The Analysis of Traffic Management in Barangay San Antonio, Floridablanca, Pampanga

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Abstract— **The main challenge in Barangay San Antonio, Poblacion, Solib, Mabical, and Maligaya is traffic congestion. The study reviewed the effectiveness of local traffic control, focusing on community awareness and respect for traffic rules and regulations. The analysis utilized surveys and demographic techniques to provide new knowledge about what is happening regarding transportation management. The findings showed that residents have high knowledge about traffic rules, but this knowledge does not prevent persistent traffic jams, especially during peak hours. These problems occur due to limited road infrastructure, ineffective management practices, and lack of driver cooperation. Moreover, it has been established that there are factors such as age, sex, vehicle type, duration of stay in the area, and level of education which determine how well the transport system is managed. Although current actions taken to manage mobility tend to be slightly effective, according to the research findings, it can still be improved. Amongst others, these include tightened enforcement through law-abiding agencies or bodies, public enlightenment campaigns reaching a broader audience that involves development in infrastructural facilities with larger capacities as well as increased volumes of motorized users' capacity. The research shows that the recommendations can only work if coordinated by the local government unit and the community cooperation in Floridablanca, Pampanga. Managing its traffic would improve and enhance life in Barangay San Antonio, Poblacion, Solib, Mabical, and Maligaya because this reduces congestion and makes roads safer through efficient use. This research provides valuable information for local government units and policymakers who realized the necessity of improving and updating the ordinance enacting the comprehensive traffic rules of Floridablanca, Pampanga. provides an expert workforce for the organization.**

***Index Terms*—Traffic Congestion, Traffic Management, Traffic Rules and Regulations, Community Awareness, Mobility Management.**

1. Introduction

Traffic management is the process of modifying or adapting how an existing road system is used to achieve predetermined goals without having to build a significant amount of new infrastructure [1]. Making the flow of people and products as effective, orderly, and safe as possible is the main objective of traffic management. Everyone who uses the roads is subject to this, including cyclists and pedestrians in addition to drivers of motor vehicles [2].

It also refers to all organizations whose duties include determining the needs for traffic flow and handling related planning, financing, building, and/or maintaining public infrastructure. It also includes all organizations in charge of granting licenses, approving them, limiting, halting, outlawing, or managing how these facilities are used [3].

Severe traffic congestion has an especially negative effect on cities, which are essential to a nation's development. For instance, the Philippines is one of the nations with the worst traffic conditions in the world [4]. The Philippines' Pampanga province is still in development, and it has been difficult to maintain clear roads and highways due to heavy traffic. One of the most pressing problems is the increasing "traffic congestion," which is primarily brought on by the absence of a well-restricted transportation infrastructure in the country and requires national attention [5]. Adjacent to these, marketplaces lie a significant area of critical congestion, with inadequate traffic management systems [6].

In Barangay San Antonio, Floridablanca, Pampanga, roads leading into and out of market areas, businesses, fast food restaurants, and schools that are close to one another draw a lot of foot and vehicle traffic. The most common causes of traffic congestion include high volumes of vehicles, inadequate traffic enforcement, ineffective traffic control systems, poor implementation of traffic laws, and non-compliant drivers and pedestrians. Persistent traffic congestion can also put a strain on the current road infrastructure [7], which regularly results in significant delays and wastes commuters' time, particularly during rush hours.

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Long stretches of time spent in traffic cause people's daily routines and productivity to suffer.

Fig.1. Map of Floridablanca, Pampanga

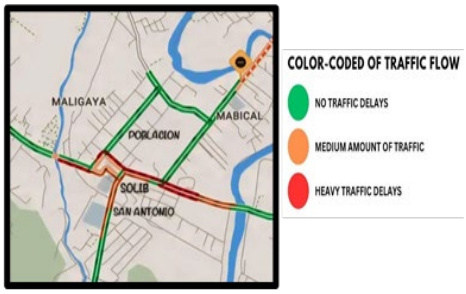

Fig.2. Traffic flow

2. Methodology

The research methodology used in this study was a descriptive method of research, which helped the researchers determine the effectiveness of traffic management functions in Barangay San. Antonio, Floridablanca, and if there is a significant difference between the effectiveness functions when grouped according to profile variables.

In this chapter, the concentration is on the detailed steps of the research process used to identify and analyze the information, which were divided into three phases. The first phase is the development of ideas and preliminary preparations, the second phase is the data-gathering process, and the third phase is the interpretation and analysis of data.

