Analysis of Parameters for Vehicles M2 and M3 Category – Case Study Republic of Croatia

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Abstract

Vehicles category can be separated into two main categories, M and N category. M categories represent motor vehicles which are used for passenger transport, and N category is used for freight transport. This paper will present one sub-category of M category (M2 and M3 category). M2 and M3 categories are motor vehicles which have more than 8 passenger seats (without seat for driver), also known as buses. Aim of paper is detect what parameters of buses influence on different variables, mainly considering ages and number of vehicles in Croatia and other countries. The paper consists of introduction, overview of vehicles category in the Republic of Croatia regarding to age, discussion, and conclusion.

Introduction

Vehicles M3 category represent all motor vehicles that can drive more than 8 passengers, without including driver. Other name for M3 category is common know as bus. Buses are widely used for city, intercity and international passenger's lines and for touristic purposes. Mainly owners of buses are companies which means they are used for economic reasons. Knowing that fact, it can be assumed that buses travel more kilometres regarding to vehicles owned by private persons. Also, it can be assumed that are buses generally older than vehicles owned by private persons. Classification of vehicle categories is generated from the ordinance on technical conditions of vehicles in road traffic (M) category, personal vehicles (M1) category, and buses (M2) and (M3) categories. [1]

Vehicle M2category represent motor vehicles for the passenger's transport with more than 8 seats in addition to the driver's seat and a maximum permissible mass ≤ 5000 kg. Vehicle M3 category represent motor vehicles for the passenger's transport, in addition to the driver's seat, have more than 8 seats and a maximum permissible mass > 5000 kg.

Categories M2 and M3 are divided into the following [2]:

- First (I) class - buses with more than 23 seats including the driver, designed for the transport of passengers primarily in a standing position and whose interior is designed to allow passengers to pass quickly through the interior of the vehicle;
- Second (II) class - buses with more than 23 seats including a driver designed primarily for the transport of seated passengers who can also drive standing passengers located only in the aisle space and/or in a space not exceeding the area occupied by two double seats;
- Third (III) class - buses with more than 23 seats including a driver designed to transport passengers in a seated position only;
- A class - buses with a maximum of 23 seats or less including a driver designed to transport passengers in sitting and standing positions;
- B class - buses with a maximum of 23 seats or less including a driver designed to transport passengers in a sitting position only.

Furthermore, will be presented and analysed the parameters that include the age of the vehicle (M3) category, the number of buses, as well as the display of the average annual distance travelled in kilometres.

Overview of vehicles category in the Republic of Croatia regarding to age

Period of 5 years was considered regarding to the average age of vehicles in the Republic of Croatia for the category of vehicles (M3), more precisely from 2014 to 2019. In the observed time period, the largest number of vehicles for the observed (M3) category was recorded in 2019 and it amounted to 5375 vehicles, where the average age was 11,55 years, which is also the lowest value for the age of the vehicle. The highest data for the average age was recorded in 2015 and 2017, and for the observed years it was 12,02. Data for other observed years are visible in figure 1. [3]

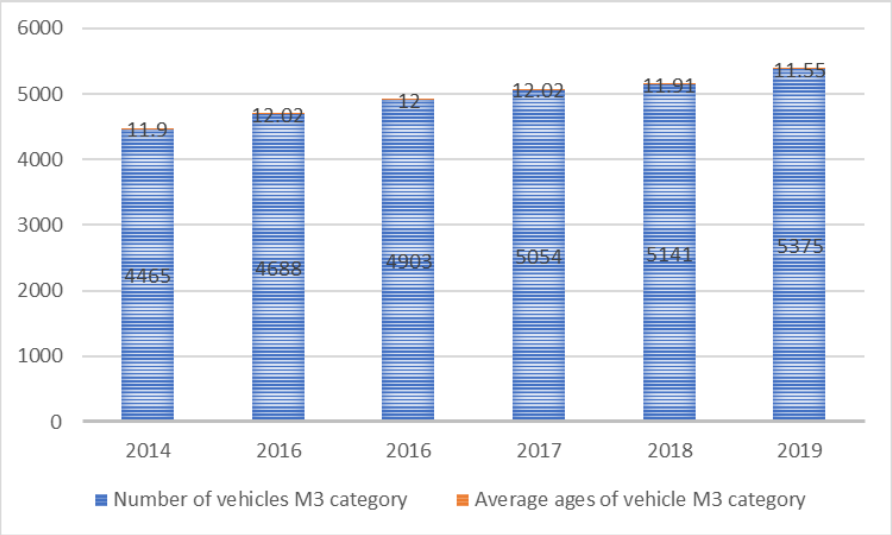

Figure 1. Overview of the total number of vehicles (M3) category and the average age for the period from 2014. to 2019.

