



**ELABORATION OF OPPORTUNITY STUDY NECESSARY TO  
PROVIDE PUBLIC TRANSPORT SERVICES ON THE  
ADMINISTRATIVE TERRITORY OF THE MUNICIPALITY TÎRGU-  
MUREȘ**

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**ABSTRACT**

This study presents and processes briefly the defining elements that characterize the system and the public transport service of TÎRGU-MUREȘ Municipality in 2015. The first contact with the "Târgu-Mureș" entity can only be achieved through a major interest in the land and the inhabitants. The Municipality of Târgu-Mureș, the county seat of Mureș, with an area of 6,696 ha and a population of approximately 150,000 inhabitants, is one of the big municipalities of Romania, a major road and air junction, a powerful center of polarization of socio-economic activity at regional level. Only 12 districts (with an area of 3201.37 hectares) can be identified for Târgu-Mureș municipality alone. The transport operator acting as the main service agent for the Tîrgu-Mureș urban area, namely S.C. Local Transportation S.A. operates as a joint stock company under the authority of the Municipal Council. Vehicle Park of S.C. Siletina Impex S.R.L. and Local Transportation S.A. Tîrgu-Mureș used for the local public transport activity is also presented in the paper. The economic and financial situation for the years 2012, 2013 and 2014 are summarized.

**Keywords:** Fire Safety, Safety Audit, Safety Management System, Safety Codes, Public Sector Building



## 1. INTRODUCTION

The purpose of this document is the elaboration of an opportunity study to delegate the management of local public transport of passengers in the municipality of Tg. Mures.

The objective of the study is to concede local public transport services to persons, as well as to entrust the administration of the assets belonging to the public patrimony part of the related infrastructure, *an authorized transport operator*, who has the necessary experience in order to continue and develop the activity in managerial and financial and competitiveness on the market of these services and the necessary technical and professional capacity.

According to the provisions of Law 92/2007, local and county councils have the power to carry out the concession, as well as the conclusion of the contracts for awarding the management of the local public transport service and the related technical and public infrastructure in the public or private property of the localities in the following ways:

- a) direct management;
- b) delegated management;
- c) other ways established by this law.

Through all the actions following the decision making the public service in one of the following situations, it is aimed at:

- ensuring the necessary legal and operational framework for the operation of an urban passenger transport operator;
- revitalizing the population service (maintaining at least the standards in previous years and the sustainable development of the service).

According to the provisions of Law no.51 / 2006, the public and / or private property of the administrative-territorial units from the public utilities system used for the provision of the services can be:

One = data in administration and operation of operators, based on the decision to give in administration - in the case of direct management;

Two = licensed to operators under the terms of the law, based on the award decision and the management delegation contract - in the case of delegated management.



In the case of direct management, the Local Council of the municipality assumes directly the provision of the local transport service and all the tasks and responsibilities, according to the law, regarding the organization, coordination, operation, financing and control of the functioning of the local public transport service, as well as administration of the utility and public system related. Direct management is also carried out by some road transport operators, but which are the structures of the local public administration authorities.

Delegated management is the concession-granting form of the local public transport service through which the local public administration authorities transfer to one or more road hauliers or public-private or mixed-ownership carriers the tasks and responsibilities regarding the actual supply of service, as well as the exploitation, maintenance, rehabilitation and modernization of the public property belonging to the local public transport system, based on a delegation of management contract.

There are major managerial differences between the two situations.

In the case of direct management, the City Hall exercises its prerogatives in all areas of service that address the whole population of Tg. Mures, the performers charged with the performance directly responding to the local administration *but local administration answering in any circumstances*; the reality describing this situation is in the foreground of the emergence of a flow of information but also of claims from the inhabitants directly to the known representatives of the City Hall, the department not having the possibility of data filtering and solving the problems of its tactical or operational sphere without loading the City Hall's leadership.

In the case of delegated management, the cessation of the entity's (complete entity) membership in the local administration structure marks a degree of autonomy over the authority that has decided to delegate; the new company becomes economically independent as a trader. The "clients" of the system are mainly addressed to the transport company, so that the flow of information and claims entering the City Hall is only the strategic sphere - that is, from the sphere that organically exceeds the organizational and economical-financial capacities of the transport society, so the loading of the known representatives from the City Hall structure is sufficiently relevant but reduced in volume, and the load becomes acceptable.

As a form of driving, this variant is equivalent to the idea of exploitation: the transport company exploits the conserved heritage.



From the managerial point of view, this should be interpreted as follows: exploitation involves anticipating the setting of goals (goals, results).

The Local Council adopts decisions regarding the choice of how to manage the local public transport services and the administration or, as the case may be, the concession of the public and / or private property of the administrative-territorial units from the public utility systems, as well as to establish programs for the rehabilitation, extension and modernization of the road infrastructure, in accordance with the law, in order to improve the local public transport.

