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A Study on the Effects of Fuel Consumption Management Plan on Urban Thoroughfares Traffic Congestion

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Abstract: One of the notable impacts of the "targeted subsidies plan" (TSP) on the economic evolution of Iran is manifested in transportation area. With the launch of the TSP and rationing of fuel in the country and given the increased energy carriers prices, it is expected that the use of private vehicles will be reduced, leading to an ease in traffic and less travels in cities. In the present study, the extent of the mentioned impact is investigated based on the statistics on traffic volume of vehicles passing six major stations of Tabriz in pre- and post-TSP. In order to scrutinize the impacts of the plan on traffic volume, respective data are studied based on the average daily traffic and peak hours while taking into account the locations of the survey stations in Tabriz's network of streets. The results indicate a decline in the use of private vehicles and a surge in the demand for public transportation. Overall, total urban commuting is also decreased.

Key words: Targeted Subsidies Plan · Travels Volume · Transportation · Survey Stations

INTRODUCTION

"Economic evolution plan" is an ongoing major project revolving around various economic areas of the country, such as targeted subsidies plan (TSP) and it can be viewed as one of the most significant economic plans of Iran in the recent decade. The plan was commenced in 2010 and has left numerous effects on various areas of the country's economy [1]. Urban transportation is one of the affected domains, owing to the initial intention of reducing private vehicle travels through increased fuel prices driven by the plan. In the present study, the effect of the plan on the traffic count in vehicles category is briefly reviewed based on the surveys administered before and after the TSP in various locations of Tabriz.

The TSP bill was passed in winter 2008. With the launch of the TSP and fuel rationing plan, there were expectations for reduced traffic counts and less travels in cities [2]. In the present study, the extent of the mentioned impact is investigated based on the statistics on vehicles traffic count in major stations of Tabriz during pre- and post-TSP. In order to determine the effect of fuel rationing in Tabriz, there was a need to pre-TSP data. For that purpose, statistical data for 2012 (pre-TSP period) were used and in order to obtain post-TSP data, a new survey was conducted in January 2013.

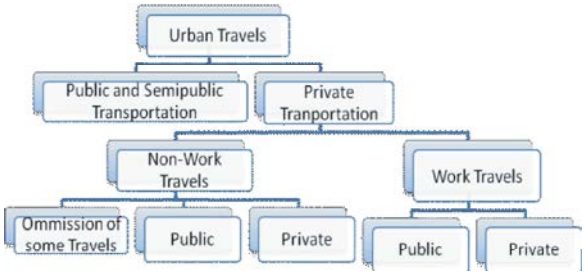

Fig. 1: Urban Travels Pattern affected by the TSP

Travels Pattern Overview: How the TSP affects urban travels should be addressed. The major goal of such initiative is to manage the demand for private vehicles [3]. As shown in Figure 1, private vehicles travels face changes and it can be predicted that reduced private travels would increase the demand for and performance of the public transportation system [4]. Two types of travels can be conceived in analyzing travels by private mode of transport. Commuting, which is mainly driven by work-related and/or educational purposes, is not abandoned by a change in fuel consumption pattern and it may only partially change to public mode of transportation. In the second type of travels, i.e. non-work travels for shopping and entertainment, however, there is the possibility of a partial decline following a rise in fuel prices [5].

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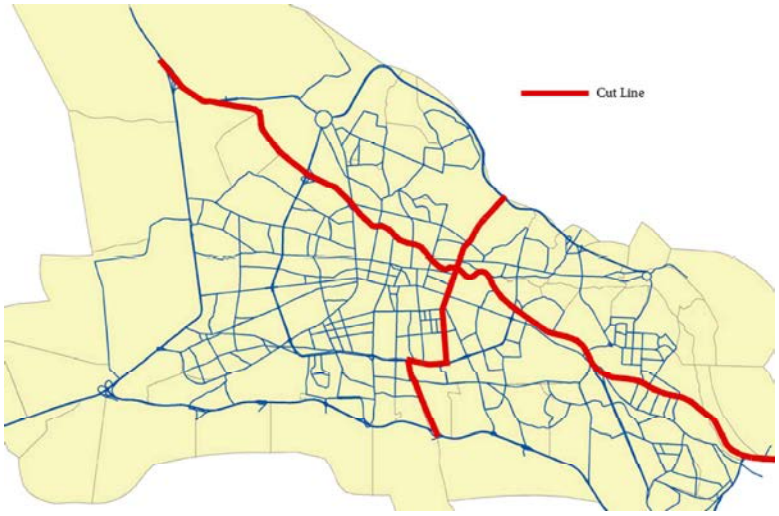