Source: [3]

Figure 2 shows the number of vehicles of category (M3) with an age of ten or more. In the year of 2014, a data of 2635 vehicles were recorded, which is also the lowest recorded number of vehicles for the observed age. Through other years, a growth trend is noticeable, which reached its peak in 2019, where a data of 3652 vehicles was recorded. [3]

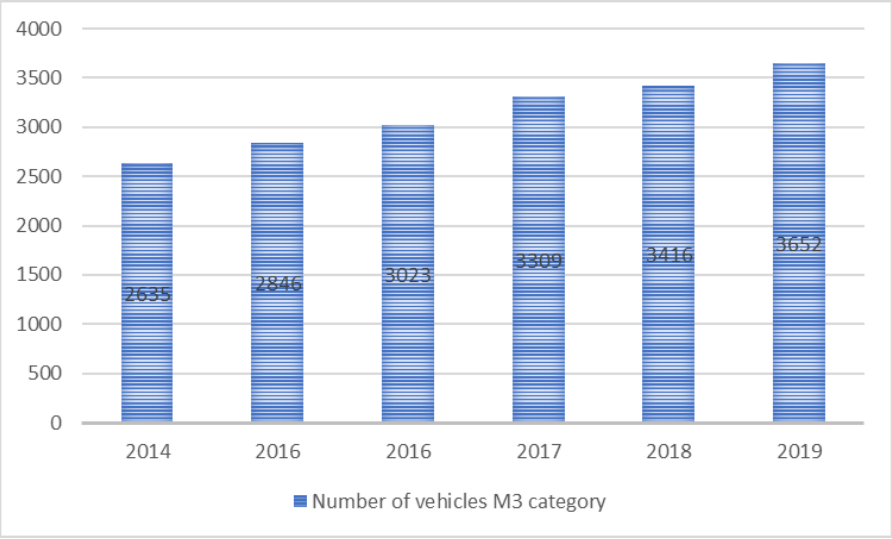

Figure 2. Number of vehicles (M3) of the category with ten or more years of ages for 2014 to 2019

Source: [3]

Figure 3 shows the number of vehicles (M3) of the category with the age from six to nine years. It is noticeable that the lowest number of vehicles was recorded in the last observed year (2019), and it is 622 vehicles. The largest number was recorded in 2015 and it was 1360. After the observed year, a negative trend followed. [3]

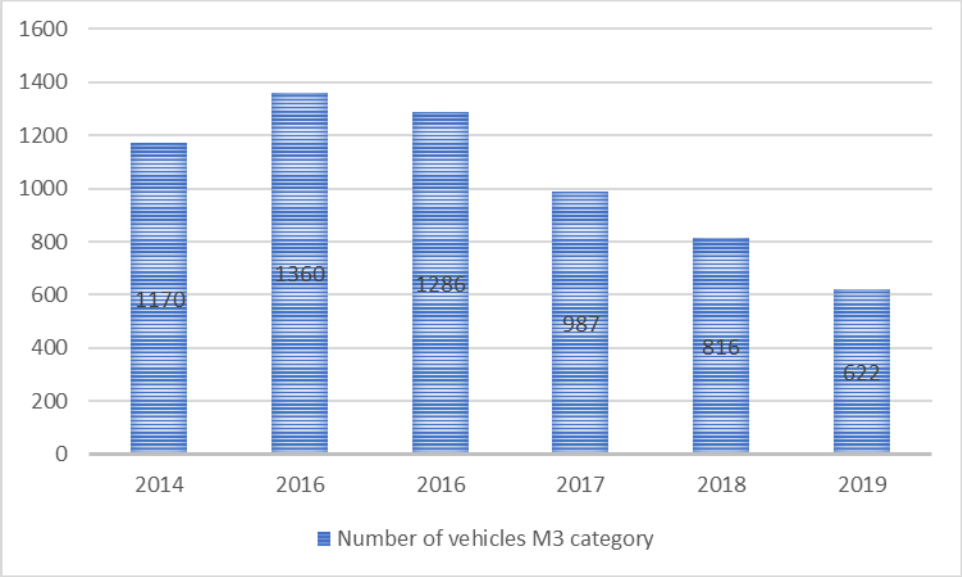

Figure 3. Number of vehicles (M3) of the category from six to nine years of age for 2014 to 2019

