value of 0.0001, which is less than the level of significance (α) = 0.05. Thus, at a 0.05 level of significance, there is sufficient evidence to reject the null hypothesis (H_0). It can be concluded that the quality of the public transportation system has a positive monotonic relationship with the effectiveness of transport policies in the City of San Fernando, Pampanga.

Furthermore, it can be inferred from Table 2 – Spearman's Rank Correlation Coefficient Strength of Association that a correlation coefficient (ρ) = 0.651, falling within the range of 0.4 - 0.69, represents a moderate strength of association. Thus, as the city's transport policies become more effective, the quality of public transportation system improves accordingly.

The statement on the positive monotonic relationship between the quality of public transportation and the effectiveness of transport policies in the City of San Fernando, Pampanga is consistent with the findings of Rodrigue et al. (2017). According to the study, transportation policy aims to allocate transportation resources efficiently, which includes regulating and administering current transportation operations. Therefore, improving the effectiveness of transport policies can lead to better allocation of resources and improved regulation, which in turn can lead to an improvement in the quality of the public transportation system.

3. 2 Discussions

The study revealed that the commuters produced an acceptable level of satisfaction with the quality of public transportation system. However, significant remarks are evident such as vehicle condition, convenience, and reliability which garnered low mean scores. On the other hand, jeepney drivers concurred with the traffic enforcers giving a satisfactory assessment of the quality of public transportation as well as the effectiveness of transport policies contrary to the computed grand means from the commuters wherein relevant performance and environmental impacts were rated as poor. Furthermore, the null hypothesis was rejected, indicating that there is enough evidence to conclude that the quality of public transportation system has a monotonic relationship with the effectiveness of transport policies.

The quality of public transportation in the City of San Fernando is satisfactory based on the assessment of commuters, jeepney drivers, and traffic enforcers. Nevertheless, there are still some notable issues with the overall quality of transportation systems that were mainly recognized by the commuters who are basically the customers of transportation services provided in the city. Consequently, the transport policies in the city appeared to be inefficient in resolving the experienced disturbances of the community represented by the commuters and jeepney drivers and were not successful in sustaining orderliness in its transportation system. In contrast, the traffic enforcers exhibit consistently strong positive ratings towards the indicators and parameters of the study.

Subsequently, for the testing of hypotheses, a significance level of 5% was utilized. The computed p-value of the paired variable ($p = 0.0001$) was less than the level of significance of 0.05. Thus, there is sufficient evidence to reject the null hypothesis. The findings indicate that the effectiveness of transportation policy has a positive monotonic correlation with the quality of the public transport system. In simpler terms, as the city's transport policies become more effective, the quality of public transportation systems improves accordingly. Furthermore, with the correlation coefficient being 0.651, which is between 0.4 - 0.69, it can also be concluded that the positive monotonic relationship is moderate. This is perhaps a result of the reflected score from the commuters which evidently shows a negative correlation between the two variables that balanced out the observed scores from the jeepney drivers and traffic enforcers which shows a consistent positive correlation decreasing the strength of association.

After data gathering procedures, statistical treatment, and data analysis, the study proceeds to the structured interview coordinating with the city's Traffic Division Office. The researchers were able to arrange a short meeting with Mr. Louie P. Clemente, the Head of the City Public Order and Safety Coordinating Office (CPOSCO) of the City of San Fernando after securing a letter of invitation for the interview. The city's Head of CPOSCO was asked about the overall situation of transportation in the city. Specifically, the current state of public transportation, the arising issues being experienced in the city as well as the preparation of the city with regard to this matter. Also, Transport Management Strategies were presented and discussed during the interview. Moreover, the researchers were able to gain a better understanding of the issues tackled during the discussion.

