TRAFFIC IMPACT STUDY FOR A NEW GAS STATION IN PITESTI CITY.

Mitran Gabriela [1], Ilie Sorin[1], Tabacu Ion [1]
[1] University of Pitesti
gabriela.mitran@upit.ro

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Abstract: Planning documentations are operational tools of spatial management of the territory, in accordance with the values and aspirations of European integration of society. Zonal urban plan sets out specific regulations for a zone within a basic administrative unit, having different functions (housing, services, circulation, green spaces, public institutions, production, etc.). Formulation of planning regulations specific to the studied zone requires the analysis of some background studies in the areas in close correlation with land use. Traffic and transportation planning is one of the background studies underlying zonal urban plan development. In this paperwork the authors present a part of the background study regarding on traffic and transport planning, namely the impact generated of a new fueling station located in Pitesti. It results that through its capacity and location in the street network, the fueling station does not produce significant effects in the volume and structure of traffic flows. The assessment of the impact on these parameters was done using specialized software in transport modeling.

1. INTRODUCTION

The transport system and land use are in interaction relationship. Decisions in transport field affect land use planning, and land use characteristics affect transport activity. The relationships between the two systems are complex, with various interactive effects. It is very important to understand these interactions in order to decide a harmonized development of the study area.

In this paper the authors describe ways that land use decisions affect the transport activities through effects on traffic flows. The changes at land use level consist in operation of a new gas station in a residential neighborhood in the city of Pitesti.

2. TRAFFIC IMPACT STUDY METHODOLOGY

For modeling the interaction between economic and social activities and transport are conceptualized, on the one hand the land use activities and on the other hand, the transport system that characterizes the study area. The traffic is the result of interaction between the two components of the land use – transportation system. The land use and transport facilities form a closed loop system, as in Figure 1.

Where one of the components change their state, via the system, is affected the behavior of other components, long reaching a state of balance.

The balance state of the system Land use-Transport may not coincide with the state designating socially optimal level of traffic. Major changes in the economic subsystem produce changes in equilibrium of the land use - transportation system. The traffic volume is determined by the activities of land use and transportation system performance.

The traffic flow is observable and measurable in time and space coordinates. This space and time dependence of the whole system has a dynamic character that is dominated by strong feedback effect, resulting in several adjustments to establish a certain balance. Studying the impact of the operation of a new economic activities involves the transport demand estimation and formalizing transport supply both the existing situation, "without project" and the proposed situation, "the project", where is considered the generation and the attraction travel potential associated with the new objective.

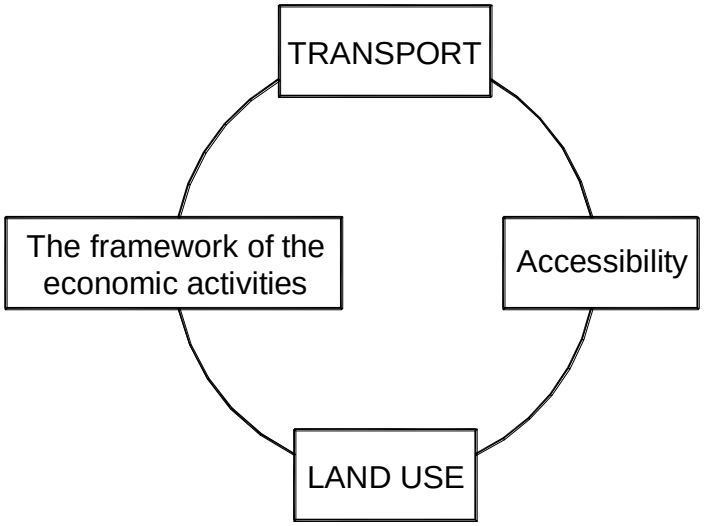

Figure 1. The interaction between land use and transportation.

The logic flow chart of the analysis methodology is presented in Figure 2.