The choice of the way of awarding the local public transport services is done, under the terms of this law, as well as of Law no. 51/2006, by a decision adopted by the local councils, by the county councils or by the General Council of the Municipality of Bucharest, as the case may be. The goods and components of local transport systems in the public or private domain of the respective public administration may be put into service for the provision of public transport services to the transport operators or authorized transporters to whom the management of the service has been assigned.

The assignment of the goods and the components of the mentioned transport systems is done through delegated management, concluding a concession contract in accordance with the provisions of the legislation in force. Pursuant to Law no.51 / 2006, in the exercise of their competences and attributions in the sphere of public services, the local public administration authorities adopt decisions regarding the choice of how to manage the public utility services and the administration or, as the case may be, the concession of the property public and / or private units of the administrative-territorial units of the public utility systems.

The main objectives pursued by the local public administration authorities in the field of the local public transport service according to the provisions of Law 92/2007 of the local public transport services are:

- a) the establishment of specialized compartments or services for local public transport, with or without legal personality, as appropriate, hereinafter referred to as local transport authorities;
- b) ensuring the financing necessary for the development of the components of the local public transport system, provided they belong to the public or private domain of the local public administration authorities;
- c) ensuring transparency in public procurement procedures;



- d) periodically informing and consulting the population on the sustainable development policies of the local public transport service;
- e) the granting of certain transport facilities to certain categories of persons;
- f) the correlation between the capacities of means of transport of passengers and the flows of passengers existing ensuring the continuity of transport services through transport or transport programs functioning, where appropriate, correlated with existing passenger or commodity flows;
- g) the assignment of the local public transport services to the road transport operators and authorized transporters, depending on the level of their investment effort made in the means of transport and in the transport infrastructure.

Rationally, the City Hall of Tg. Mures decided for the future to use the "delegated management" method.

Generally speaking, delegated management is done through public utility service operators, which can be:

- commercial companies established by local public administration authorities or community development associations holding valid transport licenses;
- commercial companies resulting from the administrative reorganization of autonomous regies of local or county interest or specialized public services subordinated to the local public administration authorities, whose share capital is wholly or partly owned as owner or co-owner by the respective public administration units holding the valid transport licenses;
- companies with private or mixed social capital, holding licenses valid transport;
- Compartments or specialized local transport services as own structures of the local public administration authorities or community development associations with or without legal personality.

The purpose of the study is to concede the local public passenger transport activity the city of Tg. Mures to an urban public transport operator based on:

- Local Public Transport Law no. 92/2007,
- Government Emergency Ordinance no. 109/2005, approved with amendments and completions



- Law no. 102/2006, as amended and supplemented,
- Odonantei nr. 97 of August 30, 1999 (republished) regarding *Guarantee of supply of public services supplied by internal and inland waterway transport*,
- Law no. 51/2006 of the community utilities services,
- Government Emergency Ordinance no.34 / 2006 on the award of public procurement contracts, public works concession contracts and service concession contracts,
- Order no. 263/2007 regarding the approval of the Framework Rules on the award of contracts for the delegation of management of local public transport services,
- Order no. 972/2007 for the approval of the Framework Regulation for the Local Public Transport and the Framework Task Force of the Local Public Transport Services,
- Regulation 1370/2007 of the European Parliament and of the Council of 23 October 2007 On public passenger transport services by rail and road,
- as well as the international agreements and conventions to which Romania is a party in order to optimize, make efficient and modernize the local public transport service.

The present study substantiates the necessity and opportunity of concession of local public transport in Tg. Mures and the establishment of optimal solutions for the delegation of service management.

The local public administration authorities have the obligation to establish and implement the medium and long-term strategy for the extension, development and modernization of local public transport services, taking into account urban and spatial planning plans, the economic and social development programs of the localities and the local public transport requirements, their evolution, as well as the use of means of transport with low energy consumption and minimal emissions of pollutants.

By achieving this goal. Local Council of Tg. Mures, representative of the Local Public Administration Authority of Tg. Mures, following the strategies he will adopt:

- Medium and long term development and operation of transport services public in accordance with the economic and social development programs of the locality, as well as the infrastructure related thereto;



- satisfying the needs of the population (the main client) in optimal conditions, as well and of the public institutions and economic agents from the administrative-territorial range of the locality, which it serves through the transport services;
- management of local public transport services on the basis of competitiveness and managerial efficiency;
- Improving the living conditions of citizens by promoting their quality efficiency of local public transport of persons;
- Ensuring sufficient capacity especially on crowded routes;
- promoting the rehabilitation of infrastructure related to public transport services
- local people;
- building new public infrastructure through an appropriate investment program;
- granting facilities to some disadvantaged categories of people social view;
- Maintaining the transport service to the proposed performance indicators.

