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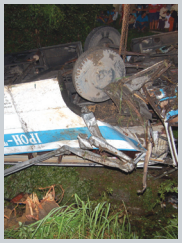

Research Report

An Impact Assessment of Banning Wee-Hour Express Bus Operation

Norlen Mohamed
Muhammad Fadhli Mohd Yusoff
Ilhamah Othman
Zarir Hafiz Zulkipli
Mohd Rasid Osman
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MIROS
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Project Contributors

Prof Dr Ahmad Farhan Mohd Sadullah
Ir. Fuad Abas
Mohamad Suffian bin Ahmad
Mohd Sukri Arifin
Mohd Nashriq Mohd Hanafiah
Wahida Ameer Batcha

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Mahligai Express Sdn Bhd
Sani Express Sdn Bhd
All the bus drivers involved in the focus group discussion

Abstract

The possibility of banning public express buses from operating during the wee-hours has emerged as an important consideration in the interest of passenger safety. An impact assessment was conducted to determine all possible impacts prior to the government making any decision on the banning. Two major steps were taken to describe all the possible impacts arising from the banning of the wee-hour operation. The first step involved profiling the existing operation scenarios, crashes involving public express buses, and stakeholders' views. The second step involved qualitative impact assessment analysis using all information gathered during the profiling stage to describe the possible impacts. Based on the assessment, the move to ban the wee-hour operation could possibly result in more negative impacts on the overall road safety agenda if the fundamental issues, such as driving and working hours, rest and sleep places for drivers, a safer and more accessible public transportation system as an alternative to those who choose to travel at night, are not improved. The proposed banning of the wee hour operation is also not a feasible solution for sustainability of express bus operations in this country especially for those operating long journeys. Taking into consideration all aspects of major road safety risks leading to a crash such as exposure, behavioural aspects, and vehicle safety and road environment factors, a more holistic approach would serve as a better solution for reducing crashes involving express buses regardless of time period of the operations.

1. Introduction

Crashes involving commercial buses are of growing concern in this country. There have been a number of tragic crashes recently that claimed many lives. From the year 2006 till now, four bus crashes have occurred involving more than eight fatalities; all these crashes have been tabled as a National Inquiry at either the cabinet or ministry level. It is alarming to observe that all the cases occurred during and after traveling at the wee-hours and had resulted in heavy casualties (Fadhli *et al.* 2009). Following these tragic crashes, banning commercial public express buses from operating during the wee-hours has emerged as a possible solution, in the interest of passenger safety.

Most commercial drivers especially those who are involved in long distance travel are required to drive around the clock. Their work involves rotating shift which could result in sleep deficit and fatigue. Sleepiness is a basic physiological state, brought about by the restriction or interruption of sleep and fatigue. It is also influenced by natural changes in the body's level of alertness during each 24-hour sleep-wake cycle. This cycle is called the Circadian Rhythm. Circadian rhythms are controlled by the body's biological clock that is modulated by the hypothalamus (a part of the brain). The biological body clock programmes a person to be very sleepy twice a day: first during the middle of the night sleep period (between 1am to 6am), and again 12 hours later, between 2pm and 4pm in the afternoon. At these times, a person will experience his worst physical and mental performance of the day. Horne & Reyner (1995) revealed that driving patterns that are against circadian rhythms have been shown to result in fatigue and drivers falling asleep while driving and this could lead to crashes.

Many studies in other countries have identified driver fatigue as one of the major causes of road accidents (Akerstedt & Kecklund 2001; Connor *et al.* 2002; Horne & Reyner 1995). A

study by Maclean *et al*. (2003) found that 15% of commercial vehicle fatalities can be attributed to driver fatigue or falling asleep. However, these studies did not specifically draw an association between driver fatigue and wee-hour crashes. A recent study (Norlen *et al.* 2008) in Malaysia has shown that driving and working hours are a major critical factor associated with fatigue among commercial bus drivers regardless of the period of travel.

The move to ban wee-hour operations of public express buses is not consistent with the road safety theme, that is, "usage of public transport reduces road accidents" that was announced by the Minister of Transport at the launch of Safety, Health & Environment (SHE) and Sustainable Transport Sector Development on 23 September 2008. As people cannot be prevented from travelling, in the absence of public transportation, they may shift to other modes of travelling during the wee hours. Instead of considering banning, the government should provide a better and safer public transportation system for travel.

Generally, several factors could contribute to increased crash risk. These are (i) exposure factors, (ii) behavioural risk factors, (iii) road environment, and (iv) vehicle safety factors. With a good driver management system in place, the issue of driver fatigue during the wee hours could be reduced. As recommended in the earlier report (MER 04/2009), in order to prevent crash and mortality, all bus operators have to comply fully to the SHE Code of Practice at all times. Moreover, all buses have to comply with good safety standards, such as the United Nation Economic Commission for Europe (UNECE) R66, R80 and R36, to be on the road. Focusing on banning of wee-hour operations as a solution to wee-hour crash concerns could result in overall negative implications on road safety. Therefore, before a decision is made on totally banning wee-hour operations, it is crucial to determine all possible impacts especially in relation to the primary objective of the banning, that is, resolving driver fatigue during wee-hour operations and consequently reducing crash risk.