According to the City Head of CPOSCO, in terms of ratio, public transportation can still accommodate the travel demands of the city. However, due to rapid development, it may not be efficient in moving goods and people. Being the City of San Fernando, the capital of the province, it is evident that there is a need to implement drastic changes in the transportation system to accommodate this forthcoming development. In line with this, measures are being taken by the city government and this includes the requirement of a Local Public Transport Route Plan (LPTRP) wherein Traffic Impact Analysis (TIA) was also mentioned. TIA evaluates the probable transportation effects of a planned land development project and also determines any changes that must be made to a transportation system in order to lessen traffic, maintain and enhance safety, give access to the location, and mitigate any effects (Armit, 2016). It is set to be accomplished within the year and may serve as the basis of what actions should be taken to prepare for the development of the city. LPTRP is a detailed plan route network with specific modes of transportation and the required number of units per mode for delivering land transport services that are now prescribed as a minimum requirement before the issuance of any PUV franchises (National Center for Transportation Studies, 2022). He also mentioned that there are plans to decentralize the city by distributing developments in the north. New route networks will be analyzed according to their responsiveness to local demands, road hierarchy, and configuration. The city is continuously exploring solutions and in fact, the Head and staff of CPOSCO are currently taking up special courses at the University of the Philippines in the field of transportation management. Therefore, the City Head of

CPOSCO was able to provide sufficient information to answer the study's inquiries.

The issues that were brought up are significantly relevant to the results gathered from the assessment of the quality of public transportation system and the effectiveness of transport policies in the study. The vehicle condition, which is one of the indicators of the quality of the public transportation system, was ranked the second least with a mean score of 2.38 as presented in Table 3 among other factors from the perspective of the commuters. Consequently, the Jeepney Modernization Program is evidently being implemented in the city despite the rising controversies in the terms and agreement of this program. Another notable remark from the results is the Relevant Performance with a mean score of 2.49 ranking third in lowest means from Table 11. This measures the effectiveness of transport policies in promoting modal diversion. It can be observed that the reliance of commuters on the utilization of public transportation is deteriorating. Moreover, Environmental Impacts from Table 12 had the lowest mean score of 2.22 among all indicators from the perspective of commuters. On the other hand, the City Head of CPOSCO stated that environmental safety is highly the priority of the city and is included in their developmental goals encouraging environmentally friendly and economic modes of transportation.

The City Head of CPOSCO was also asked about his knowledge of various Transport Management Strategies, to which he responded that these are actually in accordance with the planning objectives of the city. The researchers presented the reviewed Transport Management Strategies and they also conversed about the possibilities of adopting these strategies in the city.

The city is already contemplating Transit-Oriented Development and Pedestrian-Oriented Development, as well as the Traffic Impact Analysis (TIA) which was introduced to them during their studies. The city requires corporations who are also potential investors to submit their TIA before the approval of their proposed land developments. However, the implementation of this will require thorough planning and will take months of preparation, and small business developments do not have the ability to comply with these requisites. Therefore, it can be concluded that these developments also have a direct impact on the economic capacity of the city. On the other hand, he pointed out that Pedestrian-Oriented Development is much more likely to be included in the planning priorities of the city among other strategies taking into

consideration the budget, timeline, and planning preparation when asked about the most suitable or possible TMS that is within the management capacity of the city.

The researchers also asked about the potential issues that may arise making these TMS less feasible. Several issues may arise, including monetary issues such as the accumulation of funds for the projects, implementation, and social acceptability. The City Head of CPOSCO emphasized that social acceptability is the most crucial part of planning preparations in developing new strategies from conceptualization to implementation of these projects. Applying changes to the system while achieving equity is very critical in ensuring that all stakeholders will benefit from these developments.

IV. CONCLUSION AND RECOMMENDATIONS

4.1 Conclusion

The study aimed to assess the quality of public transportation system and the effectiveness of transport policies from the perspectives of commuters, jeepney drivers, and traffic enforcers in the City of San Fernando, Pampanga. Also, to identify the correlation between two variables and gather relevant information from the Local Government as a foundation for the proposal of a suitable Transport Management Strategy that will potentially solve traffic-related issues in the city.