In this context, the goal pursued by the Local Public Administration Authority is to improve the efficiency of the city's passenger transport activity by increasing the fluency, the speed of the traffic and the transport capacity, as well as the efficiency of the use of the funds for the exploitation activity (Petrescu et al., 2017).

## **2. METHODS AND MATERIALS**

Only for Târgu-Mureş can be found the following 12 districts (with an area of 3201.37 hectares):

- 1 = Unirii,
- 2 = Freedom,
- 3 = Mureseni,
- 4 = Pietros Dym,
- 5 = Budai Nagy Antal,
- 6 = Cornice,
- 7 = December 22,



- 8 = Center,
- 9 = Azomures,
- 10 = Zoo,
- 11 = Tudor,
- 12 = Valea Rece,

From an administrative-territorial point of view, Târgu-Mureș municipality also includes the localities of Mureșeni and Remetea.

Regarding the area characterization it is noted:

- densely populated areas, such as new blocks of flats and dwellings: Tudor Vladimirescu, Dâmbul Pietros;
- sparsely populated areas, such as Valea Rece, Mureșeni, and Libertății;
- Economic zones: Western industrial platform, industrial and commercial micro-zones;
- areas of parks, recreation areas, other objectives of citizens' interest. Analyzing the usable structure of the streets of the city one can find an arrangement in which the radial arteries predominate (with RED) figure 1 (PMUD Tîrgu Mureș; SIDU 2016-2023 Târgu Mureș; INCERTRANS SA, 2015).



- Figure 1: Analyzing the usable structure of the streets of the city one can find an arrangement in which the radial arteries predominate (red color).
  - Source: Petrescu et al. (2017) and PMUD Tîrgu Mureș



The establishment of the city's areas, following stepwise and quasi-correlated development, has led to the situation where the travel potentials of the various geographical locations of the city are differentiated, both in size and structure, so that the dissociation in relation to the origin, destination or transit, be relatively ambiguous, not respecting the zoning principle. In accordance with this principle, urban planning must take into account the constitution of urban areas, so that the potential and transport burden is minimal.

This means that each area must have sufficient utilities (jobs, housing, supply points, schools, etc.) to ensure for the largest part of the area's inhabitants facilities, thus limiting the need to overcome the boundaries of the area. The absence within the area of objectives that meet the essential needs (work, supply, education, recreation, etc.) has led to increased transporting the system. Of equal importance with the street infrastructure is also the distribution of the population (see the Table from the Figure 2):

	neighborhood	population
1	Unirii	13403
2	Libertatii	11769
3	Mureseni	14408
4	Dambul Pietros	24047
5	Budai Nagy Antal	6933
6	Cornisa	2457
7	22 Decembrie	5271
8	Centru	21115
9	Azomures	153
10	Gradina Zoologica	0
11	Tudor	50783
12	Valea Rece	83
	<b>Total</b>	<b>150422</b>

Figure 2: Characterization of neighborhoods in terms of the number of inhabitants.  
 Source: Petrescu et al. (2017) and PMUD Tîrgu Mureş

On the other hand, the monostructure of the city's quarters:

- Tudor, Drumul Pietros - mainly blocks of flats,
- Cornișă, Mureșeni, Freedom - mainly houses with a level and garden,
- Azomures, Zoo - no living quarters, etc.

Has generated significant transport demands due to the nonlinear link between the size of the area's population and the need for travel. It is known that transport needs are not proportional to the population size of the area, but to a supra-unitary power ( $\approx 2$ ). An area endowed with all utilities will have a much smaller population than one with the same area but only for dwellings. In the latter case, not only that all active citizens (and some of the inactive

ones) will travel beyond the boundaries of the area - that is, a high-level transport time will be generated - but also the order of magnitude of these quantifiers will be all else (a 2 times more populated area will generate 4 times more demand for the transport system and therefore traffic will be heavily affected by inadequate zoning). The structural-spatial component of transport needs (overlapped with time variations) reveals a type of unevenness that highlights the difficulties the urban transport system has to bear. The basic idea in this context is given by the notion of compaction of the city.

The table in Figure 3 below shows the streets currently being used for public transport.

