ROAD SAFETY LEVEL: A CASE STUDY OF MAJOR ROAD LINKED TERENGGANU AND KUANTAN TOWN

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ABSTRACT

It is a dual carriageway road which experienced a heavy traffic movement and consequently has recorded a high numbers of accident from year to year. This study is intended to explore statistic of accident rate for Jalan Beserah – Kuantan and Bypass – Kuantan which is one of the gateways to Kuantan City from Terengganu Border. The main data of this study which is the accident data were gathered from the Royal Police Malaysia, Traffic Units who has a state wide database on the accident occurred at all road in Pahang. The data was taken in a period of 4 years from year 2006 to year 2009 to make sure that the data depicted the real situation of this road. After all data was successfully collected, Biviarite Correlation Analysis from the Statistical Package for Social Science (SPSS) was used to determine the correlation. From the findings, the trend of the accident is the highest accident occurrence is at a rural area where people tend to neglect safety and lack of proper road safety measures. The road accidents increase gradually from year 2006 to 2008 and it decreasing in year 2009. In conclusion, data storage on road accidents must be completed and updated because it is very important when discussing an accidents problem in Malaysia.

ABSTRAK

Jalan ini merupakan jalan yang mempunyai kadar perjalanan traffic yang amat tinggi dan seterusnya juga mencatatkan kadar kemalangan yang tinggi dan semakin meningkat dari tahun ke tahun. Kajian ini adalah bertujuan untuk mencari data statistic kadar kemalangan bagi Jalan Beserah – Kuantan dan Bypass Kuantan yang merupakan salah satu jalan masuk utama ke Bandar Kuantan dari Negeri Terengganu. Data utama yang digunakan di dalam kajian ini adalah data kemalangan yang didapati daripada Unit Traffik, Polis Diraja Malaysia yang mempunyai rekod kemalangan bagi kesemua jalan utama yang berada di negeri Pahang. Data tersebut telah diambil untuk tempoh 4 tahun bermula daripada tahun 2006 hingga tahun 2009 bagi memastikan kadar kemalangan yang digunakan didalam kajian ini benar-benar menggambarkan situasi semasa jalan tersebut. Setelah kesemua data Berjaya dikumpul, menggunakan kaedah Biviarite Correlation Analysis yang terdapat didalam perisian Statictis Package for Social Sciences (SPSS) untuk menentukan perhubungan. Hasil kajian telah mendapati bahawa corak kemalangan jalan raya yang tertinggi berlaku di kawasan luar bandar dimana penduduk disitu tidak menitikberatkan keselamatan jalan raya dan kurangnya tindakan keselamatan jalan raya. Kemalangan jalan raya meningkat secara beransur-ansur dari tahun 2006 ke 2008 dan menurun pada tahun 2009. Kesimpulannya, pengumpulan data kemalangan jalan raya hendaklah dilengkapkan dan dikemaskinikan kerana ia sangat penting semasa membincangkan pemasalahan berkaitan kemalangan di Malaysia.

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CHAPTER 1

INTRODUCTION

1.1 Introduction

Road accidents constitute one of the major social problems in Malaysia. Accidents are relatively rare and unpredictable, sometimes it is direct observation and often impossible. In a developing country, the road accident has increased years by years. This could be due to an increasing in vehicle occupancy over time or to be more specific types of accident are much more common now than 10 years ago. Growth in urbanization and in the number of vehicles in many developing countries has led to the increase in traffic accidents on road networks which were never designed for the volumes and types of traffic which they are now required to carry.

Road safety has been considered one of the social responsibilities of the Malaysia Government. Since the country's independence, a number of bodies concerned with road safety have been formed with in government departments, private sector agencies and voluntary organizations. The concern for road safety was more visible, however, following a Karak Highway accident in 1990. The aftermath of the accident saw the government forming a Cabinet Committee on Road Safety, with the Prime Minister as the chairmen. The committee set a target of reducing fatalities by 30% by the year 2000. In 1991, a comprehensive National Road Safety Plan was formulated with special attention on safety research programmes, behavioural modification of road users, road engineering and vehicle safety, medical treatment and safety administration (Radin Umar Radin Sohadi, 1998).