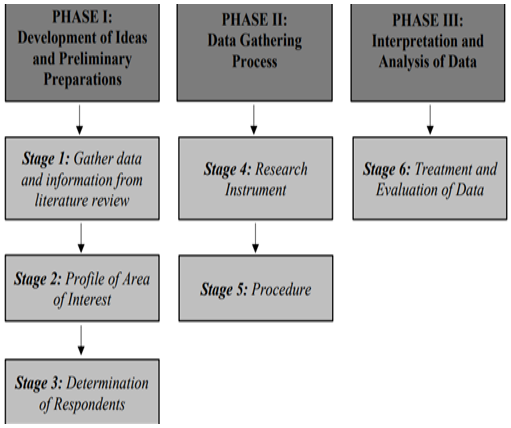

Fig.3. Methodological Framework

The figure above illustrates the phases of work the researchers followed during the conduct study.

A. Phase 1: Development of Ideas and Preliminary Preparations

The procedure began with parameter determination and the preparation of the samples. There are three stages in this phase. The first stage encompassed the gathering of data and information from the literature review. The second stage contained the profile of the area of interest, and the third stage included the determination of respondents.

Stage 1: Gather Data and Information from Literature Review

In this stage, the researchers reviewed the data and information from related literature. This includes the role and effectiveness of traffic management that stated the current situation of local traffic management functions in San Antonio, Floridablanca. This helped as a guide to achieve the objectives of the study.

Stage 2: Profile of Area of Interest

The location of this study was limited to Floridablanca, which is officially a firstclass municipality in the province of Pampanga, Philippines. According to the 2020 census, it has a population of 135,542 people. San Antonio, Floridablanca, Pampanga, is a barangay in the municipality of Floridadblanca in the province of Pampanga, with a population of approximately 3,575 people. As a result, the researchers decided to conduct a study on the effectiveness of traffic management in San Antonio, Floridablanca, Pampanga, and nearby barangays to serve as a basis.

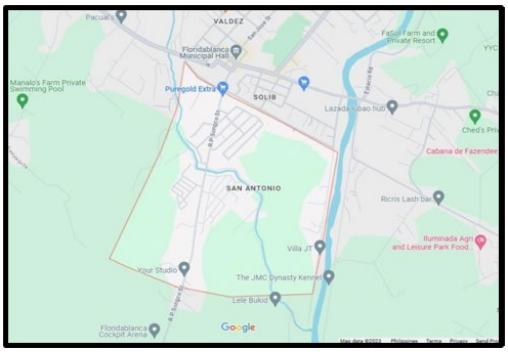

Fig.4. Map of Barangay San Antonio, Floridablanca, Pampanga

Stage 3: Determination of Respondents

The participants of the study were traffic monitoring groups, police officers assigned to the traffic division, and motorists or commuters. Using the Raosoft formula with a 0.05 error rate in a sample size of 10944 respondents, a total of 382 respondents participated in this study, including 5 personnel from the Traffic Management Group, 5 members of the Philippine National Police assigned to the Traffic Municipal, and 372 commuters or pedestrians and motorists. Purposive sampling was used to choose the respondents.

Table.1. Number of Respondents

Location	Population
Barangay San Antonio	74
Barangay Solib	117
Barangay Maligaya	24
Barangay Mabical	74
Barangay Poblacion	83
Total Population	**372**
Traffic Enforcers	10

B. Phase 2: Data Gathering Process

The data-gathering phase is divided into two stages. It starts with the research instrument and then the actual data gathering.

Stage 4: Research Instrument

This research is descriptive in nature, so data collection is conducted in three ways: through surveys, interviews, and self-made questionnaires that consist of two parts. The sets of questions were prepared, formulated, and sequenced to gather

Weighted Mean Verbal Interpretation
3.50 – 4.49 Very Effective (VE)
2.50 – 3.49 Effective (E)
1.50 – 2.49 Less Effective (LE)
1.00 – 1.49 Not Effective (NE).

data. The first part pertains to the profile of the respondents, including their age, gender, educational attainment, years of residence, and the vehicles they drive. The second part focuses on the perception of motorist, pedestrian, and law enforcement sectors regarding the traffic along Floridablanca Road in Barangay San Antonio. The third part assesses the effectiveness of traffic agencies in carrying out their functions.