Street	bands number	Surface	The line of TP
Dezrobirii	2	asphalt	1, 2b, 2e
Gh. Doja	4	asphalt	1, 2, 2e, 3, 4, 14, 16, 17, 18, 21, 23, 44
Bega	2	asphalt	1, 2e, 14, 21, 23, 43
Budiului	2	asphalt	1, 4, 14, 16, 21, 23, 43, 44
1848	4	asphalt	1, 4, 14, 16, 23, 43, 44
Pta Trandafirilor	4	asphalt	1, 2, 2b, 4, 12, 18, 19, 20, 23, 26, 27
Pta Petofi Sandor	2	asphalt	1, 2, 2b, 2e, 18, 19, 20, 23, 27
Pta Bernady Gyorgi	2	asphalt	1, 2, 2b, 2e, 18, 19, 20, 23, 27
Mihai Viteazul	2	asphalt	1, 2, 2b, 2e, 18, 19, 20, 23, 27
Gh. Marinescu	4	asphalt	1, 2, 2b, 2e, 10b, 18, 19, 20, 23, 27
22 Decembrie	4	asphalt	1, 2, 2b, 2e, 10b, 18, 19, 20, 23, 27
Pta Republicii	4	asphalt	1, 2, 2b, 2e, 18, 19, 20, 23, 27
Revolutiei	2	asphalt	1, 2, 2b, 2e, 18, 19, 20, 23, 27
Depozitelor	2	asphalt	2b, 2e
Baneasa	2	asphalt	2b, 2e, 6
Nicolae Balcescu	4	asphalt	2b, 2e, 6
Libertatii	2	asphalt	2b, 2e, 6, 16
Cuza Voda	2	asphalt	2b, 2e, 3, 6, 14, 16
Piata Matei Corvin	4	asphalt	2e, 3, 14
Calarasilor	4	asphalt	2e, 3, 4, 10b, 12, 26
Garii	4	asphalt	3
Tisei	2	asphalt	4, 10b, 12
Voinicenilor	2	asphalt	4, 10b, 12
Baraganului	2	asphalt	3
Remetea	2	asphalt	3
Cetinei	2	asphalt	3
Plopilor	2	asphalt	4, 12
Soimilor	2	asphalt	4, 12
Decebal	2	asphalt	4, 10b, 12
Livezeni	4	asphalt	6, 12, 17, 19, 20, 21, 26, 43, 44
Cutezantei	2	asphalt	6, 19, 21, 26, 44
Infratii	2	asphalt	6, 19, 21, 26, 44
1 Decembrie 1918	4	asphalt	6, 12, 17, 19, 20, 26, 27, 43, 44
Carpati	2	asphalt	10b, 14, 26
Margaretelor	2	asphalt	10b
Luntrasilor	2	asphalt	10b
Secuilor Martiri	2	asphalt	10b
Piata Onesti	2	asphalt	16
Pandurilor	4	asphalt	21, 27, 44
Sighisoarei	4	asphalt	21
Buday Nagy Antal	2	asphalt	27
Moldovei	2	asphalt	44
Predeal	2	asphalt	44
Secerei	2	asphalt	44

Figure 3: The streets currently being used for public transport.

Source: Petrescu et al. (2017) and INCERTRANS SA (2015)

Studying the compaction degree of the city is not limited to obtaining, for example, the maximum or average distances from the city center to the suburbs; if two identical city plans are sketched out as sketches, which would be distinguished by the fact that one of them would have a higher density of population in the center and the other one would have a lower density in the center and higher at the periphery, then the first one will always be more "compact" than



the second, if the degree of city compaction would mean the average distance to which the entire population of the city is placed over a given point. Or, from this point of view, Târgu-Mureș has a degree of contradictory compaction:

- reduced, taking into account the populated districts Tudor Vladimirescu, Dâmbu Pietros and Unirii - located in an extremity of the city, respectively in the districts of Valea Rece, Mureșeni and Libertății, located in another extreme;
- high, taking into account the industrial areas - or more precisely the labor-intensive areas - the Azomures district;

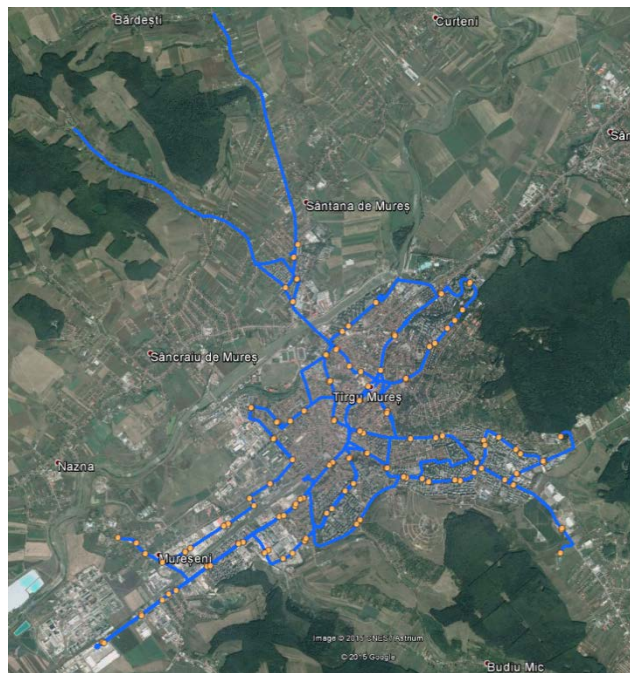


Figure 4: The road network on which the public transport activity takes place in the municipality has a total length of 51.75 km.  
Source: Petrescu et al. (2017) and PMUD Tîrgu Mureș

On the whole characterization of the city can be well covered by the qualification of "stratified city".