This report provides an overview of various potential impacts of banning wee-hour operations for all public express buses in this country. In this study, drivers, passengers, bus operators, and bus terminal operators were identified as the group that would be directly affected by the proposed wee-hour banning. Therefore, their views are crucial for MIROS to identify the possible banning impacts and to manage driver fatigue accordingly. Towards that objective, a survey and focus group discussions with representatives of drivers, passengers, bus operators, and bus terminal operators were conducted to determine how banning wee-hour driving could impact their activities. Their views are included in the profiling section (Section 2).

2. Profiling of Existing Operation Scenarios, Crashes Involving Public Express Buses, and Stakeholders' Views

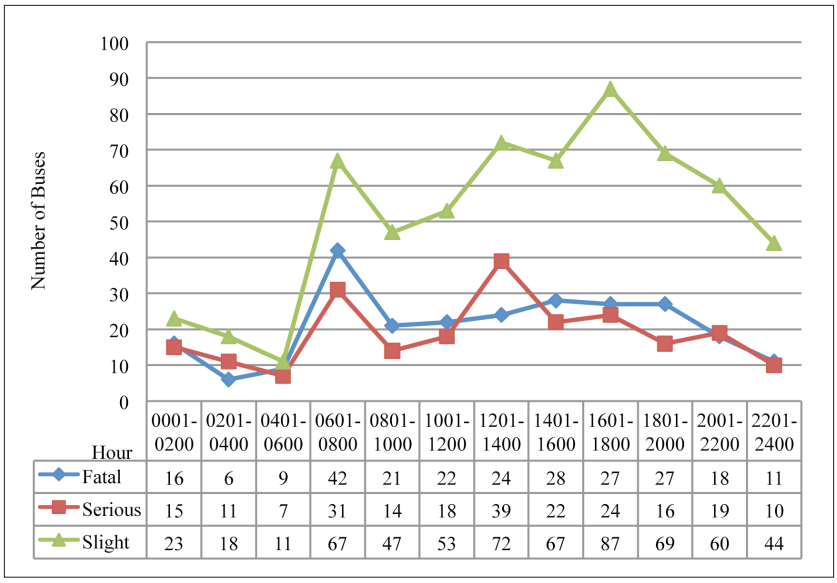
This section outlines existing scenarios related to crashes involving express buses, current operations and demand for wee-hour transport, and stakeholders' views.

2.1 Statistics on Crashes Involving Express Buses

Wee hours are defined as the period from midnight until 6am in the morning. The sentiment to ban wee-hour driving has largely risen from the incidence of a few major crashes during the wee-hour period as earlier defined. All statistics on crashes involving buses need to be analysed to represent the actual scenario before any further recommendations can be made.

Based on the accident data analysis as reported by Fadhli *et al.* (2009), two peak periods have been identified as recording a significantly high collision frequency. These peaks are consistent with the peak of high fatality and high injury risk over a period of a day. The first peak is between 6am to 8am and the second peak is between 10pm to 11pm. Crashes that occur during the first peak could be the result of driver fatigue as it is seen that drivers are driving during the cross-over from the wee-hours before the occurrence of the crash in the following morning. The report also stated that the lowest crash peak was observed between 2am to 6am in the morning. However, the analysis which was based on 2006 data also revealed that crashes that occurred during

the wee-hours tend to be more severe and are associated with a higher number of fatalities and casualties per bus accident as shown in Figure 1. As data for 2007 and 2008 was incomplete, an analysis could not be undertaken.



Hour	0001-0200	0201-0400	0401-0600	0601-0800	0801-1000	1001-1200	1201-1400	1401-1600	1601-1800	1801-2000	2001-2200	2201-2400
Fatal	16	6	9	42	21	22	24	28	27	27	18	11
Serious	15	11	7	31	14	18	39	22	24	16	19	10
Slight	23	18	11	67	47	53	72	67	87	69	60	44

Figure 1 Buses involved in accidents (2006)

Though crash risk itself during the wee hours appears lower than the non wee hours, when crashes occur, they tend to be more severe, thus claiming many lives. Figure 2 indicates that fatality and casualty rates per bus accident are higher during the wee hours as compared to the non wee hours. In general, though a crash during the wee hours causes more death and severe injury per bus accident, the cumulative numbers of fatal and severe crashes are higher during the non wee-hour period compared to the wee-hours. Table 1 indicates that the existing numbers of fatal and severe crashes are 1.7 and 1.8 times higher during the non wee hours compared to the wee-hour period. From the total number of fatal crashes involving buses, 62.5% occurred during the non wee hours compared to the wee hours (37.5%). Similar findings were also observed for severe crashes where 64.3% of all severe crashes occurred during the non wee hours.

