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STUDY AND IMPLEMENTATION OF SUSTAINABLE URBAN TRANSPORT PLAN FOR ORADEA CITY in the project SEE/B/0004/3.1/X "ATTRACTIVE URBAN PUBLIC TRANSPORT FOR ACCESIBLE CITIES" acronym ATTAC, SOUTH EAST EUROPE TRANSNATIONAL COOPERATION PROGRAMM 2007-2013

Phase 2 – Rational and transparent goal setting

BENEFICIARY: SC OTL SA
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CONTRACT: no. 12044/2012 - „Study and implementation of sustainable urban transport plan for Oradea city”

BENEFICIARY: SC OTL SA

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Cuprins:

Cap. 4 - Develop a common vision

4.1 Develop a common vision on Oradea's mobility.. 4

4.2 Actively inform of the public...105

Cap. 5 - Set priorities and measurable targets

5.1 Identify the priorities for mobility...106

5.2 SMART targets...232

Cap. 6 - Develop effective packages of measures

6.1 Identify the most effective measures...274

6.2 Best practices..314

6.3 Taking into account the principle of value for invested money (best value for money).....395

6.4 Using synergies and prepare packages of measures 414

Anexe

Annex 21 – Vision

Annex 22 – Public information materials

Annex 23 – Matrix of measures

Annex 24 – Report

Annex 25 – New matrix of measures

Annex 26 – Proposed measures framing in Konsult program

Annex 27 – Packages of efficinet measures

Annex 28 – Measures evaluation by Knonsult program

Annex 29 – The effectiveness of measures

Chapter 4 – Develop a common vision

4.1 Develop a common vision on Oradea's mobility

According to DEX (Explanatory Dictionary of the Romanian Language), vision means:

- virtual representation
- of a representative model for the analyzed ensemble
- perception is made from **top to bottom** corresponding to tangible goals.

In principle, a vision provides the basis for all intermediate stages between present and the time when the vision is translated to facts, enabling:

- definition of partial objectives and of the potential means, respectively,
- feasible measures development and finally
- turn into actions,

which have to overlap as exactly as it can the future situation over estimated structure.

The vision embodied in this project provide a qualitative description of a desirable future urban environment and of the services related to it. The vision provides a proper guidance of development by appropriate, rational and efficient planning measures. Our basic assumption for vision „infrastructure" is that of placing the mobility „in background", in the wider context of urban and social development. Also, the vision was prepared considering the most perspectives of urban policy identified in Oradea and not the least of the city's general policy: the vision was considered as a **guidance element** only in case in which it will be widely accepted among stakeholders and citizens: therefore it is essential to create a common ownership of the vision. Below figure shows the **development by cooperation** of Oradea's mobility common vision.