For the city of Târgu-Mureș, a town that has a compound structure where the streets of the old center - around which the rest of the city has developed - prevent the establishment of "direct" bases, the problems of urban transport can only be solved considering all types the movements that accompany travel needs and obviously their volume. In addition, in the rest of the city (rather than the set of streets specified above), there is a street tramway of a special bill, due to the numerous narrow and sinuous streets in the central area and on the sides of the historical center. In other words: there are chances to encounter major implementation and

operating difficulties if new kilometers of trails are introduced on other arteries than specified - unless adequate constructive measures are taken.

The road network on which the public transport activity takes place in the municipality has a total length of 51.75 km and is shown in Fig. 4.

The total length of the 24 urban public transport routes is 202.65 km - double line. Taking these values into account, the transport network density for the 12 districts is only 1.625 km / km, which means that after approx. 150 m is a common transport route - a particularly good value (for Bucharest the value is 250 meters).

From the point of view of the exploitation, reporting the length of the trajectories to the length of the network, the result of 3.91 shows an overlap of the transport lines above an acceptable average (the level of nearly 4 traces present simultaneously on a unit length of the network shows that any place on the network a presumed traveler has 4 transmission lines each with their own attributes = for the current network is a feature to be appreciated). It is worth noting, therefore, that the offer to the traveling public is generous and the volume of work undertaken should be adequate.

The total number of stations on the public transport network is 127. From the perspective of the transport network, the density of contact points between the population and the urban public transport system is relatively equal to the density recommended in the literature, namely: the stations are located at approx. 400 meters apart.

Corroborating two of the above information, it follows that after 150 m a line is found and after a maximum (400/2) m there is a landing - landing station; in other words, at the normal walking speed for a pedestrian, a citizen-transport system contact point (excellent value) is accessed in 5 minutes.

A critical analysis of the network of routes currently operated by the local transport company shows that:

- the southern part of the city - the new residential district Spring - is not served in any way;
- the center is overloaded by lines;
- most of the lines focus on the streets of the Rose Square, Petöfi Şandor Square, Bernady Gyorgy Square, Mihai Viteazul, Gheorghe Marinescu, December 22, Republic Square, Revolution.



In addition to the "infrastructure" analysis, it is noteworthy that the isochrone constituted (for 15 and 30 minutes) comprise the densest areas of the city, both in terms of population and building structure. The analysis leads to the following findings:

- the area served - so included in one of the circles - includes within it the historical center of the city;
- the undeveloped area includes inside the industrial area (Azomureş cart), areas with low density of buildings and the population (the north of the Freedom cart, the southern cart Mureşeni, the Valea Rece cart, the western and the eastern cart Unirii, cart Cornişa, southeast cart Tudor Vladimirescu), but also a booming residential area - cart. Belvedere.

The area covered by the 15-minute isochron has fixed the polarization point in the Rose Market: it can be seen that the destination of the Rose Market can only be reached by means of public transport by the inhabitants located in green areas. It has been determined that only about 536 ha of the 3201 ha of the city can be considered under public transport (less than 20% of the city's surface).

For the area covered by the 30-minute isochron with a polarization point in the Rose Market, it can be seen that the Rose Market destination can be reached by means of public transport of almost all inhabitants of the municipality, except for those in the new Belvedere Residential District the southern part of the Mureşeni district. From the calculation of the area covered by this isochron, it was determined that approximately 2601 ha of the 3201 ha of the city can be considered under the public transport service (which represents over 80% of the city's surface), most of the areas remaining outside the isochrone are missing areas residential buildings or other destinations with the potential to attract travel flows (Figures 5-6).

As a conclusion of the current situation of the extension of the public transport service resulting from the analysis of the degree of city coverage determined by the isochrone curves, it can be said that it adequately serves the population of Tîrgu-Mureş municipality, with a few small exceptions - *which will be in the executor's warning for the future opportunity study.*

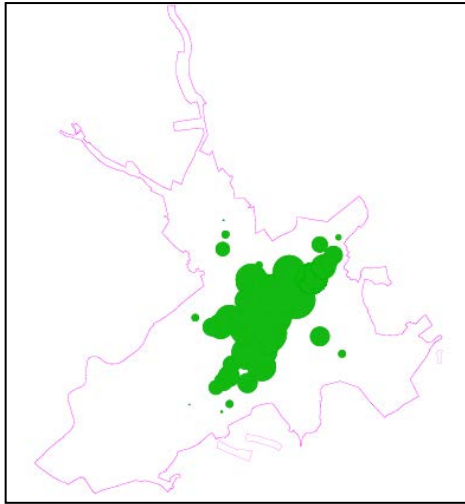


Figure 5: Isocrona of 15 min.  
Source: Petrescu et al. (2017)