Table 1 Number of cumulative fatal and severe bus accidents by period of crashes

Cumulative number of accidents	Wee hours (>12pm≤8am)	Non wee hours (>12pm≤8am)	Ratio (Wee-hours: Non wee-hours)
Fatal	94	157	1:1.7
Severe	82	148	1:1.8

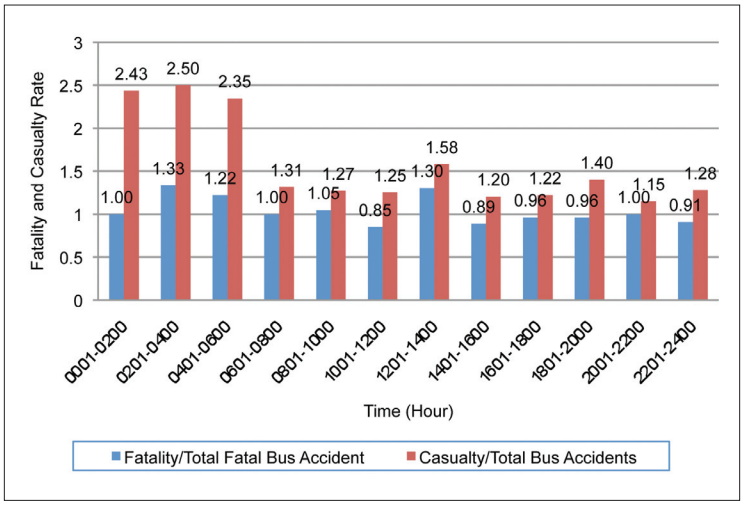


Figure 2 Fatality and casualties rate by time for year 2006

Figure 3 illustrates the distribution of bus accidents investigated by MIROS for the years 2007 and 2008 in terms of accident occurrence times. From the figure two peak periods can be seen for both accidents with fatalities and injuries. The first peak is between 0300 hours and 0500 hours and the second peak is between 1400 hours and 1800 hours. Figure 3 shows the two prominent times of the day when most of the accidents occurred. These findings mirror other existing studies that show two distinct periods of higher accident rates, one between 0300 hours and 0500 hours, and a smaller peak between 1400 hours and 1500 hours (Lenne *et al.* 1997).

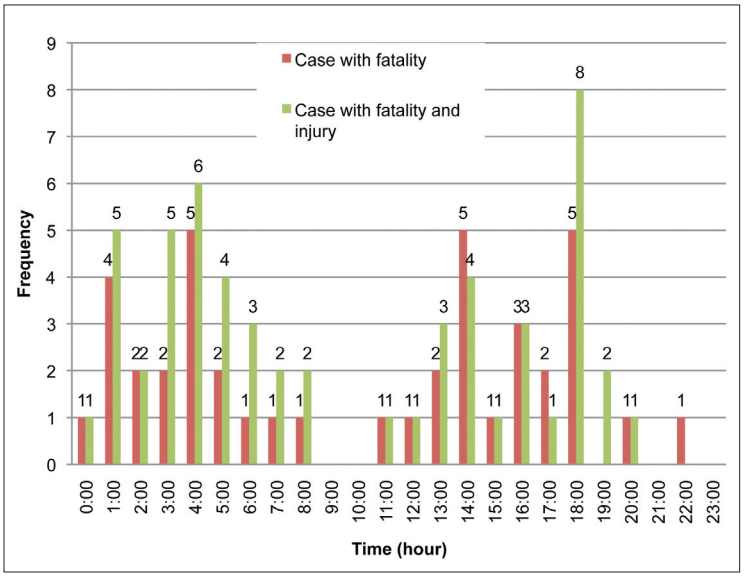


Figure 3 Distribution of bus accidents investigated by MIROS from 2007 to 2008

2.2 Present Operation Scenario and Demand

To obtain information on the current operation scenario and demand, MIROS gathered information on the operations of a number of bus companies such as the number of trips and passengers during wee hours and the non wee-hours. Six bus operators were selected based on the widest coverage of trips and had the potential to operate during wee hours. However, only four responded to provide the required information.

Based on the data collected and as shown in Table 2, the proportion of wee-hour trips was higher for all bus companies except the Konsortium Transnasional Berhad (KTB). Utama Ekspress recorded the highest proportion of wee-hour trips (78.6%) followed by Darul Naim Express Sdn Bhd (69.7%), and Konsortium Bas Ekspress Semenanjung (KBES) (61.6%). Though the wee-hour period was shorter (6 hours, from 12am to 6am) compared to the non wee hour period (18 hours, from 6am to 11pm), on average, more than half of the bus trips and passengers were recorded during that period. This obviously reflects a high demand for night bus trips.

Table 2 Numbers of trips during wee hours and non wee hours by bus operators during weekends and weekdays

No	Operators	Total trips (per month)	Wee hours (12am-6am)		Non wee hours (>6am-<12pm)	
			Number of trips (%)		Number of trips (%)	
			Weekdays	Weekends	Weekdays	Weekends
1.	Konsortium Transnasional Berhad (KTB)	7 058	*3 145 (44.5)		*3 913 (55.5)	
2.	Konsortium Bas Ekspres Semenanjung (KBES)	4 140	*2 550 (61.6)		*1 590 (38.4)	
3.	Darul Naim Express Sdn Bhd	132	92 (69.7)		40 (30.3)	
			60 (45.5)	32 (24.2)	40 (30.3)	0 (0.0)
4.	Utama Ekspress Sdn Bhd	28	*22 (78.6)		*6 (21.4)	

* Data based on weekday/weekend was not provided by the bus operators

Table 3 shows data on the number of bus passengers according to the period of operation. In general, the percentage of passengers travelling during the wee hours was higher compared to the non wee hours for all bus operators except KTB. This indicates that a lot of passengers would prefer night trips. For Utama Ekspres Sdn Bhd, though they provide both day and night trips for long journeys, all their passengers chose to travel during the night. Furthermore, according to Darul Naim Express, the number of night trips would be increased during school and public holidays.

