

Research on Automobile Average Speed Running on Roads in Ulaanbaatar

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Abstract: The higher speed of automobiles running on roads, the more automobiles can pass the road per unit of time. This shows that there is less traffic jam on the road. The opposite case can cause traffic jam, i.e. when the decreasing speed become equal to 0 or close to it, the traffic also becomes slower resulting in traffic jams. Some influencing factors of traffic jams on roads of Ulaanbaatar city change an average speed running on roads. Therefore the authors have considered that it is beneficial to carry out research on traffic jams.

Keywords: traffic jam, traffic speed, traffic intensity

1. INTRODUCTION

As one of the indexes to determine traffic jams in Ulaanbaatar, the traffic intensity on the roads of the city was measured on weekdays and weekends in November-autumn, on weekdays in December-winter. Automobile speed changes were measured and calculated on roads of relatively different intensity in the morning, afternoon, and evening by using up-to-date measuring device.

2. RESEARCH DESCRIPTION

1. Research was conducted on three routes, on three automobiles each equipped with the devices of "Garmin GPS Map 60CSx". The device measures the road travelled by the cars and registers the time consumed. Using this data we determined the average speed of the cars running on these routes.
2. Traffic speed is different depending on the width of the road, and other factors hindering traffic along the road. Concerning the above mentioned factors, we classified the roads where the traffic speed was measured into six categories. The conditions of the classified roads were explained in the Table1.
- 3.

Table 1. Road category

Road category	Explanation
1	Road with more traffic density depending on the objects along the road. For example: The road near the biggest market and shopping centers.
2	Road with four or more lanes in ger district (the suburbs).
3	Road with 2 ~ 4 lanes in ger district (the suburbs).
4	Road with four and more lanes outside of ger district (the suburbs).
5	Road with 2 ~ 4 lanes outside of ger district (the suburbs).
6	Road with much higher speed than ordinary road. For example: roads with better condition and less traffic density.

4. The three routes where was carried out our research are shown in Figure 1. We didn't intend to measure the speed of cars from one place to another in the route. The purpose of the measuring process was to determine the speed in road condition classified as 1~6 of the route. Thus it must be considered that the automobile running in the route may use any categories of road conditions classified 1~6. The measured average value of speed was taken from the research result in the road conditions marked as 1~6.