Road in Malaysia can be classified according to its functions or jurisdictions. By functions, road can be classified as primary, secondary or minor roads. By jurisdiction, roads can be classified as Tolled Expressway and Highway, Federal, State, Municipal roads. Roads may also be able to be classified as rural and urban. Rural roads are roads outside the Municipality limit or if it is 5km apart from the Municipal limits. Otherwise, it is defined as urban roads that comprise of all roads within the Municipality gazette limits or a township having a population of 10,000 and above.

1.2 Background of problem

Most people are unaware of how large a problem unsafe traffic operation represents on a worldwide basis. The tragic consequence of traffic accidents puts unsafe traffic operations on a par with war or drug use, as an example of irresponsible social behaviour that must change. This lack of awareness and responsibility may be an important reason why more than 500,000 people are killed per year or about one life every minute and over 15 million suffer injuries as a result of road accidents every year worldwide. Of the millions who injured tens of thousands are maimed for life.

From the previous accident analysis record, every year more than 1.17 million people die in road crashes around the world. It has been estimated that at least 6 million more will die and 60 million will be injured during the next 10 years in developing countries unless urgent action is taken. Road crashes cost approximately 1 to 3 percent of a country's annual Gross National Product (GNP) (Mohamed Abdalla, 2004).

Since gaining independence in 1957, Malaysia has been experiencing rapid growth in population, economy, industrialisation and motorisation. Between 1970 and 1994, the population doubled from 9,000,399 to 19,494,000 an average growth rate of about 5% per year. During the same period, the total length of roads increased threefold, from about 19,433 to 59,796 kilometres, forming a transport network in Peninsular and East Malaysia. The growth in traffic during the same period also experienced similar trend. Over a span of 24 years, the population of registered vehicles increased from 699,292 in 1970 to 7,210,089 in 1994, a nine fold increase in just over two decades. Motor vehicle ownership increased accordingly from 13.4 people per vehicle in 1970 to 2.9 people per vehicle in 1992 (Royal Malaysia Police, 1994).

Some contributing factors for road traffic injuries are motorcyclists, bicyclists, pedestrians, vehicle occupants and some other risk factors. Motorcyclists constituted 58% of road fatalities in 1995. Between 1986 and 1995, the incidence of motorcycle fatalities per 100,000 populations increased from 10.2 to 16.7. About two thirds (65.5%) of victims were below age of 30 years. In 1995, head and "multiple" injuries were observed in 36% and 43% of victims of motorcycle fatalities respectively. Since "multiple" injuries include head injuries, the most important contribution factor in motorcycle fatalities are head injuries. Bicyclist constituted 5% of road fatalities in 1995. Head and "multiple" injuries were observed in 57%and 33% of bicycle fatalities respectively.

Pedestrians constituted 12% of road fatalities in 1995 and road crossing behaviour was associated with 62% of all pedestrian fatalities. Speed of the vehicle at impact is the single most important determinant of severity of pedestrian injuries. Vehicle occupants constituted 15% of road fatalities in 1995. Air bags, occupant restraints such as seat belts and side impact protection systems have all been shown to be preventing injuries to occupants in the event of a crash. Other risks factors are alcohol use and excessive speeding. Speeding is particularly risky since the energy which dissipates in the event of a crash and causes harm is directly proportional to the square of the velocity of the vehicle (Radin Umar RS, 1994).

Through lots of observations and analysis of traffic accident conditions and effect of humans, vehicles and road conditions in traffic system on traffic safety. It is found that the road safety level is one of the most important factors to the road traffic safety.

