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BASIC STUDY ON TRAFFIC SAFETY IN METRO MANILA: TRAFFIC ACCIDENTS IN QUEZON CITY

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I. INTRODUCTION

The term traffic safety encompasses more than just the topic of traffic accident occurrence. It also deals with the factors that bring about conditions that lead to accidents, safety related issues and the measures undertaken for accident prevention. As such, it is related with the design and provision of facilities that is intended to minimize the probability of collisions. The prevailing policies and regulations, as well as the enforcement of these elements also influence traffic safety.

As cities grow and the amount of traffic increases, it is expected that the number of traffic accidents will also increase. This is logical since the increase in traffic is directly proportional to the increase in activity for both vehicles and pedestrians. This report presents and discusses concepts, prevailing conditions and issues in the Philippines, and examines a 2-year accident data set for Quezon City, the largest among the cities and municipalities composing Metro Manila. Based on this information, the paper proposes several countermeasures for improvement of the traffic safety situation.

II. SIGNIFICANCE OF THE STUDY

This research is necessitated by the lack of sufficient studies; towards the improvement of traffic safety in the Philippines. It is noted that although accident data has been available in a certain detail (i.e., based on traffic accident report forms), such is used only for investigation related to insurance purposes. Once the parties are satisfied with the information they got, the books are closed and no further studies/analyses are conducted. Hence, no measures are made based on, for example, the analysis of collision diagrams or of conditions that led to the accident. Whatever were written about them are usually opinion or feature stories dwelling on the emotional aspects of the loss of life and even considering some superstitious beliefs surrounding the accident locations. Therefore, there is a need for a scientific approach to the assessment of traffic safety and the formulation and proposal of countermeasures.

III. OBJECTIVES

In line with the problems discussed previously, the following objectives were formulated for this study:

a. To present an overview of the state of traffic safety in a Philippine city;
b. To examine the trends in accident occurrence according to various time parameters;
c. To assess the availability and adequacy of accident data; and
d. To propose measures in mitigating accidents/improving road traffic safety.

IV. SOME SAFETY ISSUES IN THE PHILIPPINES

4.1 Behavior, Education and Licensing

There are many issues regarding road traffic safety in the Philippines. These include reckless driver behavior and lack of road courtesy among motorists. These issues are related to shortcomings in the drivers' licensing system and traffic education as well as the enforcement of traffic rules and regulations. In this section we focus on driver behavior, education and licensing. It is essential to establish the logic of why Filipinos drive the way they do based on their training (i.e., education) and how they are able to get their licenses to drive. The last one is particularly important as we distinguish the non-professional licenses from professional ones. Note that only people holding professional licenses are allowed by law to drive public utility vehicles (i.e., public transport) and heavy vehicles.

Drivers in the Philippines are known for weaving their way through traffic. In the process, they employ various maneuvers that are considered risky if not dangerous under most circumstances. Regidor, Ieda and Sigua (1996) identified some of the frequently used maneuvers by Filipino drivers. These include cutting in front of another vehicle in the process of changing lanes (i.e., abrupt lane change) and tailgating to pressure slower moving vehicles to get out of the way. Public transport and heavy vehicle drivers often employ the last practice causing much intimidation for regular motorists.

Such maneuvers increase the risk of accidents occurring and must be minimized. It is well known that many accidents occur due to these maneuvers but are not reported by the involved parties. Instead, they just agree among themselves to cover the damage. This practice is applied even with the presence of a police officer.

Most of the maneuvers and problems described in the previous paragraphs are similar to those found in other countries. However, the frequency or degree of application of these maneuvers varies according to the level of enforcement. Where enforcement is lax, it can be expected that risky maneuvers are prevalent. Conversely, when enforcement is strict, drivers are discouraged to undertake risky maneuvers.

4.2 Conflicts and Friction in the Traffic Stream

The traffic flow along roads in the urban setting abounds in conflicts and sources of traffic friction. These conflicts and friction are caused by various elements in the environment including public transport operations (e.g., bus and jeepney) and pedestrian/passenger movement. Public transport drivers in Metro Manila are known to stop inadvertently in the middle of the road to load or unload passengers. Meanwhile, along busy streets, commuters are known to spill unto the road to compete with other people in getting a ride. Roadside friction is also caused by the presence of parked vehicles as well as activities at the roadside like construction work. Ambulant vendors or hawkers selling cigarettes, newspapers or candies to drivers also affect traffic along many roads and intersections. These people risk their lives by hanging on to jeepneys or running after moving vehicles.

In the case of intersections, conflicts are due to the various movements in the intersection. Each leg may have up to three basic movements: left turn, right turn and through movements. The conflicts for a typical 4-legged intersection are shown in Figure 1 below.

For four-legged intersections, the total number of conflicts is 32. As shown in Fig. 1, these conflicts may be broken down according to type: diverging, converging and crossing. The number of conflicts actually depends on the number of legs of an intersection. Therefore, a typical 3-legged intersection will have fewer conflicts and a 5-legged more conflicts when compared with a 4-legged intersection. These conflicts are the basis for traffic control (i.e., traffic signals) at intersections, whose primary purpose is to separate crossing movements that may otherwise result in accidents.

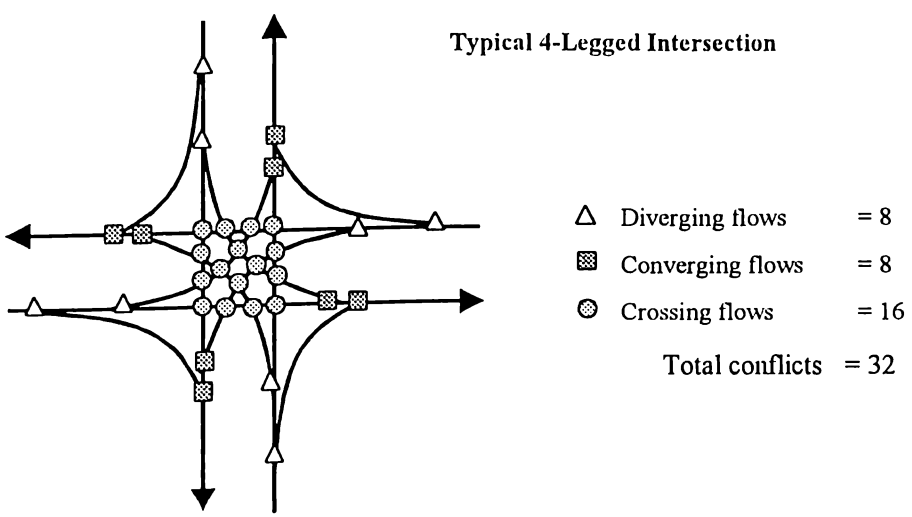

Figure 1. Conflicts at intersections.