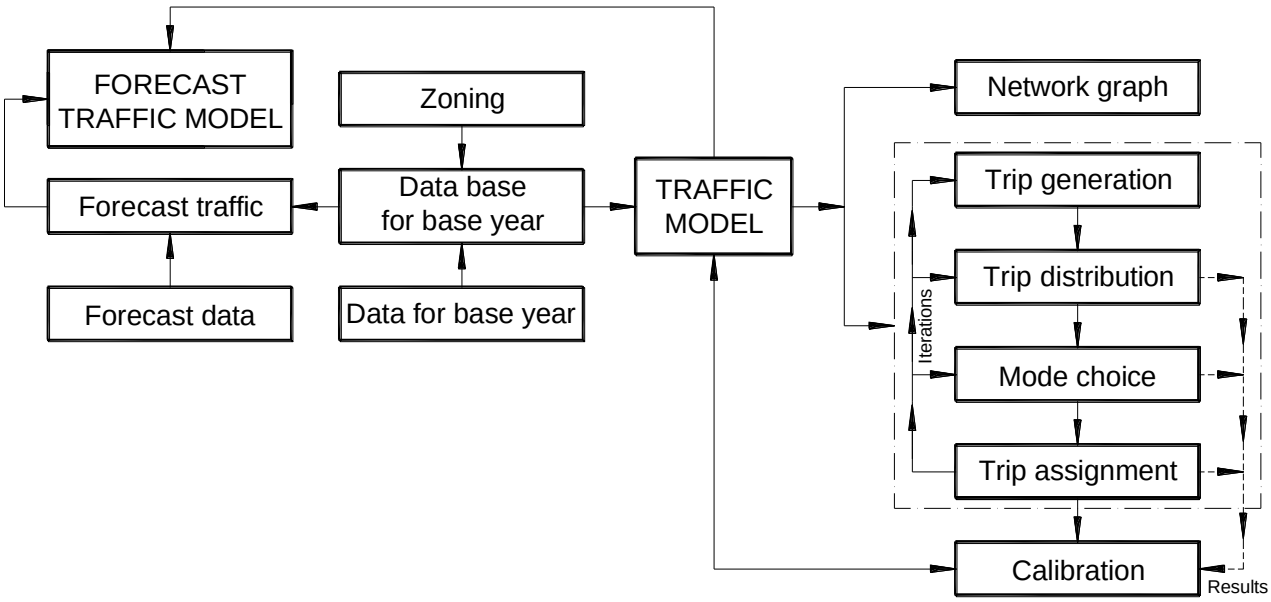

Figure 2. The logic flow chart of the study the impact of a new land use activities on the traffic.

3. THE ASSESSMENT OF THE IMPACT FROM A NEW GAS STATION ON ROAD TRAFFIC IN THE PITESTI CITY ROAD NETWORK

3.1. THE PURPOSE OF THE TRAFFIC STUDY

The automatic fuel distribution station is located in Pitesti, Smeura Street, no. 10, at the boundary between districts Center, North, Trivale and Banat (Figure 3).

The objective of this paper is to identify the influence of a gas station on road traffic in the Smeura Street. To this end, was built a traffic macro simulation model taking into account the area of influence and the links to the major road network in the area.

The land for the gas station has an area of 647 sqm. The capacity of the gas station allows simultaneous operation of two vehicles and parking of another two vehicles as a string waiting for supply. The objectiv not provide the parking spaces.

3.2. DATA TRAFFIC

The spatial location and the intensity of the activites that use this space, can be determined by surveys on the land use. The movement depends on the quality of the transport system that connects various points separated spatially, and the surveys in the transports plays a major role in location specification for the activities.

Figure 3. Location in area [2].

The correlation between land use and transport leads to a decision to travel. To identify the type and size of transport demand, are needed transport surveys for different types of travel.

The recording of vehicles that make traffic flows can either be done automatically through traffic detection equipment, video and GPS devices, either by direct observation and record the specific registration forms.