1.3 Problem statement

Road safety has long been considered one of the social responsibilities of the Malaysian Government. Since the country is independence, a number of bodies concerned with road safety have been formed within government department's private sector agencies and voluntary organisation. The committee set a target of reducing fatalities by 30% by the year 2000, (Federal Highway Administration). A comparison of Malaysia's figure with those of several developed and developing countries (Transport Research Laboratory, 1995) indicate that Malaysia is ranked about midway between the developed and developing countries. Although the accident fatality rate in Malaysia is still of concern as the death rate per 10000 vehicles is well above for the rest of the developed countries. Jalan Beserah – Kuantan and Bypass Kuantan, Pahang has been picked as the study area because those are two main entrances road entering Kuantan city from Terengganu border. The safety level of these two roads is in used to be studied because of its increasing in number of road traffic accident years by years. Data from PDRM has shows that from year 2006 until year 2008 number of road traffic accidents has increase from 197 accidents to 356 accidents and deceasing to 150 accidents in year 2009 for Jalan Beserah and from year 2006 until year 2008 number of traffic accident increase from 59 accidents to 96 accidents and deceasing to 87 accidents in year 2009 for Bypass. So this study needs to be carried out to evaluate the road safety level of these two main roads before any recommendation for improvement works can be proposed.

1.4 Objectives

There are two (2) objectives have been discussed and outlined in order to realize the purpose of this study.

I. To locate the black spot area along two main entrance road entering Kuantan city from Terengganu border.

II. To evaluate road safety level for Jalan Beserah – Kuantan and Bypass – Kuantan that linked Terengganu to Kuantan town.

1.5 Scope of study

The scopes of study have been determined in order to ensure that literature study is focusing on certain fields only. The limitations of this study are listed below.

I. The study area are focused on two main entrance road from Terengganu border entering Kuantan city which is Jalan Beserah – Kuantan and Bypass – Kuantan.

II. The reliability of result from the correlation was done from year 2006 until year 2009 only and results outcomes of this research are only applicable for that particular period of years.

III. Although the study area are taken for both roads, the calculated road accident cases are only limited from km 363 until km 408 for Jalan Beserah and from km 324 until km 349 for Bypass.

1.6 Significant of study

This study aims to create awareness to all parties involved in producing a safer and reliable environment of users of the trunk route in specific and all road users in general. In our society, people will tend to put the blame on the drivers or road users when a traffic accident occurs, although in fact that driver's carelessness might be caused by other factors that interrupt driver's attention.

This research will allow for an explicit study on the accident rates on the trunk road which may be useful to the Public Works Department (JKR) of the Ministry of Works Malaysia and the Local Authority to mitigate the problem in the road design and construction.

CHAPTER 2

LITERATURE REVIEW

2.1 Introduction

The number of vehicles has been growing rapidly in cities. Meanwhile, the number of total fatalities every year caused by traffic accidents is almost the largest in the world. Drivers' driving behaviours are largely responsible for accident. Road accidents may be defined as a human tragedy, associated with the major health problems, negative socio-economy growth and poverty road accidents involve high human suffering and monetary costs.

Car accident (or vehicle accident if the road vehicle involved is a truck, bus, motorcycle, etc.) is a euphemism for a road traffic incident which usually involves at least one road vehicle being in collision with another vehicle, another road user, or a stationary roadside object, and which usually results in injury or property damage. If the injury is only to a person not in a vehicle and consists of no other property damage other than (potentially) the vehicle that stuck them, it is then known as a pedestrian accident (the implication is that the accident involved a vehicle). The term would also exclude incidents exclusively involving vehicles which are non-powered such as bicycles. Road incidents results result in the deaths of an estimated 1.2 million people worldwide each year, and injure about forty times this number (WHO, 2004).

2.2 Malaysian Road Accident Statistics

An increases in economic growth coupled with an increment in Malaysia standard of living have made the ration of registered vehicle in 2005, 15 times more than the ratio in 1974 (Mohd.Nizam Mustapha, 2005). Since then, the accident percentages were also kept on increasing. A statistic by the Department of Statistic in 2005 shows that in 1974 with 1,090,279 registered vehicles, the 24,581 accident cases are recorded and as predicted in 2005 with 15,026,660 registered vehicles moving on the road, 328,264 accident cases were recorded.