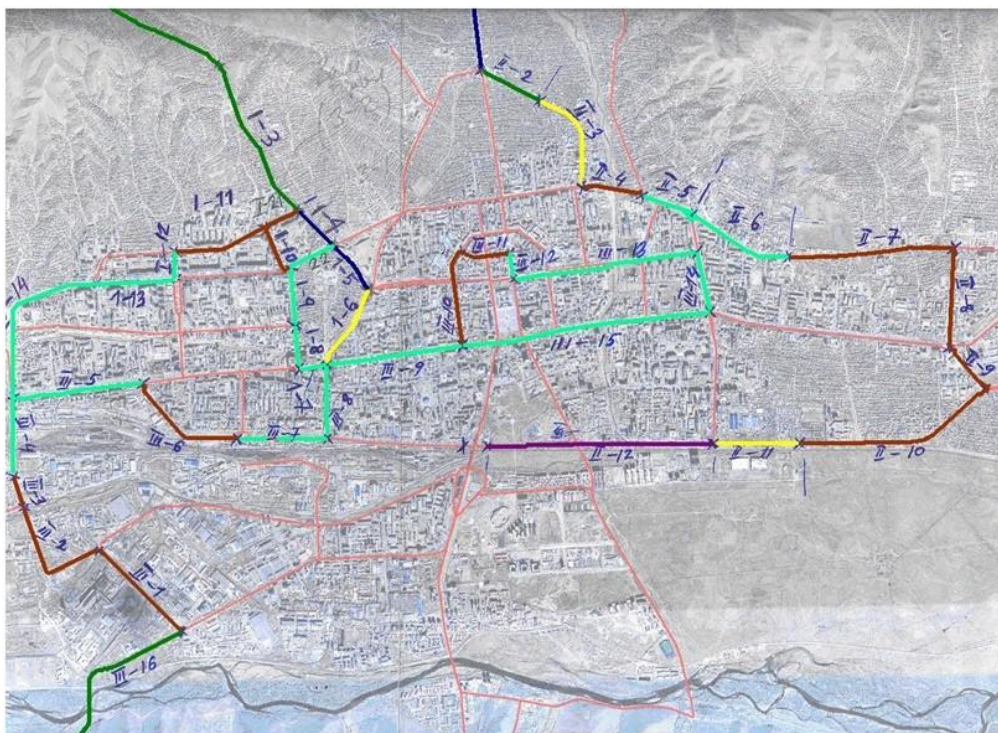


Figure1.The routes where done the research

5. The research work was done in November, i.e. in autumn, on one of weekdays and on one day of weekend. Another work was in the winter time, in December on one day of weekdays due to the possibility of decreasing traffic speed.
6. The research work was conducted at four different times in same day as shown in Table

Table 2. The time at which traffic speed was studied

Time classification	The time at which traffic speed was studied
Morning	7:30 ~ 9:30
Afternoon	12:30 ~ 14:30
Evening	18:00 ~ 20:00
Night	22:00 ~ 24:00

3.FINDINGS

The research results are shown in Table 3.

Table 3. The research results

Road category	Time classification	Average speed [km/h]		
		In November, Autumn		In December, Winter
		Weekday	Weekend	Weekday
1	Morning (7:30 ~ 9:30)	34.1	29.0	17.7
	Afternoon(12:30~14:30)	11.4	7.2	10.5
	Evening(18:00~ 20:00)	9.1	15.8	14.4
	Night (22:00 ~ 24:00)	22.5	33.0	21.4
2	Morning (7:30 ~ 9:30)	20.4	33.4	25.3
	Afternoon(12:30~14:30)	16.6	11.9	23.9
	Evening(18:00~ 20:00)	13.8	17.0	21.3
	Night (22:00 ~ 24:00)	25.3	32.0	29.4
3	Morning (7:30 ~ 9:30)	37.5	38.5	35.1
	Afternoon(12:30~14:30)	33.6	36.2	33.6
	Evening(18:00~ 20:00)	29.4	29.2	30.4
	Night (22:00 ~ 24:00)	29.3	33.7	32.9
4	Morning (7:30 ~ 9:30)	17.6	26.7	19.1
	Afternoon(12:30~14:30)	18.5	16.8	16.3
	Evening(18:00~ 20:00)	12.7	14.7	13.2
	Night (22:00 ~ 24:00)	24.4	27.0	26.4
5	Morning (7:30 ~ 9:30)	17.1	30.6	25.8
	Afternoon(12:30~14:30)	20.0	20.2	18.2
	Evening(18:00~ 20:00)	11.8	11.5	19.6
	Night (22:00 ~ 24:00)	24.7	25.4	28.3
6	Morning (7:30 ~ 9:30)	57	45.3	21
	Afternoon(12:30~14:30)	35.9	19.4	26.1
	Evening 18:00 ~ 20:00)	9.4	15.0	9.3
	Night (22:00 ~ 24:00)	55.8	49.9	32.8

For the all classified 1~6 roads shown in Table 3, there can be created a graph as shown in Figures 2 and 3. To avoid repeating the same ideas, graphs were drawn in Figures 2 and 3 for

the roads 1 and 6, i.e. the roads with more traffic density and higher speed depending on the objects along the road than ordinary roads.