Fig. 2: Locality of CL1 and CL2 in Tabriz

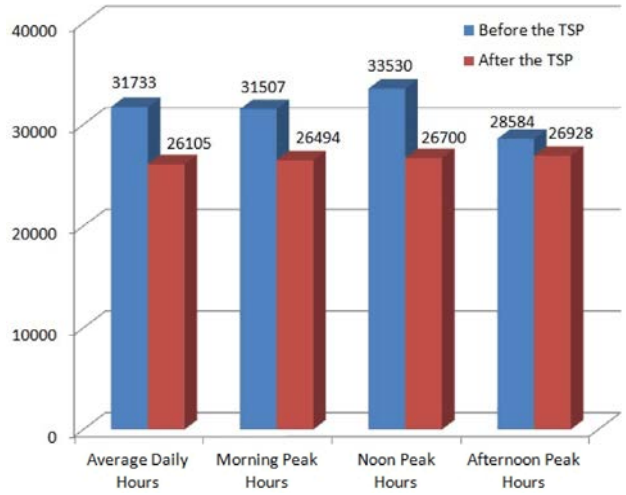

Fig. 3: Traffic volume variations in all survey stations in various hours

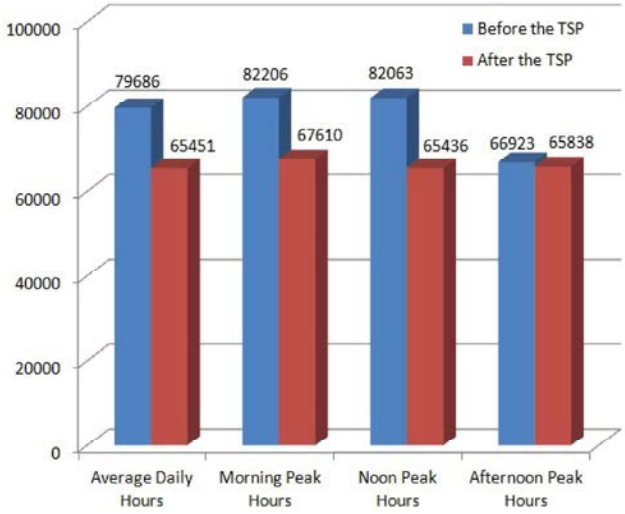

Fig. 4: Travels Count Variations in all Survey Stations in Various Hours

Table 1: Specifics of Survey Stations for CL1

Station	Traffic Flow Direction	Exact Location of the Station
Takhti Entrance	NS*	North of Shahriar sq. and at the originate end of the street
	SN**	
Cable Bridge	NS	To the north of the bridge
	SN	
Haft-e Tir St.	NS	After U-turn at the end of Farvardin st.
	SN	
Felestin	NS	Originate end of Felestin st. to the north of the bridge
	SN	
Sardaran-e Fateh Bridge	NS	On the bridge and over the bridge loops
	SN	

*North-South

**South-North

Table 2: Specifics of Survey Stations for CL2

Station	Traffic Flow Direction	Exact Location of the Station
Abbasi	WE*	To the east of Beheshti-Abbasi intersection
	EW**	
Chaikenar	WE	To the east of Beheshti st.
	EW	
Emam Khomeini	WE	To the east of Shahid Beheshti Crossroad
	EW	
Azadi	WE	To the west of Azadi-Montazeri intersection
	EW	
Pasdaran	WE	Basij sq. to Shahid Fahmideh
	EW	

*West-East

**East-West

Table 3: Locations of Individual Survey Arches

Station	Street Name	Traffic Flow Direction	Exact Location of the Station
1	Pasdaran Exp.	EW	Basij sq. to Shahid Fahmideh st.
2		WE	
3	Daneshsara	EW1	Khaqani st. to North Artesh st.
4		EW2	
5		WE	
6	Jomhoori-e Eslami Blvd.	WE	Ferdowsi st. to Meydan-e Namaz st.
7	22nd Bahamn Blvd.	EW	22nd Bahman sq. to Bahonar st.
8		WE	
9	Bahar st.	EW	Nirooy-e Havaei to Shahid Sabeti
10	Shahid Bahonar	SN	Khayyam st. to Ansarifar st.

Table 4: Percentage of changes in traffic volume of vehicles before and after the TSP within central Tabriz

	Private Cars	Taxis	Buses	Total
Average Daily Hours	5	-13	28	-9
Morning Peak Hours	5	-23	53	-11
Noon Peak Hours	11	-12	36	-8
Afternoon Peak Hours	5	16	55	-1

Table 5: Percentage of changes in traffic volume of vehicles before and after the TSP within non-central Tabriz

	Private Cars	Taxis	Buses	Total
Average Daily Hours	-20	-22	9	-18
Morning Peak Hours	-12	-34	-2	-19
Noon Peak Hours	-23	-28	12	-22
Afternoon Peak Hours	-13	39	37	0

Table 6: Percentage of changes in traffic volume of vehicles after the TSP in all stations

	Private Cars	Taxis	Buses	Total
Average Daily Hours	-15	-19	15	-18
Morning Peak Hours	-9	-31	12	-16
Noon Peak Hours	-17	-23	19	-20
Afternoon Peak Hours	-9	31	42	-6

Table 7: Percentage of changes in private vehicles traffic volume after the TSP in various areas

	Overall Network	Central Tabriz	Non-central Tabriz
Average Daily Hours	-15	5	-20
Morning Peak Hours	-9	5	-12
Noon Peak Hours	-17	11	-23
Afternoon Peak Hours	-9	5	-13

Table 8: Percentage of changes in taxis traffic volume after the TSP in various areas