Data for the main road accidents statistic of Malaysia from year 2000 to 2006:

Table 2.1 Road accident statistic from 2000 to 2006

Year	Population	Vehicle Registered	Road Accidents	Road Casualties	Road Deaths
2000	23263600	10598804	250429	50200	6035
2001	23795300	11302545	265175	20473	589
2002	24526500	12068144	279711	49552	5891
2003	25048300	12868934	298653	52741	6286
2004	25580000	13828889	326815	54091	6228
2005	26130000	14816407	328264	47012	6200
2006	26640000	15790732	341252	35425	6287

(Source: PDRM, 2007)

From the table above, the number of road accidents and road deaths increase steadily while road casualties (injured and death) fluctuates throughout year 2000 to 2006. In order to make the data such as road accidents or road deaths more meaningful and comparative, the data will be normalized against Malaysia population for that year of occurrence and against total number of vehicle registered.

The normalization of these data is shown in the 2 graphs as below:

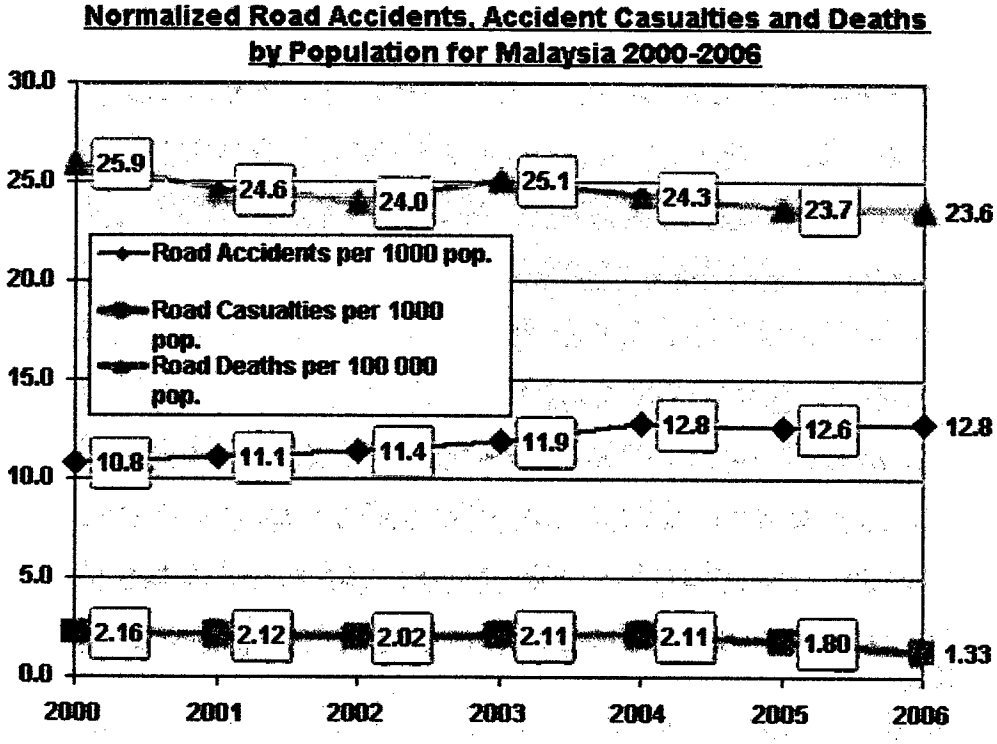

Figure 2.1 Normalization by population.

(Source: PDRM, 2007)

From the graph above, the number of road accidents per 1000 population increase steadily from 10.8 cases to 12.8 cases in year 2000 until 2004, an 18.5% increase. On the other hand, the road casualty per 1000 population decreases from 2.16 casualties (2000) to 1.33 casualties (2006). The same downward trend is also seen on road deaths per 100 000 population, year 2000 recorded 25.9 road deaths

for every 100 000 population and seeing a small decrease to 23.6 deaths per 100 000 population in year 2006. Although the road deaths is seeing a decrement over the years, it is also remindful to compare it to other countries like apparently the road deaths in Malaysia decreasing slowly, but it is not good enough.

