

Loss of Manpower due to Road Traffic Congestion in Kandy City: A Comparison between Different Vehicle Users

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Keywords: *Manpower; Traffic Congestion; Vehicle Users; Kandy*

Introduction

Traffic congestion is widely seen as a growing problem in many urban centers in Sri Lanka. The total vehicle population in the country has dramatically increased with an average annual growth rate of 6 % between 2008 and 2016 (Karunarathna, 2019). According to vehicle registration records of the Department of Motor Traffic, in peak hours, more than 3 million automobiles use road infrastructure all over the country. At present, while the total number of households in the country is 5.1 million, total number of vehicles in use is 6.4 million showing that the number of vehicle population is higher than the number of families (households) in the country. Of these, 50 % of automobiles are inbound to Colombo and Kandy while most of them are personally owned automobiles (Karunarathna, 2019). This growing trend in the vehicle population has important implications for Sri Lankan society, economy and the environment while creating severe traffic congestion in major cities.

The overall volume of vehicular traffic congestion continues to grow faster than the capacity of the urban road transportation system in the last decade. Road traffic congestion directly reduces productivity levels and adds additional costs to the total production cost in term of a loss of resources. It creates a huge loss of manpower as most commuters have to spend their productive time or leisure time on roads travelling. A few recent studies (Maparu and Pandit, 2010; Xu et al., 2013; Zhang et al., 2014) show that traffic

congestion leads to increase in the operating cost of vehicles, delay of the journey, increase in pollution and in stress. The results of these studies indicate a considerable monetary loss that is incurring due to traffic congestion. However, most of these studies have tended to concentrate on a particular aspect of congestion such as environment cost, emission etc. rather than analyzing the value of the loss of manpower which can be the most important component of the total cost of traffic congestion. Accordingly, this study will partly attempt to fill this void in the literature by using travel time survey data in Kandy City in Sri Lanka.

Objectives

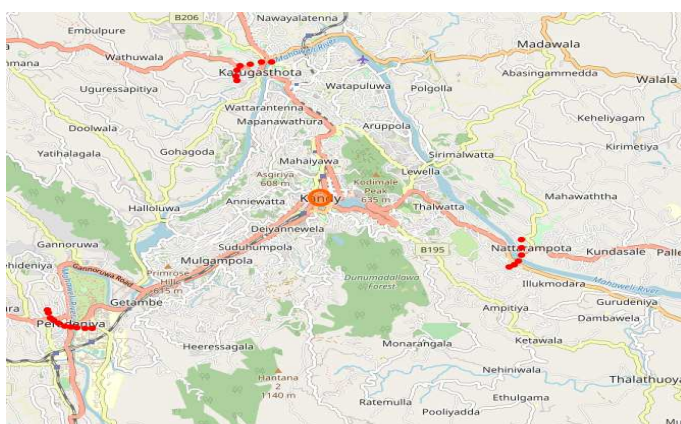
Road traffic congestion directly creates a loss of resources including manpower (Hartgen and Fields, 2009; Harriet et al. 2013). In this context, the main objective of this study is to estimate the value of the loss of manpower due to traffic congestion in Kandy City in Sri Lanka. It also compares the costs among different road users.

Methodology

This research mainly employs descriptive statistics of simple averages to analyze the field survey data. To measure the manpower loss of traffic congestion, data collected from coverage of various commuters and a road monitoring survey carried out in November 2018 are used. Data from a Vehicle Monitoring Survey covering three road corridors of the Kandy city in November 2018 is mainly used to identify the number of vehicles entering the city each day. Also, a Time Monitoring Survey carried out during the same month is used to estimate the delay time (difference between the actual time taken and average time given by Google-non traffic) for each vehicle category. We also identified the average number of passengers travelling in each vehicle using different survey techniques. Finally, the socio- economic survey covering different vehicles users is carried out to calculate the average wage rate of each category. The value of the manpower loss is estimated by combining all the survey data.

Results and Discussion

Kandy is one of the major cities in Sri Lanka located in the central province. About 0.18 million people reside within the Kandy Municipal Council (KMC) limits and more than 56,000 vehicles move daily within the area. Kandy traffic problems have made a severe impact on people by causing inconvenience as it has affected them socially and economically. At present, the Government of Sri Lanka has undertaken several expressway and road development projects that will link every part of the country. However, the government has still not taken any steps to overcome the issues related to traffic congestion in Kandy city. With this background, we identified three main corridors which lead to Kandy city from other places in the country. It presented in Figure 1.



Corridor 1 (C1)
Peradeniya Town and
Kandy Clock Tower /
Hospital – A1/AB42

Corridor 2 (C2)
Katugasthota Town and
Kandy Market Station –
A6/B518

Corridor 3 (C3)
Thennekumbura Bridge
and Kandy Market
Station – A26/B521

Figure 1: Main three corridors selected for the survey

Table 1: Total number of vehicles entering the city from each corridor

Time Slot	Corridor 1	Corridor 2	Corridor 3	Total	%
06 am -09 am	6,527	4,778	2,092	13,397	24
09 am-12 am	4,968	2,247	2247	9,462	17
12 pm-03 pm	5,480	3,278	3278	12,036	21
03 pm-06 pm	3,660	2,437	2437	8,534	15
06 pm-09 pm	2,804	1,307	1,199	5,310	9
09 pm- 06am	2,634	1,043	1,132	4,809	9
Total	26,073	15,090	14,877	56,040	100
Percentage (%)	46.53	26.93	26.55		