Source: [3]

Figure 4 shows statistical data on the age of vehicles from two to five years of age for the observed (M3) category of vehicles. For the observed ages, the lowest data of such vehicles was recorded in 2015 and it was 304. The highest recorded data was detected in 2019 and it is 644. [3]

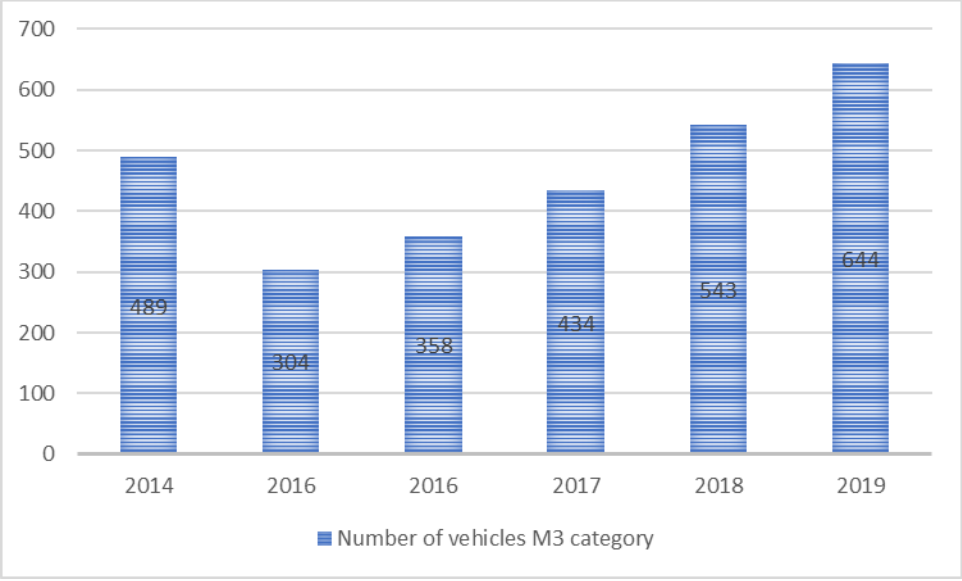

Figure 4. Number of vehicles (M3) of the category from two to five years of age for 2014 to 2019

Source: [3]

Figure 5 shows statistics for vehicles (M3) of the age category up to one year of age. In the first observed year, in the five-year period, the lowest data was recorded, and it amounted to 171 vehicles. The highest data was recorded in 2019, where it was 457. From 2014 to 2019, the figure shows a growth trend for the observed age of the vehicle. [3]

