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# SEARCHING THE EFFECT OF BITLIS RING ROAD TO DOWNTOWN TRAFFIC

*Keywords: Downtown, Ring road, Traffic projection, Traffic capacity*

## Abstract

In this study the effect of Bitlis ring road to downtown traffic was researched. The annual vehicle amounts passing through ring road and downtown were calculated separately. Also, five year of estimated vehicle projection of vehicle traffic passing through ring road and downtown was made. The traffic capacity of ring road and downtown at the end of 5 year was found. As a result of study the subjects regarding if ring road is sufficient at the end of 5 year or the necessity of a separate ring road to reduce downtown traffic were examined in result and suggestions section.

## 1. Introduction

The transportation can be stated as all of affairs and tools which provide the arrival of people and goods (Eygü, 2016). The road haulage is a type of transportations which is mostly preferred in Turkey (Bayraktutan and Özbilgin, 2013).

The rapid and plainness urbanization which is seen across the country carried the important social and executive problems with the population explosion and the rapid increase of vehicle number in some of cities. The most important ones among them are the extensive oil consumption, environmental pollution, accidents, traffic jam with the common high cost and the difficulty in transportation. The following cases create a density in the vehicle traffic that the population of Bitlis' city center increases with the migrations from the village to

the city and also, E-99 international road passes through the city. As the city center is an old center of population, the difficulties are seen in opening the alternative ways. This case affects negatively on the city traffic (Bakış and Işık, 2012).

As Bitlis' city center is an old center of population, the structuring was established on a hilly and curved area. There have been important problems in the urban traffic on this area. This jam shows itself much more after the snowing which snows in winter. In the case of heavy snow, the ways which have got the inadequate wideness in the city become narrow much more, this constriction increases as the vehicles line up on the side of ways due to the inadequacy of car park, and the bi-directional traffic becomes impossible (Bakış and Işık, 2012).

When Bitlis' transportation system is examined, it is seen that the city center is on E- 99 international road. This case carried a set of problems with it in the traffic of city center. Divided ring roads which go around the industry of Bitlis to Bashan were made for the international transitions in order to resolve this problem. The building of Bitlis Ring road at 12 km started to be done in 2004, and it was opened to the traffic in 2010.

The ring road consists of 9-km road, 1 tunnel at 1950-meters length, 1 viaduct at 300-meters length and 2 bridges. The international road's traffic which passes through the city center built down with the construction of the ring road.

The transportation from Siirt's direction to the direction of Tatvan-Van and Muş is done directly with the ring road without entering into the city center. Bitlis ring road has been seen at Figure 1.

Fig.1. Bitlis ring road


*Source: www.google.com.tr/maps/*

The contribution of traffic on Bitlis' ring road to the city center's traffic was searched in this study. Moreover, the calculations on the ring road's traffic capacity were done at the end of five years as the five-years traffic projection was calculated for the ring road.

## 2. Five-Years Vehicle Projection between 2017-2021 Belonging to Bitlis

The number of motor land vehicles between 2012-2016 belonging to Bitlis has been seen at Table 1.

Table 1. The number of motor land vehicles between 2012-2016 belonging to Bitlis

| Vehicles | Car | Minibus | Bus | S.Truck | Truck | Motorcycle | Special | Tractor | Total |
|---|---|---|---|---|---|---|---|---|---|
| 2012 | 6800 | 1272 | 163 | 4618 | 1701 | 301 | 164 | 2614 | 17633 |
| 2013 | 6976 | 1298 | 158 | 4936 | 1737 | 314 | 177 | 2698 | 18294 |
| 2014 | 7183 | 1321 | 133 | 5180 | 1736 | 336 | 187 | 2884 | 18960 |
| 2015 | 7356 | 1418 | 134 | 5548 | 1786 | 376 | 187 | 3168 | 19973 |
| 2016 | 7357 | 1475 | 144 | 5742 | 1770 | 382 | 202 | 3405 | 20477 |

*Source:TÜİK Ulaştırma İstatistikleri, Dinamik Sorgulama, Ulaştırma İstatistikleri Veri Tabanı.*

The arithmetical increase method was used in the calculation of 2021 traffic vehicle projection.

$K_a = (T_s - T_i) / (t_s - t_i)$
$K_a$ : The Arithmetical Increase Speed
$T_g$ : The Number of Future Vehicle
$K_a = (20477 - 17633) / (2016 - 2012) = 711$
$T_g = T_i + K_a * (t_g - t_i)$

$T_{2017} = 17633 + 711*(2017-2012) = 21188$ vehicle
$T_{2018} = 17633 + 711*(2018-2012) = 21889$ vehicle
$T_{2019} = 17633 + 711*(2019-2012) = 22610$ vehicle
$T_{2020} = 17633 + 711*(2020-2012) = 23321$ vehicle
$T_{2021} = 17633 + 711*(2021-2012) = 24032$ vehicle
The results belonging to the calculations which were obtained were shown at Table 2.

