

**TRAFFIC SAFETY MANAGEMENT SYSTEMS IN THE CITY OF BALANGA:
BASIS FOR ENHANCEMENT PROGRAM**

Raul V. De Guzman, MPA
Natividad J. Decada, Jr., MPA
Bataan Peninsula State University
City of Balanga 2100, Bataan, Philippines
E-mail: bpsu_qa@yahoo.com.ph

ABSTRACT

The main thrust of the study is to gain an insightful understanding of traffic safety management systems of a specific city, in this case, the city of Balanga during the Fiscal Year 2015. The respondents were the pedestrians, drivers, traffic enforcers, and city marshals.

Specifically, the administrator related factors comprised the mechanism, policy, duty and information system. As for the technical part of the traffic safety management, it included the analysis of accident, person management, vehicle management, road management, environmental management and pre-warning management. It also included the facilities of the traffic safety management which has road safety, vehicle safety, and driver, pedestrian and disables person safety and training facilities.

The data gathered was analyzed with the used of the following statistical tools: Frequency count and percentage were employed to describe the problems on traffic safety management in terms of time and location. The mean was used to describe the level of traffic safety management systems. Moreover, to determine the significant difference between administration, technical and facilities, Analysis of Variance (ANOVA) was supposed to be employed. However, the assumptions of normality and homogeneity of variance are not met. Hence, the nonparametric version of ANOVA called the Kruskal Wallis Test was used.

It was also concluded that the lone null hypothesis that there is no significant difference in the perceptions of the pedestrians, drivers, traffic enforcers, and city marshals on the status of the traffic safety management program is rejected.

In view of the foregoing, the following specific recommendations are offered: to make the city enforcers and the community itself more responsive, the concerned agencies on traffic administration should review and enrich the criteria and procedures in the implementation of traffic signalization; the Traffic Engineering and Management should extend their services in the planning and designing of transport facilities like traffic signals to deliver an effective and efficient implementation of traffic services in the cities; the city government should seek funds from funding agencies for the construction of developmental

projects in line with the improvement of the transportation system in the city; the city government should allocate funds for computerized traffic signal systems, and traffic lights camera system mounted on a police vehicle which scans license plates to identify unlicensed, suspended and uninsured drivers by automatic license plate recognition system. Likewise, the city government should provide electronic collision reporting system for faster investigations at collision scenes device located at high collision intersections which photographs vehicles that disobey red lights like red light cameras. Along with the findings of this study, an enhancement programs is being proposed.

Keyword: traffic safety management, mechanism, policy, information systems

Introduction

Road safety as a global problem and experience shows that it needs to be undertaken in a comprehensive and coordinated manner in order to achieve success. It is a problem that needs to be addressed by a systematic and strategic planning to maximize benefits that shall be derived there from. It has also shown that different types of intervention are effective at different stages of a country's development in safety.

Traffic safety management has become a vital issue concerning the safety and well being of our societies. The mounting challenge is to move away from the long-standing maxim that all accidents result from human error and can be solved by enlightening pedestrians, towards a comprehensive organized approach that embraces all aspects of road traffic safety management to lessen errors and cancel out human mistakes.

The rapid growth in the level of motorization has resulted in a significant worsening of the road safety situation. Hence, traffic safety management system is now a key and urgent issue that may undermine the economic and social development of one country. Eliminating hazards and obstructions and sustaining safety consciousness among motorists hand in hand with the planning and laying down of world class infrastructures with modern road safety technologies would not only make the roadway sound but also promote the fast transformation of the city. A compatible traffic safety management is a prerequisite of ensuring unobstructed road and people's safety and promoting economic development making this an important component of traffic safety management.

Unfortunately, citizens often times are unaware about traffic safety. They break rules and regulations by traversing the streets randomly rather than following the cross walk, making a dash across the red light, carrying flammable and explosive luggage and smoking in the carriage transit. Similarly, there is also the addition of motorcycle accident wherein the

main cause is the usual not wearing of helmet, going over the speed limit, drinking and rushing in the forbidden zone.

For the reasons, road safety management is an integral part of the different components of traffic management which include: driver training and assessment; development of road user behavior through awareness and education; traffic engineering including audit of road safety, traffic enforcement and accident investigation; post-crash management; standards for traffic control devices, road geometrics and vehicles; and finally, the legislation itself. Developed countries have built their standards based on years of research through which they have developed an inbuilt system of ongoing audit, keeping pace with technology in all the areas of human, road and vehicle development. With the urbanization process constantly accelerated, it causes a lot of the traffic safety problems. It is a serious subject how to bring down the high rate of traffic accidents through the traffic safety management.

The main thrust of this study is to analyze the traffic safety management system in the City of Balanga by identifying a set of prioritized effective measures to provide an immediate and long-term impact on the safety of the most vulnerable road users, the pedestrian and motorists and to strengthen the capability and capacity of key agencies to coordinate and implement traffic safety management activities.

Body

This chapter deals with the presentation, interpretation and analysis of data relevant to the study on traffic management systems in the City of Balanga, Bataan during the Fiscal Year 2012.

Part 1 presents the problematic areas and critical time for traffic safety management. Part 2 deals with the administrative aspect of traffic safety management with respect to mechanism, policy, duty and information system. Part 3 describes the technical aspects of the traffic safety management with regards to analysis of accident, person management, vehicle management, road management, environmental management and pre-warning management. Part 4 reveals the facilities aspect of traffic safety management in terms of road safety, vehicle safety, driver, pedestrian and disabled person safety and training facilities. Part 5 compares the perceptions about the traffic safety management of the three (3) groups of respondents – traffic enforcers, drivers and pedestrians. Part 6 proposes an enhancement program based on the findings of the study.

Part 1. Problems on Traffic Safety Management System

Table 2 presents the problematic areas of traffic management in Balanga City ranked by the traffic enforcers, drivers and pedestrians.