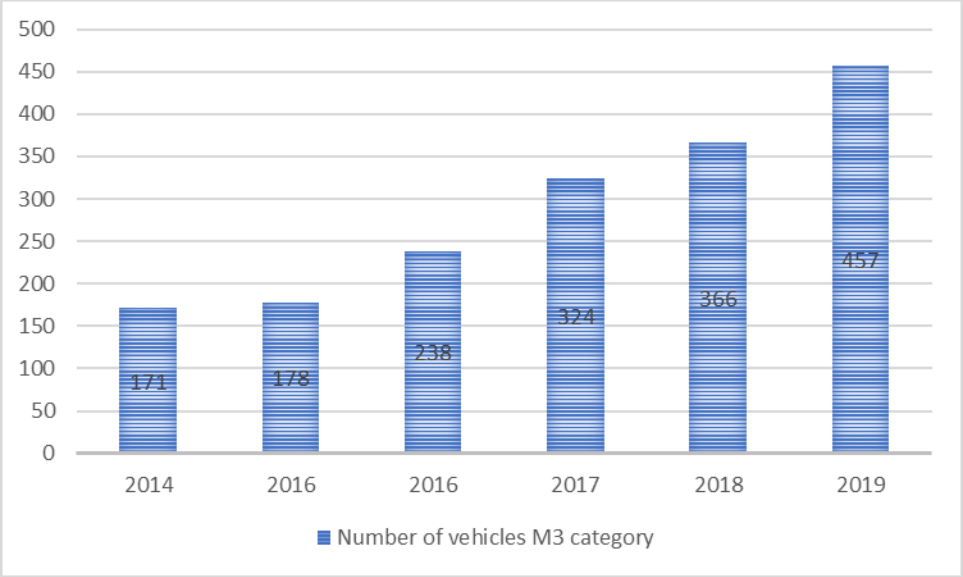

Figure 5. Number of vehicles (M3) of the category up to one year of age for 2014 to 2019

Source: [3]

Figure 6 shown average ages for M3 vehicle category.

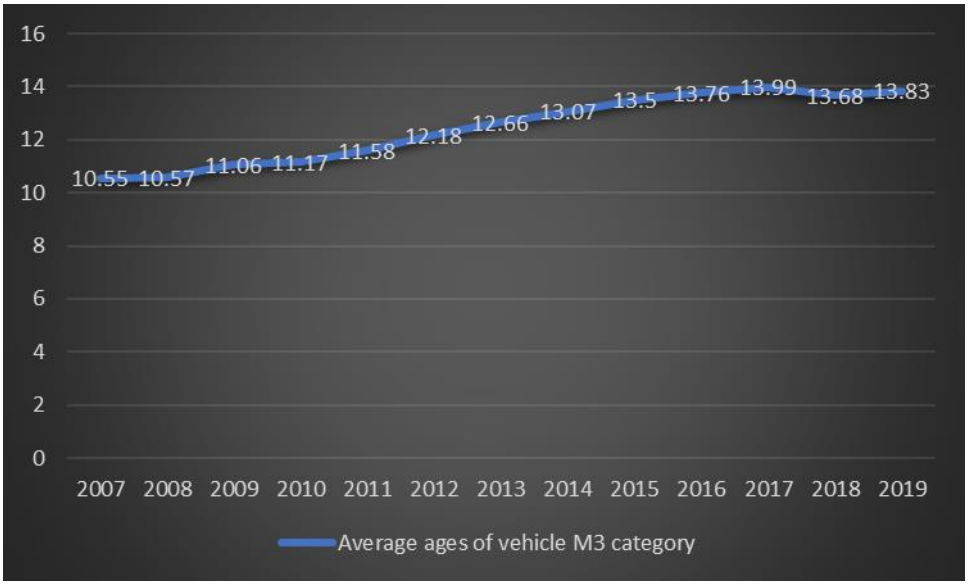

Figure 6. Average ages for M3 vehicle category

Source: [3]

Figure 7 shows average annual travelled kilometres regarding to all vehicle's categories in the Republic of Croatia.

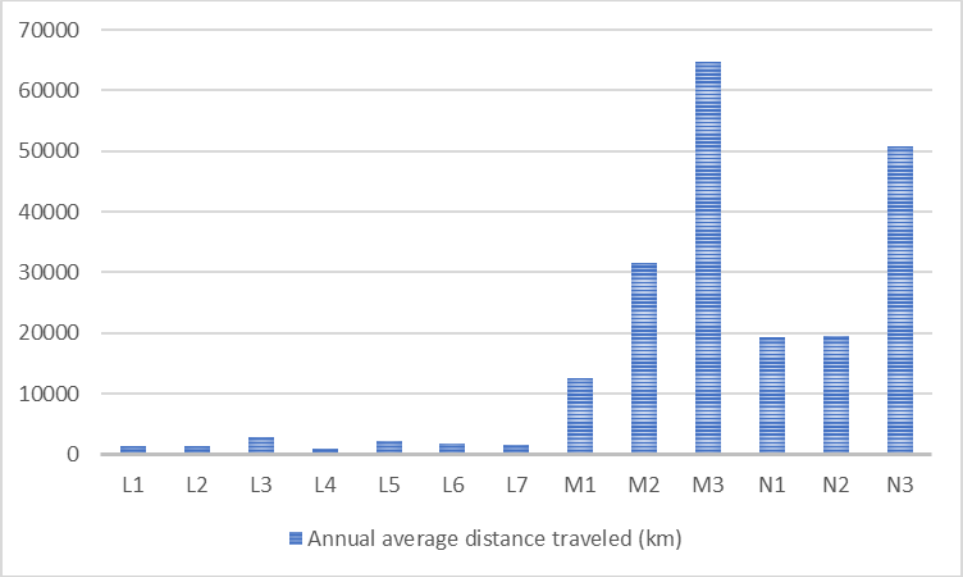

Figure 7. Average annual travelled kilometres regarding to all vehicle's categories in the Republic of Croatia
Source: [3]