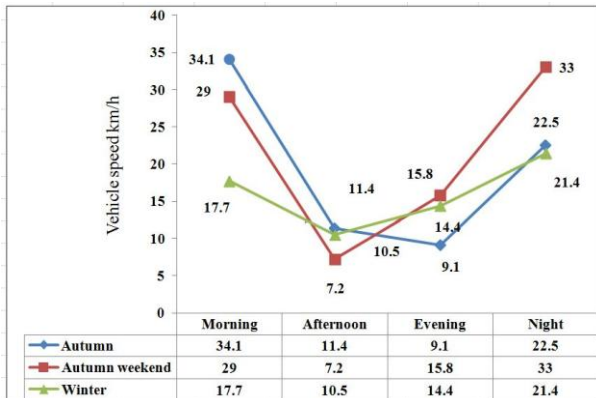


Figure 2. Traffic speed of the roads of 1st category

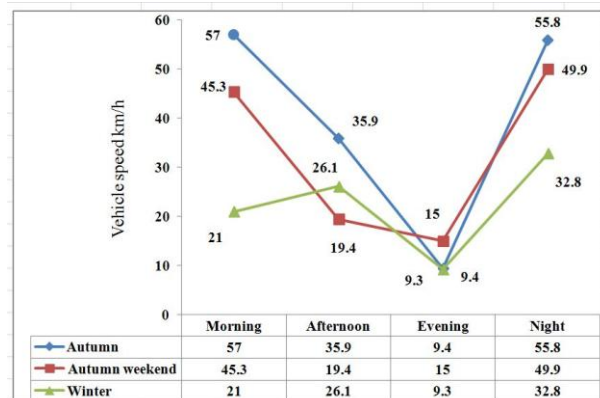


Figure 3. Traffic speed of the roads of 6th category

Judging from the graphs shown in Figures 2 and 3, we can come to the following conclusion. In the morning and at night when traffic density is always sparse, average traffic speed was much more different, while the speed difference was less in the evening at the time of finishing work and in the afternoon. It is also obvious from the graph that in winter the average speed decreased due to slippery road condition. This time of the year, drivers become more careful and tend to drive slowly. The indexes of the roads of 2nd and 5th categories say that average speed increased in the afternoon, in the evening and at night in winter. There are shown graphs of another research posing the questions which road was more loaded, how high its average traffic speed was on a given day.

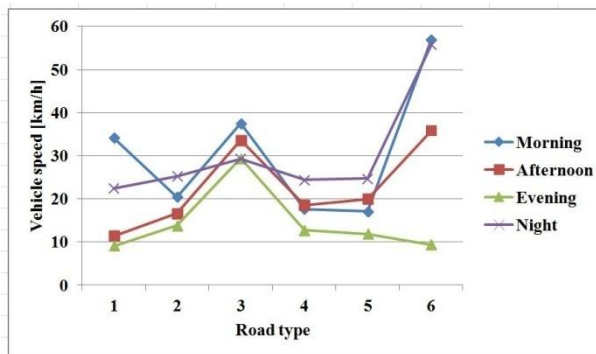


Figure 4. Research on a weekday in autumn

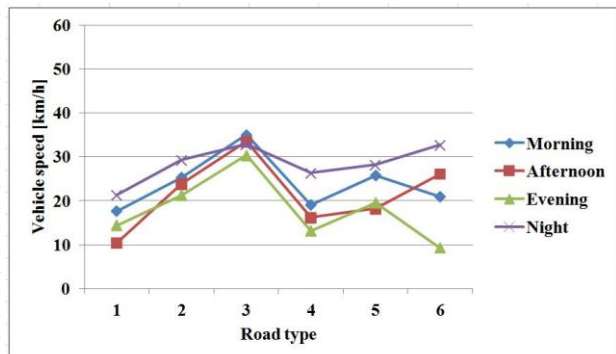


Figure 5. Research on a weekday in winter

The graph shown in figure 4 says that the average speed was higher in the morning and at night, and any road of categories 1~6 was less loaded on a given day. In contrary, there was less average speed and more traffic load in the afternoon and evening.

In Figure 5 it was much more surprising that the automobiles run with higher speed from morning till afternoon on the road of 6th category which usually has higher average speed. Traffic speed became slower in the evening on the road of 6th category shown in Figures 4 and 5 where cars are allowed to run faster.

CONCLUSION

1. Seasonal factors influence on average traffic speed on roads. For instance, slippery road condition.
2. Average traffic speed depends on weekdays and weekend and there have been noticed a lot of difference in average traffic speed.
3. We have determined that average traffic speed is different at various time of the day and the road conditions are the most influencing factors on average traffic speed.
4. The research finding will be available for further use in any research work on decreasing traffic jams in Ulaanbaatar city.
5. This research work had been done before the limitation numbers of cars running on roads with their State numbers. Thus it is necessary to carry out such kind of research work in the future with the increasing issues of traffic conditions and numbers of cars. The findings of these studies can be compared and concluded.