Table 2
Mean Ranks of Traffic Management Problematic Areas

Area	Enforcer	Driver	Pedestrian	Total	Overall Rank
Don Manuel Banzon Avenue (From Total Gasoline Station to Shell Gasoline Station)	1.37	1.61	1.65	1.61	1
Paterno Street (From Malabia Bridge to Cupang)	2.70	3.03	2.93	2.95	3
Capitol Drive (From City Walk to Capitol Drive)	3.67	3.10	3.03	3.11	4
Camacho Street (From Caltex Gasoline to Sta. Rosa, Pilar, Bridge)	2.76	2.88	2.84	2.85	2
Others	3.53	3.68	3.78	3.71	5

Enforcers, drivers and pedestrians coincide in ranking Don Manuel Banzon Avenue as the most problematic areas with a total of 1.61. Overall, Don Manuel Banzon Avenue encountered the heaviest traffic problem then followed by Camacho Street, Paterno Street, Capitol Drive and others. For the enforcers, the second most problematic in terms of traffic management is the Paterno Street with a total of 2.70 then followed by Camacho Street and Capitol Drive. However, for the drivers and pedestrians, the second is Camacho Street, then Paterno Street and lastly Capitol Drive. It cannot be denied that intersections along the national highways and arterial roads are very much congested and most often have limited pedestrian and other safety signals for drivers.

Table 3 presents and summarizes the most critical hour for traffic management in the City of Balanga.

Table 3
Most Critical Hour for Traffic Management

Time	Enforcer (n=46)		Driver (n = 187)		Pedestrian (n =267)		Total (N = 500)		Overall Rank
	<i>f</i>	%	<i>f</i>	%	<i>f</i>	%	<i>f</i>	%	
7:00AM–8:00AM	4 4	95.65	152	81.28	157	58.80	353	70.60	2
8:01AM– 9:00AM	3 7	80.43	136	72.73	97	36.33	270	54.00	6
9:01AM–10:00AM	4	8.70	21	11.23	30	11.24	55	11.00	11
10:00AM–11:00AM	6	13.04	45	24.06	63	23.60	114	22.80	8
11:01AM–12:00NN	4 4	95.65	156	83.42	139	52.06	339	67.80	3
12:01NN–1:00PM	2 8	60.87	91	48.66	45	16.85	164	32.80	7
1:01PM–2:00PM	4	8.70	42	22.46	22	8.24	68	13.60	10
2:01PM–3:00PM	1	2.17	8	4.28	16	5.99	25	5.00	12
3:00PM–4:00PM	4	8.70	33	17.65	44	16.48	81	16.20	9
4:01PM–5:00PM	4 5	97.83	143	76.47	134	50.19	322	64.40	4
5:01PM–6:00PM	4 4	95.65	164	87.70	176	65.92	384	76.80	1
6:01PM–7:00PM	4 3	93.48	139	74.33	96	35.96	278	55.60	5

Evidently, 5:01PM–6:00PM, which is usually the time for employees and students go out from their offices or schools, is the most critical hour for traffic.

As shown, 96% of the traffic enforcers, 88% of the drivers, and 66% of the pedestrians claimed that 5:00 to 6:00 in the afternoon is the most vital time for an efficient traffic management system in the city. Further, traffic management should also be focused on at 7:00 to 8:00 in the morning and before lunch at 11:01 am to 12 noon which are the second and third most critical time. In general, traffic management should be given more attention at 7:00 to 8:00 am, 11:00 am to 1:00 pm and 4:00 to 7:00.

Part 2. Administration Aspect of Traffic Safety Management in the City of Balanga

Table 4 presents the perceptions of the traffic enforcers, drivers, and pedestrians on the mechanisms of the administrative aspect of traffic management.

Table 4
Mechanism of Traffic Management Administration

Indicator	Enforcer		Driver		Pedestrian		Total	
	Mean	DE	Mean	DE	Mean	DE	Mean	DE
1. Marks roads, walkways and parking areas properly according to the traffic management plan of the city.	4.20	Agree	4.11	Agree	4.03	Agree	4.08	Agree
2. Provides roads and walkways in the city that are suitable for the types of vehicular traffic and pedestrian traffic	4.04	Agree	3.91	Agree	3.82	Agree	3.88	Agree
3. Assigns traffic routes for transport vehicles and pedestrian walkways in the city are free from obstructions and other hazards.	3.65	Agree	3.83	Agree	3.79	Agree	3.79	Agree
4. Indicates traffic routes properly	3.98	Agree	3.87	Agree	3.76	Agree	3.82	Agree
5. Installs standard traffic signs at necessary locations.	3.70	Agree	3.90	Agree	3.81	Agree	3.83	Agree
Composite	3.91	VS	3.93	VS	3.84	VS	3.89	VS

For the traffic enforcers, drivers, and pedestrians, ‘marking roads, walkways and parking areas properly according to the traffic management plan of the city’ with means of 4.20, 4.11, and 4.03, respectively, is the most satisfactory aspect of the mechanism of the administrative aspect of traffic management. On the other hand, traffic enforcers and drivers rated ‘assigning traffic routes for transport vehicles and pedestrian walkways in the city are free from obstructions and other hazards’ with the lowest means of 3.65 and 3.83, respectively. ‘Indicating traffic routes properly’ is the lowest mean of 3.76 for the Pedestrians. Overall, the traffic enforcers, drivers, and pedestrians, with composite means of 3.91, 3.93, and 3.84, correspondingly, considered the mechanism of the administrative aspect of traffic management as very satisfactory. They are most especially satisfied on ‘marking roads, walkways and parking areas properly according to the traffic management plan of the city’ with 4.08 total mean.

Needless to say road traffic crashes are one of the world’s largest public health and injury prevention problems. Vehicle speed within the human tolerances for serious injury and death is a key goal of modern road design because impact speed affects the severity of injury to both occupants and pedestrians.

Table 5 presents the perceptions of the traffic enforcers, drivers, and pedestrians on the policies concerning the administrative aspect of traffic management.