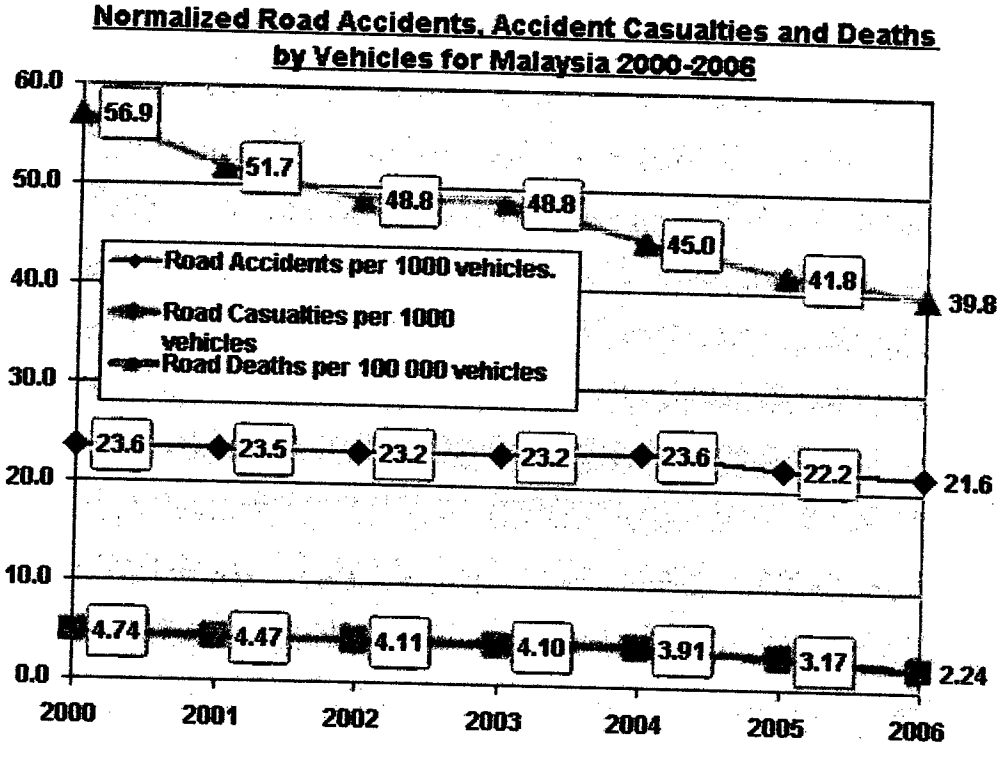

Figure 2.2 Normalization by vehicle registered

(Source: PDRM, 2007)

From the graph above, the number of road accidents per 1000 vehicles decrease over the years from 2000 to 2006, with 56.9 accidents to 39.8 accidents per 1000 vehicle. The increase in road vehicle does not necessarily increase the likelihood of more death caused by road accidents. Side evidence also pointing into the same direction for the number of registered vehicle increase from 10.6 million to 15.8 million from 2000 to 2006, equivalent to 48.99% while number of deaths shows small increment from 6035 to 6287 deaths in 2006 increase 4.18%.

2.3 Accident Black Spot Area

An accident black spot is a term used in road safety management to denote a place where accidents are concentrated. It may occur for a variety of reasons, such as a sharp drop or corner in a straight road, so oncoming traffic is concealed, a hidden junction on a fast road, poor or concealed warning signs at cross-roads and so on (McGuigan, 1986).

For some decades treatment of accident black spots (e.g. by signage, speed restrictions, improving sightlines or straightening bends) was a mainstay of road safety policy, but current thinking has it that these interventions do no long-term good. Effects such as regression to the mean, risk compensation and accident migration combine to reduce the overall benefit. In some cases it has been claimed that the end result is an increase in overall casualties (Baguely, 1995).

The traditional approach of carrying out remedial works at crash sites has resulted in large crash reductions across Australia. In year 2001, evaluation of Australia's federal black spot program (BTE, 2001) showed that the program had produced a BCR (Benefit-Cost Ratio) of 14.1. Further black spot treatments, carried out in the years after 2001, will still have produced impressive BCRs, but the opportunity to treat sites with high crash rates is of course diminishing as the black spots are steadily eliminated by remedial treatments. As reported by (Turner, 2007) through his investigation of Victorian and New Zealand crash data, he proved that only a third of fatal crashes occur in locations classed as black spots.

