Analysis of Taxi Transportation in Tourist Centres

Davor Brčić[a], Marko Slavulj[a], Dino Šojat[a], Božo Radulović[a]

[a] *Full professor, Faculty of Transport and Traffic Sciences, Zagreb, Croatia*

A B S T R A C T

The liberalization of the taxi market in 2018 in the Republic of Croatia has resulted in an increase in the number of taxi vehicles on the roads. In coastal tourist centres, the demand for taxi transportation increases during the summer months. In order to meet the transport demand, taxi carriers with licenses have arrived from the continental cities to coastal cities. The paper will investigate the extent to which continental taxis affect congestion and the overall structure of the traffic flow. The purpose of the paper is to define a methodology for calculating the share of taxi vehicles in the traffic flow, which will allow their distinction according to registration marks. The aim of this study is to examine the proportion of vehicles with non-domiciled plates in the centres of the tourist cities of Dubrovnik and Split.

1. INTRODUCTION

The liberalization of the taxi market in the Republic of Croatia has resulted in a rapid increase in the number of taxi vehicles on the roads. The effect of a large number of taxi vehicles is particularly evident in coastal cities during the tourist season, when demand for taxi services is extremely high. Due to the increased demand for a transport service, part of the taxi drivers from the continental part of Croatia decided to provide a transport service in the coastal cities. The result is directly reflected in the newly generated traffic flow. The aim of this paper is to investigate the share of taxi vehicles in the total traffic flow, as well as the share of taxi vehicles of continental license plates providing transportation services in the coastal cities. The research was conducted in two cities, Split and Dubrovnik, and the paper presents the research methodology, generalized results, discussion and conclusion.

2. METODOLOGY

In the study of traffic flow structure, the method of counting was used. Counting is a methodological procedure that determines the number of elements or members of a set. In this case the elements or members of a set are defined groups of vehicles.

Consequently, the traffic flow structure is divided into eight groups of vehicles, namely:
1. City bus – public transport;
2. Tourist bus;
3. Passenger car;
4. Taxi (domestic registration plates);
5. Taxi (other registration plates);
6. Motorcycle / moped;
7. Van (cargo and passenger);
8. Truck / heavy vehicle.

The counting was done manually at the cross sections of selected roads. In total, ten counting locations were selected, six in the city of Split, and four locations in Dubrovnik. Counting was done in the morning and afternoon peak periods.

Vehicle flow q (vehicle / h) is the number of vehicles passing through a cross section of a road or one lane in a unit of time. By its structure, the traffic flow can be homogeneous or mixed. A homogeneous flow is considered to be a flow of a type of motor vehicle composed of vehicles of the same or similar technical characteristics. Thus, traffic flow can be: freight, passenger, special and other vehicles. [7]

A mixed flow is considered to be a traffic flow consisting of several types of vehicles. In practice, the heterogeneity of such a flow is represented by the percentage of other vehicles (buses, trucks, motorcycles, etc.) in the traffic flow. [2]

$$P_{taxiDOM} = \frac{\sum q - q_{bus} - q_{car} - q_{mo} - q_{hv} - q_{van} - q_{taxiOTHER}}{\sum q} * 100 \ [\%]$$

(formula 1), where:

$P_{taxiDOM}$ - share of taxi vehicles of domestic registration plates;
$\sum q$ - the sum of all vehicles in the traffic flow;
q_{bus} - number of buses in the traffic flow;
q_{car} - number of passenger cars in the traffic flow;
q_{mo} - number of motorcycles/mopeds in the traffic flow;
q_{hv} - number of heavy vehicles in the traffic flow;
q_{van} - number of vans in the traffic flow;
$q_{taxiOTHER}$ - number of taxi vehicles of other registration plates.

$$P_{taxiOTHER} = \frac{\sum q - q_{bus} - q_{car} - q_{mo} - q_{hv} - q_{van} - q_{taxiDOM}}{\sum q} * 100 \ [\%]$$

(formula 2), where:

$P_{taxiOTHER}$ - share of taxi vehicles of domestic registration plates;
$\sum q$ - the sum of all vehicles in the traffic flow;
q_{bus} - number of buses in the traffic flow;
q_{car} - number of passenger cars in the traffic flow;
q_{mo} - number of motorcycles/mopeds in the traffic flow;
q_{hv} - number of heavy vehicles in the traffic flow;
q_{van} - number of vans in the traffic flow;
$q_{taxiDOM}$ - number of taxis of domestic registration plates.

For the purposes of this research, formula (1) is defined to express the share of taxis with domestic registration plates in the traffic flow and formula (2) to determine the proportion of taxis that do not have the domestic registration plates. [3]

3. RESEARCH RESULTS

The collection of traffic data and its projections of traffic volumes are basic prerequisites for planning and managing road development schemes. [6]

Data were collected at a total of ten locations and averaged data were presented for more convenient presentation. Data were collected at a total of ten locations and averaged data were presented for more convenient presentation. Complete data can be accessed in studies [4] [5]. Traffic counting was conducted in two periods of the day, the morning and afternoon peak periods. Figure 1 and Figure 2 show the share of each vehicle type in the total traffic flow for the city of Dubrovnik and Split during the observation period.
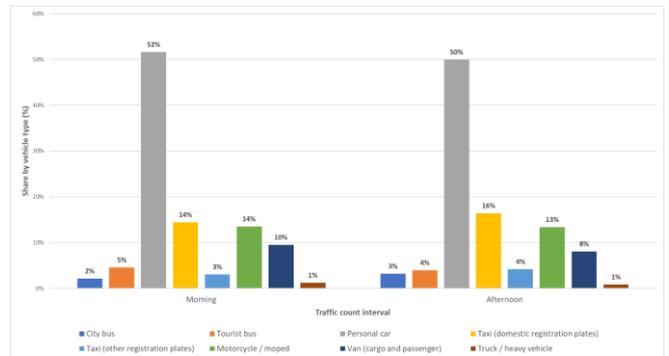

