

Highlighting the Ongoing Roads Infrastructure Challenges: Car Ownership Rates in Iraq

Dr. Jalal Taqi Shaker Al-Obaedi[†]

[†]College of Engineering, University of Al-Qadisiyah, Iraq
Email address: jalal.alobaedi@qu.edu.iq

Abstract

Vehicles that use highway facilities have increased rapidly last decades mainly due to increasing of population and also due to industrials development for vehicles. In Iraq, it has been noticed that the car ownership has been increased since the year of 2003. This paper uses real data taken from the Central Statistical Organization of Iraq (CSO) to focus on car ownership in Iraq as a whole as well as focusing on each province separately. The finding of this paper highlighted the ongoing traffic problems due to sharp increase in the number of vehicles and the unusual traffic growth rate. The expected number of vehicles during the next 10 years is estimated and expected to increase from 4.5 million on 2013 to be as minimum as 11 million private cars. This will create a new challenge for Iraq roads infrastructure which must be enhanced significantly so as to cover such increase in traffic. The results suggest that the average car ownership per 1000 people is increased from 58 to 124 from 2003 to 2013. The average car ownership per households has also increased from 0.39 to 0.83 vehicles per households. Significant differences in car ownership rates are found among Kurdistan, middle and south regions in Iraq. The annual traffic growth rate during the last 10 years of 11.5% is found which is much higher than the population growth rate of 3.14%.

Keywords: Traffic, car ownership, traffic growth rate, households, roads.

1. Introduction

Traffic use highway facilities have usually in increasing since it is related to the population. Car ownership per capita is usually uses to describe the number of vehicles per capita. The car ownership rates is vary among countries as it rated to other factors such as economical, political and also related to number of households [1]. According to some statistical reports, the car ownership is significantly varies across worldwide and varies from 1263 vehicles per 1000 people in San Marino to 2 vehicles per 1000 people in Togo.

Previous research suggested a strong relationship between the number of vehicles and the number of households [1-5]. A household is usually consists of one or more people living in the same house and sharing their meals or living accommodation. Ritter and Vance [6] highlighted the increasing in car ownership with the increasing of households even when the population is in decline. Verma [7] reported that one of the main reasons of growing car ownership is that low interest rates on car loan in India. Guerra [4] highlighted the relationship between car ownership and income to show the geography of car ownership in Mexico.

This paper focus on car ownership in Iraq since it has been noticed that the number of vehicles have been significantly increased during the recent years (from 2003 to 2014). The traffic growth rate has also been estimated.

2. Methodology

This paper uses real data taken from the Central Statistical Organization of Iraq (CSO) [8] to evaluate vehicle ownership in Iraq as a whole as well as focusing on each province separately. The data provided represents the registered vehicles from 2002 to the end of 2013 for each of the Iraqi's eighteenth provinces.

3. Data analysis and results

This section describes the analyses of data taken from Central Statistical Organization of Iraq (CSO). The car ownership rates by the end of 2002 were used as a base values for comparison reasons with the last years. This is due to a fact that there are dramatic political and economical changes happed in Iraq during and after 2003.

3.1 Car ownership rates before 2003

Fig. 1 shows the car ownership for all of the eighteen Iraqi provinces by the end of 2002. The car ownership presented in the figure is calculated per 1000 people using Equation 1. Based on the data in the Figure, the average car ownership in Iraq was 58 vehicles/1000 people (i.e. 1 car per 17 persons). This makes Iraq in the rank of about 130 across the worldwide in the car ownership rates according to statistical reports.

The highest car ownership rates were in Iraqi's north provinces "Kurdistan region" (i.e. Duhok, Erbil and Al-Sulaimaniya presented in dark color in Fig.1). The average car ownership for Kurdistan region was about 125 vehicles per 1000 population (i.e. 1 car per 8 persons). This is mainly due to a fact that these north provinces have special political and economical environments since 1991 when these provinces become out of Iraqi government control.

The south provinces had the lower average car ownership as the average was 25 vehicles per 1000 people (i.e. one car per 40 people). This is an expected since these provinces were suffering from the government due to religion reasons. For the other middle and north provinces (i. e. Baghdad, Al-Anbar, Salah Al-Din, Diala, Kirkuk, Neniveh), the average car ownership was about 65 vehicles per 1000 people (i.e. 1 car per 15 persons).