In the case of midblocks, the number of conflicts may be determined according to the number of lanes available for one direction. It is expected that with increasing number or lanes, there would be a corresponding increase in the potential conflicts. Again, these conflicts may be classified similar to those found in intersections (i.e., merging, diverging and crossing). Two examples are shown in Figure 2 (i.e., 2-lane and 3-lane unidirectional) to illustrate the increase in the number of potential conflicts when one lane is added to the configuration.

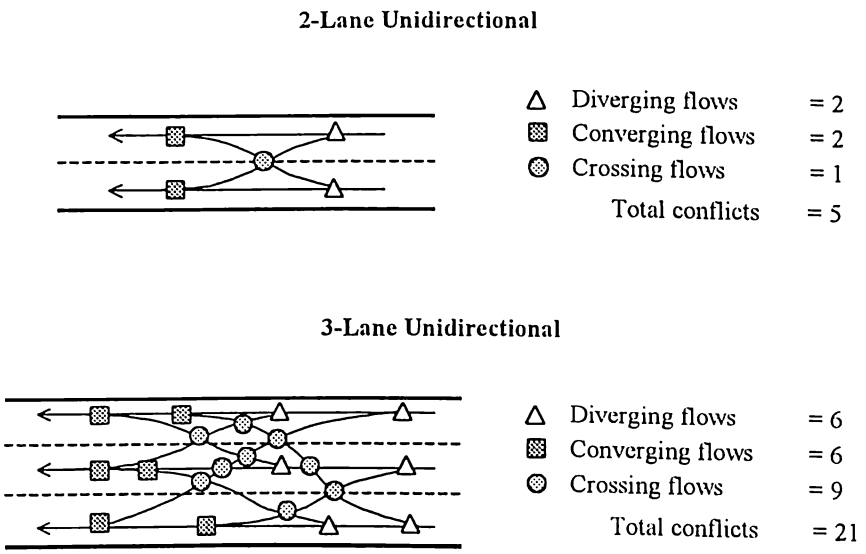

Figure 2. Conflicts at midblocks.

Such conflicts along midblocks are not altogether encountered by the typical road user. Many constraints are present along the roadway like the space between vehicles (i.e., lateral and longitudinal distances) that will allow overtaking or lane changing. The perceived densities and speeds along adjacent lanes as well as the operational characteristics of particular vehicles (i.e., public transport) will dictate lane-changing patterns. As such, it is expected that crossing flows are concentrated along particular adjacent lanes (e.g., where jeepney operation is present, along the 2 lanes next to the curbside).

4.3 Other Issues

At this point, it is necessary to mention other issues not covered by the 2 previous sections. It is also stressed that although we limit the discussion of these "other" issues, they are nonetheless important elements that need to be addressed. These issues include enforcement and vehicle design and maintenance.

It can be contended that the enforcement of traffic rules and regulations is a prerequisite to orderly traffic flow. Enforcement is almost always assumed as ideal in most studies, while usually noting that it is a critical factor in the efficient flow of traffic. In reality, however, enforcement is far from being ideal

although cities/towns of industrialized nations have developed various aids to enforce traffic rules (e.g., cameras on expressways to catch speeding motorists).

Vehicle design and maintenance is not so much a problem in the developed world where strict safety standards often force manufacturers to recall vehicles for modification. Seatbelts, airbags and child seats are mandatory in most developed nations. The same cannot be said as true in the developing world where old model vehicles are maintained and are lacking of safety features. It is common to see vehicles equipped with seatbelts that are never used by the occupants.

In the case of the Philippines, many vehicles are assembled locally. A significant number of private and public utility vehicles are made of pressed aluminum with surplus engines and chassis mainly coming from Japan. The jeepney is a prime example of these vehicles but many other "models" are assembled all over the country and are classified as Asian utility vehicles (AUVs).

V. DATA

Data for this study were taken from the database of traffic accidents in Metro Manila, compiled by the Philippine National Police (PNP), which is the agency that has jurisdiction over traffic enforcement in Metro Manila. Accident data for 2 successive years (1995 and 1996) were chosen for analysis. These years were chosen for a number of reasons as stated below:

a. Previous years' data was in the form of manually- or typewritten files that would be difficult to sort through and would entail a lot of time to obtain relevant data.
b. After 1996, several major projects have been initiated (e.g., EDSA MRT) and continue to be under construction at present. As such, there was significant rerouting of traffic resulting in modified patterns of flow.

A sample traffic accident report form is shown in Figure 3. Such forms are filled out at the precinct or police station and then encoded into the database.

VI. TENDENCIES IN TRAFFIC ACCIDENT OCCURRENCE

6.1 By Month of the Year

At the macroscopic level, we first examine the monthly variation of traffic accidents for 1995 and 1996. This allows us to have a look into the seasonal trends in traffic accident occurrence and determine whether there are significant differences within the year. The succeeding figures show the monthly variation of road traffic accidents in Quezon City (QC) for 1995 and 1996.

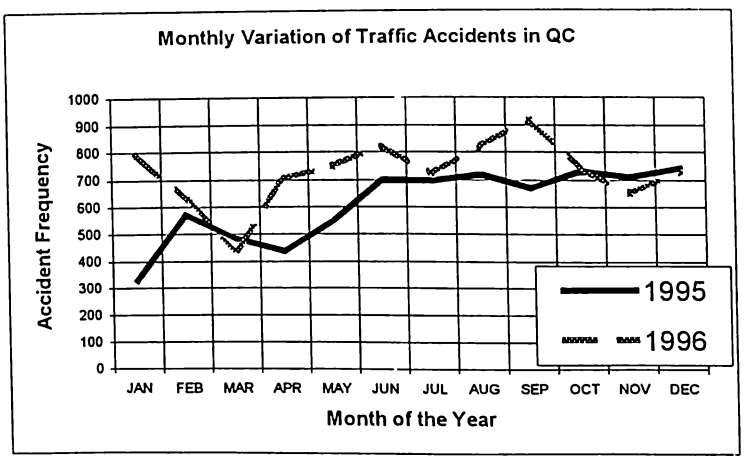

Figure 4. Monthly variation of road traffic accidents (frequency).