Table 6
Policy of Traffic Management Administration

Indicator	Enforcer		Driver		Pedestrian		Total	
	Mean	DE	Mean	DE	Mean	DE	Mean	DE
1.Implements penalty on violations to licensing.	4.02	Agree	3.96	Agree	3.87	Agree	3.92	Agree
2.Executes penalty on violations to vehicle registration.	3.93	Agree	3.88	Agree	3.81	Agree	3.85	Agree
3.Employs penalty on violations to number plates and stickers.	3.61	Agree	3.76	Agree	3.76	Agree	3.75	Agree
4.Instigates penalty on violations to parking.	3.50	Agree	3.65	Agree	3.57	Agree	3.59	Agree
5.Implements penalty on violations to relative to equipment, parts, accessories, devices and marking of a motor vehicle.	3.46	To some extent agree	3.45	To some extent agree	3.33	To some extent agree	3.39	To some extent agree
Composite	3.70	VS	3.74	VS	3.67	VS	3.70	VS

The respondents are unified in agreeing that penalty on violations to licensing are implemented as can be observed through direct inspection of the means. While they are agree on the implementation of penalty on various violations, they deemed that implementing penalty on violations relative to equipment, parts, accessories, devices and marking of a motor vehicle are implemented only to some extent. Overall, the respondents are very satisfied with the policy of traffic management with 3.70.

This is goes to say that road safety cannot be the responsibility of government alone. Though countless citations have been issued for traffic violations across the country, the commercial sector, and non-Governmental Organizations (NGOs) play an important role in increasing road safety awareness.

Table 7 presents the perceptions of the traffic enforcers, drivers, and pedestrians on the duties of the administrative aspect of traffic management.

Table 7
Duty of Traffic Management Administration

Indicator	Enforcer		Driver		Pedestrian		Total	
	Mean	DE	Mean	DE	Mean	DE	Mean	DE
1.Involves local government in the implementation of traffic safety management plan	3.65	Agree	3.95	Agree	3.93	Agree	3.91	Agree
2.Includes schools within the city in the implementation of traffic safety management plan	4.13	Agree	3.87	Agree	3.86	Agree	3.89	Agree
3.Requires insurance companies in the implementation of traffic safety management plan	3.63	Agree	3.74	Agree	3.54	Agree	3.62	Agree
4.Compels driving instructors' organizations and driving schools in the implementation of traffic safety management plan.	3.57	Agree	3.65	Agree	3.50	Agree	3.56	Agree
5.Includes media in the implementation of traffic safety management plan.	4.02	Agree	3.70	Agree	3.45	To some extent agree	3.59	Agree
Composite	3.80	VS	3.78	VS	3.65	VS	3.72	VS

For the traffic enforcers, the highest mean of 4.13 is on 'including schools within the city in the implementation of traffic safety management plan' while the lowest mean of 3.57 is on 'compelling driving instructors' organizations and driving schools in the implementation of traffic safety management plan'. Similarly, 'compelling driving instructors' organizations and driving schools in the implementation of traffic safety management plan' with mean of 3.65 is the lowest mean for the drivers. However, the highest mean of 3.95 for drivers is on 'involving local government in the implementation of traffic safety management plan'. The highest mean of 3.93 for pedestrians is similar to that of the

drivers; but their lowest mean of 3.45 is on ‘including media in the implementation of traffic safety management plan’. In general, traffic enforcers, drivers and pedestrians considered the duty of the traffic management system having composite means of 3.80, 3.78, and 3.65, respectively, and overall mean of 3.72.

Road safety is the teaching and learning process which lead community like school and other organizations behave in safe and responsible way in the road as passengers, pedestrians and drivers. This policy statement encourages members of the community to be actively involved in the road safety and to be committed to supporting road safety program.

Table 8 presents the perceptions of the traffic enforcers, drivers, and pedestrians on the information system of the administrative aspect of traffic management.

Table 8
Information System of Traffic Management Administration

Indicator	Enforcer		Driver		Pedestrian		Total	
	Mean	DE	Mean	DE	Mean	DE	Mean	DE
1.Equips cameras which records provincial and criminal offences, reduce officers court time and ensures professionalism at roadside.	4.11	Agree	3.88	Agree	3.84	Agree	3.88	Agree
2. Allows faster investigations at collision scenes by electronic collision reporting system.	4.09	Agree	3.81	Agree	3.72	Agree	3.79	Agree
3.Provides camera system mounted on a police vehicle	4.04	Agree	3.68	Agree	3.69	Agree	3.72	Agree
4.Allows officers to process offenders more efficiently by electronic ticketing system	4.04	Agree	3.61	Agree	3.54	Agree	3.61	Agree
5.Provides a device located at high collision intersections like Closed-Circuit Television (CCTV)	3.96	Agree	3.60	Agree	3.46	To some extent agree	3.56	Agree

Composite	4.05	VS	3.72	VS	3.65	VS	3.71	VS
Overall Administrative Aspect	3.87	VS	3.79	VS	3.70	VS	3.75	VS

With respect information system, the views of the enforcers, drivers and pedestrians coincides in terms of the highest mean which is on 'equipping cameras which records provincial and criminal offences, reduce officers court time and ensures professionalism at roadside' with mean of 4.11, 3.88, and 3.84, respectively.

Taken as a whole, the respondents are very satisfied with the traffic management information system having an overall mean of 3.741. Furthermore, the overall administrative aspect of traffic management shown in Table 8 indicate that traffic enforcers, drivers and pedestrians are very satisfied having overall means of 3.87, 3.79, and 3.70, respectively.

Advanced technologies are being applied to many transportations problems. For the assessment of new technology, there is a need to develop a consistent theory of road user behavior to provide a common base of evaluating road safety, thus there should be evidence of technology feasibility and successful testing of prototypes of any equipment involved. A number of the new technology involved some method of determining the location of vehicles in the real time automatically without reference to the driver. With extensive road networks, there is a rapidly increasing concerns about financial burdens to maintain these road with these high end technology traffic system.

Part 3. Technical Aspect of Traffic Safety Management in the City of Balanga

Table 9 presents the perceptions of traffic enforcers, drivers and pedestrians on the technical aspect of traffic safety management in the City of Balanga with respect to analysis of accidents.

Table 9
Analysis of Accident

Indicator	Enforcer		Driver		Pedestrian		Total	
	Mean	DE	Mean	DE	Mean	DE	Mean	DE
Secures the area of accident.	4.26	Agree	4.25	Agree	4.21	Agree	4.23	Agree
Documents the event of accident.	4.13	Agree	4.07	Agree	4.06	Agree	4.07	Agree
Provides accurate information of the accident during the accident.	4.13	Agree	3.95	Agree	3.94	Agree	3.96	Agree
Acquires vehicular identification like description of the car and license plate number during the accident.	4.02	Agree	3.96	Agree	3.90	Agree	3.93	Agree
Advises person involved in the accident to file a claim or a notification with their insurance company.	4.04	Agree	3.86	Agree	3.77	Agree	3.83	Agree
Composite	4.12	VS	4.08	VS	3.98	VS	4.00	VS

The respondents concurred that analyses of accidents are very satisfactorily handled; with overall mean of 4.00. The highest mean of traffic enforcers, drivers and pedestrians is on securing the area of accident.