For an accurate estimate of current traffic conditions in the area of influence of the automated fuel distribution station is necessary to conduct traffic surveys.

In this way, were carried traffic volumes counts in the following points located in the area of influence of the objective that is studied influence on traffic:

- ✓ *Smeurei Street, between Armand Călinescu Street and Exercitiu Street;*
- ✓ *Negru-Voda Street, between the Ion Cantacuzino Alley and Eremia Grigorescu Street;*
- ✓ *Drăgăşani Way between Frasinului Street and Libertatii Street.*

The traffic records during 13 hours was made on 30.11.2011, between 7:00 a.m. to 8:00 p.m. The hourly distribution of the traffic, expressed in private car units, is shown in Figure 4 [2].

The private car unit is a standard reference unit for sizing and verification of road infrastructure in terms of traffic capacity and bearing capacity of road system and for traffic flow analysis.

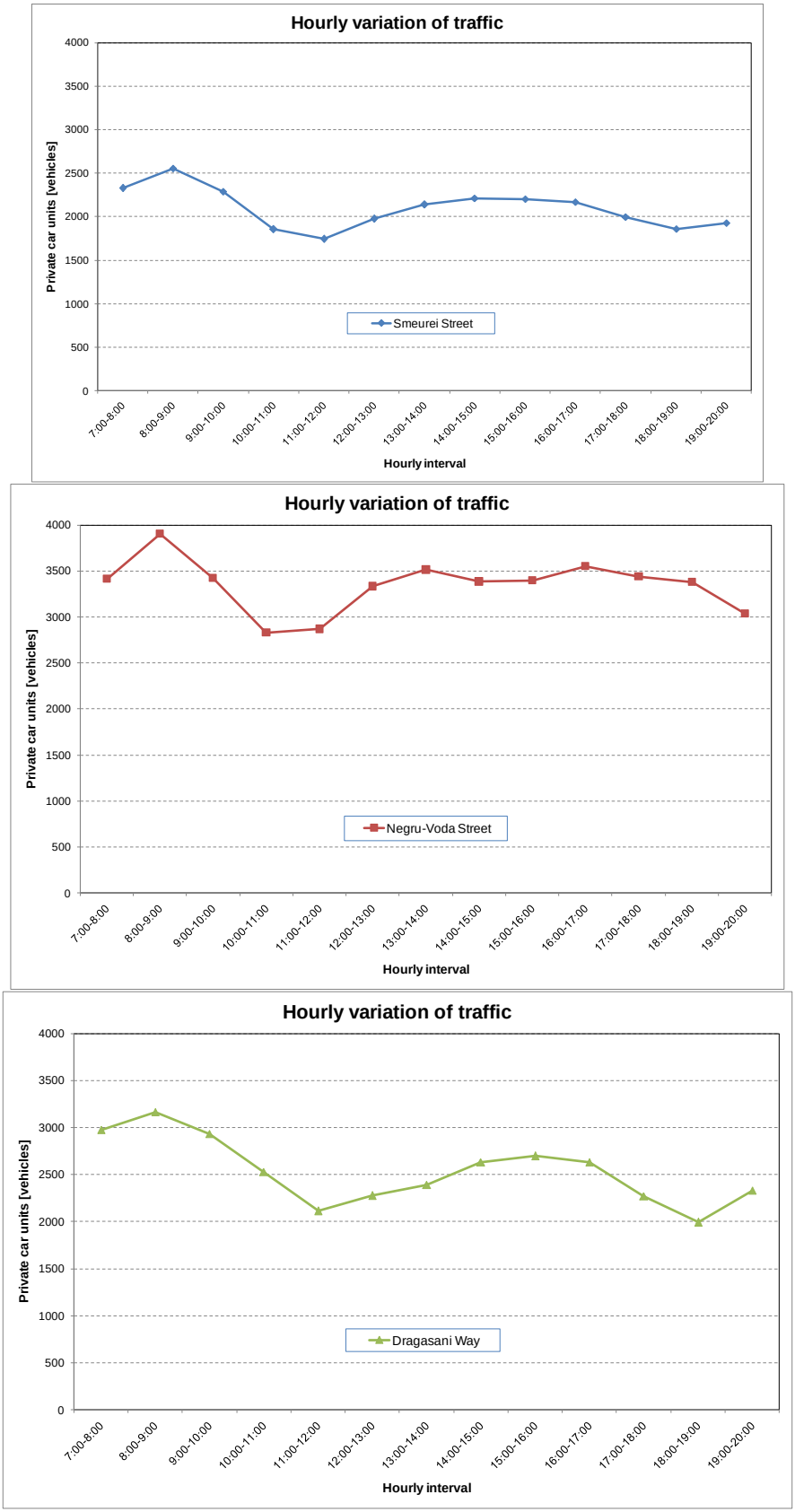

Figure 4. Hourly variation of traffic.

In the literature there are relations for calculate the equivalence coefficients (Table 1) between physical vehicle and private car unit for different categories of vehicles and terrain conditions [1], [2].

Table 1. The equivalence coefficients of physical vehicle to private car unit.

Vehicle type	*Coefficient of equivalence*
Bicycle, motorcycle	0.5
Car	1.0
Light trucks	3
Medium trucks	3
Heavy trucks	4.5
Bus, coach	3.5
Tractor	3.5
Animal drawn vehicles	3.0

3.3. TRAFFIC FLOWS – ACTUAL SITUATION

This study is based on a macroscopic transport model known in literature as the "four-steps model" (Figure 2), performed using the software VISUM [3]. The University of Pitesti, Faculty of Mechanical Engineering and Technology is licensed to use this program.