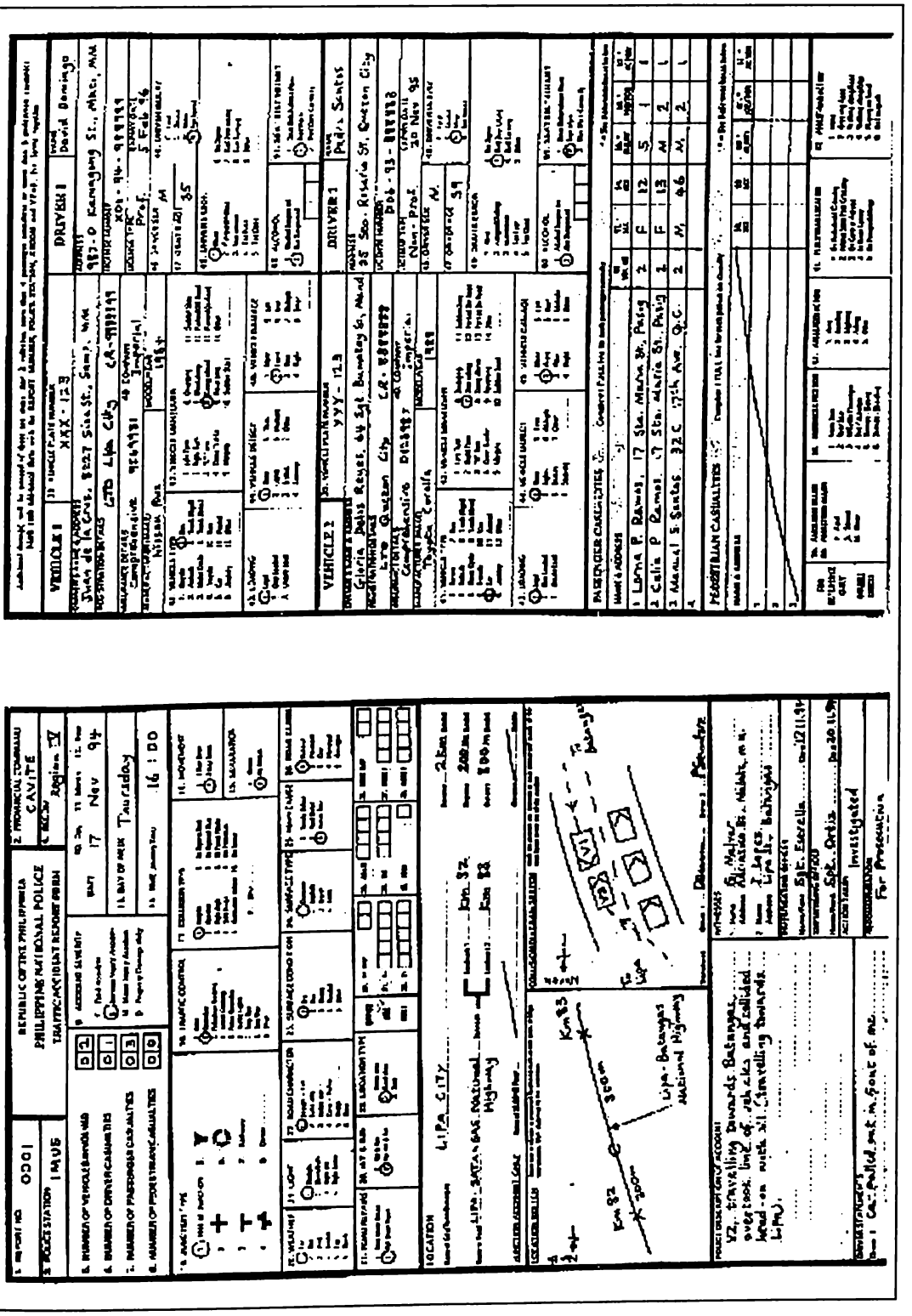

Figure 3. Traffic Accident Report Form

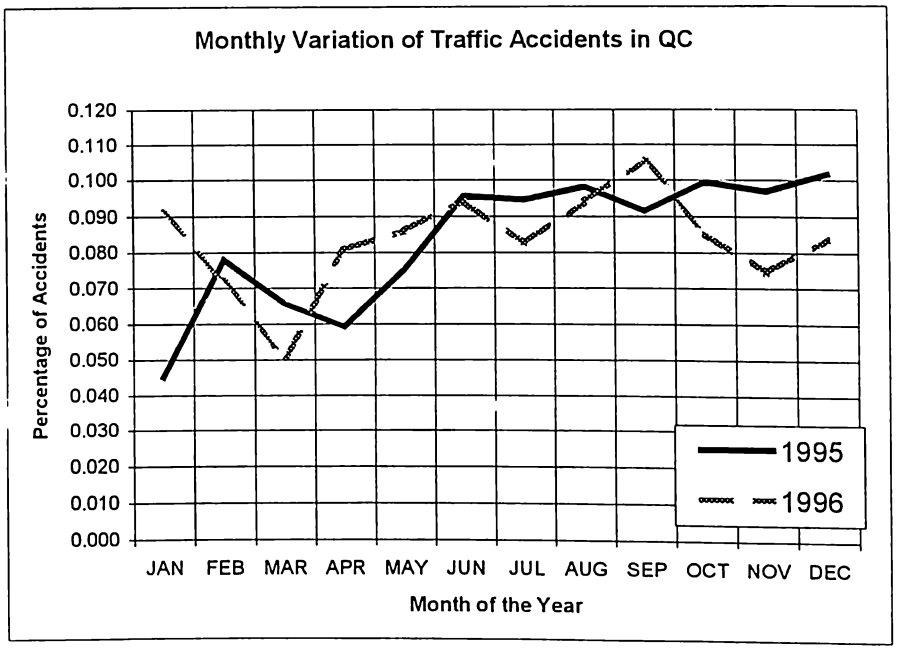

Figure 5. Monthly variation of road traffic accidents (percentage).