The lowest mean of 4.02 for traffic enforcers is on ‘acquiring vehicular identification like description of the car and license plate number during the accident’ while ‘advising person involved in the accident to file a claim or a notification with their insurance company’ of 3.86 and 3.77, respectively for the drivers and pedestrians.

Table 10 presents the perceptions of traffic enforcers, drivers and pedestrians on the technical aspect of traffic safety management in the City of Balanga with respect to personnel management involving drivers and pedestrians.

Table 10
Personnel Management

Indicator	Enforcer		Driver		Pedestrian		Total	
	Mean	DE	Mean	DE	Mean	DE	Mean	DE
On Driver	3.83	VS	3.94	VS	3.91	VS	3.91	VS
1. Prohibits the use of cell phone while driving around the city	3.67	Agree	4.03	Agree	4.00	Agree	3.98	Agree
2. Implements using seat belt while driving within the city (i.e Super Highway)	3.41	To some extent agree	3.84	Agree	3.78	Agree	3.77	Agree
3. Prohibits driving under influence of alcohol and drugs	3.96	Agree	3.95	Agree	4.04	Agree	4.00	Agree
4. Follows traffic sign and signal from the enforcer	4.09	Agree	3.97	Agree	3.90	Agree	3.94	Agree
5. Prohibit unlicensed driving	4.02	Agree	3.90	Agree	3.83	Agree	3.87	Agree
On Pedestrian	3.69	VS	3.84	VS	3.78	VS	3.79	VS
1. Prohibits jaywalking in the city	3.52	Agree	3.76	Agree	3.69	Agree	3.70	Agree
2. Observes walking	3.39	To some	3.75	Agree	3.70	Agree	3.69	Agree

at the footpath.		extent agree						
3. Advises walkers to walk in pedestrian lanes	4.09	Agree	3.95	Agree	3.91	Agree	3.94	Agree
4. Prohibits climbing at road barriers.	3.61	Agree	3.92	Agree	3.94	Agree	3.90	Agree
5. Observes Don't "Drink and Walk" rule.	3.83	Agree	3.81	Agree	3.67	Agree	3.74	Agree
Composite	3.76	VS	3.89	VS	3.85	VS	3.85	VS

With respect to personnel management, the respondents are very satisfied as reflected by the composite mean of 3.76 for traffic enforcers, 3.89 for drivers, and 3.85 for students.

Specifically on drivers, the respondents are very satisfied with total mean of 3.91. The highest mean of 4.09 for traffic enforcers is on following traffic signal while their lowest mean of 3.41 is on implementing using seat belt while driving within the city. For the drivers themselves, their highest mean of 4.03 is on prohibiting the use of cell phone while driving while the lowest mean of 3.84 is also on implementing using seat belt while driving within the city.

For the pedestrians, their highest mean of 4.04 is on prohibiting driving under the influence of alcohol and drugs while their lowest mean of 3.78 is also on the use of seat belts. With regards to the pedestrians, the respondents are also very satisfied having a total mean of 3.79. The highest means of 4.09 and 3.95 for traffic enforcers and drivers is on advising walkers to walk in pedestrian lanes while that of pedestrians is on prohibiting climbing at road barriers with mean of 3.94.

On the other hand, observing walking at the footpath is the least mean for the traffic enforcers and drivers with 3.39 and 3.75. For the pedestrians, their lowest mean of 3.67 is on observing Don't "Drink and Walk" rule.

It is widely recognized that human factors intervene in most, if not all, road accidents. It is a major reason for the present project; contribute to put in light the role of human factor in the road accidents genealogy. More specifically, it is the social dimension of human factor that will be studied. Main purposes here are to describe the state of road users attitudes and reported behavior with regard to road traffic risk, to evaluate the range from approval to opposition towards regulations and countermeasures, to search for underlying social or cultural factors leading to various behavior in term of risk, and lastly to recommend actions to take in consideration when improving road safety policies.

Table 11 presents the perceptions of traffic enforcers, drivers and pedestrians on the technical aspect of traffic safety management in the City of Balanga with regards to vehicle management.

Table 11
Vehicle Management

Indicator	Enforcer		Driver		Pedestrian		Total	
	Mean	DE	Mean	DE	Mean	DE	Mean	DE
1. Checks side mirrors of vehicles (jeepneys, cars and motorbikes) within the city	4.02	Agree	3.87	Agree	3.68	Agree	3.78	Agree
2. Observes wearing of seat belts in four-wheeled vehicles within the city	3.63	Agree	3.80	Agree	3.59	Agree	3.67	Agree
3. Considers vehicle capacity specially both private and passenger vehicle	3.65	Agree	3.80	Agree	3.57	Agree	3.67	Agree
4. Examines strictly the car registration during accidents	4.09	Agree	3.80	Agree	3.76	Agree	3.80	Agree
5. Inspects and checks technicalities like brakes, tires lights during accidents	3.59	Agree	3.60	Agree	3.49	To some extent agree	3.54	Agree
Composite	3.80	VS	3.77	VS	3.62	VS	3.69	VS

In terms of vehicle management, ‘examining strictly the car registration during accidents’ is the highest mean of 4.09 and 3.76 for traffic enforcers and pedestrians, respectively. Drivers, on the other hand, deemed that the highest mean of 3.87 is on

‘checking side mirrors of vehicles (jeepneys, cars, and motorbikes) within the city’. Overall, the respondents are very satisfied with the vehicle management of the technical aspect of traffic management in the City of Balanga.

Table 12 presents the perceptions of traffic enforcers, drivers and pedestrians on the technical aspect of traffic safety management in the City of Balanga with respect to road management.

