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KEY INDICATORS AFFECTING THE EVOLUTION OF ROAD TRAFFIC IN ROMANIA

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Abstract

As with all forecasts, in estimating road traffic for large periods of time (20 or 30 years) there is uncertainty regarding the outcome of key input variables, such as future GDP growth, fuel prices, and population. The forecasts presented should be read as projected trends for traffic, considering the most likely evolution of the input variables. The main indicators affecting the evolution of road traffic are: population and employment, Gross Domestic Product, average net wage gain, vehicle fleet and motorization rate, Average Daily Travel, and road capacity and network utilization rate. To assess the maximum variation around the central forecast, we model scenarios based on a combination of these indicators. The medium scenario - average car park consumption is expected to decrease between 2030 and 2035. The high demand scenario combines a high per capita GDP, an increased motorization rate, moderate population decline, increased employment rate, low oil prices, and high fuel economy. The low demand scenario assumes a low GDP and therefore low per capita income, a sharp decline in population and employment rate, a degradation of road infrastructure quality, high oil prices, and a low level of fuel economy. It must be emphasized that all forecasts are uncertain. This is the result of the uncertainty of the input indicators. The forecast for the period 2020 – 2050 is more uncertain compared to previous road traffic forecasts. It is unrealistic to take a high growth version of each variable and on this basis make a high forecast because the probability of a high rate continuing for 30 years just because the first year has a high rate is very low.

Keywords: forecasts, scenario, road traffic, indicators, evolution

1 Introduction

As with all forecasts, in estimating road traffic for substantial periods (20 or 30 years), there is uncertainty regarding the outcome of key input variables, therefore, the forecasts presented in should be read as projected traffic trends, considering the most likely evolution of the input variables. The main indicators affecting the evolution of road traffic analysed in this paper are: Population and Employment, Gross Domestic Product (GDP), Average Net Wage Earnings, Vehicle Fleet and Motorization Rate, Average Daily Distance (ADD), Road Capacity and Network Utilization Rate.

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2 CESTRIN traffic data collection

Traffic data collection was conducted by CESTRIN, an entity under the jurisdiction of C.N.A.I.R. - S.A. tasked with processing and providing traffic data. The main methods for obtaining traffic data include: the general road traffic census, Origin-Destination traffic surveys, and automatic traffic recordings. The data used in this work are derived from the processing of automatic traffic recorders for the period 2000 – 2020, in terms of Annual Average Daily Traffic, by vehicle categories. Table 1 shows the average annual growth rate of total traffic for each of the last 20 years, alongside the evolution of the main economic indicators.

Table 1 Historical growth of traffic and main economic indicators [1-4]

Period	Traffic	GDP [mld.$]	GDP/population [$]	Motorization rate	Average net wage earnings [$]
2000	3776	37.25	1659	139	99
2005	4150	98,6	4617	157	206
2010	5441	170	8397	213	390
2015	5498	177.9	8976	260	465
2020	7422	251.4	13047	379	745

The traffic growth rate over the past 20 years has been inconsistent, with periods of more pronounced growth and periods of slow growth or even decline. It is anticipated that this trend will continue to some extent, with an average increase of about 8% for each forecast period over 2020 – 2050. This is based on a continued increase in the degree of motorization, and although we will face an aging population, we can anticipate a significant repatriation of the emigrant population. Additionally, the construction of a highway network, as well as its impact on travel times, will act to increase demand, while simultaneously managing to reduce traffic congestion in the area of large urban agglomerations. Figure 1 presents road traffic in Romania for the period 2000 – 2020, along with the forecast until 2050.

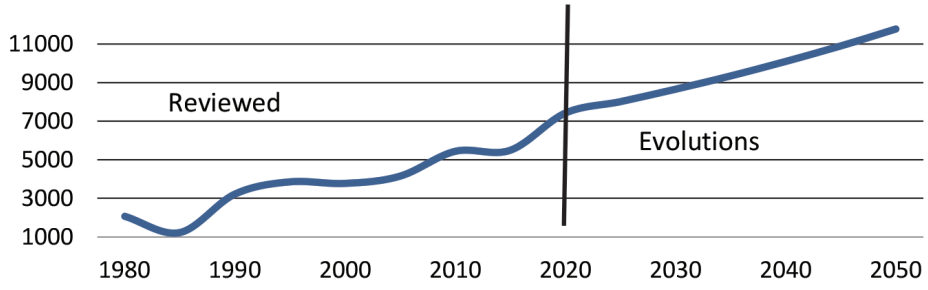

Figure 1 Traffic evolution from 1980 to 2050 [1]