Table 3 Total number of passengers travelling during the wee hours and non wee hours for weekdays and weekends by bus operators

No	Operators	Total trips (per month)	Total Passengers		Wee hours (12am-6am)		Non wee hours (>6am-<12pm)	
			Weekdays	Weekends	Weekdays	Weekends	Weekdays	Weekends
1.	Konsortium Transnasional Berhad (KTB)	7 058	*190 000		*96 000 (50.5)		*94 000 (49.5)	
2.	Konsortium Bas Ekspres Semenanjung (KBES)	4 140	*92 550		*56 100 (60.6)		*36 450 (39.4)	
3.	Darul Naim Express Sdn Bhd	132	3 396		2 396 (70.6)		1 000 (29.4)	
			2 500	896	1 500 (60.040)	896 (100.0)	1 000 (29.4)	0 (0.0)
4.	Utama Ekspress Sdn Bhd	28	*1 148		*902 (78.6)		*246 (21.4)	

* Data based on weekday/weekend was not provided by the bus operators

2.3 Stakeholders' Views

2.3.1 Passengers' views

A survey was conducted among the public who regularly use express buses as their mode of transportation to obtain passengers' views on the banning wee-hour operations by bus companies. A total of 161 respondents were interviewed with the age ranging from 19 to 53 years. The respondents were predominantly female (65.2%) compared to male (34.8%). Of the 161, 52.8% were students with higher education while 47.2% fell into the 'other' category. In terms of marital status, 75.8% were not married while 23.3% were married.

a) The majority of the respondents (88.2%) used express buses for personal reasons such as *balik kampung* and for holidays, while only 11.8% travelled on express buses for business/ working purposes.

b) More than half of the respondents (55.3%) travelled more frequently during the night.

c) A higher proportion of the respondents (78.0%) stated that they travel more frequently during weekends compared to weekdays (22.0%).

d) With regard to accident experiences while travelling by express bus, 11.2% of those who frequently travelled during the day had experienced at least one crash compared to 2.8% of those who frequently travelled at night.

e) More than half of the respondents (54.0%) disagreed with the proposed banning of the wee-hour operations. Among those who frequently travelled at night, only 26.4% agreed to the proposed banning.

f) The survey revealed that 62.0% of respondents will not switch to day time travelling if the night operation is banned. They would still prefer to travel at night by using either other modes of public transportation such as taxi, train and airplane (70%) or driving his or her private vehicle (30%).

g) More than half respondents (60.9%) expressed concern about the limited choice of time for travelling if the night operations were banned.

h) Based on the respondents' observation on the current situation, if the night operation is banned, and respondents switch from night to day trips, 55.9% and 49.7% of respondents believed that it could lead to heavy traffic jams during the day on the roads and at the bus terminals respectively.

2.3.2 Drivers' views

To obtain drivers' views, a few sessions of focus group discussions were conducted with bus drivers from 5 main bus companies (Konsortium Transnasional Berhad, Konsortium Express Mutiara, Mahligai, Sani Express, and Darul Naim Express Sdn Bhd). A total of 16 drivers were interviewed in 4 separate sessions. Each session took about one and half hours. Age of the drivers ranged from 40 to 59 while their work experience as a bus driver ranged from 5 to 30 years. All of them were long distance drivers plying the KL-Kota Bharu, KL-Baling, KL-Butterworth, KL-Kangar,

and KL-Alor Star, KL-Kuala Terengganu destinations. More than 60% of their trips involved driving during the wee hours. This arrangement was mainly due to demand from passengers. According to them, most of the night trips were fully occupied compared to day trips.

a) Causes of public bus express crashes during wee hours

To questions on crashes involving buses, the majority of the drivers stated that in most crashes, misbehaviour of other road users is the main cause of the accidents especially motorcyclists. Bus drivers also associated the crashes to poor road conditions. They lamented that despite this, bus drivers are always being blamed.

They did not agree with the statement that driving during the wee hours is solely the cause for falling asleep at wheel. The majority of the drivers stated that the main issue leading to fatigue is inadequate rest due to a tight work schedule especially during holidays and weekends. According to them, the root cause of the tight driving schedule is the inadequate number of drivers. They have to work around the clock in order to catch the next trip, thus speeding becomes inevitable.

On questions related to their preference for driving either at night or during the day, 75% (12 out of 16 drivers) of the drivers stated that there would be no difference in terms of their level of alertness while driving either during the day or the wee hours. The drivers dismissed wee-hour driving as a non issue because of their experience of years of driving a bus during the night. Another one-third of the drivers actually preferred to drive at night as they regarded it as more convenient compared to driving during the afternoon (2pm to 5pm) which could lead to lethargy and sleepiness. Another reason offered by drivers for their preference for night driving is less traffic especially cars and motorcycles during the night compared to the day. Therefore, the possibility of being involved in a crash is lower.

b) Method of salary payment

On questions related to payment and salaries received from bus companies, the drivers said that they were paid based on (Basic salary) *Gaji Pokok* and the number of trips made. The *gaji pokok* varies between the companies and as a whole their *gaji pokok* ranged from RM 300 to RM 700. Trip allowance also varies between companies - from RM 70 to RM 91 per trip. On average, during a normal season, the number of trips made ranged from 15 to 18 per month. Thus, during a normal period, their income (*gaji pokok* plus trip allowance) would vary from RM 1500 to 2000 per month depending on the number of trips they made. However, during any festive season, their income could go up to RM 2500 to RM 3500 per month due to the increased number of trips. According to them, if there were no night trips, it would mean a loss of more than 50% of trips for a long distance driver. This will definitely affect their income.