In the field of road safety engineering, the traditional approach to reducing crash rates has been to use crash history as the basis for assessing risk. This approach has been highly successful in Australia and elsewhere (e.g. benefit-cost ratios of 14 from the federally funded black spot program - BTE 2001). However,

recently there has been a move towards an additional risk assessment approach based on the risk inherent in road and roadside features. This approach has grown from the safety audit process (particularly audits of existing roads) and the movement has occurred for a number of reasons (Philip Roper and Blair Turner, 2005).

University Pertanian Malaysia (UPM), Ministry of science, Technology and Environment under the mechanism of IRPA and the National Road Safety Council (MKJR) has been funding research programmes to improve the accident data collection and the analysis system in Malaysia. The programmes also aim to encourage wider usage of the system to assist in the identification and effective treatment of accident black spots to improve road safety in this country. In view of the massive number of accident records to be analysed (95,500 nationwide in 1991), the use of computer based analysis systems was investigated in early 1990 and a micro computer accident analysis package, MAAP, licensed by the Transport Research Laboratory (TRL), United Kingdom, was customised to fulfil the requirement (Radin Umar Radin Sohadi and C.J. Baguely, 1994).

2.4 Road Safety

Road safety is characterized by the absence of accidents, for example collisions between road users (Browm, 1994). The safety is traditionally measured by the number of collisions or rather its expected number at a given time. Traffic safety diagnosis has been traditionally undertaken using historical collision data. However, there are well-recognized problems of availability and quality associated with collision data. Additionally, the use of collision records for safety analysis is a reactive approach: a significant number of collisions have to be recorded before action is taken (Brown, 1994).

Therefore there has been considerable interest in research dealing with surrogate safety measures (Gettman and Head, 2003). The observation of traffic conflicts has been advocated as an alternative or complementary approach to analyze traffic safety from a broader perspective than collision statistics alone (Brown, 1994, Hyden, 198, Sayed et al., 1994, Sayed and Zein, 1999, Svensson and Hyden, 2006).

Traffic conflicts are intersections with very similar processes to collisions, but without collision. A conflict is defines as "an observational situation in which two or more road users approach each other in space and time to such an extent that a collision is imminent is their movements remain unchanged" (Amundsen and Hyden, 19). The concept of collision course is derived from this widely accepted definition of traffic conflicts. (Svensson, 1998) defined that user can be on a collision course when, "speed and/or the direction of the road user changes". Deciding if two road users are on a collision course thus depends on extrapolation hypotheses.

2.5 Level of Service (LOS)

The development of the concept of level of service (LOS) for highway facilities dates back to the 1950s. LOS was formally introduced in the Highway Capacity Manual (HCM) published in 1965 (Highway Research Board, 1965). HCM defined level of service as a qualitative measure of the effect of a number of factors, which include speed and convenience, and operating costs. In HCM 1985, reserve capacity of lane was specified as a LOS measure unsignalized intersections (Transportation Research Board, 1985). In HCM 2000, average control delay replaced a reserve capacity (Transportation Research Board, 2001). However, that measure does not include safety measure, which deviates from the definition of LOS.

Evidently, HCM has not adequately considered safety problems for highway facilities. For the lasting benefit of road users, operational measures of LOS should be combined with safety measures. Regarding unsignalized intersections, the current operational measure can only reflect traffic efficiency and not traffic safety. In other words, considering only the delay measure will not reflect the real operations of an unsignalized intersection. In order to objectively to evaluate LOS for unsignalized intersections, the service measure should be a comprehensive measure that includes traffic efficiency and safety.

For evaluation of intersection safety, traffic accident data often are used. However, collection of traffic accidents takes a long time to obtain adequate sample sizes, and the accident records are often unreliable. Hence, some scholars have studied traffic conflict as a surrogate measure for predicting traffic accidents (Perkins, 1967).