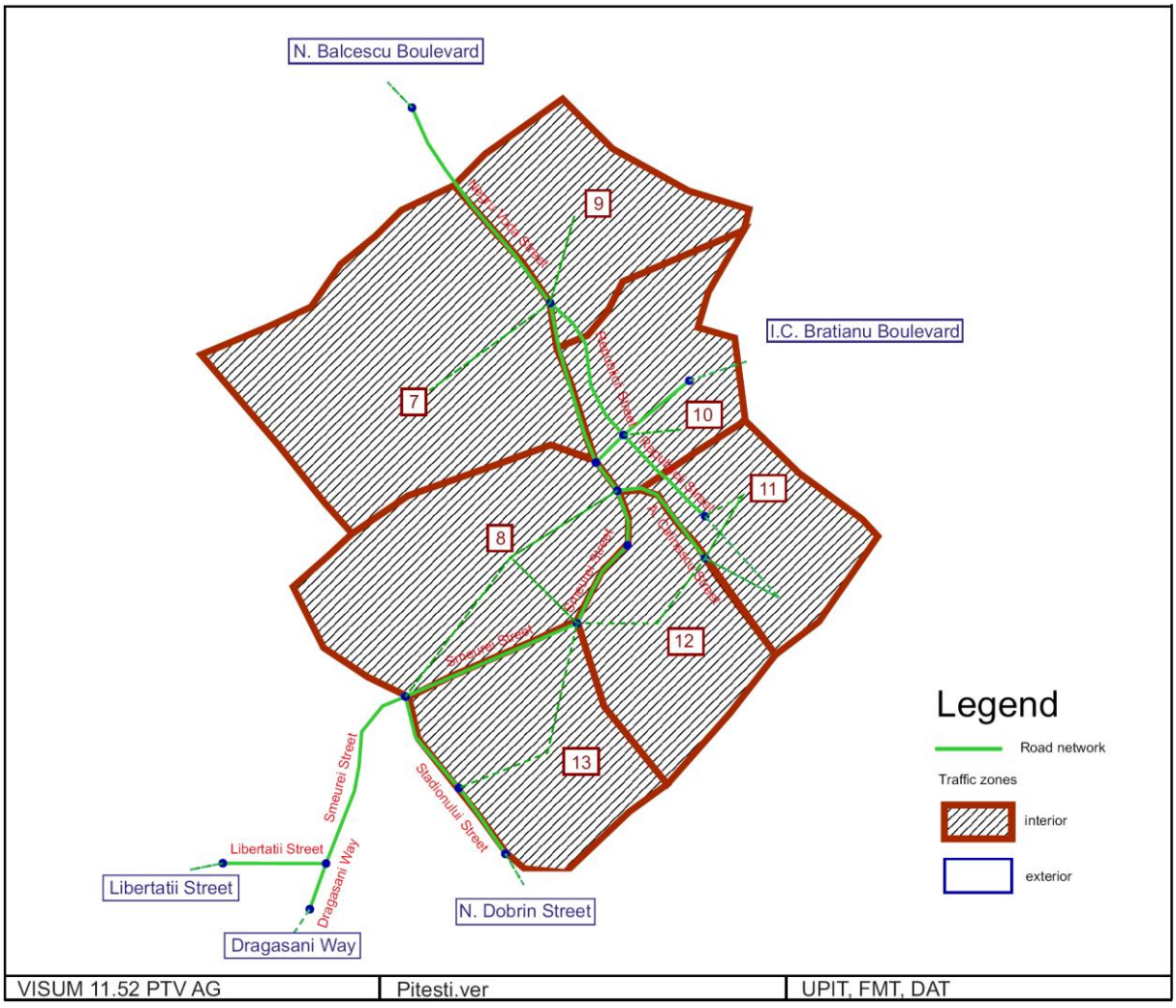

Figure 5. Traffic analysis zones – graph network.

The main attributes of the four-steps model are:

- ✓ *the traffic model is specific for study area - is not transferable;*
- ✓ *the traffic pattern is a pattern of behavior - is based on choices of road users;*
- ✓ *the traffic model captures the interaction between road users and transport systems available;*
- ✓ *the traffic model should be calibrated and validated based on field data collected;*
- ✓ *based on traffic model are estimated the impact of changes on traffic fluency.*

In the process of estimation of transport demand is required functional zonification of the territoriu and formalisation of the transport network by a graph with nodes and arcs. Figure 5 presents the analysis traffic zones and the graph network of influence [2].

The traffic flows, by categories of vehicles are shown in the Figure 6 [2].