Stage 5: Procedure

The researchers conceptualized this study with the help of their adviser. They used books, journals, manuals, operational manuals, unpublished materials, and the internet as references. The researchers also conducted a formal interview with road users in Barangay San Antonio. Additionally, they visited Floridablanca's local government unit to gather data and determine the number of officers involved in Patrol and Traffic. They also sought permission from the Traffic Management Group of Floridablanca to determine the number of its enforcers.

C. Phase 3: Interpretation and Analysis of Data

The final step is to establish the settings, indicators, and needed data. The interpretation and analysis of the data were considered during this step. It demonstrates the study's relevance and accuracy with regard to the compliance of the supplied variables and parameters.

Stage 6: Treatment and Evaluation of Data

The data collected from the questionnaire was tallied, tabulated, analyzed, and interpreted using various statistical tools. Frequency was utilized to count and rank the items in the questionnaire, while weighted mean was employed to assess the effectiveness of the traffic management function in Barangay San Antonio, Floridablanca. Additionally, Analysis of Variance (ANOVA) was conducted to determine if there are significant differences in the effectiveness of the traffic management function of Barangay San Antonio, Floridablanca when grouped according to profile variables.

The formula of Weighted Mean and Analysis of Variance (ANOVA):

$$W = \frac{w \times n}{N}$$

Weighted Mean
where:
w = Weights applied to x values
n = No. of answers
N = No. of respondents

$$F = \frac{MST}{MSE}$$

Analysis of Variance (ANOVA):
where:
F=ANOVA coefficient
MST=Mean sum of squares due to treatment
MSE=Mean sum of squares due to error

Table.2. Level of Effectiveness

Weighted Mean	Verbal Interpretation
3.50 – 4.49	Very Effective (VE)
2.50 – 3.49	Effective (E)
1.50 – 2.49	Less Effective (LE)
1.00 – 1.49	Not Effective (NE).

This given scale was used to interpret the result of the data gathered.

Table.3. Level of Significance

P – Value	Verbal Interpretation
0.05; 0.05	Highly Significant (HS)
0-0.09	Significant (S)
0.01-0.9	Not Significant (NS)

This table was used to assess the difference in traffic management effectiveness in Barangay San Antonio,

Floridablanca, based on profile variables.

3. Results And Discussion

Table.4. Distribution of Respondents According to Profile.

Participant	Frequency	Percentage	Rank
Traffic Monitoring Group/PNP	10	2.62	2
Motorists/ Commuters/Pedestrians	372	97. 33	1
Age			
15-24	69	18.06	4
25-34	130	34.03	1
35-44	92	24.08	2
45-54	72	18.85	3
55 and above	27	7.07	5
Gender			
Male	218	57.07	1
Female	164	42.93	2
Vehicle Driven			
Car – Alone	16	4.19	4
Car – Share with Others	11	2.88	5
Private – Motor	159	41.62	1
Public – Motor	92	24.08	3
Public – Jeep	93	24.35	2
Mini Van/ Pick up	8	2.09	6
Truck	2	.52	7
Bicycle	1	.16	8
Years of Residence			
0-3 years	14	3.664	3
3-6 years	24	6.25	2
7 years and above	344	90.05	1
Educational Attainment			
Elementary Graduate	42	11	3
High School Graduate	89	23.3	1
College Undergraduate	115	30	4
College Graduate	136	35.7	2

The data presents the percentage distribution of the respondents based on their profile. The majority of the respondents, totaling 372 or 97.33 percent, were motorists, commuters, or pedestrians. Following closely behind were the traffic monitoring group/PNP, representing 10 or 2.62 percent of the respondents.

Considering age, the largest proportion fell within the 25-34 age group, comprising 130 or 34.03 percent of the respondents. The 35-44 age group followed with 92 respondents, constituting 24.08 percent. The 45-54 age group was next, with 72 respondents making up 18.85 percent. The 15-24 age group accounted for 69 respondents, totaling 18.06 percent, while the smallest representation was from the 55 and above age group, comprising 27 or 7.07 percent.

In terms of gender, the survey respondents consisted of 57.07 percent male and 42.93 percent female.

Regarding the type of vehicle driven, the majority of respondents (41.62 percent) preferred private cars, followed by public jeeps (24.35 percent) and public motorcycles (24.08 percent).