On questions related to whether they would resort to other work at night to recover loss of income, most of them stated a high possibility of working on extra jobs at night to compensate loss of income if their salary continues to be based on the number of trips per month.

c) Rest place and parking lot

The drivers also raised the issue of lack of a rest place at bus terminals. Normally, a driver will rest in the bus while waiting for the next departure. For a long distance driver, in the event there is no night trip, he has to stay overnight at the bus terminal before the next morning trip. If there is no proper place for a driver to sleep, the issue of inadequate rest and fatigue would not be resolved.

Bus drivers also regarded the issue of adequate parking places as critical. Without provision for adequate parking places, a driver could be summoned by an enforcement officer for wrongful parking and if that happened, based on the current practice, the driver would have to incur the expense of paying the fine which is not reimbursed.

In conclusion, drivers would be happy with the proposal if the following were undertaken:

1. their salary is revised accordingly to compensate loss of income;
2. accommodation is provided for them to sleep as they cannot afford to rent a room; and
3. parking lots are provided so that the issue of being summoned by an enforcement officer will not arise.

2.4 Bus Terminal Operator's Views

To obtain data on bus terminal operations, two main terminal operators were selected. However, only one terminal operator responded. Based on the information given by UDA Holdings, the maximum capacity of their terminal at any one time is about 200 buses for Puduraya Terminal and 50 buses for Hentian Duta. About 1000 trips per day (day and night) are made from Puduraya Terminal while 200 trips are made from Hentian Duta. According to the bus terminal operator, the current load has already caused congestion at both bus terminals during peak and non-peak hours. This may suggest that UDA Holdings will not be able to cope with additional buses if all bus operators convert all night trips to day trips if the new policy on banning wee-hour operations is adopted. However, a more qualitative assessment could not be made as existing data on the number of buses operating at a particular time was not made available to MIROS by the bus terminal operators.

3. Impact Assessment

This section will qualitatively explain the possible impacts of banning the wee-hour operations based on the input gathered from the profiling section.

3.1 Impact on Sleepiness and Fatigue Among Bus Drivers

The main objective of banning wee-hour driving is to address the issue of sleepiness and fatigue which is consequently expected to reduce crashes involving buses during that period of time. The circadian rhythms indicate two peaks in a day during which time an individual will experience the worst physical and mental performance. The first peak is during the middle of the night sleep period (between 1am to 6am), and the second peak occurs about 12 hours later, between 2pm and 4pm. Inadequate rest and sleep will increase the need for sleep especially during these peak hours.

The move to ban wee-hour driving may only resolve the issue of driver fatigue during the first peak. However, the second peak is as critical as the first peak if the underlying factors of inadequate rest and sleep among drivers are not rectified. Assuming wee-hour driving is banned, for a long distance trip, the driver would have to stay overnight at the final destination before the next morning trip. Going by the current situation, no proper rest place is provided by the bus companies for drivers to stay overnight at the final destination and drivers cannot afford to use their own money to rent a room. This situation will aggravate the issue of inadequate sleep and rest as the issue of driver fatigue will not be resolved. In fact the situation could worsen as the normal practice is for the co-drivers to take a rest on the bus during the journey at night. They no longer have the opportunity to do so.

Based on their responses, there is high possibility that the drivers will find part time work or odd jobs at night to replace income lost as their monthly salary could be reduced by as much as 50% if banning of wee-hour driving is implemented. This is critical as banning will not resolve the issues of inadequate rest and sleep. Therefore falling asleep at the wheel during the day especially during the second peak period of the circadian rhythm would still remain a problem.

In conclusion, banning wee-hour operations is not likely to resolve the issue of driver fatigue, and has the possibility of worsening the situation if fundamental issues like the availability of resting and sleeping places, and salary scheme and method of payment to drivers are not improved. Thus, falling asleep at the wheel during the non wee hours could still remain a major problem leading to crashes involving buses.