Overall, the study was able to identify the most suitable Transport Management Strategy to propose that has great potential to address the city's current and foreseeable issues after analyzing the assessment of all stakeholders that provides different perspectives on the quality of the public transportation system and the effectiveness of transport policies. In addition, the study supports that the quality of public transportation has a positive monotonic relationship with the effectiveness of transport policies rejecting the null hypothesis. Therefore, the study concludes that the development of a more comprehensive and effective transport policy will result in an improved quality of public transportation in the City of San Fernando, Pampanga. In conclusion, based on the findings of the study which gathered relatively low scores among the assessed parameters. Major concerns were found to be the deteriorating conditions of jeepneys, the management capacity of the city promoting modal diversion, traffic management, and mitigating environmental impacts. Consequently, the study was able to gather relevant information regarding the planning objectives

and capabilities of the city in addressing the occurring and foreseen issues in its transportation system. With the inherent role of the city in emerging developments and as one of the major economic centers of the region, it must continually ensure accessibility and mobility throughout the city. Moreover, the city is currently exploring solutions in anticipation of the increasing volumes of traffic and major developments. Jeepney Modernization Program is evidently being implemented and also the provision of a Local Public Transport Route Plan and formulation of Traffic Impact Analysis are underway. Subsequently, Pedestrian-Oriented Development (POD) and Transit-Oriented Development (TOD) were suggested to be appropriate in the city and they complement each other. However, due to the insufficiency of transportation facilities such as transport centers or terminals, the study proceeds with the proposal of Pedestrian-Oriented Development.

4.2.1 Proposal of Transport Management Strategy

In this section of the paper, the study introduced the potential of Pedestrian-Oriented Development in addressing the city's current issues and foreseeable problems. The relevance of the findings from the surveyed data and the acquired knowledge from the structured interview concludes that the commuters who are the customers of transportation services have major concerns about the deteriorating conditions of jeepneys resulting in discomfort, management capacity of the city in promoting the use of public transportation, and the effects of these recurring issues in the environment. Pedestrian-Oriented Development (POD) promotes the creation of public policies that give pedestrians convenient access to residential areas, transit hubs, and commercial areas. Additionally, communities that utilize POD techniques reduce traffic speeds, noise, and air pollution produced by vehicles.

The City of San Fernando (CSFP), which is also the provincial capital of Pampanga, is strategically situated in the center of Central Luzon and is subject to heavy intra- and inter-city traffic. Congestion has been noted as a concern in the city in recent research on traffic and transport management (Transport and Traffic Management Plan, 2017). The city must continually ensure accessibility and mobility throughout the city due to its emerging role in the Metro Clark area and its inherent role as one of the major economic and service centers of the region.

The Transport and Traffic Management Plan (TMP) for the City of San Fernando identified that despite the high public

transport mode share (about 85%), the city's road network is congested due to a seeming oversupply of tricycles, inefficient loading/unloading operation, unsafe pedestrian crossings, and roadside friction due to encroaching commercial activities and parking. Other concerns include road safety and pollution from transport and road safety of pedestrians. Sustainability issues have revealed that the city lacks elements in its systems, particularly its transportation system despite the city's ongoing system development. TMP has also outlined the following key goals in transportation that support the city's mission and vision: promote and maintain, improve public transport quality, decrease air pollution from transportation, ease traffic congestion, and improve transport equity to achieve sustainable growth. Moreover, these outlines are aligned to the project objectives of Pedestrian-Oriented Development.