Table 12
Road Management

Indicator	Enforcer		Driver		Pedestrian		Total	
	Mean	DE	Mean	DE	Mean	DE	Mean	DE
1.Provides roads and walkways in the city that are suitable for the types and volumes of vehicular traffic and pedestrian traffic.	4.11	Agree	3.88	Agree	3.84	Agree	3.88	Agree
2.Assigns adequate numbers of suitable parking places in the city.	4.52	Strongly Agree	3.89	Agree	3.82	Agree	3.91	Agree
3.Examines surfaces of roads and walkways that are slip-resistant.	4.37	Agree	3.81	Agree	3.63	Agree	3.76	Agree
4.Inspects road routes within the city that are wide enough to prevent traffic.	4.41	Agree	3.77	Agree	3.65	Agree	3.77	Agree
5.Observes visible markings for pavements and pedestrian lanes	4.02	Agree	3.87	Agree	3.64	Agree	3.76	Agree
Composite	4.29	VS	3.84	VS	3.71	VS	3.81	VS

As gleaned from Table 12, traffic enforcers strongly agree that adequate numbers of suitable parking places in the city are assigned with mean of 4.52. The drivers and pedestrians concurred with this. As shown, ‘assigning adequate numbers of suitable parking places in the city’ is the highest mean of 3.89 for drivers while that of pedestrians is on ‘providing roads and walkways in the city that are suitable for the types and volumes of vehicular traffic and pedestrian traffic’ with mean of 3.84.

Overall, the respondents are very satisfied with the road management of the technical aspect of traffic management of the City of Balanga. The traffic enforcers are most satisfied with composite mean of 4.29; then followed by drivers with 3.84 and pedestrians with 3.71.

Manifestly, the road structures data can be used as evidence in evaluating the progress of road safety intervention as well as for performance monitoring. By having a well established and comprehensive set of road accident database system, it will aid in the formulation of effective road safety research and interventions thus providing a more promising result in reducing both road accidents and fatalities.

Table 13 presents the perceptions of traffic enforcers, drivers and pedestrians on the technical aspect of traffic safety management in the City of Balanga with respect to environmental management.

Table 13
Environmental Management

Indicator	Enforcer		Driver		Pedestrian		Total	
	Mean	DE	Mean	DE	Mean	DE	Mean	DE
1. Creates traffic routes for transport vehicles and pedestrian walkways that are free from obstructions and other hazards.	4.11	Agree	3.90	Agree	3.80	Agree	3.87	Agree
2. Installs sufficient Lightings in the pedestrian areas and for vehicle activity.	4.63	Strongly Agree	3.93	Agree	3.83	Agree	3.94	Agree
3. Instates standard traffic signs at necessary locations	4.39	Agree	3.92	Agree	3.74	Agree	3.87	Agree
4. Marks properly traffic routes in the city according to the traffic	4.41	Agree	3.86	Agree	3.68	Agree	3.82	Agree

management plan.								
5.Provides convex mirrors to create greater vision at blind bends.	3.39	To some extent agree	3.54	Agree	3.48	To some extent agree	3.50	Agree
Composite	4.19	VS	3.83	VS	3.71	VS	3.80	VS

As revealed in Table 15, ‘installing sufficient Lightings in the pedestrian areas and for vehicle activity’ received the highest mean of 4.63 by traffic enforcers, 3.93 by drivers and 3.83 by pedestrians.

Overall, the traffic enforcers, drivers, and pedestrians are very satisfied with the environmental management of the technical aspect of traffic safety management as reflected by the composite means of 4.19, 3.83 and 3.71, respectively.

This means that maintenance may be needed to avoid that parts of the structure fall on road users. Maintenance may also be needed to ensure safe passage of pedestrians and drivers. Maintenance is undertaken to extend the life of the road and to ensure that the structure remain servicing its functions without impairing risks to road users or the environment.

Table 14 presents the perceptions of traffic enforcers, drivers and pedestrians on the technical aspect of traffic safety management in the City of Balanga with respect to pre-warning management.

Table 14
Pre-warning Management

Indicator	Enforcer		Driver		Pedestrian		Total	
	Mean	DE	Mean	DE	Mean	DE	Mean	DE
1.Assigns signalman to guide the maneuvering transport vehicles in parking areas	4.07	Agree	3.98	Agree	3.87	Agree	3.93	Agree
2.Deploys adequate traffic enforcers to	4.15	Agree	3.99	Agree	3.97	Agree	4.00	Agree

handle city traffic								
3.Monitors control and warning devices in strategic traffic areas such as horn, flashing lights that are in good working condition	3.59	Agree	3.76	Agree	3.64	Agree	3.68	Agree
4.Allots visibility vests for traffic enforcers when managing traffic	4.46	Agree	3.90	Agree	3.80	Agree	3.90	Agree
5.Provides guidelines that are readily available for rerouting during special occasions or parades	4.37	Agree	3.82	Agree	3.62	Agree	3.77	Agree
Composite	4.13	VS	3.89	VS	3.78	VS	3.85	VS
Overall Technical Management	4.00	VS	3.88	VS	3.78	VS	3.84	VS

As gleaned from Table 14, ‘deploying adequate traffic enforcers to handle city traffic’ received very satisfactory ratings and the highest means ranging from 3.97 to 3.99 for the drivers and pedestrians. For the traffic enforcers, ‘allotting visibility vests for traffic enforcers when managing traffic’ received the highest mean rating of 4.46, which is very satisfactory.

Generally, the respondents are very satisfied with the pre-warning management of the technical aspect of traffic safety management having an overall mean of 3.85.

Furthermore, the overall technical aspect of traffic safety management received very satisfactory ratings from the three groups of respondents; 4.00 for traffic enforcers, 3.88 for drivers, and 3.78 for pedestrians.

Part 4. Facilities aspect of traffic safety management in the city of Balanga

Table 15 presents the perceptions of traffic enforcers, drivers and pedestrians on the facilities aspect of traffic safety management in the City of Balanga with regards to road safety.