The Philippines is a tropical country where the climate is defined by two seasons: wet and dry. The wet season generally starts around June until November while the dry season stretches from December to May. This is a rough estimate though, since rains may come as early as May and continue until December. If we divide the year according to these two seasons, we can see that there are more accidents occurring during the wet season than in the dry season. Such an observation may be attributed to the effects of rain on the pavement surface (i.e., slippery) and the limited visibility due to overcast skies and/or heavy downpours. Add to this the breakdowns due to flash floods in many areas of the city. Based on these arguments, it is easy to understand why accident frequency is high around July to September. This suggests that inclement weather (i.e., rains) is a critical element that increases the probability of accidents occurring.

It is also possible to consider the academic year (i.e., school calendar) to explain some dips in the accident frequency. Most schools will have a "summer" break after the second semester starting March until May depending on the date of the Catholic Holy Week which is observed throughout the country. This may mean less activity as students go elsewhere (i.e., their home provinces) or stay at home for vacations. Notice that for 1995 the months with the lowest accident frequency are March and April. Meanwhile, for 1996 the months are February and March.

6.2 By Day of the Week

Data was classified according to the day of the week and are shown in Figures 6 and 7. This allowed us to identify variations within the week when accidents occur either more or less frequently. It is assumed that significant differences among the days of the week are present based on the nature of traffic during weekdays and weekends. For example, Monday is the first day for both work and school and thus, it is expected that traffic during these days is particularly heavy. Meanwhile, it is also expected that traffic will be lighter in the weekends or sometime during the midweek.

Based on Figures 6 and 7, it is clear that accident frequency is fairly even from Mondays to Saturdays and dips on Sundays. This is easy to understand since most activities in Quezon City (as well as Metro Manila) are undertaken within the six days (Monday to Saturday). Sunday is generally regarded as a rest day when recreational and shopping trips are made. Traffic does not attain the levels of the other days since many people prefer to stay at home during weekends.

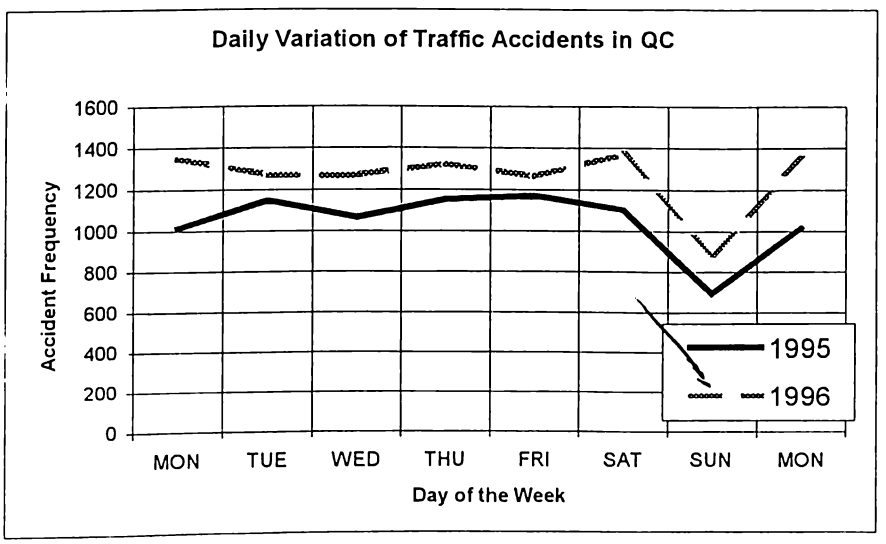

Figure 6. Daily variation of road traffic accidents (frequency).

The characteristics of weekend car use in the Philippines are different, for example, from that of Japan. For one, private car use for "to work" and "to school" trips comprise a significant part of the total trips in Metro Manila. Most of the people using public transport do not own cars and cannot avail of rail-based systems. The mode share of rail-based transportation in Metro Manila is very small compared to those that are road-based (i.e., buses and jeepneys). In fact, our subject city (Quezon City) is not served by any railway system. In Japan, a big portion of car owners leaves their cars at home to commute using the railway systems. It is during the weekends when car owners opt to use their vehicles for recreational or shopping trips.

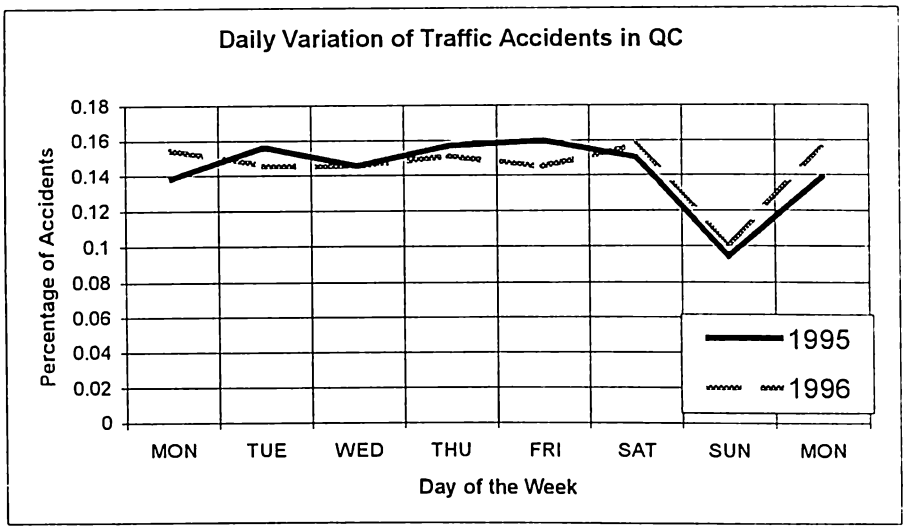

Figure 7. Daily variation of road traffic accidents (percentage).

It is also possible to consider the average frequency of accidents in terms of weekends and weekdays. Note that activities during these periods are quite different and therefore we can examine if there are differences in the accident frequencies.

6.3 By Hour of the Day

Traffic accident data was classified according to the hour of occurrence. This allows us to have a close look at the pattern of accident frequency within the 24-hour day. The hourly variation of road traffic accidents in Quezon City is shown for the years 1995 and 1996 in Figures 8 and 9, respectively.