Table 2. 2021 Traffic vehicle projection belonging to Bitlis

| Year | Total Vehicle |
|---|---|
| 2017 | 21188 |
| 2018 | 21889 |
| 2019 | 22610 |
| 2020 | 23321 |
| 2021 | 24032 |

The mean percentages of vehicles were calculated at the following figure in consideration with the values at Table 2.

The mean automobile percentage ($K_o$);

$K_o$=(6800+6976+7183+7356+7357)*100/
(17633+18294+18960+19973+20477)= 38%

The following results were gotten as the other vehicle percentages were calculated in a similar way:

The mean minibus percentage ($K_m$) = 7%
The mean bus percentage ($K_{ot}$) = 1%
The mean small truck percentage ($K_{km}$) = 27%
The mean truck percentage ($K_k$) = 9%
The mean motorcycle percentage ($K_{mo}$) = 2%
The mean private vehicle percentage ($K_{öz}$) = 1%
The mean tractor percentage ($K_t$) = 15%

Automobiles got the highest share with 38% rate among the road vehicles. 2021 traffic vehicle distribution projection belonging to Bitlis which was done as a result of above-available calculations is seen at Table 3.

Table 3. 2016-2021 traffic vehicle projection belonging to Bitlis

| Vehicles | Car | Minibus | Bus | S.Truck | Truck | Motorcycle | Special | Tractor | Total |
|---|---|---|---|---|---|---|---|---|---|
| % | 38 | 7 | 1 | 27 | 9 | 2 | 1 | 15 | 100 |
| 2017 | 8051 | 1483 | 212 | 5721 | 1907 | 424 | 212 | 3178 | 21188 |
| 2018 | 8318 | 1532 | 219 | 5910 | 1970 | 438 | 219 | 3283 | 21889 |
| 2019 | 8592 | 1583 | 226 | 6105 | 2035 | 452 | 226 | 3391 | 22610 |
| 2020 | 8862 | 1632 | 233 | 6297 | 2099 | 467 | 233 | 3498 | 23321 |
| 2021 | 9132 | 1682 | 240 | 6489 | 2163 | 481 | 240 | 3605 | 24032 |

The number of motor land vehicles between 2012-2016 across Turkey is seen at Table 4.

Table 4. The number of motor land vehicles between 2012-2016 across Turkey

| Vehic. | Car | Mini. | Bus | S.Truck | Truck | Motorcy. | Spe. | Tractor | Total |
|---|---|---|---|---|---|---|---|---|---|
| 2012 | 8648875 | 396119 | 235949 | 2794606 | 751650 | 2657722 | 33071 | 1515421 | 17033413 |
| 2013 | 9283923 | 421848 | 219885 | 2933050 | 755950 | 2722826 | 36148 | 1565817 | 17939447 |
| 2014 | 9857915 | 427264 | 211200 | 3062479 | 773728 | 2828466 | 40731 | 1626938 | 18828721 |
| 2015 | 10589337 | 449213 | 217056 | 3255299 | 804319 | 2938364 | 45732 | 1695152 | 19994472 |
| 2016 | 10752863 | 454332 | 218662 | 3305886 | 812398 | 2949778 | 47312 | 1710915 | 20252146 |

*Source:TÜİK Ulaştırma İstatistikleri, Dinamik Sorgulama, Ulaştırma İstatistikleri Veri Tabanı.*

$K_a = (T_s - T_i) / (t_s - t_i)$
$K_a = (20252146 - 17033413) / (2016 - 2012) = 804683$
$T_g = T_i + K_a * (t_g - t_i)$

$T_{2017} = 17033413 + 804683*(2017-2012) = 21056828$ vehicle
$T_{2018} = 17033413 + 804683*(2018-2012) = 21861511$ vehicle
$T_{2019} = 17033413 + 804683*(2019-2012) = 22666194$ vehicle
$T_{2020} = 17033413 + 804683*(2020-2012) = 23470877$ vehicle
$T_{2021} = 17033413 + 804683*(2021-2012) = 24275560$ vehicle

The results belonging the calculations which were obtained were shown at Table 5.

Table 5. 2021 traffic vehicle projection belonging to Bitlis

| Year | Total vehicle |
|---|---|
| 2017 | 21056828 |
| 2018 | 21861511 |
| 2019 | 22666194 |
| 2020 | 23470877 |
| 2021 | 24275560 |

It is possible to find the vehicle mean percentage in consideration with the values at Table 5.