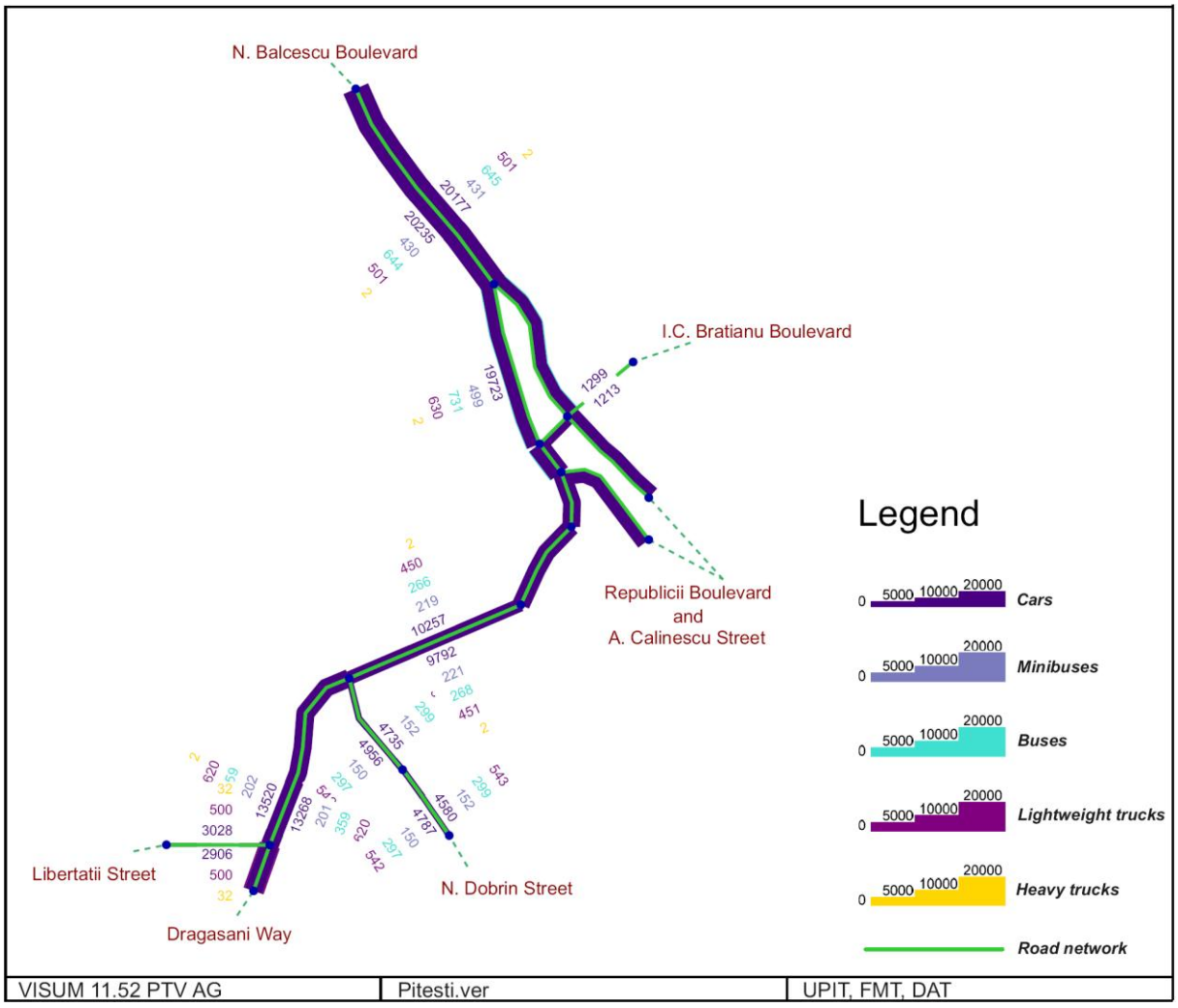

Figure 6. Traffic flows – the actual situation, "without the project".

3.4. TRIP DISTRIBUTION TRAFFIC FLOWS – SITUATION "WITH PROJECT"

Under these assumptions in the stage of trip generation to take into account the potential for generation and attraction of trips assigned to automatic fuel distribution station located on the Smeura Street, no. 10. This potential is aggregate to the generating and attractiveness potential of the traffic area no. 8 (Figure 5).

The traffic flows for vehicle categories analyzed are shown in Figure 7 [2].