Numerous factors are occurring within the city that slow down and impede an area's mobility. One of the effects of these elements affecting the city's mobility is traffic congestion which slows down the movement of products, extends travel times, costs more to fuel, and worsens air pollution. Traffic congestion within the city continuously happens due to unlawful and unorganized activities within the road networks, such as illegal parking, illegal boarding and alighting, and road conditions in different parts of the city. Celso et al. (2022) concluded that the conduct of road users, the state and features of the road infrastructure, and the rising numbers of cars are the main elements determining the effectiveness and efficiency of the city's existing traffic management system. Insufficient facilities such as jeepney stop result in swerving vehicles to avoid queued and merging jeepneys, jeepneys competing for better positions, stopping in inconvenient locations on the road to pick up or drop off passengers, and passengers occupying the outer lane, reducing the available space for other vehicles (Ieda et al., 2018).

Despite the city's expanding infrastructure and economic sector, the Transport and Traffic Management Plan (TMP) noted that public transportation accounts for a significant portion of the city's development—about 80%. Additionally, due to the city's transportation system's underlying expansion, the city's road networks appear to no longer be sufficient to support the city's expanding population. The Transport and Traffic Management Plan (TMP) found that it needs to be improved in order to support the community's and economy's expected development.

Pedestrian-Oriented Development (POD) is an urban planning and design approach that prioritizes pedestrians and encourages

walking as the primary mode of transportation. It aims to create more livable and sustainable communities by promoting active transportation, reducing reliance on private vehicles, and fostering social interaction and economic vitality. This approach has gained popularity in recent years, as cities and communities seek to create more walkable environments that promote health, safety, and a sense of community. It creates a built environment that encourages people to walk, bike, and take transit, which has been shown to improve physical and mental health, reduce traffic congestion and air pollution, and boost economic activity (National Complete Streets Coalition, 2014). This approach includes a range of strategies such as creating safe and accessible sidewalks, crosswalks, and bike lanes; designing buildings and public spaces that prioritize the needs of pedestrians; encouraging mixed-use development that includes housing, shops, and services in close proximity; promoting public transit and reducing reliance on private cars and; enhancing public spaces such as parks, plazas, and streetscapes to encourage social interaction and community engagement. Studies have shown that pedestrian-oriented development can have significant benefits for individuals, communities, and the environment. POD can help reduce greenhouse gas emissions and air pollution. A study by Litman (2011) found that shifting from automobile-dependent to more walkable communities could reduce greenhouse gas emissions by up to 30%, while also reducing other air pollutants that contribute to respiratory illnesses. It can also help reduce the urban heat island effect, which is a phenomenon where cities are warmer than surrounding rural areas due to human activities. Increasing green spaces, shaded areas, and pedestrian-friendly infrastructure can help reduce surface temperatures and improve thermal comfort (Kwon and Chiu, 2021). Pedestrian-oriented development can reduce the amount of land used for parking lots and roads, as fewer personal vehicles are required. This can help reduce habitat destruction and preserve open space. A study by the National Association of Realtors (2015) found that walkable communities tend to have higher residential densities and more mixed-use development, allowing for more efficient use of land.

However, this alone would not achieve the intended goals but shows a conceivable potential as a starting point in the city's urban transportation planning and design. As the study reviewed, successful POD implementation in other countries achieved pleasing results by integrating these developments with other strategies. If other components of the system are also found to be impotent, it will lead to unwanted results. Transit-

Oriented Development complements Pedestrian-Oriented Development effectively. A transit-oriented development (TOD) is an urban development that increases the amount of residential, commercial, and recreational space that is within walking distance of public transportation (NOSPlan, 2020). POD and TOD are important concepts in urban transportation planning and design, as they aim to make cities more livable, sustainable, and accessible. Both POD and TOD share similar goals of promoting sustainable transportation, reducing automobile dependency, and improving the quality of life for urban residents. By prioritizing walking and transit as primary modes of transportation, cities can reduce traffic congestion, air pollution, and carbon emissions, while enhancing public health, social equity, and economic vitality (Ewing et al., 2015).