Car-alone usage accounted for 4.19 percent, while sharing a car with others represented 2.88 percent. A smaller percentage of respondents used minivans/pickups (2.09 percent), trucks (0.52 percent), and the least common was bicycles (0.16 percent).

As to their years of residency, the majority of them have been living for 7 years and above with a frequency of 344 or 90.05 percent. Next is the 3-6 years with a frequency of 24 or 6.25 percent, while the 0-3 years has a frequency of 14 or 3.664 percent.

With regards to their educational attainment, the majority of road users were college graduates, with a frequency of 136 or 35.7 percent, followed by college undergraduates at a frequency of 115 or 30 percent. High school graduates accounted for 89 or 23.3 percent, and the lowest was obtained by the elementary graduate group at a frequency of 42 or 11 percent.

Table.5. The effectiveness of traffic management functions of Barangay San Antonio, Floridablanca in relation to existing traffic rules.

Indicators	WM	VI	Rank
Causes of Traffic Problems	4.09	Very Effective	1

This table shows the weighted mean of 4.09 for the rating scale concerning the causes of traffic. It indicates that, on average, the respondents rated the causes of traffic relatively high. The verbal interpretation of "very effective" suggests that the traffic problem in San Antonio, Floridablanca, Pampanga is relevant and significant according to the respondents. This high rating implies that the respondents perceive the causes of traffic in the area to have a significant impact on the traffic situation. It highlights the importance of addressing these causes and implementing effective traffic management measures to alleviate congestion and improve traffic flow.

Table.6. The effectiveness of traffic management functions of Barangay San Antonio, Floridablanca in terms of traffic enforcement

Indicators	WM	Verbal Interpretation	Rank
Traffic rules and regulation	4.21	Very Effective	1
Traffic management	3.92	Very Effective	2
Traffic Law	3.77	Very Effective	3
Composite Mean	3.97	Very Effective	

Table provides an analysis of the effectiveness of traffic management functions in terms of traffic enforcement, using a rating scale. According to the respondents, the weighted mean for the effectiveness of traffic rules and regulations is 4.21, indicating a very effective rating, which ranks it as the top factor. The second-ranked factor is traffic management, with a weighted mean of 3.92. Finally, the existing traffic law is ranked third, with a weighted mean of 3.77.

Table.7. Summary Table of the effectiveness of traffic management Functions of Barangay San Antonio, Floridablanca.

Indicators	WM	Verbal Interpretation	Rank
Existing Traffic Data	4.09	Very Effective	1
Traffic Enforcer	3.97	Very Effective	2
Composite Mean	4.03	Very Effective	

The table provides a summary of the effectiveness of traffic management functions, based on existing traffic data and the role of Traffic Enforcers, using a rating scale. According to the data, the weighted mean for the effectiveness of existing traffic data is 4.09, ranking it as the top factor. The second-ranked factor is the effectiveness of traffic enforcement, with a weighted mean of 3.97.

Table.8. The significant difference in the effectiveness of traffic management functions when grouped according to profile variables.

Profile Variables	Ft	p-value	Interpretation
Participant	9.552094	0.71628	Not Significant
Age	5.143253	0.022248	Significant
Gender	9.552094	0.006339	Significant
Vehicle Driven	4.256495	0.289213	Not Significant
Years of residence	6.944272	0.58705	Not Significant
Educational Attainment	6.516052	0.04584	Significant

In Table 8, we can see the variation in the effectiveness of the traffic management function in Brgy. San Antonio Floridablanca, Pampanga when grouped according to different profile variables. This indicates that there are significant differences in how respondents have assessed the effectiveness of the traffic management function in San Antonio Floridablanca, Pampanga. It also suggests that respondents of different ages, genders, vehicle types driven, years of residence, and educational attainment have varying perspectives on the effectiveness of the traffic management function in San Antonio Floridablanca, Pampanga.

Age is a second demographic variable often associated with non-compliance with rules and regulations. Younger drivers tend to violate the law more frequently and are more likely to not follow existing traffic rules and policies in San Antonio, Floridablanca, particularly in relation to illegal parking and yielding right of way on main thoroughfares.

Gender is also a significant factor in not following existing traffic policies and rules. Specifically, males tend to receive a higher number of fines and are more prone to violating traffic rules. Educated drivers can easily acquire basic knowledge of driving and are better able to comply with traffic rules and regulations.