It is clear from the figures above that accident frequency is low in the early mornings and peaks around the afternoon to early evening. This is true for both 1995 and 1996 and, in general, over all 12 months considered for each year. Such a trend is easy understand from the perspective of traffic flow since it is expected that there would be less vehicles at nighttime as compared to the daytime. Most accidents generally occur when there are so much activity (e.g., peak hours).

It is also possible to interpret the data according to the nighttime and daytime periods. As such, we may be able to assess the general effect of illumination. This will only entail the grouping of accident data from 6 a.m. to 6 p.m. (i.e., day) and 6 p.m. to 6 a.m. (i.e., night).

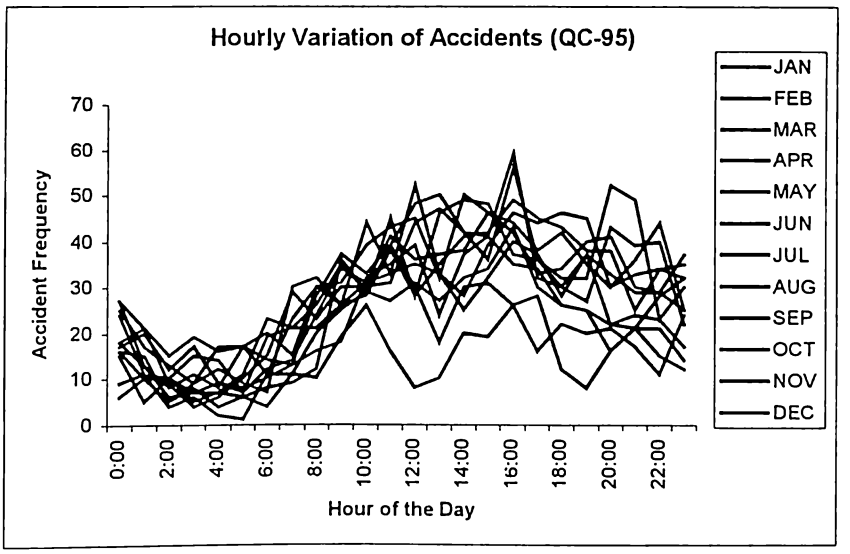

Figure 8. Hourly variation of road traffic accidents (1995).

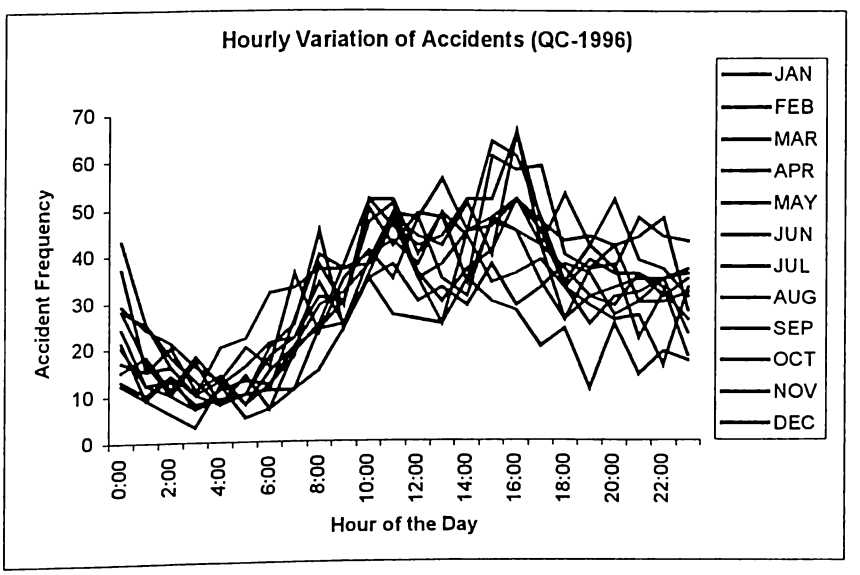

Figure 9. Hourly variation of road traffic accidents (1996).

VII. TRAFFIC ACCIDENT SEVERITY

Traffic accident severity is classified under four categories in the Philippines based on the Traffic Accident Report Form:

- Fatal accident,
- Serious injury accident,
- Minor injury accident, and
- Property damage

It is interesting to see that in the database, only three types are recorded. Types I, II and III are defined as property damage, personal injury and fatal accidents, respectively. This is unlike what is written in the traffic accident report form (Figure 3), where injury related accidents are grouped separately. Figures 10 and 11 show accident severity classified into 3 types in terms of frequency and percentage of the total number.

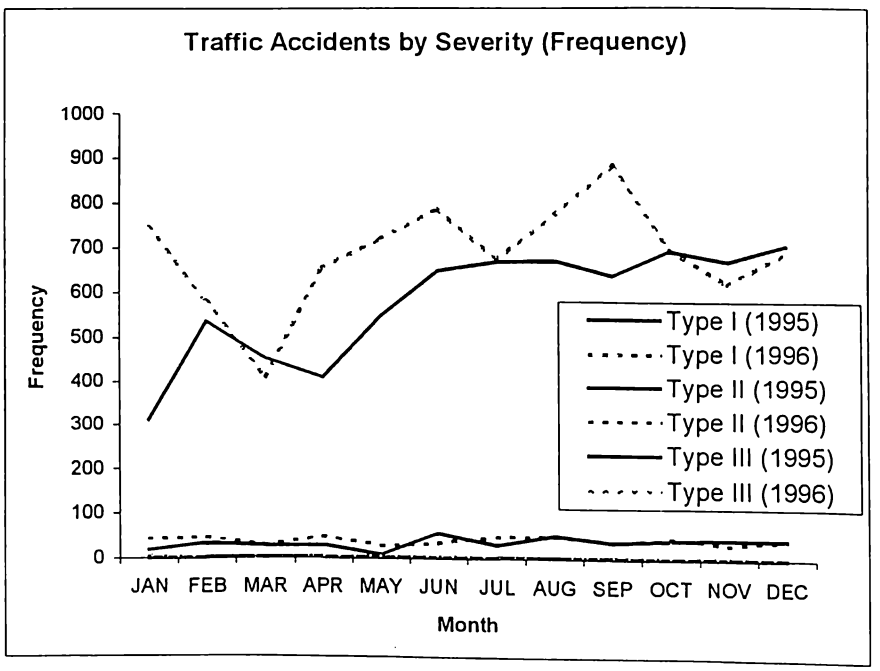

Figure 10. Accident severity in Quezon City (frequency).