POD promotes the utilization of public transportation by offering safe and secure access to public transit. In line with the ongoing Jeepney Modernization Program in the city, the development of sidewalk facilities such as bike lanes, walkable pathways, and pedestrian lanes is desirable. Short trips that can be taken within a walkable distance of the community may decrease the travel demand. At the same time, with sufficient facilities, this will promote active transportation and may increase the reliance of the community on public transportation. Moreover, it may be instrumental in achieving a favorable decline in greenhouse gas emissions through the promotion of active transportation provided that facilities are sufficient and can accommodate the necessary level of service to the community. Active transportation produces fewer carbon emissions than single-occupancy vehicles, which is a major contributor to climate change. According to a study by Litman (2019), replacing car trips with active transportation can significantly reduce carbon emissions and improve air quality. It can also reduce urban land use and result in more efficient land use patterns. Active transportation requires less land than automobiles, as it requires less space for parking and road infrastructure. PODs typically reduce parking requirements, which can discourage car use, therefore, reducing traffic congestion. Ewing and Cervero (2010) implied that PODs with high levels of walkability have significantly lower traffic congestion and reduced vehicle miles traveled. Therefore, the study concluded that the alignment of the planning objectives of the city and the findings from the study supports the suitability of Pedestrian-Oriented Development with its potential to solve the city's emerging issues. Relevant to the ongoing developments and planning preparations of the city in accordance with the impending urbanization growth in the

country, the selected Transport Management Strategy of the study may be equitable to all stakeholders. Generally, Pedestrian-Oriented Development can have a significant impact on the society, economy, and the environment of the city.

4.2 Recommendations

The findings of the study serve as a good starting point in evaluating the perception of commuters, jeepney drivers, and traffic enforcers regarding the current traffic situation in the City of San Fernando, Pampanga. Future researchers may explore the effectiveness of the current measures being taken by the government in aiding the transportation problems in the city. Furthermore, a thorough review of the transportation policies is needed as they may seem to be ineffective in managing the current traffic situation in the city. The study delimits itself in determining the viability of the actual implementation of the proposed strategy and the proposal was merely based on quantified qualitative data, specifically the perceptions of concerned stakeholders.

After the proposal of a suitable transport management strategy in the City of San Fernando, the researchers recommend the analysis of its viability and the gathering of statistical data for a more concrete basis in the selection of an appropriate project. Measuring the viability of a Transport Management Strategy in a city can be a complex process that requires a combination of qualitative and quantitative methods. Although the following metrics and indicators may help in determining its viability:

- a. Modal Split – refers to the distribution of travel demand across different modes of transportation, such as walking, cycling, public transit, and private cars.
- b. Average Trip length – measures the average distance traveled by individuals in a city.
- c. Travel Time – measures the time taken by individuals to travel from one place to another.
- d. Traffic Congestion – measures the degree of delay and queuing experienced by road users, particularly during peak hours.
- e. Air Pollution – measures the concentration of harmful pollutants in the air, such as particulate matter and nitrogen oxides.
- f. Road Safety – measures the number of accidents and fatalities on the road and determines road hierarchy and configuration.

- g. Cost-effectiveness – measures the economic capacity of the city to achieve the desired outcomes at a reasonable cost and provide value for money.
- h. Public Acceptance – measures the public acceptance and satisfaction from the community. A viable POD should gain public support and be perceived as a positive change for the city.

Moreover, the researchers suggest the forecasting of travel demands that is required before any construction, expansion, or improvements of facilities by employing different types of surveys such as:

- a. Socio-economic surveys that collect socio-economic profiles and establish detailed trip information of household members in an area.
- b. Origin-Destination Travel Surveys
- c. Land-Use Inventory
- d. Infrastructure and existing services Inventories

The complexity in determining appropriate solutions to traffic-related problems undoubtedly would require a very tedious process but it is attainable when given sufficient time and resources to conduct procedures. Considering all stakeholders involved would bolster social acceptability which is a crucial part in transportation planning. Additionally, economic measures and environmentally sound approach in addressing recurring issues are desirable.

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