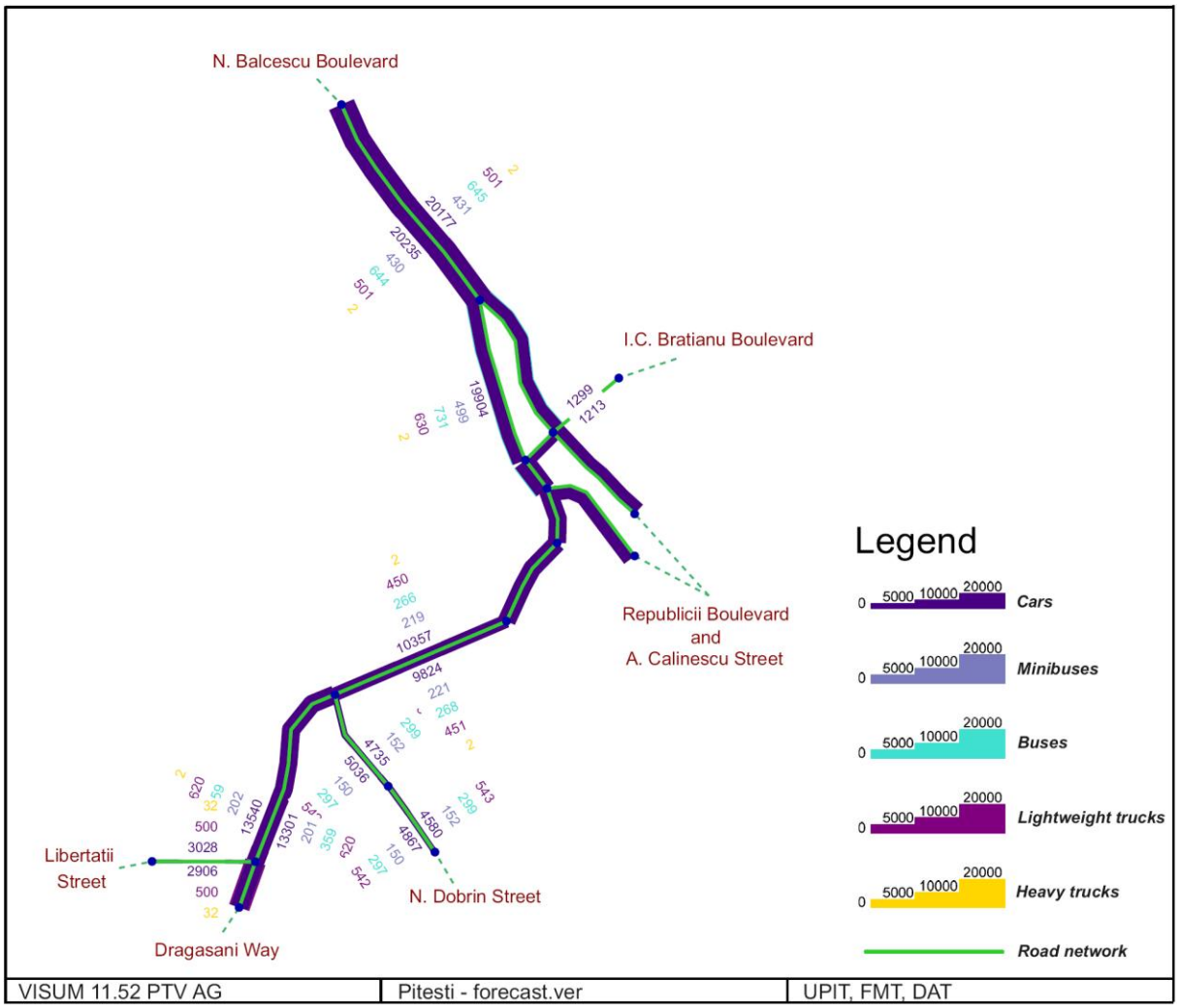

Figure 7. Traffic flows – the future situation, "with the project".

Figure 8 summarizes the differences between the traffic volumes registered in the event that in the Smeura street, no. 10 operate an automated fuel distribution station and traffic flows recorded in the current situation.

4. RESULTS AND DISCUSSIONS

Analyzing the traffic model, it can be concluded that the operation of a fuel distribution stations in the Smeurei Street, no. 10, will generate an increase in traffic on the artery with 317 passenger cars units in the section, at the Annual Average Daily Traffic (AADT) level. This value represents an increase of only 1.2 % of traffic from the current situation, which is reflected on the insignificant value of flow / capacity rate in the transport network within the project area.

The assess of the impact generated by changes in the characteristics of land use on the structure and the volume of traffic flows is a complex process with special importance in the studies underlying decision-making process on the development of transport systems and traffic management.