3.2 Impact on Road Safety

3.2.1 Crashes involving public express buses

Should banning of wee-hour operations be implemented, crashes involving buses during the wee hours will certainly be prevented as no buses will be travelling during that period. However, there will be more buses travelling during the day to compensate for the trips lost and to meet public demand for transport. The volume of traffic during the day is expected to be much higher than during the wee-hour period; as such, the likelihood of crashes is expected to be higher. As stated by road safety experts, exposure to a higher traffic volume is one of the major risk factors in the occurrence of a crash. Of course, other factors such as behaviour, road environment and vehicle factors also play an important role. The observed trend of public express bus crashes confirms these views. Based on accident data analysis, three peak periods are noted for the occurrence of bus crashes in a day, that is, between 6am to 8am, 12pm to 2pm and 4pm to 6pm. The first period is when most people are travelling to their work place; the second is during lunch hour break and the

third period is when people are travelling home from the work place. This indicates that busy traffic could be one of the factors contributing to bus crashes. The interaction between higher traffic exposure during the day, effect of circadian rhythms and day time fatigue is likely to increase the chances of a crash during day time. Accident data analysis based on cases investigated by MIROS supports this view. The findings of MIROS are also consistent with other existing studies that show two distinct periods of higher accident rates: a first peak between 0300 hours and 0500 hours, and a second peak between 1400 hours and 1500 hours (Lenne *et al.* 1997). Essentially, banning wee-hour operations is likely to switch a large number of buses plying at night to day time trips and this could possibly increase further the chances of crashes occurring during the second peak.

Based on the passenger survey, 11.2% of those who frequently travelled during the day had experienced a crash, compared to only 2.8% of those who frequently travelled at night. These findings support the view that the chances of a crash occurring during the day are higher compared to its occurrence during the wee-hour period. As mentioned in the profiling section, the ratio of cumulative fatal and severe crashes between the wee-hour and the non wee-hour period was 1 to 1.7 for fatal, and 1 to 1.8 for a severe crash. With an increasing number of buses during the day, the cumulative number of fatal and severe crashes could possibly increase further.

Further, banning of wee-hour operations would result in rigid operation hours. This could be another factor contributing towards increased chances of crashes as it is likely to exert pressure on drivers to reach their destination by mid-night. Drivers will resort to speeding to reach their destinations by mid-night and this likely to result in a non conducive working environment.

Those findings support the assumption that the impact of wee-hour operations banning could possibly shift the wee-hour crash burden to non wee hours instead of reducing the overall number of crashes.

3.2.2 Modal shift and likelihood of crashes involving other vehicles

Among those who regularly travel at night, 62% stated that they would travel at night but by other available modes of transportation. 18.3% of respondents stated that they would travel using their own transport while 42.3% would travel using other modes of public transportation such as taxi, train and air based on the availability of service to their destination. However, a review of current public transportation services indicates that not many places are accessible by train. Travelling long distances using a taxi could be as dangerous as travelling using a private car, costly and beyond the affordability of the public. The socio-economic background of those who regularly use express buses indicates that many cannot afford air travel. Therefore, given the current public transportation services scenario, a higher proportion of those who regularly travel at night would likely resort to travelling using their own transport. Thus, this could be more dangerous and furthermore it is not consistent with the road safety theme "using public transport reduce crashes" promoted by the government. Banning wee-hour operations of public express buses could endanger up to 62% of people who regularly travel at night as they would still choose to travel at night by using other modes of transportation. This finding is very critical as most of the affected passengers could be considered as non regular wee-hour drivers; thus, the effect of circadian rhythms on fatigue while driving their own private car or motorcycle during the wee hours would have far more serious implications for them. This could well turn out to be a fatal journey for them.

3.3 Socio-economic Impacts

3.3.1 Drivers

Based on the current payment scheme, that is, *Gaji Pokok* and payment for each trip made, there would be a significant reduction in income for drivers if no trips are allowed during

the wee-hour period. According to the long distance drivers, it would result in a more that 50% reduction in income as more than 50% of the their trips could easily be lost. This significant income reduction may pose as the driving factor to hold part-time or odd jobs at night while continuing to drive during the day. Thus, the problem of not having enough sleep and rest will continue to prevail; they may fall asleep at the wheel during the day especially in the afternoon when the circadian rhythm moves the body towards sleep. Hence, these negative impacts could defeat the purpose of banning wee-hour operations.

3.3.2 Passengers

Among those who would still choose to travel at night if the night operations of public buses are banned, 68.2% stated that they would switch to other modes of public transport such as taxi, train and air, while 31.8% stated that they would travel using their own private vehicle. In general, other modes of transportation are relatively more expensive than using an express bus. This would impose an additional financial burden on passengers especially those from low economic backgrounds.

Another mode of relatively cheap public transportation is the train but train services are only limited to cover certain designated routes, benefiting only certain groups of people. Limited train services would be very inconvenient to the public and this could result in frustration and anger.

3.3.3 Sustainability of the public express bus operations

There will be a significant reduction in number of trips and passengers recorded by bus operators and this will directly affect their revenue. For a long distance journey such as KL-Kota Bharu, KL-Terengganu, KL-Baling, KL-Kangar, KL-Alor Star and other destinations with equivalent kilometres travel, return trips would not be possible for buses which depart later than 9am. Only with

the first trip in the morning would it be possible to do a return trip as it is expected to reach the destination by mid-night provided the return journey starts not later than 5pm. An illustration of the trips is shown in Figure 4. If there is no incentive scheme provided by the government, the bus operators have to increase fares to recover income loss and subsequently it is the public that has to pay higher prices. The public may refuse to use public transport if they have other options and this will increase the number of people shifting to non public transport modes of travel. This would defeat the ministry's call to use public transport as well as increase the chances of crashes occurring.