Meanwhile, in terms of educational attainment, respondents are knowledgeable about and conscious of traffic laws; nevertheless, when it comes to adhering to these regulations, they only sporadically do so.

No matter how many cars is put on the road, they will not be stopped or backed up until one or more drivers obstruct the flow of traffic. If a peace officer is not there to witness the obstruction, the drivers will get away with it. The cars are under the drivers' control. The people who are creating traffic bottlenecks are the drivers who break the rules.

Table.9. Proposed Action Plan and Improved Traffic Management Functions in Barangay San Antonio, Floridablanca (SHORT TERM MEASURES)

Propose program	Yes	No	Rank
Regular traffic education seminars	97.04	2.69	1
Strengthening traffic enforcement	96.77	2.96	2
Improvement of bottleneck intersections	96.77	2.96	2
Traffic safety campaign and education	95.97	3.76	3
Improvement of parking system	95.43	4.30	4
Improvement of traffic safety facilities	95.16	4.57	5
Improvement of U-turn and right- turn points	94.62	5.11	6
Improvement of traffic operation	94.35	5.38	7
Improvement of traffic signals	93.55	6.18	8
Rerouting of Heavy Vehicles	91.94	7.80	9

Among 382 respondents, 97.04% agreed on mandatory traffic education seminars, while 2.69% disagreed. In order to increase road safety, lower accident rates, and ease traffic congestion, traffic education seminars are crucial. The lectures' increased understanding of the value of adhering to traffic laws promotes a culture of careful driving.

Strengthening traffic enforcement and improving bottleneck intersections rank second, with 96.77% agreeing and 2.96% disagreeing. Traffic laws must be followed for all road users to be safe, and this can only be done by increasing traffic enforcement and improving traffic flow by sternly enforcing regulations. By enhancing these intersections with improved design and signal synchronization to improve traffic flow and reduce congestion, the overall efficiency of transportation can be raised.

The third-ranked traffic safety campaign and education had a 95.97% agreement rate, with 3.76% disagreement. Traffic safety and education are prerequisites for the promotion of responsible driving and the reduction of traffic accidents. By informing drivers and pedestrians about traffic laws and safe driving practices, awareness and compliance can be increased.

Finally, 95.43% agree with improvements to the parking system, while 4.30% disagree. Two advantages of improving the parking system are less time spent looking for parking spots and less traffic congestion. Making parking more accessible and easier to discover leads to improved traffic flow in urban areas and a more straightforward driving experience.

Based on the table of proposed action plans and improvements to traffic management functions, the researchers

solved the survey findings of yes or no for each proposed program. After calculating the results, the researchers rated them from highest to lowest percentage.

However, the planned program for improving measures for rerouting heavy vehicles received the lowest ranking, with just 91.94% agreeing and 7.80% disagreeing. Rerouting large vehicles is necessary to preserve road safety and lessen traffic jams. By guiding big vehicles along the appropriate routes, rerouting ensures more efficient traffic flow and lowers the possibility of accidents.

Table.10. Proposed Action Plan and Improved Traffic Management Functions in Barangay San Antonio, Floridablanca (LONG TERM MEASURES)

Proposed Program	Yes	No
Traffic information system	95.43	4.30
Traffic demand management system	91.40	8.33

Table 13 summarizes the results of a survey on long-term traffic management system measures. The data shows that a significant majority of respondents (95.43%) answered "YES" when asked if they support the implementation of a long-term traffic information system. Only a small percentage (4.30%) responded with "NO". Similarly, a high percentage of respondents (91.40%) expressed support for a traffic demand management system, with only 8.33% answering "NO".

The proposed long-term measures, the Traffic Information System and Traffic Demand Management System, have garnered agreement from the majority of respondents for their potential to enhance transportation efficiency and reduce congestion.

In order to help commuters plan their trips and get directions while traveling, the Traffic Information System makes use of information and communication technology. This system provides information about events and road construction, best routes, and alerts about bad weather that could affect traffic flow. It also provides real-time traffic conditions (such as queue length, travel time, and delays). Dynamic navigation systems, internet portals, smartphone apps, and variable speed limits or interchangeable message signs are some of the routes via which this data is provided. This technology seeks to positively impact commuter behavior by providing them with accurate, timely, and trustworthy traffic information, which will shorten travel times and ease traffic.