3 The main indicators affecting the evolution of road traffic

3.1 Population and Employment

The population of Romania was 14.1 million people in 1930 and peaked in 1990 at 23.2 million. Since that year, the population has been declining to 21.7 million in 2002 and to 19.9 million inhabitants in 2014, reaching 19.4 million in 2020. Regarding the active population and the employment rate of the active persons, the National Strategy for Employment of Labor Force 2014-2020 (NSLF) aimed to boost efforts to achieve the employment target set by Romania for the year 2020, namely an employment rate of 70% for the population aged 20-64 years (Table 2, Figure 2 and Figure 3). Table 2. Evolution of the employment rate of active persons (20-64 years) between 2000 and 2020 [4]. It can be easily observed that, although there are significant changes in the population, their effect is not reflected in the evolution of road traffic.

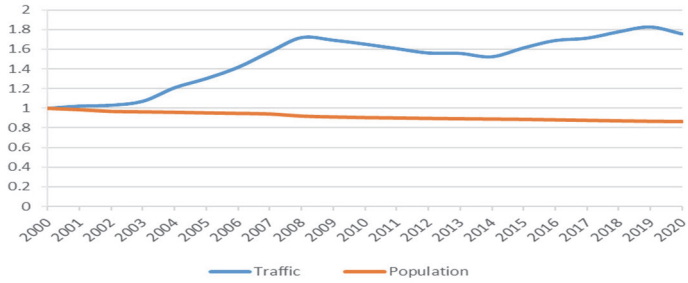

Figure 2 Evolution of Population and Road Traffic from 2000 to 2020 [1, 2]

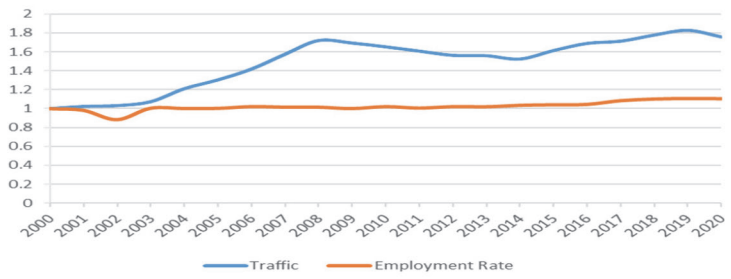

Figure 3 Evolution of Employment Rate and Road Traffic from 2000 to 2020 [1, 3]

Given that the motorization rate, employment rate and living standards in Romania are significantly below the European average, neither the population decline nor its aging have a decisive effect on the evolution of road traffic, at least in the short and medium term, up to the horizon of the year 2040. After this year, this factor might level off the growth coefficients as a result of reaching a certain saturation level.

3.2 Gross Domestic Product (GDP) (Romania's Development Strategy for the Next 20 Years, 2017)

The increase in travel is also closely associated with income growth. In a flourishing economy, people travel more, and businesses transport more goods across communication networks. The impact of GDP on traffic growth is evident in two ways (Figure 4).
Firstly, GDP growth leads to an increase in disposable personal income, which is closely associated with an increase in car ownership levels. As might be expected, the impact of having a greater availability of cars is to increase the number and length of car journeys and to reduce the occupancy rate of vehicles;
Secondly, the increase in disposable income causes people to change their travel patterns to travel to more attractive destinations, which are further away.

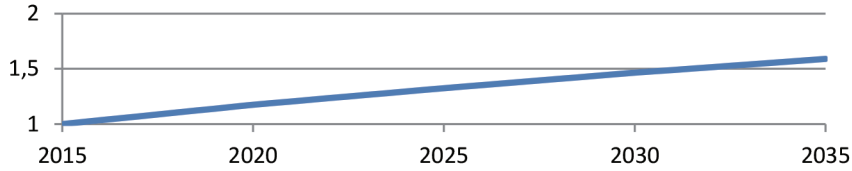

Figure 4 Estimated GDP Growth in Romania 2015-2035 [5]

The growth of domestic demand supported by the increase in lending activity and wage growth was 7.5% for the period 2000 – 2004 and respectively 10.6% during 2005 – 2008. After 2008, as an effect of the crisis, a sharp decline in domestic demand by 12.9% was recorded. Starting with 2017, the consumption rate gradually increased, so that in 2021 there was an increase of about 1.02 percent compared to 2020, highlighting sustainable economic growth through consumption.
However, an increase in GDP does not necessarily translate into an improvement in the quality of life at the societal level. One of the main reasons is that economic growth does not always occur in a way that enhances overall well-being, as can be observed in Figure 5.