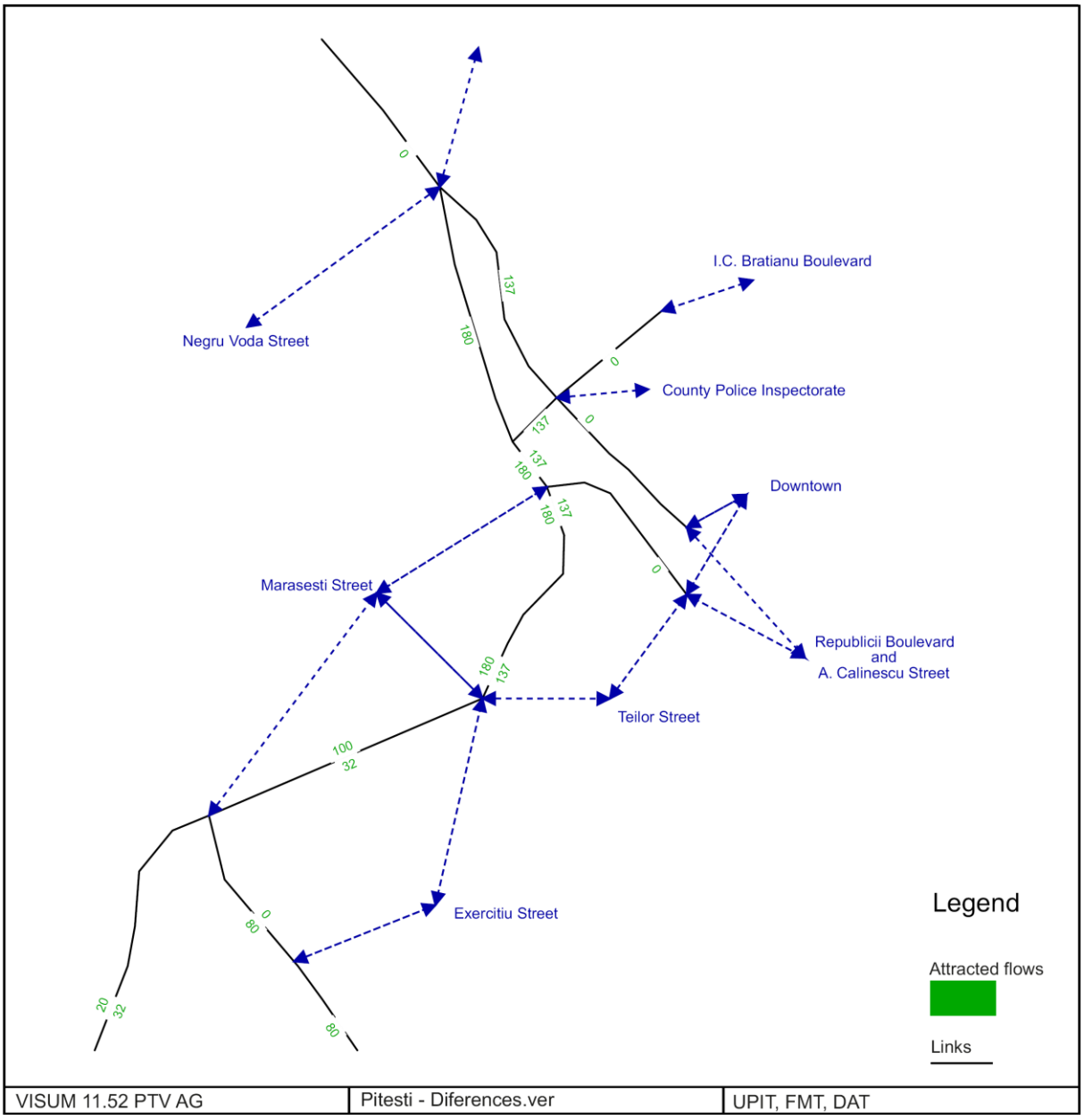

Figure 8. The differences between traffic flows in the situation with and without the project.

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