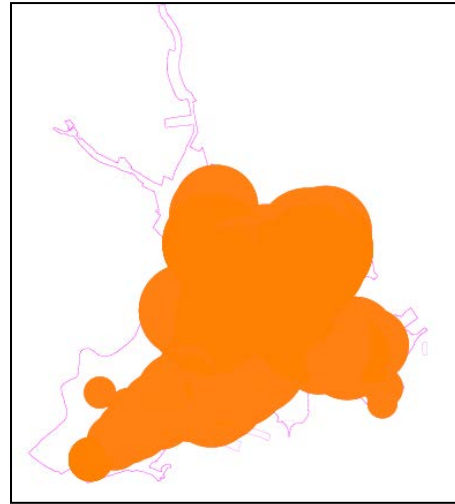


Figure 6: Isocrona of 30 min.  
Source: Petrescu et al. (2017)

## RESULTS AND DISCUSSION

A critical analysis of the service provided for these transport applications highlights several aspects:

- lack of alveoli for stopping buses in stations;
- Inappropriate organization of traffic at the main intersections of streets (in some cases);
- lack of traffic lights at certain intersections;
- the inadequate viability of certain traffic arteries;
- The low number of ticketing and subscription points (5) plus the existence of the toll system in the vehicle (lack of e-ticketing service).

Regarding the transport potential that a medium size human community such as Tîrgu-Mureş can generate, the following can be appreciated:

- Potentials are the expression of possible actions, without being able to tell whether they will materialize or not. The materialization is reflected in population mobility. Mobility is the average number of trips a city resident spends in one year.
- Mobility can be estimated by a mathematical model, which leads to 173 trips per year per inhabitant. As a result, this value turns into a number of daily journeys, in line with the reality represented by the statistical data provided by the companies currently providing the public passenger transport service, where the value of 173 is the result of mobility calculations at the level of Tîrgu-Mureş municipality:

$$S = \frac{150000 * 173}{365} = 71096 \text{ [number of trips per day in both directions]}$$

The refinement of this information led to a demand for transport broken down by districts, the structure of which is shown in the table below:

So, it can be estimated that:

- about 60,000 journeys paid by public transport are made daily;
- and together with individual displacements - it is estimated that these displacements outside the framework of the public transport are approx. 30% of the above-mentioned basic value - the urban area generates through its inhabitants (but also through the penetration, diffusion and transit journeys) approx. 78,000 trips / day.

Table 1 shows the most likely values of travel between districts.

Table 1: The most likely values of travel between districts

Source: Petrescu et al. (2017)

The transport operator acting as the main service agent for the Tîrgu-Mureş urban area, namely S.C. Local Transportation S.A. operates as a joint stock company under the authority of the Municipal Council. The company is registered with the Mureş Trade Register Office under number J26 / 828/1995 and the General Directorate of Public Finance of Mureş County with fiscal registration number RO1219301. The object of the company is represented by the following services:

- provision of passenger transport services within Tîrgu-Mureş municipality and within the limits of its localities within the Association;



- provision of passenger transport services within the city of Sovata as well as municipalities belonging to the administrative-territorial area of this city;
- provision of passenger transport services by special flights;
- car services and repairs;
- providing advertising and advertising services;
- provision of rental services, royalties and management locations.

In order to restore the economic and financial situation and to extend the territorial sphere of the main activity, namely the efficient carrying out of the passenger transport activity, S.C. Local Transportation S.A. and S.C. Siletina Impex S.R.L. have concluded a joint venture agreement, approved by the Decision of the Municipal Council of Târgu-Mureş nr. 123 of May 31, 2001. The main activity of this association consists in organizing and carrying out, by means of its own or rented means of public transport, sale of fuels, repair services, car wash.

SC Siletina Impex S.R.L. is a company established in December 1992 and has the object of carrying out urban, suburban and metropolitan passenger transport. The company is registered at the Mureş Trade Register Office under number J26 / 2382/1992 and at the General Directorate of Public Finance of Mureş County with fiscal registration number RO2532276. On 31.12.2014 the company registered registered capital is 701,000 lei.

SC Tudor Trans S.R.L. is a company set up in January 1998 and has as its object the deployment of urban, suburban and metropolitan passenger transport. The company is registered with the Mureş Trade Register Office under number J26 / 2/1998 and with the General Directorate of Public Finances of Mureş County having fiscal registration code RO10097599. On December 31, 2014, the registered social capital of the company is 320 lei.