Figure 1. Share of vehicles by type, City of Dubrovnik
Source: [5]

According to data obtained from a field research in the City of Dubrovnik (Figure 1), passenger cars account for the largest share of vehicles in traffic, with a share of 50% in the morning and 52% in the afternoon periods. This is followed by the share of taxi vehicles with 17% in the morning, of which 14% are domestic registration plates and 3% of other registration plates. In the afternoon, taxi vehicles represent a share of 20% of total traffic flow, of which 16% recorded taxis refer to taxis of domestic registration plates, while 4% referred to vehicles of other registration marks. Of other vehicles, motorcycles / mopeds have a higher share in the total traffic flow with a share of 14% in the morning and 13% in the afternoon, and vans with a share of 10% of the total traffic flow in the morning and 8% in the afternoon periods.
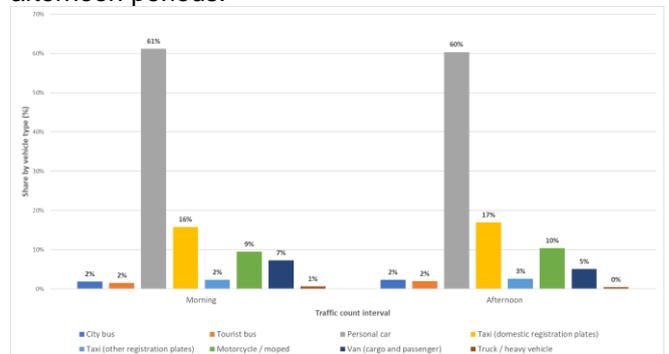

Figure 2. Share of vehicles by type, City of Split
Source: [4]

Figure 2 shows the results of the field research in the city of Split. It is evident that passenger vehicles account for the largest share in the total traffic flow, with 61% in the morning and 60% in the afternoon periods. As in Dubrovnik, the second highest share of vehicles in Split is represented by taxi vehicles, with 18% (16% of domestic registration plates and 2% of other registration plates) in the morning observation period, while in the afternoon, the share of taxi vehicles increased to 20% (17% of domestic registration plates and 3% of other registration plates) of the total traffic flow. This is followed by motorcycles / mopeds with a share of 9% of the total traffic flow in the morning and 10% in the afternoon periods, and vans with a share of 7% of the total traffic flow in the morning and 5% in the afternoon periods.
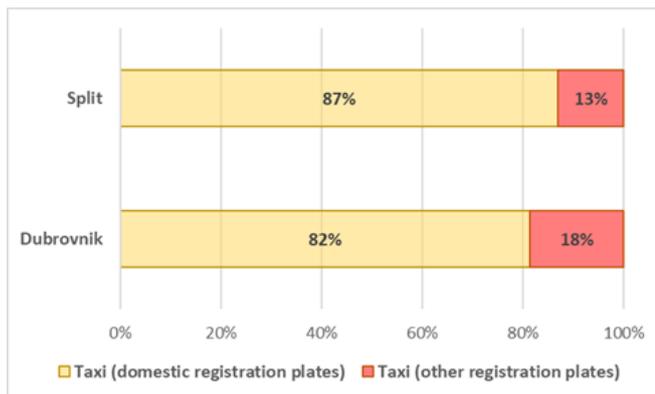
Figure 3. The share of taxis by registration plates, *Source: [4] [5]*

Observing the share of taxi vehicles according to vehicle registration marks, it was concluded that domestic taxi vehicles still represent a major proportion. The survey found that taxi vehicles of other license plates represent 18% of the total number of taxi vehicles in the city of Dubrovnik, while in Split the share is lower and amounts to only 13% of the total number or taxi vehicles in operation.

4. DISCUSSION

The data presented in this paper show the average results of all observed locations, and there are considerable discrepancies for certain locations. There are locations where the traffic flow with large differences in proportions when it comes to taxis is recorded, thus highlighting the location of "Ulica Domovinskog rata" in Split, where at peak time the share of taxi vehicles was as high as 40% (34% of the domestic registration plates and 6% of other license plates), thus becoming the primary form of traffic in the city. There are also similar locations in Dubrovnik, an example of which is the "Pile" location, where the share of taxi vehicles in the peak hour reaches 34% of the total traffic flow, of which 28% are taxis of domestic registration plates, and 6% of taxis of other registration plates.

There is a great need for continuous monitoring and collection of traffic flows and other indicators of mobility. The reason for this is to obtain urban mobility trends that would result in better decision-making and urban policies for cities. [1]

5. CONCLUSION

Although there are concerns about the rapid increase in the number of taxi vehicles as a result of market liberalization and the arrival of a large number of taxi vehicles from the continental area of the Republic of Croatia to the coastal area for the purpose of providing transport services, this share still represents about 3% of the total traffic flow in the cities researched.

When viewed as a share of the number of taxi vehicles of other registration plates compared to domestic registration vehicles, the ratio continues to favor domestic taxis. The share of taxi vehicles with domestic registration plates in Dubrovnik represents 82%, while in Split 87% of the total number of taxi vehicles, which concludes that a large number of taxi drivers coming from the continental territory of the Republic of Croatia is still not a critical segment in the total traffic flow, and therefore cannot be a main cause of traffic congestion in the observed areas.

It was concluded that future research should monitor the structure of traffic flow, as one of the important traffic indicators, on an annual basis, in order to enable comparison and quality decision-making in the direction of improving the urban transport system.

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