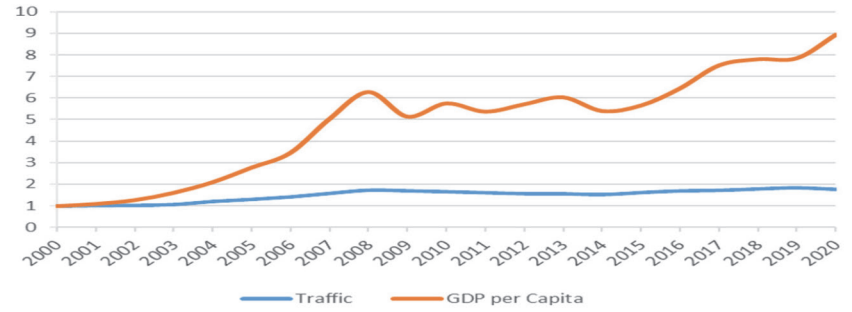

Figure 5 Evolution of GDP per Capita and Road Traffic from 2000 to 2020 [1, 6]

3.3 Average net wage earnings

Nominal and real wage earnings have shown a continuous upward trend. In 2010, the index of real wage earnings compared to 2000 recorded a value of 208.0%, while in 2012, still compared to 2000, the indicator was 206.1%. In 2008 compared to 2000, the increase in nominal gross wage earnings was recorded especially in the public sector, this increase also driving the growth of nominal gross wage earnings in the private sector, as can be observed in Figure 6.

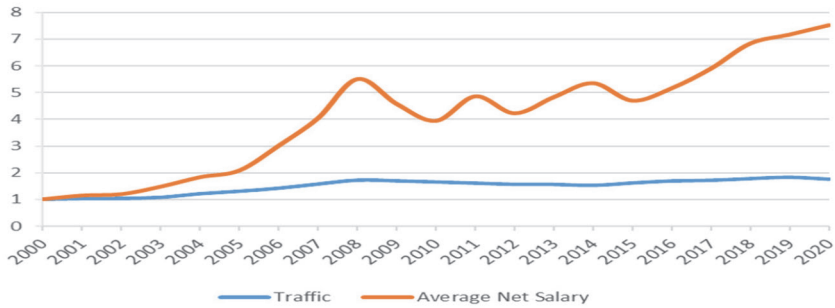

Figure 6 Evolution of Average Net Salary and Road Traffic from 2000 to 2020 [1, 4, 7]

3.4 Vehicle fleet and motorization rate

The motorization rate in Romania is still at relatively low levels, which means that it is expected to increase significantly in the future. In 2011, 19.3% of the population owned a car, a percentage that increases to 24.9% in 2020. With the increase in the motorization rate, the proportion of the population "captive" to public transport is reduced. This reduction of the captive market changes the dynamics of the public transport sector, which is in increasingly intense competition with the road sector (private car transport) for the population with a car available, as can be observed in Figure 7 and Figure 8.

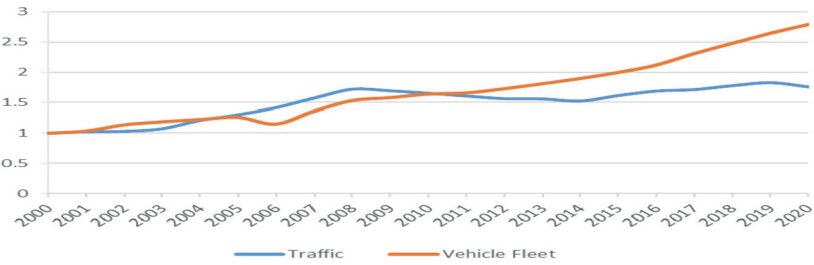

Figure 7 Evolution of Vehicle Fleet and Road Traffic from 2000 to 2020 [1, 8]

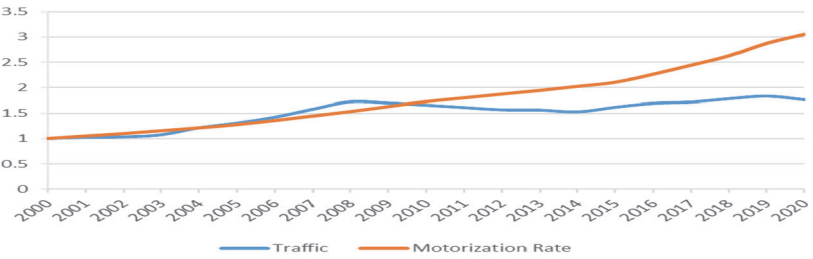

Figure 8 Evolution of Motorization Rate and Road Traffic from 2000 to 2020 [1, 9]

