THE BUSWAY OPERATIONS IN ISTANBUL

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INTRODUCTION

Istanbul, the largest city in Turkey, straddles the two continents, Europe and Asia, separated by the Bosphorus Straits. The population is 7.3 million and is increasing by 5% per year. The number of registered motor vehicles are 755,000, with a growth rate as high as 12% per annual at the moment. Public transport in the city is mainly bus-based although all other modes of transport are represented, including ferry boats and newly opened LRT metro.

About 6 million motorized trips are made per day in Istanbul. The modal split of those trips are 26% by buses, 25% by minibuses (paratransit), 20% by private cars, 7% by taxis and shared taxis (dolmuş), 6% by boats, 6% by trains and 10% by special service vehicles (oparates twice a day, from home to work in the morning and from work to home in the evening).

A segregated busway was introduced on one of the main arteries in the north of the city in 1979. The Taksim Zincirlikuyu corridor runs between the acknowledged centre of European Istanbul, Taksim Square, and a bus station on the periphery of the CBD adjacent to a major junction, Zincirlikuyu, onto the E-5 Bosphorus Bridge Motorway. This extends for 5.2 km and has one lane in each direction, seperated from other traffic by 1.5 m high railings until lately, and by specially designed 0.8 m high kerbs at the moment.

The second busway was introduced in 1990 in the old part of Istanbul. The Aksaray - Topkapı corridor runs between the biggest junction of Istanbul which has connections to allmost all parts of the city, Aksaray Square, and a bus station near the intercity bus terminals of Topkapı, just in front of the walls and again adjacent to Bosphorus Bridge Motorway. This busway extends for 2 km and has 3 lanes for two directions. This is also seperated from general traffic by specially designed 0.8 m high kerbs.

A third busway artery was introduced a couple of months ago. Unfortunately, there was no chance to conduct a before study on this artery.

1. THE TAKSİM - ZİNCİRLİKUYU BUSWAY

1.1.Description

The busway varies from 8 to 10 m in width, and is 5.2 long. It has one lane for each direction and is located either in the middle of the general traffic lanes or replaces one direction of the traffic. Diversion, in the case of replacement, traffic manegement, and at least 3 lanes are provided for general traffic.

There are 12 bus-stops in each direction, with an average distance of 500 m between bus-stops; and stops are about 50 m in length. No overtaking places are provided and all services stop at every bus stop.There are 8 at-grade intersections with other traffic, and two pedestrian crossings that are all signalized. Access to median bus stands is facilitated by pedestrian crossing signals and obedience to these by both buses and other traffic, is generally good.

Buses owned by İETT, public bus company, and privately owned buses which are scheduled and controlled by İETT, are operated on the busway. Tickets (approximately 40 US cents) are purchased off the bus from official outlets or street vendors. These are then placed into a collecting box overlooked by the driver. Monthly pass and student concessions are available.

1.2.Post Implementation

Unfortunately, no survey was made on the corridor before the construction of this busway. However, early results on the Taksim -Zincirlikuyu corridor were encouraging. Acording to İETT's own figures, during the two months after the opening of the busway in 1979:

* Passenger trips increased by 27%
* Number of round trips per bus increased by 7%
* Bus journey times were reduced by 62%.

As car ownership level at the time implementation was still relatively low, the busway faced little opposition; and judged by the figures above it must be regarded successful.

1.3.Studies On The Busway

The delays to movement began to increase, because levels of both bus and car usage increased. In 1985, a survey by İTÜ found that overall average speed had fallen from the design value of 17-20 kph down to 11-17 kph. Despite this, the busway continued to carry peak passenger volume of almost 12,000 passengers with a maximum bus volume of 164 buses per hour per direction.

A more detailed study in 1987 by İTÜ identified two main reasons for these delays. Firstly, the increasing number of buses operated on the corridor had led to some queueing at stops. Secondly, the increasing level of other traffic competing for green time at signalised junctions had resulted in delays to buses. Then, average bus commercial speed decreased to 9-14 kph and maximum passenger flow was 11,000 passengers with a maximum of 174 buses.

Another study has been done in 1989 for TRRL's "Study of Bus Priority Systems for less Developed Countries". The increasing number of buses and other traffic, the two reasons of delays on the busway, tun out to be worse. The maximum bus flow was 169 buses per hour carrying 10,700 passengers. Table I summarises the main results of Taksim Zincirlikuyu busway surveys of 1985, 1987, 1989 for morning and evening peak hours, for peak direction.