The Mean Automobile Percentage ($K_o$):

$K_o$=(8648875+9283923+9857915+10589337+10752863)*100/
(17033413+17939447+18828721+19994472+20252146)= 52%

The other vehicle percentages were shown at the following as they were calculated in the similar way.

The mean automobile percentage ($K_o$) = 52%
The mean minibus percentage ($K_m$) = 2%
The mean bus percentage ($K_{ot}$) = 1%
The mean small truck percentage ($K_{km}$) = 16%
The mean truck percentage ($K_k$) = 4%
The mean motorcycle percentage ($K_{mo}$) = 15%
The mean private vehicle percentage ($K_{öz}$) = 1%
The mean tractor percentage ($K_t$) = 9%

Automobiles got the highest share with 52% among the road vehicles across Turkey. 2021 Traffic Vehicle Distribution Projection across Turkey which was done with the above-available calculations has been seen at Table 6.

Table 6. 2017- 2021 traffic vehicle projection across Turkey

| Vehic. | Car | Mini. | Bus | S.Truck | Truck | Motorcy. | Spe. | Tractor | Total |
|---|---|---|---|---|---|---|---|---|---|
| % | 52 | 2 | 1 | 16 | 4 | 15 | 1 | 9 | 100 |
| **2017** | 10949551 | 421137 | 210568 | 3369092 | 842273 | 3158524 | 210568 | 1895115 | 21056828 |
| **2018** | 11367986 | 437230 | 218615 | 3497842 | 874460 | 3279227 | 218615 | 1967536 | 21861511 |
| **2019** | 11786421 | 453324 | 226662 | 3626591 | 906648 | 3399929 | 226662 | 2039957 | 22666194 |
| **2020** | 12204856 | 469418 | 234709 | 3755340 | 938835 | 3520632 | 234709 | 2112378 | 23470877 |
| **2021** | 12623291 | 485511 | 242756 | 3884090 | 971022 | 3641334 | 242756 | 2184800 | 24275560 |

## 3. The Number of Five-Year Vehicles between 2017-2021 Which Pass through Bitlis Ring Road

The total vehicle number across Turkey became 20252146 in 2016. The long vehicle, truck, small truck and special vehicle number was included into the column of lorry. It is assumed that the motorcycle and tractors don't pass through the ring road, in consideration with the tunnel traffic restrictions. When the numbers of motorcycle and tractors are taken from the total vehicle number across Turkey, the vehicle number across Turkey for 2016 is found as 15591453.

The number of automobiles which pass through the ring road is nearly 2,12% of the total vehicle number across Turkey for 2016, the number of minibus vehicle is 0.53%, the number of bus vehicles is 1.33 and the number of truck vehicle is 0.95%. The number of total vehicles which pass through the ring

road is 4.95% of the vehicle number across Turkey. 2016 data were taken from Bitlis Tunnel Operation Chiefdom. The calculations were done for the other years in consideration with the percentage rates. The results of calculations are shown at Table 7.

The long vehicle, truck, small truck and special vehicles were included in the column of truck. As there is a tunnel on the ring road, it was considered that the tractor and motorcycle don't pass through the ring road in consideration with a set of traffic restrictions on the transitions from the tunnel.

Table 7. The number of 2016-2021 motor land vehicles which pass through the ring road belonging to Bitlis

| Vehicles | Car | Minibus | Bus | Truck | Total |
|---|---|---|---|---|---|
| 2016 | 330995 | 82499 | 206793 | 151869 | 772156 |
| 2017 | 339268 | 84817 | 212842 | 155231 | 792158 |
| 2018 | 352233 | 88058 | 220976 | 161163 | 822430 |
| 2019 | 365198 | 91299 | 229110 | 167095 | 852702 |
| 2020 | 378163 | 94541 | 237244 | 173027 | 882975 |
| 2021 | 391128 | 97782 | 245377 | 178959 | 913246 |

## Conclusion and Recommendations

A set of conclusion and recommendations were presented at the following in consideration with Bitlis ring road 5-year traffic projection:

The number of automobiles which pass through the ring road is nearly 2,12% of the total vehicle number across Turkey for 2016, the number of minibus vehicle is 0.53%, the number of bus vehicles is 1.33 and the number of lorry vehicle is 0.95%. The number of total vehicles which pass through the ring road is 4.95% of the vehicle number across Turkey.

Automobiles comprise nearly 43% of total vehicle number which pass through Bitlis ring road, the minibuses comprise 11%, the buses comprise 27 and the trucks comprise 19%.

There isn't any traffic lightening for the intersection part on the other side of traffic on Tatvan for the ring road that its construction was done. This case brings mortal-and-wounding accidents. It requires that the traffic signalization system is immediately established in these areas.

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