The higher car ownership rate was at Duhok province (203 vehicles/1000 people) while the minimum was at Thi-Qar and Maysan provinces (14 vehicles per 1000 people).

$$\text{Car ownership} = \frac{\text{Total private vehicles}}{\text{Population}} * 1000 \tag{1}$$

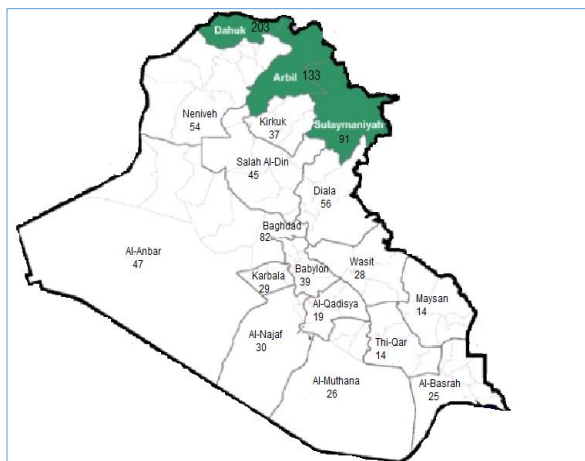


Fig. 1 Car ownership rates for Iraq provinces on 2003

3.2 Car ownership rates after 2003

Since the year of 2003, the registered vehicles have been increased rapidly due to political and economical changes in Iraq. Fig.2 shows the number of registered vehicles in Iraq before 2003 and by the end of 2013. As shown in the figure, the number of vehicles has significantly increased from 1.5 million on 2003 to about 4.5 million in 2013.

In order to estimate the car ownership rates, it is essential to know the population. The Iraqi population was 32.1 millions on 2009 with the annual growth rate of 3.14%. This suggests that the expected population on 2013, based on Equation 2, is 36.3 million.

The car ownership has increased considerably from 58 in 2003 to about 124 in 2013 (see Fig. 3) with an increase of more than two times. The car ownership value of 124 suggests that Iraq ranking has increased from 130 to about 96 by the world countries having highest car ownership rates. The other nearby countries such as Kuwait and Saudi Arabia were lies within the first 50 highest car ownership countries.

$$F = C(1 + i)^n \tag{2}$$

Where:

F is the future traffic/population by the end of n years

C is the traffic/population value before of n years

i is the annual growth rate

n analyses period in years

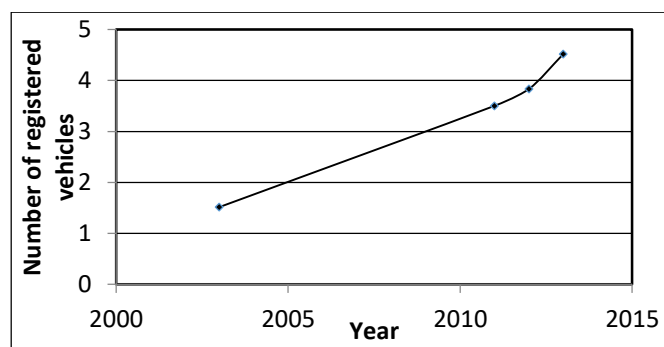


Fig. 2 Number of registered vehicles in Iraq

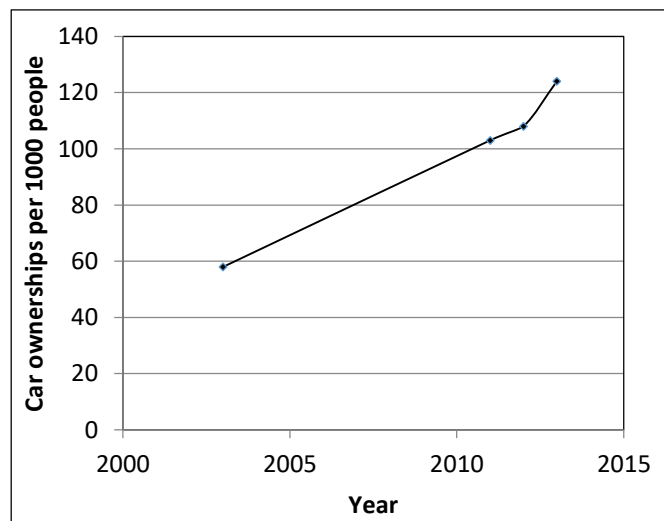


Fig.3 Car ownership per 1000 people in Iraq

3.3 Estimation of annual traffic growth rate

The annual traffic growth rate is also estimated in this study. By solving the Equation 1, it is found that the annual traffic growth rate for the period from 2003 to 2013 was about 11.5%. This is much higher than the population growth rate of 3.14%. This is mainly due to economical changes happened in Iraq during the referred period.

3.4 Car ownership rates with households

“Household” is a term used to describe one or more individuals who are living together in one house or flat. According to the project of Housing and Population Census (HPC2011) which has been conducted in Iraq during 2010, average household size is 6.7 individuals. Taking into consideration the Iraqi population of 36 millions in 2013, the total number of household is about 5.42 million households. In addition, the project suggested that about 6% of houses in Iraq are occupied by more than one household. This suggests that the number of houses is about 5.1 millions houses.