Table I: Results of Taksim-Zincirlikuyu surveys

Years	Morning Peak 1985	1987	1989	Evening Peak 1985	1987	1989
Maximum bus volume	164	174	169	138	185	143
Max passenger flow	12000	11400	10700	9400	12700	7300
Average Speed (kph	14.0	14.6	14.0	11.2	10.2	11.5
Average number of buses in daily service				1150	1800	2100

Over 80 routes use this busway and all share the same stops. There is no bus ordering or overtaking. A bus can be boarded at any point of a stop, and many times it stops more than once to be boarded at a bus-stop. The result of this is the disorganization and delays at bus-stops. As it was mentioned before, junctions with other traffic cause delays, too.

Considering these bad conditions however, bus flows and passenger flows are higher than expected. On the other hand, in passenger terms, an achieved theoretical maximum hourly flow of 150 buses, and if all buses are loaded at nominal capacity, a peak of 12,000 passengers or at crush capacity, a peak of 15,000 passengers per hour are found. This indicates that the Taksim-Zincirlikuyu busway is utilized just under its capacity. Besides, these flows decreased while the number of buses using the corridor has increased.

3. THE AKSARAY - TOPKAPI BUSWAY

3.1.Description

The Aksaray-Topkapı busway is 12-13 m in width and 2 km in length. It has three lanes for the two directions except for a few very short sections to save some trees on the median. The centre lane is reserved for passing at stops and as turning bays at intersections for both directions. The busway is located in the middle of the general traffic lanes. Traffic management and at least two lanes for each direction have been provided for general traffic.

There are 7 bus-stops in each direction with an average distance of 350 m between bus-stops. Stops are 80 m in length. There are 6 at-grade intersections with other traffic and one pedestrian crossing which are all signalised. There is no express service on the busway.

Bus operations and fare collection on this busway are the same as the first one.

3.2.Before Implementation Study

The Aksaray-Topkapı artery, Millet Caddesi, is one of the crowded ones. West of Istanbul is connected to CBD through this artery.

A bus survey had been conducted in 1989 on the arterial found the conditions before busway. The average commercial speed of morning peak hour was as low as 4-5 kph with a maximum bus volume of 160 buses and a passenger volume of 12000 passengers. However, evening peak hour was much better with an average speed of 11 kph, maximum bus flow of 136 buses and passenger flow of 7700 passengers.

The busway on this artery has been constructed in 1990. A survey held in 1991, showed that the average commercial speed increased during the morning peak hour, while it was the same at evening peak hour. The main results of the before and after studies are summarized in Table II.

Table II: Results of Aksaray-Topkapı artery before and after busway studies

	Before Busway		After Busway	
	Morning	Evening	Morning	Evening
Maximum bus volume	160	136	125	106
Max passenger flow	12000	7700	11800	8500
Average Speed(kph)	5.5	11.0	9.5	10.5

The reason of the decreasing number of the buses using this arterial is the new routing and scheduling of the bus line. Despite this, the number of passenger was the same in the morning and even more in the evening. This means that the bus fleet on this artery was used more effectively. However, in passenger terms, an achieved theoretical maximum hourly flow of 200 buses (considering the overtaking availability), and if all buses are loaded at nominal capacity, a peak of 16,000 passengers or at crush capacity, a peak of 20,000 passengers per hour are found. This indicates that the Aksaray-Topkapı busway is utilized under its capacity.

4. CONCLUSIONS

The city authorities in Istanbul showed commendable foresight in introducing bus priority in in 1979 just ahead of increasing car ownership levels, which may have made its introduction more difficult. Unfortunately, until 1990 no progress was recorded. In the last three years two new arteries were introduced; furthermore, another is being projected at the moment. In the near future these will be expanded into a network.

The Taksim-Zincirlikuyu Busway is operating just at the available capacity. This capacity can be increased by introducing a new order, and eliminating the disorganized bus-stop operations.

The Aksaray-Topkapı busway is operating under its capacity. Overtaking facility provides an advantage of carrying more passengers with a smaller bus fleet.

Another physical measure, also likely to be cost effective would be the introduction of priority call loop detectors at the signalised intersections on busways.

The busway scheme in its existing format is is carrying almost 20,000 passenger per hour in two directions in only two lanes. This compares very favourable with the number of passengers carried by other traffic on the remaining lanes of the same artery.

However, as the number of buses and/or routes using the busway exceeds an optimum value, its effectiveness is reduced.

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