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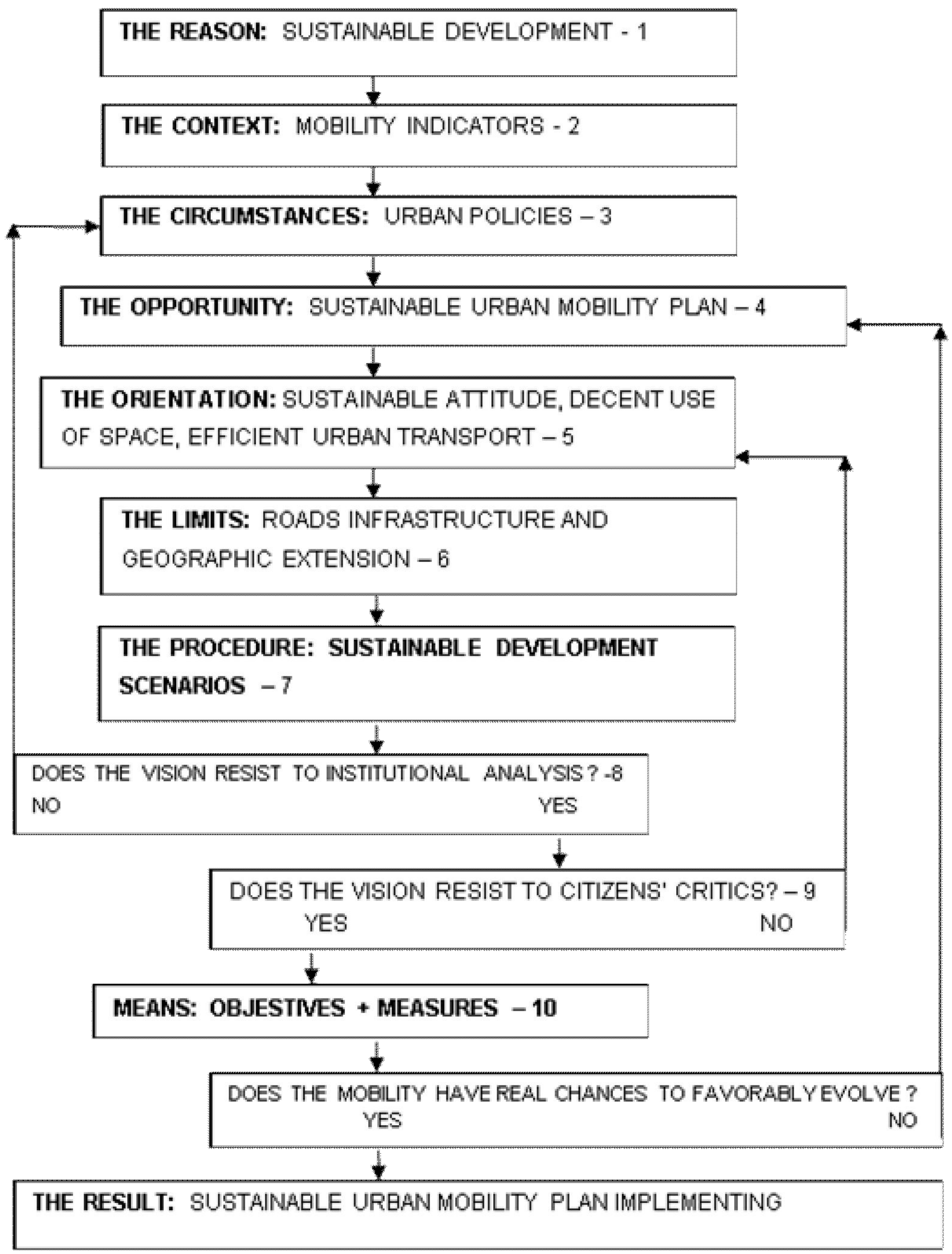

Fig. II.1 – Vision establishing blocks

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THE REASON: ECONOMIC GROWTH

Sustainable development is a multidimensional concept and constantly evolving. It is hard to determine a definition of sustainable development that meets the approval of all stakeholders. The most widely used definition is the one given by "Brundtland Report" or "Our Common Future", prepared by the World Commission on Environment and Development in 1972 and formally adopted at global summit in Rio de Janeiro in 1992 "**ability to meet present generation needs without compromising the ability of future generations to meet their own needs**".

Because of the difficulties involved in analyzing intergenerational dimension of sustainable development, **many interpretations of the term focuses on the issue of inequalities increasingly persistent can be seen in the same generation**. Inequalities may relate to the distribution of income (the most discussed in the literature), and other resources of society, such as education services, health services, equal opportunities, etc.. Most attempts to describe the concept of sustainable development call for the existence of four dimensions: **social, economic, institutional and environmental**.

The sustainable development evaluation model – on the urban areas in Romania – contains a set of indicators and multiple dimensions (or pillars of development) **aggregated into a composite indicator**.