Consequently, this suggests that on an average, the car ownership is about 0.88 cars per one house (4.5million vehicles per 5.1 million houses) and the car ownership is about 0.83 per household. This could explained the rapid increase in cars ownership in Iraq after 2003 since there is an increase in the number of houses due to economical enhancement in the average income for Iraqi people.

The car ownership rates for North “Kurdistan”, middle and south regions in Iraq for years of 2003 and 2013 are summarized in Table (1). The table suggests that the car ownership is increased from 0.39 on 2003 to 0.83 on 2013 for Iraq as a whole. The average car ownership for middle provinces is still much higher than that for south provinces (0.92 vehicles per household on middle region and 0.47 on south region). The average car ownership for Kurdistan region is very high even if compared globally. However, there are some limitations in the data available represented by a fact that some of the registered vehicles, in some regions, might be owner by other people live in other regions.

Table 1 Car ownership rates on 2003 and 2013

Region	Car ownership per 1000 people		Car ownership per household	
	Up to 2003	Up to 2013	Up to 2003	Up to 2013
North	126	435	0.84	2.93
Middle	65	137	0.43	0.92
South	25	71	0.167	0.474
All	58	124	0.39	0.83

3.5 Estimation the expected traffic

It is expected that the traffic will continue increasing in the next years due to a fact that there are no governmental plans to reduce the need for owner private cars such as by adopting public transport system or legalization some laws to limit parking or making roads fines. In order to estimate the expected future traffic, two scenarios are adopted as follows:

a. One car per household scenario

As explained above, the current car ownership rate is about 0.83 cars per one household. It is expected that the

car ownership rates will reach to the rate of one car per household during the next few years. This means that the car ownership will become about 150 cars per 1000 people based on the average household individuals of 6.7 as reported by HPC2011.

Taking into consideration the population growth rate of 3.14%, the expected population on 2013 will be 49.5 million. This suggests that the number of private cars will be 11 million private cars.

b. Traffic increased based on the same previous traffic growth rate

In this scenario, the expected number of vehicles after 10 years from the data used (i.e. on 2023) is estimated by applying the current growth rate of 11.5%. This suggests that the number of private cars will be 13.4 million private cars with car ownership rates of 270 cars per 1000 population.

Based on above, the minimum expected for number of vehicles in Iraq will be about 11 million (based on scenario 1 above). Such ongoing traffic increase should be considered properly by politicians and other related ministries in Iraq to control the amount of newly traffic and also to make a new strategies since the available highways infrastructure, is already incapable of satisfying the required level of service based on current traffic conditions.

3.6 Impact of traffic increase

In order to highlight the ongoing roads infrastructure challenge due to traffic increase, a virtual six lane multilane highway (3 lanes per direction) operates with an assumed current flow rate of 3000 veh/hr. The future demand (after 10 years) based on Equation 2 will become about 8900 veh/hr. These current and future two rates are analyzed using the Highway Capacity Software (HCS, 2010). The level of service (LOS) for the current rates of 3000 veh/hr was found to be LOS: C while the future LOS based on traffic demand of 8900 veh/hr will be LOS: F. The required number of lanes in order to satisfy the requirements of LOS: C based on the future traffic is 7 lanes per direction according to HCS, 2010. It is well known that it is not possible to construct such wide highways due to land use limitations.

This suggests that a great attention should be given to enhance the roads infrastructure so as to cover such increasing in traffic. In addition, car ownership policy should be restricted with the creating and encouraging of over modes of transports such as the use of public transport systems facilities.

4. Conclusions

This paper used real data taken from the Central Statistical Organization of Iraq (CSO) to focus on car ownership in Iraq as a whole as well as focusing on each

province separately. The idea is to examine the ability of roads infrastructure to serve the future traffic. The finding of this paper highlighted the ongoing traffic problems due to sharp increase in number of vehicles and the unusual traffic growth rate. The expected number of vehicles during the next 10 years is estimated and expected to increase from 4.5 million on 2013 to be as minimum as 11 million private cars. This will create a new challenge for Iraq roads infrastructure which must be enhanced significantly so as to cover such increase in traffic. The results suggest that the average car ownership per 1000 people is increased from 58 to 124 from 2003 to 2013. The average ownership per households has also increased from 0.39 to 0.83 vehicles per households. Significant differences are found in car ownership rates among Kurdistan, middle and south regions in Iraq. The annual traffic growth rate during the last 10 years is found about 11.5% which is much higher than the population growth rate of 3.14%. Further work is needed based on economical data so as to develop a model to estimate the car ownership rates based on average income rate and number of households.

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