	Overall Network	Central Tabriz	Non-central Tabriz
Average Daily Hours	-19	-13	-22
Morning Peak Hours	-31	-23	-34
Noon Peak Hours	-23	-12	-28
Afternoon Peak Hours	31	16	39

Table 9: Percentage of changes in public buses traffic volume after the TSP in various areas

	Overall Network	Central Tabriz	Non-central Tabriz
Average Daily Hours	15	28	9
Morning Peak Hours	12	53	-2
Noon Peak Hours	19	36	12
Afternoon Peak Hours	42	55	37

Table 10: Percentage of changes in traffic volume by private and public vehicles after TSP in various areas

	Overall Network		Central Tabriz		Non-central Tabriz	
	Private	Public	Private	Public	Private	Public
Average Daily Hours	-16	-24	-1	-26	-19	-24
Morning Peak Hours	-10	-33	0	-32	-12	-34
Noon Peak Hours	-18	-28	1	-25	-23	-29
Afternoon Peak Hours	-10	15	0	-5	-12	27

Selected Cutting Lines: After numerous studies to include major urban travels in Tabriz, the cutting lines (CLs) were finally determined as follows and as illustrated in Figure 2 for surveying purposes.

CL1: Which crosses Pasdaran Blvd., Takhti St., Avicenna Blvd., Moallem Blvd., Qobadi St., Cable Bridge, Vali Asr Blvd., Golkar St., Haft-e Tir Blvd., Bilankouh St., Baqmishe St., Beheshti Blvd., Seqat-ol-Eslam Blvd., Madani Blvd., Felestin Blvd., Monjam Sq.-Shams Blvd., Monjam Sq.-Sattarkhan Blvd., Azarbayejan Blvd. (Sardaran-e Fateh Bridge) and Kargar Blvd.

CL2: Which crosses Pasdaran, Sarbaz-e Shahid, Aref, Abbasi, Chaikenar, Emam Khomeini, Montazeri, Jandarmeri, Chamran, Azadi, Mollasadra and Kassaei thoroughfares.

Surveying the CLS: The CLs were surveyed according to the following tables. Tables 1, 2 and 3 show the data relating to each of the CLs. After determining the number of staff required for the surveys and deciding for their location, the surveys were conducted during three time spans, namely 7-10, 11-14 and 16-20. After controlling and summarizing the gathered data, they were analyzed for completing the database.

Analysis of the Results over the Network: In order to compare the results of surveys on traffic volumes along the CLs in 2010 (pre-TSP) and 2013 (post-TSP), statistical data of results tables for the two time frames were assimilated. To summarize the traffic volumes of the stations, the following comparison table can be suggested for showing the overall changes before and after the TSP. Figures 3 and 4 illustrate traffic volume and travels count variations in major periods.

Given the dispersion of statistical survey stations across the city, to obtain more precise analytic results and to realistically analyze the impacts of the TSP, the results are divided into two categories of "Central Tabriz" and "Non-central Tabriz" based on the locations of the survey stations.

Stations within Central Tabriz, The comparison data for traffic flow before and after the TSP recorded in central Tabriz stations are presented in Table 4 as average hourly traffic and peak hours. The table includes the percentage of changes in traffic counts associated with various vehicles, namely private cars, taxis and buses, as recorded by the survey stations of central Tabriz non-central Tabriz Stations, The comparison data for traffic flow before and after the TSP recorded in central Tabriz stations are also provided as average hourly traffic and peak hours. Table 5 shows the percentage of changes in traffic counts associated with various vehicles, namely private cars, taxis and buses, as recorded by the survey stations of non-central Tabriz.

In general, taking into account the impact of other vehicles, the traffic count has shown an average decline of 18%.

Investigating the variations in peak hours also reveal considerable points. Afternoon peak hours show the lowest amount of decline and noon peak times exhibit the highest rate of decrease in traffic volume. This may indicate that various vehicle drivers have ignored some unnecessary travels. Nonetheless, non-work and not-for-education travels, which are mainly seen in afternoons, have dropped quite slightly.

The results of analyzing central and non-central Tabriz's traffic volume are presented in the following tables by type of vehicles.

In addition, investigation of transportation modes, including private and public vehicles, can be presented as follows.

The decrease in the number of public transportation vehicles is associated with the decline in the number of taxis.

CONCLUSION

According to what was provided above and assuming a low error level for survey data on traffic flow of vehicles in the two periods of interest, i.e. pre- and post-TSP, following changes in the modes of urban transport are proposed.

By taking into account the above-mentioned issues, following notions about the impact of the TSP on traffic volume of various vehicles and the contribution of various modes of transport can be made:

Generally, in all calculations, there has been a decline in traffic volume of private vehicles (9-17%). Of course, the average growth in the number of private vehicles should also be added to those figures.

Against the expectations driven by studies, the traffic volume of taxis has also declined (19-31%). However, an increase by 31% is seen in afternoon peak hours. The observed changes are also a partial result of the growth in bus fleet size and improvement in transportation system performance.

Given the increase in the number of buses after the TSP, increased bus traffic volume was predictable (12-42%).

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