Note: Survey data is used to calculate the averages in each time slot

In many urban areas, there are increasing concerns about how the growth of traffic congestion may adversely affect the area's economy (business sales and income). At the most basic level, increasing congestion is associated with the type of vehicles that use the road as some trips on the road system related to some vehicles such as truck and bus will entail longer travel times for riders and higher vehicle operating costs for vehicle operators. The added time and the expenses for drivers and passengers are the key elements of the total congestion costs, in addition to the cost of emission. Therefore, it is vital to identify time period that different type of vehicles enter the city on a particular day. Table 1 and 2 reports the average number of vehicles and the type of vehicles accessing the city in a given working day. During business days in Kandy city, traffic congestion reaches a great intensity at predictable times of the day due to a large number of vehicles using the road at the same time. This phenomenon is called peak hour, although the period of high traffic intensity often exceeds one hour. In some places of the city, traffic volume is consistently extremely high during peak hours which is evident in the data given by Table 1. We also identified the type of vehicles entering the city from each corridor in a particular day given in Table 2.

Table 2: Type of vehicles entering the city (%)

Type	Corridor 1	Corridor 2	Corridor 3	Average	%
Bus	7.57	5.72	6.18	6.49	6.49
Lorry	4.00	3.91	3.85	3.92	4.90
Truck	0.44	0.38	0.46	0.43	
Bowser	0.36	0.52	0.76	0.55	
Car	24.63	24.00	23.82	24.15	32.60
Cabs	1.79	1.42	1.33	1.51	
Jeep	2.97	4.08	4.64	3.89	
Wagon	3.21	3.21	2.72	3.05	
Van	5.35	7.93	8.67	7.32	7.32
Ambulance	0.14	0.21	0.16	0.17	0.17
Three-wheeler	23.75	21.96	20.21	21.97	21.97
Motorcycle	25.52	26.34	26.97	26.28	26.28
Others	0.26	0.33	0.22	0.27	0.27

Note: Vehicle type is further categorized to identify the loss of manpower

According to the monitoring survey, approximately 0.28 million working age people entering the Kandy City from the three main corridors daily. All these commuters are involved in extra-time loss and sometimes delays, which may result in late arrival for employment, meetings, and education, resulting in lost business and income, disciplinary action or other personal losses. In this context, we estimated the total number of loss time (number of minutes) for different vehicle users per day due to traffic congestion and identified the monetary value of it based on the wage rate estimated. These estimations presented in Table 3.

Table 3: Estimate of the total value of the manpower loss per day

Vehicle Type	Total Vehicle No.	Total Passenger No.	Loss time (minutes)	Average Salary (Rs.)	Total Loss (Rs./ Per day)
Bus	3,620	152,040	34	1,561	16,811,190
Lorry, Truck					
Bowser	2,081	4,162	38	2,430	800,664
Car, Cabs,					
Jeep, Wagon	14,390	28,780	31	7,228	13,434,744
Van	3,427	41,124	28	1,273	3,053,800
Three Wheel	10,144	30,432	6	2,890	1,099,356
Motorcycles	12,408	24,816	-2	1,683	-174,022
Total (Rs.)					35,025,732

Note: i. Average salary is estimated based on the discussion carried out with each category. Data are only from 12 hours per day (6.00am to 6.00pm). ii. Total number of passengers is adjusted for kids/old for the bus, car, van, three wheel and motorcycles. iii. Negative number represent the benefits as their vehicles move greater than average speed.

Table 3 reports the time loss due to traffic congestion per day under each vehicle category. The total number of passengers, adjustment for kids/old commuters, average salary in each group, etc. were estimated based on several qualitative surveys carried out in the same month. Loss time (number of minutes) is the average delay time between 6.00am and 6.00pm per day. Accordingly the average loss number of man-dates per day for all commuters are approximately 15,634 for all and the value approximately about 35 million rupees per day, which is about 0.7 billion rupees per month, assuming 20 working days per month. Manpower loss is relatively higher for bus (47 %) and car, cabs, jeep or wagon user (38 %).

Conclusion

The main objective of this research is to estimate the total loss of manpower due to road traffic congestion in Kandy city in Sri Lanka. Results show that on average the value of the loss of manpower due to traffic congestion is approximately Rs. 35 million per day and which is significantly higher in public or private bus users as well as private vehicle users such as car, cabs, jeep and wagon. This indicates the magnitudes of the economic loss incurred each day due to existing traffic congestion in the city. Therefore, steps need to be taken to reduce traffic congestion and provide significant economic benefits to the commuters and the economy. According to the commuter survey, it is evident that 98 % of the respondents perceived that existing traffic congestion has some serious impact on increasing their mental stress level while approximately 97 % of the respondents accepted that traffic congestion results in decreasing their productivity in the workplace. Furthermore, it is found that the number of crossing roads, the number of vehicles parked along the roadsides, crossing rail tracks, closer location of schools, hospitals, temples, availability of number of small temporary shops (small hut-type shops) along the roadsides, narrow crossing bridge and availability of main junctions have resulted in increasing traffic congestion significantly in the study area.

References

- Karunaratna, M. (2019). Loss of Manpower due to road traffic Congestion in Sri Lanka: The case of Kandy city, *Applied Economics and Business*, 3(1) 55 - 69.
- Maparu, T. S. and D. Pandit. (2010). A Methodology for Selection of Bus Rapid Transit Corridors: A Case Study of Kolkata, *India Journal*, 7: 21-36.
- Xu, L., Yue, Y., and Q. Li. (2013). Identifying urban traffic congestion pattern from historical floating car data. *Social and Behavioral Sciences*, 96: 2084 – 2095.