3.5 Average daily distance (ADD)

The Average Daily Distance of a vehicle represents the average daily distance travelled by a vehicle over the course of a year. This indicator provides a measure of the vehicle's productivity. A vehicle should be used as intensely as possible, provided that the transport demand is sufficient to cover the direct operating costs. A high ADD figure indicates intense use, but does not provide any indication of the utility of the kilometres operated, and therefore does not necessarily imply an economically optimal use of a vehicle. Needless use, even if it increases utilization, should obviously be kept to a minimum.
The average distance per vehicle is influenced by the speed of travel, the proportion of idling to running time, the hours of operation each day, the number of stops, the time spent stationary, and delays due to traffic congestion. Transport activity indicators determine the quantity (volume) and quality of the transport process. The most important quantity indicators are the goods' travel distance, average transport distance, and average transport duration for goods transport, and for passenger transport, the passengers' travel distance, average distance, and average transport duration. For both categories of transport, the average vehicle distance can also be defined. Passenger travel, in passenger-kilometers, represents the number of passengers transported multiplied by the distance over which the transport took place, as can be observed in Figure 9. Goods travel, in tonne-kilometers, represents the quantity of products transported multiplied by the distance over which the transport took place, as can be observed in Figure 10. The vehicle kilometres travelled by passenger or freight vehicles represent a significant variable in analysing fuel efficiency, environmental quality, and road and highway traffic safety.

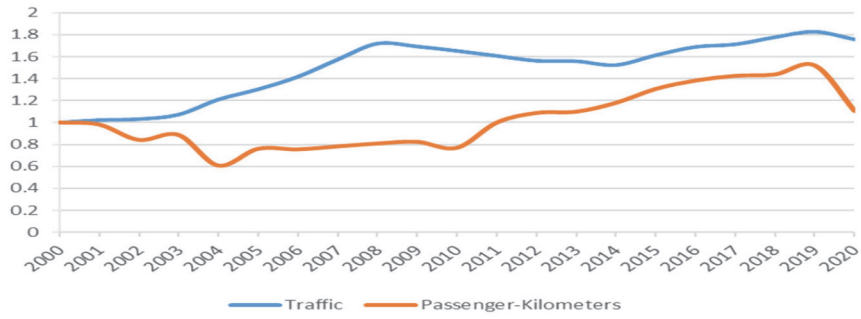

Figure 9 Evolution of Passenger-Kilometers Indicator and Road Traffic 2000-2020 [1, 10]

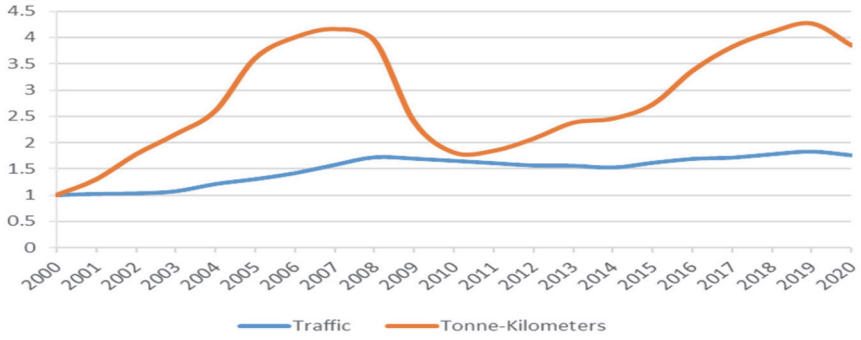

Figure 10 Evolution of Tonne-Kilometers Indicator and Road Traffic 2000-2020 [1, 3]

3.6 Road capacity and network utilization rate

Strategic road investments are dominated by improvements such as highways and European roads, primarily through the construction of new highways, widening existing roads, and improving intersections. A well-maintained road network contributes to reducing user costs, the risk of accidents, and improving road safety, avoiding the risk of road closures for major repairs, and reducing environmental impact. The infrastructure deficit is reflected in reduced mobility, insufficient connectivity at the level of certain regions, high transit traffic in numerous localities, and long travel times.

4 Conclusions

To assess the maximum variation around the central forecast, we model scenarios based on a combination of these indicators. The high demand scenario combines high GDP, or high per capita GDP, an increased motorization rate, moderate population decline, increased employment rate, low oil prices, and high fuel economy. It must be emphasized that all forecasts are uncertain. This is the result of the uncertainty of the input indicators. The forecast for the period 2020 – 2050 is more uncertain compared to previous road traffic forecasts. This improves the basis of forecasts and brings an increased recognition of the true uncertainty present by considering a larger number of inputs. It is unrealistic to take a high growth version of each variable and on this basis make a high forecast because the probability of a high rate continuing for 30 years just because the first year has a high rate is very low. On the other hand, there is considerable uncertainty in the early years associated with specifying the current situation in relation to transformation moments in the economic cycle.

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