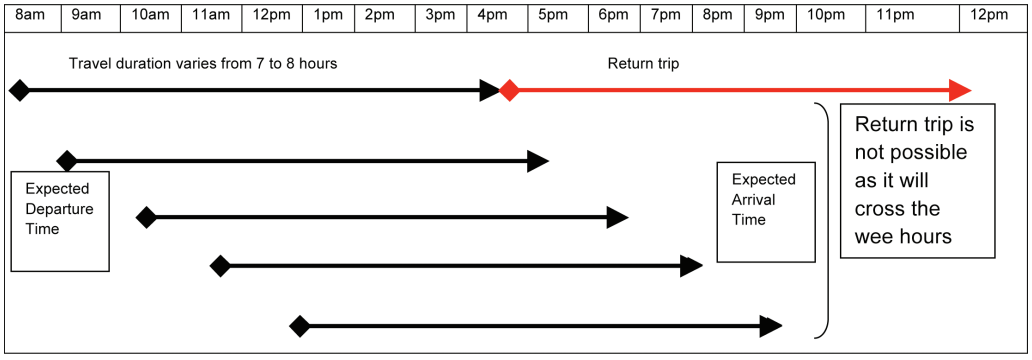


Figure 4 Illustration of bus trips for a long distance journey

3.3.4 Traffic congestion at bus terminals

The current situation indicates that the traffic load is already causing congestion at the bus terminals during peak and non peak hours. If wee-hour operations are banned, almost all of the night trips would be converted to day trips. This would impose an additional 60% burden on bus terminal operators during the day. Based on the current capacity, it is obvious that UDA Holdings will not be able to accommodate the additional buses if all bus operators were to switch their night trips to day time trips after the implementation of this new policy. Other bus terminals are also likely to face a similar problem.

4. Summary

Driver fatigue is well documented as a risk factor for a crash that could occur at any period of driving. Several studies on driver fatigue and crashes did not specifically identify wee-hour driving as the only cause of fatigue. It is however established, that driving and working hours are important determinants of driver fatigue. The banning of driving during wee hours is not likely to resolve the issue of driver fatigue, and yet has the potential to worsen the problem if the fundamental issues related to inadequate rest and sleep are not remedied. For a long distance driver, banning of wee-hour driving would require them to stay overnight at their final destination. As there is no proper place for them to sleep at the final destination, the issue of inadequate of rest and sleep would remain a major problem.

There will be a high tendency towards part time work at night by drivers to compensate the loss of income as banning of wee-hour driving could result in a more than a 50% reduction in trips made, which would translate into significant loss of income. This will defeat the purpose of banning wee-hour driving as the issues of inadequate rest and sleep would continue to be a problem.

The implementation of banning wee-hour operations also raises the possibility of shifting the wee-hour crash burden to the non wee-hour period instead of reducing the number of overall crashes. Based on current findings, 62.5% of fatal and 64.3% of severe crashes occurred during the non wee hours. The banning is likely to result in a big increase in the number of buses switching to day time operations. The large number of buses on the road during the day time especially during busy hours would also increase leading to increased chances for crashes to occur.

The banning of wee-hour operations is also likely to have an impact on the modal shift as 62% of passengers would still prefer to travel at night but using other mode of transportation

including their own transport. This modal shift would emerge as an issue of road safety as a higher proportion of passengers may switch to a more dangerous mode of transportation such as driving a private vehicle during the wee-hours when traditionally they are not wee-hour drivers. A higher cumulative number of fatalities and severely injured victims could arise either as a result of public bus crashes during the non wee hours or crashes involving private vehicles during the wee hours.

The move to ban wee-hour operations could possibly result in more negative impacts on the overall road safety agenda if fundamental issues such as driving and working hours, resting and sleep places for drivers, and a safer and more accessible public transportation system as an alternative to those who still choose to travel at night are not improved.

The proposed banning of wee-hour operations is also not a feasible solution for sustainability of express bus operations in this country especially for those who operate long distance journeys.

All of the possible impacts is summarised as an impact tree and shown in Figure 5.