Table 15
Road Safety Management

Indicator	Enforcer		Driver		Pedestrian		Total	
	Mean	DE	Mean	DE	Mean	DE	Mean	DE
1.Provides safety review of existing road networks to identify deficiencies and potential hazards	4.13	Very Adequate	3.98	Very Adequate	3.90	Very Adequate	3.95	Very Adequate
2.Presents local plans check list for road safety implications and impacts	3.54	Very Adequate	3.82	Very Adequate	3.70	Very Adequate	3.73	Very Adequate
3.Creates road safety unit that identifies and improves hazardous locations within the city	4.00	Very Adequate	3.78	Very Adequate	3.62	Very Adequate	3.71	Very Adequate
4.Initiates safety unit in the City Engineers office to oversee safe operation of the city road network	3.89	Very Adequate	3.79	Very Adequate	3.66	Very Adequate	3.73	Very Adequate
5.Provides information dissemination campaigns about road safety within the city.	3.39	Adequate	3.64	Very Adequate	3.61	Very Adequate	3.60	Very Adequate
Composite	3.79	VS	3.80	VS	3.70	VS	3.75	VS

As shown, the respondents are very satisfied with the road safety management in the City of Balanga having a composite mean of 3.75. Specifically, the respondents indicated very adequate ratings on the indicators listed in Table 15. For the enforcers, the highest mean of 4.00 is on ‘creating road safety unit that identifies and improves hazardous locations within the city’.

Likewise, the lowest means for drivers and pedestrians are on ‘providing information dissemination campaigns about road safety within the city’. However, the highest mean for them is on ‘providing safety review of existing road networks to identify deficiencies and potential hazards’. Truly, traffic conditions and road safety indicators such as weather, natural calamities which can act as a proxy for the traffic condition may indicate hazardous situations leading to accidents. Traffic flow and speed are the two important indices used to quantify the traffic performance while number of accident is used as a performance index for roadway safety.

Table 16 presents the perceptions of traffic enforcers, drivers and pedestrians on the facilities aspect of traffic safety management in the City of Balanga with regards to vehicle safety.

Table 16
Vehicle Safety Management

Indicator	Enforcer		Driver		Pedestrian		Total	
	Mean	DE	Mean	DE	Mean	DE	Mean	DE
1.Provides public facility for prevention of vehicle mechanical trouble	3.96	Very Adequate	3.83	Very Adequate	3.69	Very Adequate	3.77	Very Adequate
2.Gives anti-collision buffers to public transport	3.41	Adequate	3.66	Very Adequate	3.52	Very Adequate	3.57	Very Adequate
3.Allocates available towing unit within in the city	3.87	Very Adequate	3.66	Very Adequate	3.60	Very Adequate	3.64	Very Adequate
4.Undertakes public information regarding vehicle maintenance	3.65	Very Adequate	3.74	Very Adequate	3.60	Very Adequate	3.66	Very Adequate

5.Performs technical training on topics such as travel route and traffic safety.	3.74	Very Adequate	3.67	Very Adequate	3.54	Very Adequate	3.61	Very Adequate
Composite	3.73	VS	3.71	VS	3.59	VS	3.65	VS

As reflected in Table 17, the respondents concurred on their highest mean which is having a very adequate public facility for prevention of vehicle mechanical trouble with a total mean of 3.77. On the average, the respondents are very satisfied with the vehicle safety management facilities with an overall mean rating of 3.65.

This has been achieved by adopting a systems approach to road safety that emphasizes environment, vehicle safety and road user interventions, rather than solely focusing on direct approaches aimed at changing the behavior of road users. Although solutions for low-income and middle-income countries may differ from those that have a longer history of motorization, some basic principles are the same. This report offers governments the opportunity to assess the current status of road safety in relation with vehicle safety, review policies and institutional arrangements and capacity, and take appropriate actions.

All recommendations should be addressed across a wide range of sectors and disciplines if they are to achieve success. However, the recommendations should be treated as flexible guidelines. They leave much room for adaptation to local conditions and capacities. There is no doubt that accident prevention is more valuable than any mitigative or compensatory measure. Its effectiveness will depend on cooperation amongst including the safety and maintenance of the vehicle used.

Table 17 conveys the perceptions of traffic enforcers, drivers and pedestrians on the facilities aspect of traffic safety management in the City of Balanga with regards to the safety of drivers, pedestrians and disabled persons.

Table 17
Driver, Pedestrian and Disabled Person Safety

Indicator	Enforcer		Driver		Pedestrian		Total	
	Mean	DE	Mean	DE	Mean	DE	Mean	DE
1.Undertakes special defensive driver training courses for drivers based on needs assessment	3.57	Very Adequate	3.85	Very Adequate	3.76	Very Adequate	3.77	Very Adequate
2.Creates directive plans of public transport driver hours	3.98	Very Adequate	3.73	Very Adequate	3.65	Very Adequate	3.71	Very Adequate
3.Performs workshops on the safe transport of disabled person	4.50	Highly Adequate	3.76	Very Adequate	3.67	Very Adequate	3.78	Very Adequate
4.Provides seminar regarding curb cuts and ramps for disabled	3.87	Very Adequate	3.63	Very Adequate	3.63	Very Adequate	3.65	Very Adequate
5.Allocates effective operation plans and safety programs, consisting of supervisory control elements among drivers, pedestrian and disabled person.	4.00	Very Adequate	3.66	Very Adequate	3.65	Very Adequate	3.69	Very Adequate
Composite	3.98	VS	3.72	VS	3.67	VS	3.72	VS

For the traffic enforcers, ‘performing workshops on the safe transport of disabled person’ is highly adequate with a mean of 4.50, which is their highest mean rating. Their lowest mean of 3.578, which is very adequate, is on ‘undertaking special defensive driver training courses for drivers based on needs assessment’. For the drivers, their highest mean of 3.85 is on

‘undertaking special defensive driver training courses for drivers based on needs assessment’, the lowest mean for traffic enforcers. The lowest mean of 3.63 for drivers is on ‘providing seminar regarding curb cuts and ramps for disabled’.

Similarly, the highest mean of 3.76 for pedestrians is on ‘undertaking special defensive driver training courses for drivers based on needs assessment’ while their lowest mean of 3.63 is on ‘providing seminar regarding curb cuts and ramps for disabled’.

Table 18 presents the perceptions of traffic enforcers, drivers and pedestrians on the facilities aspect of traffic safety management in the City of Balanga with regards to training facilities.