By either lowering travel demand or redistributing it across space or time, the Traffic Demand Management System implements strategies and policies to improve the effectiveness of transportation networks. This system includes extensive initiatives with integrated services, including programs to reduce commute trips and promote ridesharing walking, and cycling, all of which are designed to encourage users to get the most out of the transportation system. Using a number coding scheme is one of this system's most successful tactics; it helps control the number of cars on the road at certain times, which promotes better mobility and less traffic.

Propose plan	Strategies	Person involves
Traffic Outpost • Promotes smooth traffic flow, reducing congestion and travel time for the community. • Reduced Traffic Violations: Traffic outposts enable effective enforcement of traffic regulations, discouraging reckless driving and reducing traffic violations in the community. • Traffic outposts can implement measures to enhance pedestrian safety, such as crosswalks and pedestrian signals, benefiting the community's pedestrians.	Coordinate with proper agencies responsible for traffic management, such as traffic police, and LGU, to propose the establishment of a traffic outpost. Through effective communication and collaboration, the researchers will present their proposal, share research findings, and work together with the agencies to develop a comprehensive plan for the traffic outpost, ensuring its successful implementation and operation.	• Local Government Unit • Traffic Management Unit
Updating outdated existing traffic policy • Updating traffic policy, can help clarify and reinforce the rules, making it easier for the community to understand and comply with them. This can lead to increased compliance with traffic laws, resulting in safer roads and reduced violations. • Updating traffic policies can provide an opportunity to strengthen enforcement mechanisms. • By updating outdated traffic policies, road safety measures can be enhanced. This can include stricter regulations on traffic laws.	Coordinating with the proper agencies, such as the Local Government Unit (LGU), to update the existing traffic policy in Floridablanca, Pampanga is a proactive approach to address the issue of noncompliance due to outdated policies.	• Local GovernmentUnit • Traffic ManagementUnit

4. Conclusion And Recommendation

The majority of the respondents were motorists, commuters, and pedestrians between the age of 15-24 years old, 7 years of residence, college graduates and most drove private motors. The majority of respondents were aware of existing traffic data. However, some of the respondents were not aware of other traffic rules and policies. 51.3% were satisfied and 37.9 were not satisfied with the current existing policy.

The survey questionnaires on the causes of traffic problems yielded a WM (Weighted Mean) score of 4.09, indicating "Very Effective." This high rating suggests that respondents perceive the identified causes of traffic in the area to significantly impact the overall traffic situation. Researchers examined the traffic management function of San Antonio in Floridablanca to identify differences in assessment based on respondent demographics such as age, gender, and educational attainment.

A proposed action plan aims to enhance traffic management and alleviate traffic issues in San Antonio, Florida, Pampanga. The plan includes specific strategies and initiatives aimed at addressing the identified issues and enhancing the efficiency of traffic management in the area.

After thorough assessment and considering the foregoing findings and conclusions of the study, the following recommendations are presented:

- The drivers of Floridablanca, Pampanga, may attend a one-day seminar on road safety and defensive driving, coordinated by the Land Transportation Office (LTO). The seminar aims to enhance drivers' awareness of road safety and courtesy, defensive driving techniques, riding tips, values, qualities, and responsibilities of drivers, as well as transportation-related ordinances such as RA 4136 (Land Transportation & Traffic Code).
- Enhanced enforcement of traffic regulations must be conducted to reduce the waiting time of commuters in Floridablanca, Pampanga. To establish this, measures should be implemented to deter reckless driving behaviors, enforce speed limits, and prevent illegal parking and obstruction of traffic flow, thus improving road safety and reducing traffic violations. Achieving this requires the active participation and support of the Local Government Unit, traffic enforcers, and the community of Floridablanca, Pampanga.
- The traffic enforcers in Floridablanca, Pampanga may complete a three-day retraining seminar and basic life support training with the coordination of the Land Transportation Office (LTO). This seminar focuses on discipline, proper conduct, behavior in the performance of their duties in the strict implementation of the traffic rules, and knowledge to respond in providing first aid in emergencies so that it would help them effectively perform their duties. The retraining sessions conducted recently focused on lectures and workshops aimed to enhance competence and professionalism among the traffic enforcers, particularly on decorum in apprehension, proper hand signals in manning the road, and also knowledge about first aid emergencies.
- Future researchers can utilize and expand upon this research about traffic analysis policy to further explore its impact and effectiveness. By incorporating additional data sources and considering emerging technologies, they can enhance the comprehensiveness and effectiveness of their recommendations.

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