It can be seen from Figure 10 that most traffic accidents for the two years considered are classified under property damage. Such a tendency is realized even with the increased number of incidents for 1996. In more relative terms, Figure 11 shows that in both 1995 and 1996 about 95% of all accidents reported and recorded are of Type I while personal injury comprises virtually the remaining 5%. Fatal accidents were minimal (on the average of 0.2 percent in 1996).

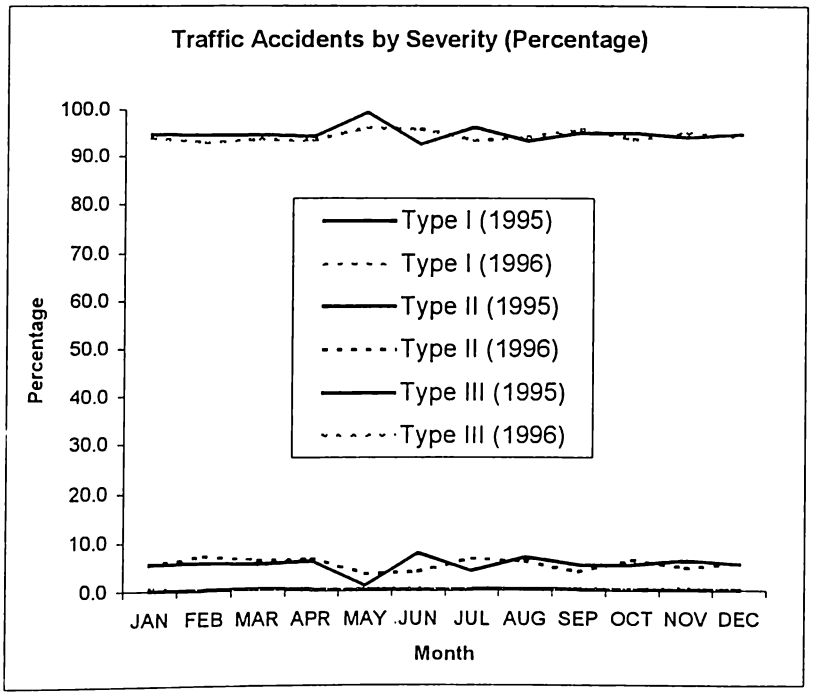

Figure 11. Accident severity in Quezon City (percentage).

One point for scrutiny would be the question on how serious an injury should be before it gets classified as Type II. That is, does a person require hospitalization or treatment at a medical facility before an accident can be classified as Type II? This brings attention to the reliability of the report itself. The question is focused on who and how the report forms are accomplished and how information is inputted to the database. Such is significant because errors in the data will tend to underestimate the overall impact of accidents and would not lead to the adoption of countermeasures to improve safety conditions. The mentality is that the loss of human life will most likely be the strongest case for pushing for measures to improve safety at particular locations. Otherwise, it is easy to dismiss or forget incidents regardless of the frequency only because these accidents are Type I and have not directly involved harm to people (i.e., Type II or Type III).

VIII. VEHICLE INVOLVEMENT

With respect to the available data, it was possible to estimate the cases where certain types of vehicles are involved. The traffic mix also affects safety since drivers of different vehicles behave according to the type of vehicle they operate. Such is due to the motives of particular driver groups. For example, bus drivers may want to stay close to the curbside for easy stopping for loading and unloading passengers. Meanwhile other vehicles' lane preference will be influenced by the direction they will take upon approaching an intersection.

That is, drivers intending to go through may keep to the middle lanes while drivers intending to turn left will use the median-side lane.

Of particular interest is the involvement of jeepneys in traffic accidents. This paratransit mode has often been said to be the cause of many traffic accidents. Concerns regarding traffic safety stem from the frequent use of risky maneuvers by jeepney drivers as they operate along their routes. From the accident database, it was possible to determine the number of accidents wherein jeepneys were involved. However, this can only be done from 1996 data because such information was not included in the 1995 database. Figure 12 shows the percentage of the accidents per month when jeepneys were involved.

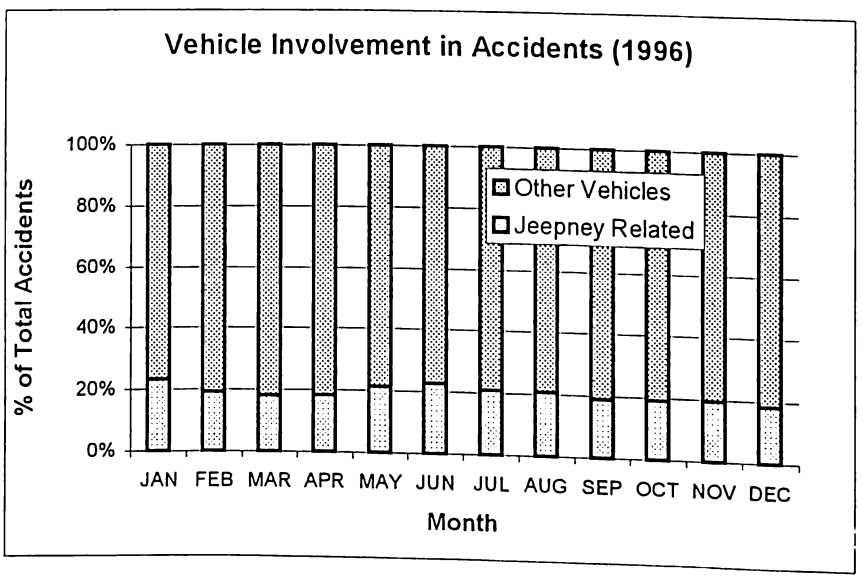

Figure 12. Jeepney Involvement in Traffic Accidents (1996).

It is clear from the figure that jeepney involvement in accidents is significant. About 20% of the total accidents directly involve the jeepney. While it is difficult to determine the number of accidents where jeepneys are indirectly involved (e.g., car bumps into another as a result of trying to avoid swerving jeepney), it is not difficult to imagine and observe such incidents happening.