Table 18
Training Facilities

Indicator	Enforcer		Driver		Pedestrian		Total	
	Mean	DE	Mean	DE	Mean	DE	Mean	DE
1. Creates training office for safety conscious planning of road networks and land use	4.46	Very Adequate	3.80	Very Adequate	3.69	Very Adequate	3.80	Very Adequate
2. Reinforces sense of neighborhood and community with transportation designs that accommodate pedestrian use	3.98	Very Adequate	3.64	Very Adequate	3.56	Very Adequate	3.63	Very Adequate
3. Devises traffic calming trainings for pedestrian and drivers	3.59	Very Adequate	3.70	Very Adequate	3.60	Very Adequate	3.63	Very Adequate
4. Organizes free defensive driving classes for drivers manage by city government	3.67	Very Adequate	3.75	Very Adequate	3.52	Very Adequate	3.62	Very Adequate
5. Provides safe-driving training for novice drivers	3.61	Very Adequate	3.66	Very Adequate	3.54	Very Adequate	3.59	Very Adequate

and free driving road test to observe their driving skills								
Composite	3.86	VS	3.71	VS	3.58	VS	3.65	VS
Overall Facilities for Safety Management	3.84	VS	3.74	VS	3.63	VS	3.69	VS

Creating training office for safety conscious planning of road networks and land use' obtained the highest mean for the enforcers, drivers, and pedestrians with mean of 4.46, 3.80 and 3.69, respectively. Moreover, they considered the indicators of training facilities as very adequate.

Overall, the respondents are very satisfied with the training facilities for traffic management having an overall mean of 3.65.

Moreover, the respondents are very satisfied with the overall facilities for safety management having an overall rating of 3.69. Specifically, 3.84 overall mean rating was provided by the traffic enforcers, 3.74 by drivers and 3.63 by pedestrians.

Part 5. Comparison of Perceptions on Traffic Safety Management

Table 18 presents the comparison on the perceptions of the traffic enforcers, drivers, and pedestrians about the administrative aspect of traffic safety management.

Comparative analysis was done using Kruskal Wallis Test, the non-parametric version of Analysis of Variance (ANOVA), because the data does not comply with the assumptions of normality and homogeneity of variance.

Kruskal Wallis Test compares the mean ranks of the respondents unlike in ANOVA that deals with the mean and standard deviations.

The mean and standard deviations are also presented in Table 18 for direct comparison among respondents on the specific aspects of traffic safety management.

Table 18
Comparison on Administrative Aspect

Aspects	Respondent	Mean	Std. Deviation	Mean Rank	Kruskal Wallis Test [Sig.]	Remarks
Mechanics	Traffic Enforcer (n=46)	3.91	.58	245.22	1.110	Not significant <i>[Do not reject Ho]</i>
	Driver (n=187)	3.93	.79	259.24	<i>[.574]</i>	
	Pedestrian (n = 267)	3.84	.74	245.29		
Policy	Traffic Enforcer	3.70	.608	235.20	1.371	Not significant <i>[Do not reject Ho]</i>
	Driver	3.74	.84	259.26	<i>[.504]</i>	
	Pedestrian	3.67	.87	247.00		
Duty	Traffic Enforcer	3.80	.64	249.73	3.027	Not significant <i>[Do not reject Ho]</i>
	Driver	3.78	.80	264.62	<i>[.220]</i>	
	Pedestrian	3.65	.87	240.75		
Information System	Traffic Enforcer	4.05	.56	301.45	8.031	Significant <i>[Reject Ho]</i>
	Driver	3.72	.99	255.73	<i>[.018]</i>	
	Pedestrian	3.65	.89	238.06		
Overall	Traffic Enforcer	3.87	.52	261.64	2.459	Not significant <i>[Do not reject Ho]</i>
	Driver	3.79	.76	261.26	<i>[.293]</i>	
	Pedestrian	3.70	.75	241.04		

As gleaned from Table 18, the traffic enforcers, drivers and pedestrians alike are very satisfied with the mechanics, policy, and duty of the administrative aspect of traffic safety management having mean values ranging from 3.50 to 4.49.

The Kruskal Wallis test values are not significant at 0.05 for these indicators; hence, the hypotheses of no significant differences among the perceptions of traffic enforcers, drivers and pedestrians on these matters are not rejected.

However, significant difference in the mean ranks is observed in terms of information system having a Kruskal Wallis Test value of 8.031 significant at 0.018.

Evidently, the traffic enforcers have the highest mean rank, then followed by drivers and pedestrians. Looking at the values of mean, it can be surmised that traffic enforcers have the highest mean of 4.05, followed by drivers with 3.72, and pedestrians with 3.65.

Although the test shows a significant difference in perceptions, the mean values indicate that all the three groups of respondents concurred that information system is very satisfactory. Overall, there is no significant difference in the perceptions of the traffic enforcers, drivers, and pedestrians as manifested by the Kruskal Wallis test value of 2.459 significant at 0.293.

Hence, null hypothesis that there is no significant difference in the perception of respondents on the administrative aspect of traffic management system is not rejected. The data did not show sufficient evidence that traffic enforcers, drivers and pedestrians differ in views about this matter. Evidently, they are all very satisfied with the administrative aspect of traffic management system

Table 19 presents the comparison on the perceptions of the traffic enforcers, drivers, and pedestrians on the technical aspect of traffic safety management using Kruskal Wallis test, though the mean and standard deviations are also presented.

