

# INTRODUCTION OF TWO-WAY CENTER TURN LANE IN SRI LANKA

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**ABSTRACT** - Automobiles that enter a minor road from the main road or turn for services create congestions by holding traffic to make a right turn in two-way streets. As a solution, this paper proposes the ‘Center Turn Lane (CTL)’ concept used by some countries allowing the driver to make turns with caution without holding traffic in the lane. This research aims to investigate CTL as a feasible solution to aforesaid problem. A field study was conducted to qualify the magnitude of the issue and an interview survey was conducted among Sri Lankan drivers to gather the opinion of the proposed solution. According to the results, 60% of the respondents were not familiar with CTL. Furthermore, 49% of participants have stated that it is difficult to make right turns without holding traffic due to oncoming vehicles. According to the drivers’ judgment, an average of 37s is needed to make a right turn. While the field study data suggested that drivers spend an average of 25s. Based on the proposed solution motorists will only spend 12.5s to make a right turn in an ideal condition. This paper suggests that implementing a CTL would be an effective method to mitigate traffic congestions in Sri Lanka.

**Keywords:** Center turn lane; Right turns; Traffic congestion

## 1. INTRODUCTION

With current road regulations in Sri Lanka, a driver making a right turn in two-way road will need to wait till the opposing incoming traffic is cleared which leads to the hold up of traffic flow behind them. This causes drivers who are waiting, to take risky turns under pressure which leads to accidents. While disruptive traffic flow increases commuter anxiety, it negatively impacts the environment by increasing CO<sub>2</sub> levels. To minimize potential accidents and reduce traffic congestion, some countries have introduced the concept of ‘Center Turn Lane’ (CTL) (Figure 1). A CTL is a single lane in the middle of a two-way street (Figure 2) which vehicles use to make right turns. It can be used to turn right without interrupting the flow of traffic in the existing lane and can be used for drivers who are entering the main road from other side streets.



Figure 1. Sign of Center Turn Lane [1]

(Saskatchewan Driver’s Handbook, 2019)

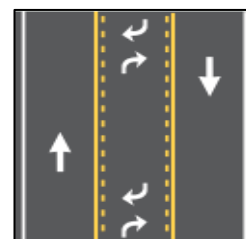


Figure 2. Center Turn Lane [2]

(Road Diet Informational Guide, 2021)

After the installation of CTL operation flexibility was improved [3], cost-effectiveness and safety were also increased in many cities [4,5,6,7]. Safety in CTL was increased by decreasing speed differential [2,8]. Before and after study that was conducted in Iowa state stipulates that crash rate was reduced by 18.8% and crash frequency per mile was reduced by 25.2% after implementing CTL [9]. In essence to Datta, the introduction of CTL has reduced travel time, the number of brakes, delays, accidents by 75% and enhanced the level of service (LOS) [6]. Subsequently, Nemeth et al. has proved that crashes such as midblock-left-turn collisions, rear-end collisions, sideswipe collisions, head-on collisions can be reduced by this lane [5]. Nemeth et al. presented that CTL generated the potential of saving fuel by reducing stops and delays [10]. This research aims to quantify the right-turn waiting time in Sri Lanka and investigating Sri Lankan driver perceptions of CTL.

## 2. METHODOLOGY

This study was conducted in two steps: observation survey and questionnaires survey. An observation study was done at Bandarawatte minor road which connects to Colombo-Kandy main road (GPS Coordinates are 7.01, 79.96). Vehicles that are approaching from Colombo direction and turning right for Bandarawatte minor road were observed. The time that was taken by a driver to make a right turn from the main road to a minor road was measured using a stopwatch. Accordingly, the observed waiting times were estimated and minimum awaiting time with the introduction of CTL was estimated making following assumptions. Vehicles speed when using CTL is 20kmph, the allowable gap between two vehicles is 10m [11], no vehicles are coming from the opposite direction, allowable travel distance in CTL is 200ft (61m) without deceleration [11], take perception reaction time as 1.5s were assumed when calculating the waiting time. The field study was conducted from 6:45 a.m. - 8:45 a.m. on 06th April 2021 and 81 vehicles were observed. An online questionnaire was conducted among Sri Lankan drivers to investigate driver perceptions of implementing the CTL in Sri Lanka. A brief introduction about the proposed solution was demonstrated, in the questionnaire form. The questionnaire consisted of close-ended questions and one open-ended question.

## 3. RESULTS AND DISCUSSION

According to the questionnaire survey (Table 1), respondents make six right turns per day and wait for 37s on average to make a right turn. They must wait four minutes to make all six turns. Summary of the collected waiting time data on the field study (Table 2) indicates that vehicles spend about 25.35s on average to make a right turn. The estimated minimum awaiting time with introduction of CTL to make a right turn was 12.48s. Figures 3-8 show the characteristics and the results of the questionnaire survey. The responses for the open-ended question on “what are the difficulties when you are making a right turn in a single carriageway two-way street?” was as followed. About 49% of participants stated that it is difficult to make a right turn without holding traffic due to incoming vehicles. Additionally, 38% of the respondents stated that they tend to make risky turns due to pressure from drivers behind them and drivers who do not follow road regulations.