IX. MEASURES TO IMPROVE SAFETY

9.1 Principal Elements

In order to develop and propose measures for safety improvement, we must first identify the causes of most accidents. As such, it is important to examine the principal elements leading to accidents. We identify four of them as:

- Weather
- Risky maneuvers
- Vehicle
- Human error

In the case of weather, there is not much that can be done except to exercise caution when the roads are wet or even flooded. The Philippines is affected by more than 20 typhoons every year during the wet season (i.e., June to November). Then there is also the monsoon, which brings particularly heavy rains. Flash floods are common in Metro Manila and are often the cause of vehicle breakdowns.

Risky maneuvers can be minimized with proper enforcement of traffic rules and regulations as well as instilling discipline among drivers. The key word here is "discipline" since this is perceived as the root of mayhem in the streets. The apparent lack of discipline is attributed to the manner by which most people learn to drive. Most public transport drivers (i.e., jeepney and bus drivers) learn to drive outside of any accredited driving schools. Learning from their peers, they tend to invest more in courage as they acquire driving skills and depend on experience in becoming aware of traffic rules and regulation. Reliance on courage brings about an attitude for risk taking and this leads to frequent use of risky maneuvers.

Vehicle performance is a function of its specifications or design. The level of maintenance is also a factor especially for older models. Breakdowns often occur due to poor maintenance and incidents involving the loss of brakes are common. Such is especially true in the case of public transport (i.e., bus and jeepneys). It was found that of the total costs borne by public transport operators, maintenance costs account for a small percentage (Bayan, Villoria and Ieda, 1996). Maintenance costs comprise 23.4% of total costs for buses. For jeepneys it is only 7%. A comparison of operating costs (i.e., basically fuel and drivers' wages) shows that it is 62.3% for buses and 91.2% for jeepneys. The remaining part is due to fixed costs (i.e., acquisition of the vehicle, depreciation).

The discrepancy is partly explained by the fact that buses are organized into companies. Thus, maintenance can be done on the fleet on a regular basis. In the case of jeepneys, however, ownership is usually on an individual basis and operators (in some cases the driver himself) opt for cheap solutions to vehicle problems or seldom conduct maintenance.

Human error can be caused by a number of factors. These include the influence of road physical characteristics (i.e., geometry), alcohol, drugs and even peer pressure (from the behavioral point of view). Logically, error also stems from risky maneuvers, as drivers of moving vehicles would tend to make miscalculations on the space between their vehicles. The bottomline is that all four elements do not exist alone but are actually inter-related with each other. As such, the combination of all four elements is not at all improbable. The relationship between the vehicle, the environment and the behavior of drivers may be summarized in what is termed as the Human-Vehicle-Environment Operating System (FHWA, 1980). A diagram illustrating this is shown in Figure 13.

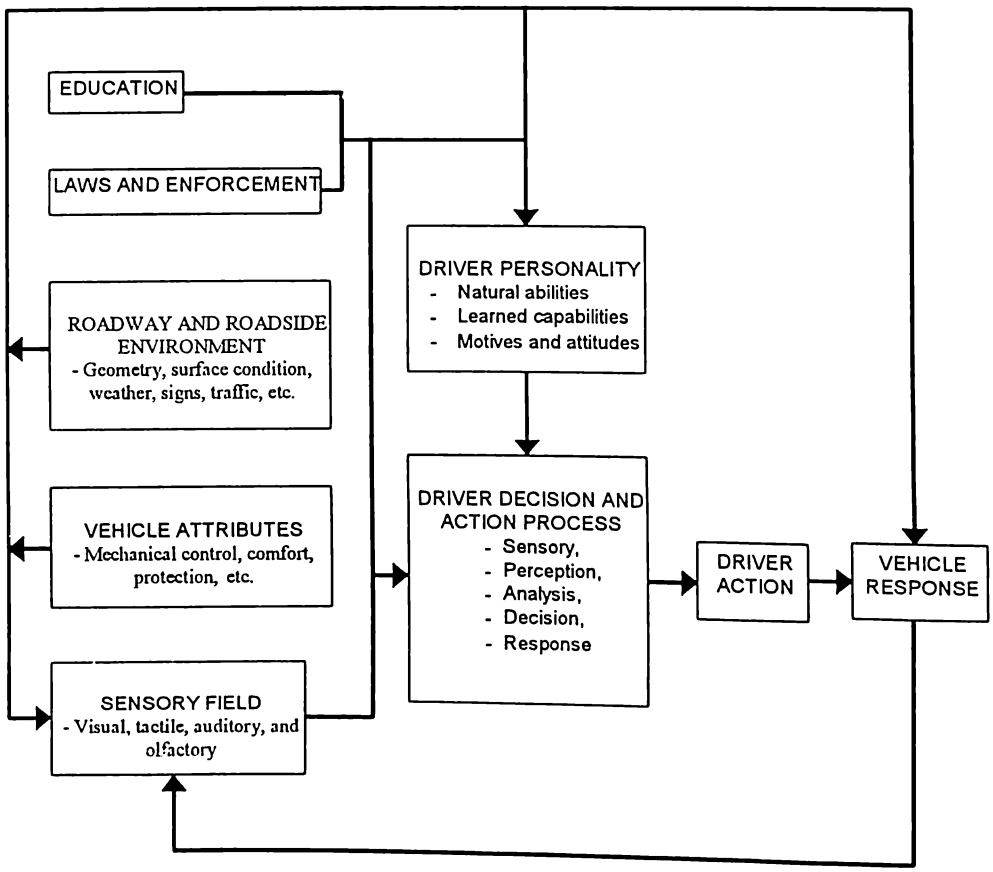

Figure 13. The Human-Vehicle-Environment Operating System. (FWHA, 1980)

Figure 13 outlines the interrelationships among various aspects of the road environment for the road user. Simply, it integrates all elements that serve as input to the driver decision and action process. These inputs include road and vehicle characteristics, knowledge of traffic rules and regulation, as well as the personal (e.g., biological and behavioral) characteristics of the driver himself.

9.2 Measures to be Taken

At this point we discuss several measures that need only to be emphasized as they have been identified time and again. Focus is given on three areas namely, rules and regulations, accident data, and education and enforcement. Discussion will be limited to certain examples to establish points for emphasis.

a) Rules and Regulations

While there are a lot of rules and regulations governing drivers and their vehicles in Metro Manila, it cannot be assumed that most drivers are knowledgeable of these. Again, such can be attributed to the lack of formal instruction (in traffic rules), especially for public transport drivers. As an example, we consider the speed limits set along Philippine roads that are described in Table 1.