Figure 8 represent available data regarding to current state of buses fleets in the European Union.

	2014	2015	2016	2017	2018
Austria	9,585	9,679	9,825	9,956	10,037
Belgium	16,028	15,926	15,934	15,956	16,147
Croatia	4,465	4,688	4,903	5,054	5,141
Czech Republic	19,871	19,966	20,224	20,824	21,443
Denmark	8,802	8,858	9,052	9,077	8,982
Estonia	4,618	4,770	4,838	4,964	4,973
Finland	12,446	12,455	12,471	12,623	12,481
France	89,000	90,000	91,000	91,800	92,498
Germany	77,501	78,345	78,949	79,438	80,519
Greece	24,871	22,873	23,460	24,016	27,970
Hungary	17,384	17,681	18,143	18,594	19,091
Ireland	8,802	9,259	9,841	10,371	10,944
Italy	97,914	97,991	97,817	99,100	100,042
Latvia	4,000	4,035	4,069	4,075	4,035
Lithuania	6,937	6,856	6,926	7,164	7,517
Luxembourg	1,759	1,778	1,857	1,904	1,963
Netherlands	10,145	9,409	9,741	10,069	10,055
Poland	106,057	109,844	113,139	116,090	119,471
Portugal	14,500	14,700	15,000	15,605	16,200
Romania	20,055	21,123	21,946	22,928	23,935
Slovakia	8,879	8,944	8,810	8,955	9,078
Slovenia	2,576	2,645	2,699	2,796	2,850
Spain	59,799	60,252	61,838	63,590	64,915
Sweden	13,992	14,114	13,890	14,421	14,378
United Kingdom	88,638	88,186	87,778	86,607	84,391
EUROPEAN UNION	**728,623**	**734,377**	**744,150**	**755,977**	**769,056**
Norway	17,172	16,716	16,307	16,080	15,644
Switzerland	15,713	15,684	15,602	15,431	15,435
EFTA	**32,885**	**32,400**	**31,909**	**31,511**	**31,079**
Russia	394,458	390,938	395,326	400,845	405,737
Turkey	211,200	217,056	220,361	221,885	218,523
EUROPE	**1,367,166**	**1,374,771**	**1,391,746**	**1,410,218**	**1,424,395**

Figure 8. Number of registered buses in the countries of European Union from 2014 to 2019.
Source: [4]

Discussion

Listed figures in the past chapter show interesting data. We can detect growth of buses in the Republic of Croatia and growth of average ages of same buses. Same trend is visible regarding to vehicles older than 10 years. Problem

is detected with buses older than 6 years and younger than 9 years. In this area the number of buses is decreasing every single year. Good signs are buses younger than 6 years, where is visible larger number of vehicles every single year. Average ages of vehicle M3 category in the past decade shown constantly growth of ages from 10,55 to 13,82, which is growth more than 20 %. If considering annual average distance travelled (in kilometres), M3 categories are first and M2 category is third.

Conclusion

This paper show interested possible conclusion regarding to buses fleet in Republic of Croatia (M2 and M3 categories). Analysing the number of buses regarding to ages, we can detect that buses are getting older and older with same trend. Also, problem is that buses are vehicle categories that travel most kilometres (almost 4 times regarding to private cars). By comparing to other countries in the European Union, it can be seen that are growing number of buses in almost all countries (approximately 5 % in the last five years), while in Croatia that number is more than 10 % which can be justify by becoming part of European Union which which made it possible to procure cheaper buses from most developed countries. Analyzing that data, two conclusions can be determined. Fist is constant growth of buses in Croatia and other countries, and second is constant growth of older bus fleet.

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