Table 19
Comparison on Technical Aspect

Aspects	Respondent	Mean	Std. Deviation	Mean Rank	Kruskal Wallis Test	Remarks
Accident	Traffic Enforcer	4.12	.39	269.57	1.236	Not significant <i>[Do not reject Ho]</i>
	Driver	4.02	.72	253.09	<i>[.539]</i>	
	Pedestrian	3.98	.77	245.40		
Personnel Management	Traffic Enforcer	3.76	.60	214.39	3.662	Not significant <i>[Do not reject Ho]</i>
	Driver	3.89	.84	259.81	<i>[.160]</i>	
	Pedestrian	3.85	.80	250.20		
Driver	Traffic Enforcer	3.83	.62	208.61	4.491	Not significant <i>[Do not reject Ho]</i>
	Driver	3.94	.89	258.10	<i>[.106]</i>	
	Pedestrian	3.91	.85	252.39		
Pedestrian	Traffic Enforcer	3.69	.64	215.02	3.818	Not significant <i>[Do not reject Ho]</i>
	Driver	3.84	.89	261.05	<i>[.148]</i>	
	Pedestrian	3.78	.86	249.22		
Vehicle Management	Traffic Enforcer	3.80	.60	250.30	2.730	Not significant <i>[Do not reject Ho]</i>
	Driver	3.77	.90	263.85	<i>[.255]</i>	
	Pedestrian	3.62	.94	241.19		
Road Management	Traffic Enforcer	4.29	.57	336.15	20.545	Significant <i>[Reject Ho]</i>
	Driver	3.84	.87	254.78	<i>[.000]</i>	
	Pedestrian	3.71	.88	232.75		

Environmental Management	Traffic Enforcer	4.19	.51	313.25	11.834	Significant <i>[Reject Ho]</i>
	Driver	3.83	.90	256.11	<i>[.003]</i>	
	Pedestrian	3.71	.94	235.76		
Pre-warning Management	Traffic Enforcer	4.13	.56	301.38	8.375	Significant <i>[Reject Ho]</i>
	Driver	3.89	.85	256.86	<i>[.015]</i>	
	Pedestrian	3.78	.87	237.28		
Overall	Traffic Enforcer	4.00	.38	272.55	3.262	Not significant <i>[Do not reject Ho]</i>
	Driver	3.88	.75	259.95	<i>[.196]</i>	
	Pedestrian	3.78	.74	240.08		

As shown in Table 19, there are no significant difference on the perception of traffic enforcers, drivers, and pedestrians with regards to accident, personnel management and vehicle management as suggested by the values of Kruskal Wallis Test with significant levels greater than 0.05. Also, the respondents' views on the specific driver and pedestrian personnel management are not significantly different as indicated by the Kruskal Wallis Test with significant levels greater than 0.05.

In terms of road management, significant difference in the perceptions of the respondents is observed as reflected by the Kruskal Wallis Test value of 20.545 significant at 0.05 level. As shown, the mean rank of traffic enforcers is greater than that of drivers and pedestrians.

Evidently, the traffic enforcers have a higher level of satisfaction on road management compared to that of drivers and pedestrians. Nonetheless, all of the three groups deemed that road management is very satisfactorily implemented.

Likewise, the respondents have significantly different perceptions on environmental management with Kruskal Wallis Test value of 11.834 significant at 0.003 level. Also, significant difference in perception on pre-warning management is observed; with Kruskal Wallist Test value of 8.375 significant at 0.015.

Hence, the null hypotheses for these are rejected. Evidently, traffic enforcers have significantly higher level of satisfaction on environmental and pre-warning management.

Overall, there is no significant difference in the perceptions of traffic enforcers, drivers, and pedestrians on the technical aspect of traffic safety management as reflected by the Kruskal Wallis Test value of 3.262 significant at 0.196. Hence, the null hypothesis is rejected.

Table 20 presents the comparison on the perceptions of the traffic enforcers, drivers, and pedestrians on the facilities aspect of traffic safety management using Kruskal Wallis test, though the mean and standard deviations are also presented.

Table 20
Comparison on Facilities Aspect

Aspects	Respondent	Mean	Std. Deviation	Mean Rank	Kruskal Wallis Test [Sig.]	Remarks
Road Safety	Traffic Enforcer	3.79	.69	238.20	2.369	Not Significant <i>[Do not reject Ho]</i>
	Driver	3.80	.95	263.13	<i> [.306]</i>	
	Pedestrian	3.70	.91	243.78		
Vehicle's Safety	Traffic Enforcer	3.73	.72	245.59	2.650	Not Significant <i>[Do not reject Ho]</i>
	Driver	3.71	1.01	263.98	<i> [.266]</i>	
	Pedestrian	3.59	.95	241.90		
Driver's Safety	Traffic Enforcer	3.98	.56	286.68	4.105	Not Significant <i>[Do not reject Ho]</i>
	Driver	3.72	.96	254.40	<i> [.128]</i>	
	Pedestrian	3.67	.89	241.54		
Training	Traffic Enforcer	3.86	.58	257.86	3.290	Not Significant
	Driver	3.71	1.05	264.06	<i> [.193]</i>	

	Pedestrian	3.58	.98	239.74		<i>[Do not reject Ho]</i>
Overall	Traffic Enforcer	3.84	.51	256.96	2.055	Not Significant
	Driver	3.74	.91	261.17	[.358]	<i>[Do not reject Ho]</i>
	Pedestrian	3.63	.87	241.92		

As gleaned from Table 20, there are no significant difference in the perceptions of the traffic enforcers, drivers, and pedestrians on the road safety, vehicle's safety, driver's safety and training as suggested by the values of Kruskal Wallis Test with significance level greater than 0.05.

Overall, no significant difference on the opinions of traffic enforcers, drivers and pedestrians is inferred as the Kruskal Wallis Test value of 2.055 is significant at 0.358, which is greater than 0.05 level. Hence, the null hypothesis that there is no significant difference in perceptions of the three groups of respondents on the facilities of the traffic safety management is not rejected. The data does not provide sufficient evidence to show that they differ in opinions on this aspect.

Conclusion

The null hypothesis that there is no significant difference in the perceptions of the pedestrians, drivers, traffic enforcers, and city marshals on the status of the traffic safety management program is partially upheld.

Recommendation

In view of the foregoing, the following specific recommendations are offered: to make the city enforcers and the community itself more responsive, the concerned agencies on traffic administration should review and enrich the criteria and procedures in the implementation of traffic signalization; the Traffic Engineering and Management should extend their services in the planning and designing of transport facilities like traffic signals to deliver an effective and efficient implementation of traffic services in the cities; the city government should seek funds from funding agencies for the construction of developmental projects in line with the improvement of the transportation system in the city; the city

government should allocate funds for computerized traffic signal systems, and traffic lights camera system mounted on a police vehicle which scans license plates to identify unlicensed, suspended and uninsured drivers by automatic license plate recognition system. Likewise, the city government should provide electronic collision reporting system for faster investigations at collision scenes device located at high collision intersections which photographs vehicles that disobey red lights like red light cameras. Along with the findings of this study, an enhancement programs is being proposed.

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