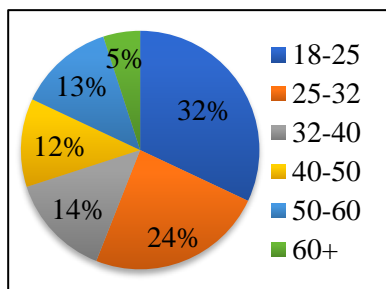
**Table 1.** Estimation of Average Right Turns and Waiting Time According to the Questionnaire Survey

Right Turn class	Mid value ( $u_i$ )	Respondents ( $f_i$ )	$f_i u_i$	Time class (s)	Mid value (s) ( $m_i$ )	Respondents ( $f_i$ )	$f_i m_i$ (s)
1-3	2	31	62	0-14	7	13	91
4-6	5	32	160	15-29	22	27	594

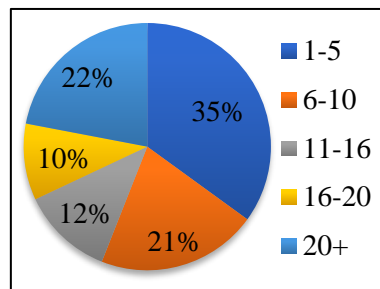
7-9	8	18	144	30-44	37	19	703
10-12	11	6	66	45-59	52	18	936
12+	12	13	156	60 or 60+	60	23	1380
		$\Sigma=100$	$\Sigma=588$			$\Sigma=100$	$\Sigma=3704$
Avg. right turns made per day= $588/100 = 5.88 \sim 6$				Avg. wait time to make a turn= $3704/100= 37.04s$			

**Table 2.** Estimation of Average Waiting Time to Make a Right-Turn According to the Field Study

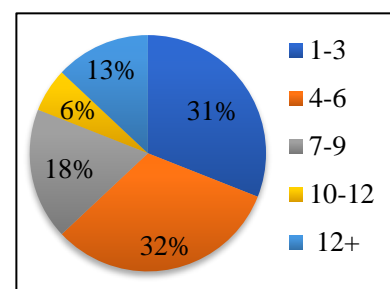
Vehicle Type	Cars	Van	Lorry	Cabs	Motorcycle	Three-wheeler	Total
Waiting time to make a turn (s)	604	78	99	47	547	679	2054
Number of vehicles observed	22	3	5	2	23	26	81
Standard Deviation (s)	10.47	7.21	4.97	2.12	13.61	13.16	-
Avg. time taken (s)	27.45	26	19.8	23.5	23.78	26.12	25.35



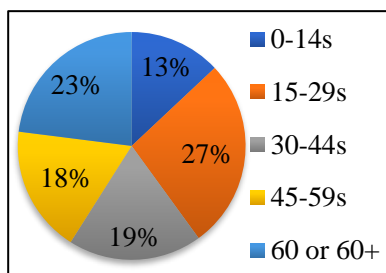
**Figure 3.** Respondents' Age in Years



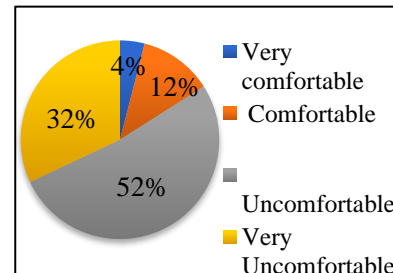
**Figure 4.** Respondents' Driving Experience in Years



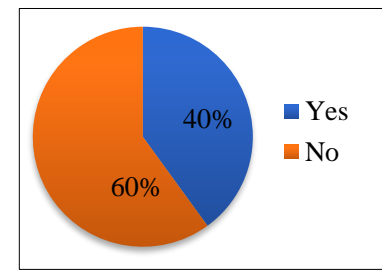
**Figure 5.** Number of Daily Right-Turns Made from Main Road



**Figure 6.** Waiting Time in Traffic to Make a Right Turn



**Figure 7.** Comfort Level when Making a Right-Turn



**Figure 8.** Familiarity of Center Turning Lane

## 4. CONCLUSION

CTL is a cost-effective and safe method used by countries to mitigate traffic congestions. A field study and a survey were conducted among drivers. To make a right turn, observation study showed that drivers spend 25s while questionnaire survey data suggests that drivers spend 37s. Based on the proposed solution the minimum time that motorists spend in ideal conditions to make a right turn is 12.5s—without holding traffic.

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