The analysis of the economic and financial situation of the transport operators for several years, both as a stand-alone company and as an "Association", points out that the financial resources necessary for the realization of major investments for the performance of the public transport service by regular flights, under conditions of increasing efficiency, quality and increasing attractiveness at the expense of car transport.

The statistical values for the public transport system presented below resulted from the data gathered ONLY via the S.C. Siletina S.A.

- The cumulative length of transport routes 202.65 km





- Inventory Park (equipped) 89 buses and minibuses
- Number of passengers carried in the year (2014) 19,843,955 passengers
- Autobaza = one (of S.C. Siletina S.A.)

Following the monitoring of passenger flows between February and March 2015 (one week with school holidays, one normal week and one weekend), the following conclusions can be drawn:

- the public transport operator's offer in the school holiday week on the 24 public transport lines = 68,950 places / sense
- Number of journeys made by public transport in the week of school holidays on the 24 public transport lines = 49,439 trips / day
- the public transport operator's offer in the normal working week on the 24 public transport lines = 75,350 places / sense
- number of trips made by public transport in the normal working week on the 24 public transport lines = 59,807 trips / day
- offer of public transport operator over the weekend on the 24 public transport lines = 43,645 places / sense
- number of trips made by public transport in the normal working week on the 24 public transport lines = 29,040 trips / day

In this "static" framework, following the adoption of Law no. 92/2007 of the local public transport services (and of other legislative acts), a sufficient regulatory framework for the allocation of local public passenger transport services was created simultaneously with the local public transport program for regular persons.

The necessity of carrying out the present opportunity study is mainly due to some disfunctionalities within the ensemble:

- inhabitants - street tram - general traffic vehicles - public service buses, in opposition to user requirements:
- Reasonable travel time - an attractive travel speed for citizens – accessibility less in terms of the costs of purchasing travel tickets, but especially from the perspective of the economic efficiency of the operators carrying out public transport.



These malfunctions originate (for the most part):

- In the spectacular growth of the privately owned car fleet, a resident in Tirgu Mures city, in conjunction with the aging of the car park at the level of the urban transport service, and obviously lagging behind in terms of the improvements needed for a modern transport system to keep step with general progress in the field,
- respectively in the delicate situation regarding the implacable structure of roads and constructions that only hardly admit the modification of the existing street tram.

Reaction to these challenges can only come by:

- investments in efficient road transport means = ALFA OBJECTIVE,
- new organization of the company that will assume the management of the joint transport service = OBJECTIVE BETA, ie in the sphere of public transport.

The overall picture of the space-time coordinates of the public passenger transport process in the area of Tîrgu-Mureş Municipality can be constructed on the basis of the investments made as practical achievements to the theoretical framework stipulated in the contracts and additional acts of the Transport Association in common.

In a series of acts, there are stipulated "investments" that should have been made by a series of investments to be jointly exploited by the two parties as follows:

- Car wash for large tonnage cars and buses;
- car service according to European standards (for buses, minibusses and cars);
- Outlet shop for car parts and accessories;
- curing;
- fuel station;
- Shared dispatcher equipped with radio-broadcast stations.

There are also obligations to provide utilities (electricity, water, gas, telephone) for the activity of the Association.

In Annex 1 to the Decision no. 47 of 2002 approving the additions and modifications of the "Norms for the organization of public transport of persons in Tîrgu-Mureş" included in the Decision of the Municipal Local Council no. 122 / 31.05.2001 specifies the technical, execution and financial conditions for the realization of the public passenger transport service.



Between these obligations, there are also those related to equipment such as illuminated signs of motor vehicles (illuminated track plates, located in the front, side, right and behind the vehicle). From the observations made in the field on the vehicles on the route, we can say that they do not benefit from such facilities, the whole circulating park has more than 10 years of age.

In figure 8 shows the area of equal distance from the in-service transport lines. Representation of circular areas along public transport routes: The radius of the circles is 400 m corresponding to the 6-minute walk (gray areas are the areas left outside the area served by public transport).



Figure 8: The area of equal distance from the in-service transport lines.  
Source: Petrescu et al. (2017)

By the time of the analysis (2015), the degree of realization of these investments was not exactly known, although this was requested by the developer of the study. However, from the observations made on the field, the following conclusions can be drawn:

- The arrangement of the stations, with a few exceptions, does not meet the requirements of a high-quality public transport (lack of passenger information systems, covers, alveoli, etc.);
- Passenger cars are not equipped with automatic toll systems, passenger information systems, GPS navigation systems, etc. The length of the circulating park is very high, the vehicles are not equipped with low-polluting engines (Euro IV, V and VI);
- dispatching of the underserved lines is ensured by dispatching at the endpoints at the Centrofarm, European Retail Park and the central dispatch from the local Transport Autogara;

- there is a regular technical inspection station located on the territory of the Local Transport Bus Station;
- there is a bus station that serves both county and inter-county races and is the end of a line for several public transport routes. However, its facilities from the traveler's point of view are minimal.