The speed limits in Table 1 one can be compared with actual measurements along some major arterials. One such arterial located in Quezon City is Aurora Boulevard, which can be classified as a road where the maximum speed should be 20 kph for all types of vehicles. However, actual measurements reveal that vehicles travel around 37 kph, thereby exceeding the limits. It can be contended that the speed limits in Table 1 are unrealistic and inappropriate for the case of arterials. Such concern would have to be addressed through proper studies that will lead to the adoption of more practical speed limits.

Only recently, the Seat Belts Use Act of 1999 was signed into law as Republic Act No. 8750. This law mandates the installation and use of seatbelts in public and private vehicles. Compliance with the provisions of the law would be required 1 year from the issuance of the implementing rules and regulations (IRR) by the Land Transportation Office (LTO) and penalties will be meted out to violators apprehended thereafter.

Table 1.

Speed Limits in the Philippines.

	Maximum Allowable Speed	
	Passenger Cars and Motorcycles	**Trucks and buses**
On open country roads, with no "blind corner" not closely bordered by habitation	80 kph	50 kph
On "through streets" or boulevards, clear of traffic with no "blind corner" when so designated	40 kph	30 kph
On city and municipal streets with light traffic, when not designated "through streets"	30 kph	30 kph
Through crowded street approaching intersection at "blind corners," passing school zones, passing other vehicles which are stationary, or for similar dangerous circumstances	20 kph	20 kph

(Source: Land Transportation Office)

It is interesting that such a law has only been passed at this time while similar laws have been implemented in most other countries. This underlines the need for effective legislation of laws concerning traffic safety. It is expected that other laws will follow to assure that safety provisions are followed.

b) Reliability of Data

Too often, there are concerns regarding the reliability of accident data. Such concerns are well-founded and rooted on the recording process, as there are often a lot of detail required by the forms like the one shown in Figure 3. Critical data like the collision diagram are overlooked and simplified to the point that they become useless for engineering analysis. Also, the resulting injuries are often erroneously recorded as the classification of accident severity (i.e., how serious an injury is) is dependent on the person who fills out the forms. One can only wonder how many deaths are not recorded, thereby underestimating the traffic safety situation.

Hutchinson (1987) posed several questions about the data collection process. Among the relevant ones are the following:

- Who fills out the form?
- How long after the accident is the form typically completed?
- What training is received by the people responsible for tabulating the statistics?
- What use is made of the data? Are statistics published for the public?

Such questions delve into the high probability that there will be errors in traffic accident data. This can easily be addressed by making sure that the persons filling up the forms are knowledgeable of the importance of accident data. That is, accident data will be used to analyze incidents (e.g., through collision diagrams) and develop measures to mitigate accident occurrence. Statistics would permit evaluation of the effects of measures applied (i.e., before and after studies) and access to such information would make people aware of trends and accident-prone areas. Such awareness will help people, road users in particular, to take precautions especially as they drive.

c) Education and Enforcement

It is obvious that the most basic among safety countermeasures concern the education of road users and the proper enforcement of traffic rules and regulations. It has been proposed that traffic education should be included in the high school curriculum but so far such a bill has not been discussed in the legislature. More important to address would be the dissemination of information regarding these rules and regulations so that people would become aware. One approach would be to use popular media (e.g., radio, television, and print) to provide information. Such a proposal has been mentioned before. Unfortunately, information campaigns are usually done for short periods and only for specific programs (e.g., color coding of vehicles). Information dissemination should be sustained over a long period in such a way that people become familiar with rules, regulations, and policies, inclusive of the penalties. The licensing system should also be addressed in such a way that aspiring drivers would be knowledgeable of rules and regulations. Examinations should be stricter and public transport and heavy vehicle drivers must meet certain requirements regarding driving experience.

Enforcement continues to be inconsistent and ineffective due in part to corruption among traffic enforcers composed of police and traffic aides. The Metro Manila Development Authority (MMDA) deputizes traffic enforcers. Police are composed of personnel from the Philippine National Police while traffic aides are usually hastily trained personnel without enforcement backgrounds (i.e., the minimum required educational attainment is secondary school). Nevertheless, experience has shown that most enforcers are not aware of the traffic rules and regulations and end up apprehending and imposing penalties without being able to determine exactly the violation incurred by the driver. Therefore, it should be required that all enforcers must undergo a formal (albeit short) training programs for them to have a more comprehensive knowledge of the rules they are going to enforce.

Curiously, overspeeding is not included in the list of 20 of the common traffic violations under the unified Traffic Violation Receipt used by traffic enforcers in Metro Manila. One reason for this is that police officers are not provided with any devices by which they can measure vehicle speeds. Thus, related devices as well as facilities that would aid enforcement must also be considered in the long term. High-speed cameras as well as other detection devices are available and may help to curb violations. While these may be expensive to acquire, they are very useful for large cities and suitable for other purposes as well (i.e., surveillance of general traffic conditions like congestion).

X. CONCLUSIONS

In this study, the traffic safety situation in a city located in Metropolitan Manila was examined. We considered the occurrence of accidents by time of day, month of year, and day of week. Additionally, accident severity was taken into account as well as vehicle involvement in accidents.

The elements combining and contributing to the occurrence of accidents were also identified and discussed, including the inter-relationship among these elements. The elements were presented in terms of the Human-Vehicle-Environment Operating System (ref. Fig. 13). More importantly, the paper discussed measures and proposals to improve the state of traffic safety. These include:

- Legislation/formulation of policies toward traffic safety;
- Assuring integrity of accident data and statistics;
- Promotion of traffic education and awareness of rules and regulations; and
- Strengthening of enforcement

In conclusion, it must be emphasized that traffic safety is a top concern for the road user. As such, it is deserving of proper attention and appropriate measures must be taken to ensure that fewer accidents occur. It is expected that the number of accidents will increase in proportion to the annual increase in the number of vehicles. This is inevitable as a result of continuing motorization as well as the absence of a comprehensive rail-based mass transit system to serve as an alternative for road users. However, the accident rate

(e.g., number per year, number per 1 million vehicles passing, etc.) should be monitored and evaluated such that it may be kept within manageable levels. Finally, it should be reiterated that since accidents involve the probable loss of human life and entails certain psychological-emotional aspects, it is always in the best interest of people that issues regarding traffic safety be addressed.

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