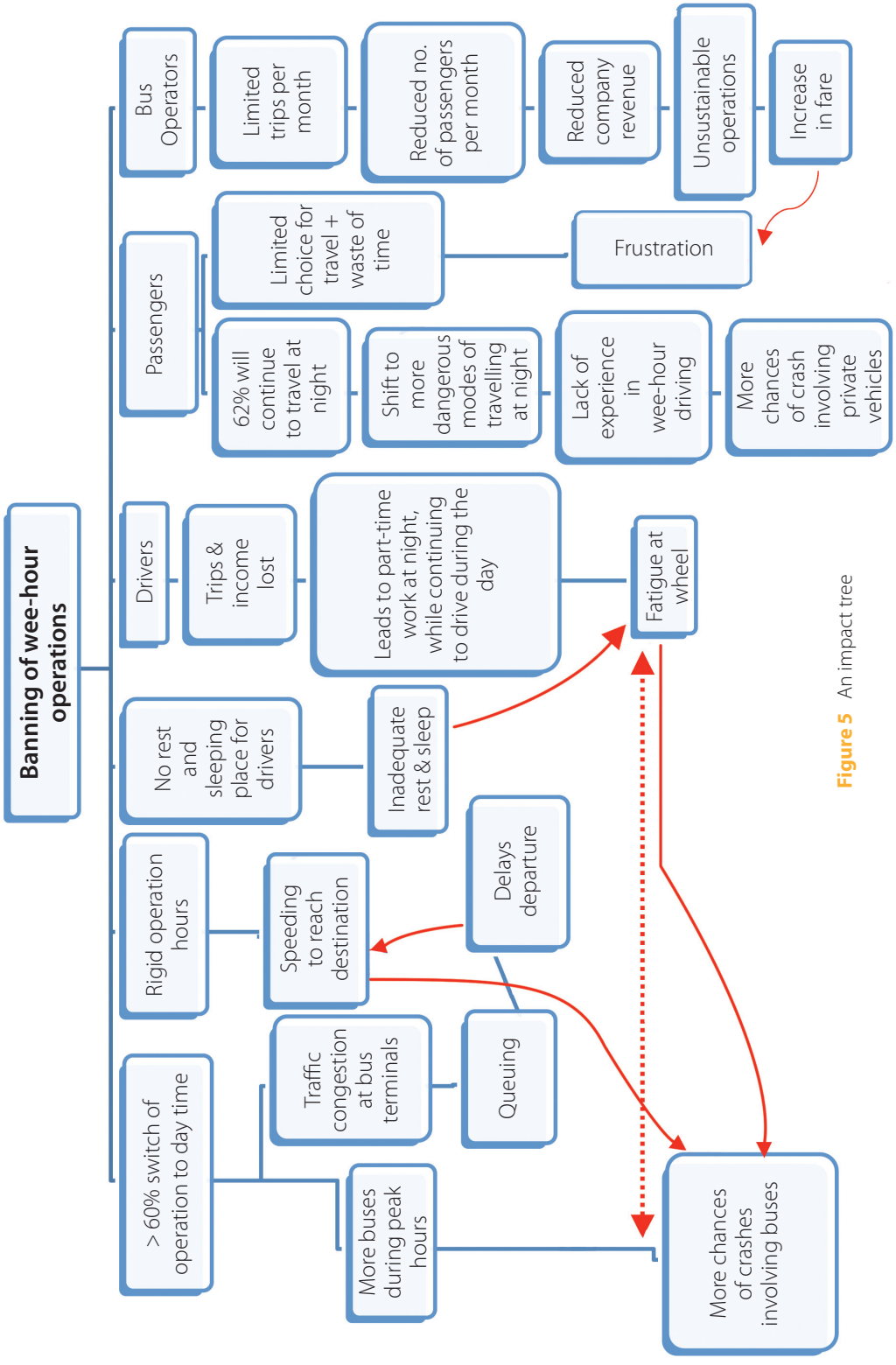


Figure 5 An impact tree

5. Recommendations

The findings of this impact assessment does not support total banning of wee-hour operations as a solution towards reducing crashes resulting from driver fatigue and falling asleep on the wheel. Furthermore, the ban will not be in line with international standards which would seek better management of wee-hour operations. A more holistic approach considering all aspects of major road safety risks leading to a crash such as exposure factors, behavioural factors, vehicle safety factors and road environment factors would serve as a better solution to reducing crashes involving express buses regardless of time period of the operation.

As mentioned in the earlier report of MIROS (MER 04/2009), ultimately, at all times, all bus operators have to fully comply with Safety, Health and the Environment Code of Practice (SHE COP; MCP 1/2007). All buses have to comply with good safety standards, such as the UNECE R66, R80 and R36*, to be on the road.

However, as an interim measure to the above requirements, the high risk of travelling during the wee hours may be addressed via the following recommendations:

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UNECE R66:	Uniform Technical Prescriptions Concerning The Approval of Large Passenger Vehicles With Regard to The Strength of Their Superstructure
UNECE R80:	Uniform Provisions Concerning The Approval of Seats of Large Passenger Vehicles and of These Vehicles With Regard to The Strength of The Seats and Their Anchorages
UNECE R36:	Uniform Provisions Concerning The Approval of Large Passenger Vehicles With Regard to Their General Construction

i. Do not allow any bus operator without satisfactory compliance to the SHE COP to operate during the wee hours.
ii. Do not allow any bus with sub-standard safety elements to be on the road during the wee hours.

Although disruptions to the public will be lower compared to a total ban of all non-compliance operators and for all sub-standard buses to be off the road, MIROS still anticipates significant resistance from operators and the affected public. Thus, the following are also recommended for consideration as an interim approach for a specific grace period:

i. Strengthen and have full enforcement of the log book system.
ii. Complete compliance with driving and working hour requirements as stated in the SHE COP (MCP 1/2007).
iii. Develop and enforce complementary requirements to the SHE COP in scheduling night shifts for drivers. Thus, the circadian rhythm and sleep loss during wee-hour driving will be properly taken care of and managed.

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Research Report

An Impact Assessment of Banning Wee-Hour Express Bus Operation

MIROS
MALAYSIAN INSTITUTE OF ROAD SAFETY RESEARCH

Malaysian Institute of Road Safety Research
Lot 125-135, Jalan TKS 1, Taman Kajang Sentral
43000 Kajang, Selangor Darul Ehsan
Tel +603 8924 9200 **Fax** + 603 8733 2005
Website www.miros.gov.my **Email** dg@miros.gov.my