It is to be noted that the graphic representation of FIG. 8 comprises the densest area of the city, both in terms of population and structure of buildings. It can easily be observed that:

- the area served - so included in one of the circles - includes within it the historical center of the city;
- the undeveloped area comprises inside the industrial area (Azomureş neighborhood), areas with low density of buildings and population (north of the Freedom Freight Cart - E, southern cart Mureşeni - B, Valea Rece - C and D, western and eastern cart, Unirii - G and H, cart Cornișa - I, southeast cart Tudor Vladimirescu - J and K), but also a booming residential area - cart. Belvedere (F). This aspect will be reviewed in order to ensure access to the rest of the transport network, especially for areas B, D, F and I.
- Additionally, the possible completion of the transport network will obviously have a radial arrangement.

In the most concrete way - and without large investments - the track structure targeted at 2015 was finalized taking into account:

- Representation of isochrons where it is easy to see that the undeveloped area comprises within it the industrial area (Azomureş neighborhood), areas with low density of both buildings and the population (north of the Liberty - E district, the south of the Mureseni - B district, the Valea neighborhood C and D, west and east of Unirii - G and H, Cornișa - I district, southeast of Tudor Vladimirescu - J and K), but also a booming residential area - Belvedere district (F);
- calculation of the transport demand for the most probable values, from which it follows that:
  - lines 1, 2 and 2e that circulate only during the school course doubles other existing lines, their profitability being questionable;
  - far the most requested route is line 4, followed by lines 18 and 17;



- the highest values of travel trips for Tîrgu-Mureş are recorded between Tudor, Dâmbul Pietros, Centre and Buday Nagy Antal, all of them with a high population density.

In these circumstances, in order to ensure access to the public transport system of all the inhabitants of the municipality, it is necessary to complete this network with some additional lines and at the same time, for the increase of the profitability, it is necessary to renounce some routes.

Thus, it is proposed that the public transport network in Tîrgu-Mureş municipality be composed of the following routes:

Lines 2b, 3, 4, 6, 10, 12, 14, 16, 17, 18, 19, 20, 23, 26, 30, 30b, 43 and 44 remain unchanged;

- lines 1, 2 and 2e to remove;
- line 10b should be extended to the Belvedere district - to ensure the connection between the Belvedere districts (expanding), Tudor Vladimirescu, the Center (including the recreational area) and the Unirii;
- Line 21 to shorten and slightly alter the route between Belvedere and ERP to make connections between the Belvedere, Tudor Vladimirescu, Dambu Pietros, Centre and Mureşeni districts
- Line 45 between the Valea Rece districts and the Zoological Garden is introduced - to ensure the connection between the Valea Rece, Mureseni, Centre and Cornişa districts.
- Direction 1 = entrustment of transport service management to ONE entity empowered and based on public capital.
- Direction 2 = A tight planning is required in which, at most 1-2 years the road infrastructure to undergo a constructive restoration of the streets on which the public transport takes place.
- Direction 3 = The municipality needs an alternative transport network to facilitate achieving the efficiency objective of the urban public transport service (Aversa et al., 2017; Petrescu et al., 2017).
- Direction 4 = REDUCED vehicle fleet performing urban public transport pressures.

### 3. CONCLUSIONS



This study presents and processes briefly the defining elements that characterize the system and the public transport service of TÎRGU-MUREȘ Municipality in 2015. The first contact with the "Târgu-Mureș" entity can only be achieved through a major interest in the land and the inhabitants.

The Municipality of Târgu-Mureș, the county seat of Mureș, with an area of 6,696 ha and a population of approximately 150,000 inhabitants, is one of the big municipalities of Romania, a major road and air junction, a powerful center of polarization of socio-economic activity at regional level. Only 12 districts (with an area of 3201.37 hectares) can be identified for Târgu-Mureș municipality alone.

The transport operator acting as the main service agent for the Tîrgu-Mureș urban area, namely S.C. Local Transportation S.A. operates as a joint stock company under the authority of the Municipal Council. Vehicle Park of S.C. Siletina Impex S.R.L. and Local Transportation S.A.

Multi-line routes have been modified or new ones have been added.

- Direction 1 = entrustment of transport service management to ONE entity empowered and based on public capital.
- Direction 2 = A tight planning is required in which, at most 1-2 years the road infrastructure to undergo a constructive restoration of the streets on which the public transport takes place.
- Direction 3 = The municipality needs an alternative transport network to facilitate achieving the efficiency objective of the urban public transport service.
- Direction 4 = REDUCED vehicle fleet performing urban public transport pressures.

#### 4. AUTHORS' CONTRIBUTION

All the authors have contributed equally to carry out this work.

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