The methodology for the set of sustainable development indicators belong to the Commission for Sustainable Development of The United Nations, "the sustainable development" consists of four main dimensions specified and multiple themes and sub-themes related to these dimensions:

Tab. II.1 - The economic dimension

No.	Topic	Subtopic
11	Economic structure	Economic status
		Economic performance
		Trade
12	Consumption and production	Material consumption
		Power consumption
		Generation and waste management
13	Transport	Passengers- kilometers
		Mileage network

Tab. II.2 – Social dimension

Nr.	Topic	Subtopic
21	Equity	Poverty
		Nutritional status
		Gender equality
22	Health	Death rate
		Sanitation
		Drinking water
		Services
23	Education	Educational level
		Illiteracy
24	Habitation	Conditions
		Access to utilities
25	Safety	Criminality
26	Population	Natural motion

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Tab. II.3 – The institutional dimension

Nr.	Topic	Subtopic
31	The institutional framework	Communications infrastructure
		Access to information
		international Cooperation
32	The institutional capacity	Science and technology
		Response to disaster

Tab. II.4 – The environmental dimension

Nr.	Tema	Subtema
41	Atmosphere	Air quality
		Climate change
		Ozone layer depreciation
42	Soil	Agriculture
		Pasture
		Desertification
		Urbanization
43	Coast area	Mileage of coast
		Fishing
44	Sweet water	Amount
		Quality
45	Biodiversity	Ecosystems
		Species

EU recommended way to calculate and aggregate indices related to these topics and sub-topics is called "Sustainability Dashboard Software (sustainability dashboard)[1]. Software sustainability dashboard was created to provide objective results, experts and researchers from around the

[1] To aggregate indicators (there are considered 4 sizes and a representative part of the 16topics/39subtopics), sustainability dashboard is a non-commercial software, freely distributed provided by the Joint Research Centre of the European Commission (Joint Research Center) International Institute for Sustainable Development (International Institute for Sustainable Development) and can be downloaded from the following address: http://esl.jrc.it/envind/dashbrds.htm.

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world or simply interested persons, the opportunity to create their own sustainability index. The program is called "board" because it gives the user like a car dashboard, visual information about the status of the analyzed system (a country, a city, a business) and enable them to drive to desirable destination - in this case sustainable development. The material that formed the basis of this analysis is the result of research conducted by the "Institute for Quality of Life"and aims: to provide a basis, a foundation for future strategies, local plans for sustainable development, detailed analysis on the differences in development between territorial units .

The first results published - for Romania - was that in which the "Institute for Quality of Life" led the country's counties relative position on the point of view of sustainable development[2]. Taking into account:

- social dimension: health, education, poverty, housing (access to utilities);
- economic dimension: GDP, employment, personal income level (salary) and revenues of the firms;
- environmental component: global warming, protection of green spaces in cities and energy;
- institutional dimension: the institutional framework for sustainable development, public access to information and telecommunications, it was created a distribution of counties whose image is found in Fig. II.2. Conclusion:
    - the below sustainable development synthetic indicator shows a very good rank for Bucharest, followed by Cluj and **on 20th by Bihor**.
    - Bihor county is in the middle platoon from the rest of the country’s counties, with the last rank Botosani.

Oradea has a relevant position among other Romanian cities. Considered indicators to compile a hierarchy like that shown above were selected based **SOLELY ON ELEMENTS RELATING**

2 "Index of sustainable development in Romania at the county and regional level" in Social Innovation Review no. 1/2009, article.

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TO URBAN PUBLIC TRANSPORT, in this way[3] resulting a list of 117 detailed numerical values for 31 cities belonging to the Romanian Union of Public Transport[4]. In detail, the values of these indicators and calculations (in excel format) necessary are found attached material. In the FIG. II.3 is given the ranking of cities according to the index of sustainability (in terms of transport). In detail, the values of these indicators and necessary calculations (in excel format) are found attached material. In the fig. II.3 it is shown the ranking of cities according to the index of sustainability (in terms of transport).

[3] The extent of the list was dictated by the lack of complete information about many of the activities in a city. Even for Oradea it was difficult to find values of the first order indicators such as the number of trips made by public transport.
[4] It should be mentioned that some statistical data material provided by SC OTL SA was not complete and approx. 3% of statistical information are filled in from other sources.

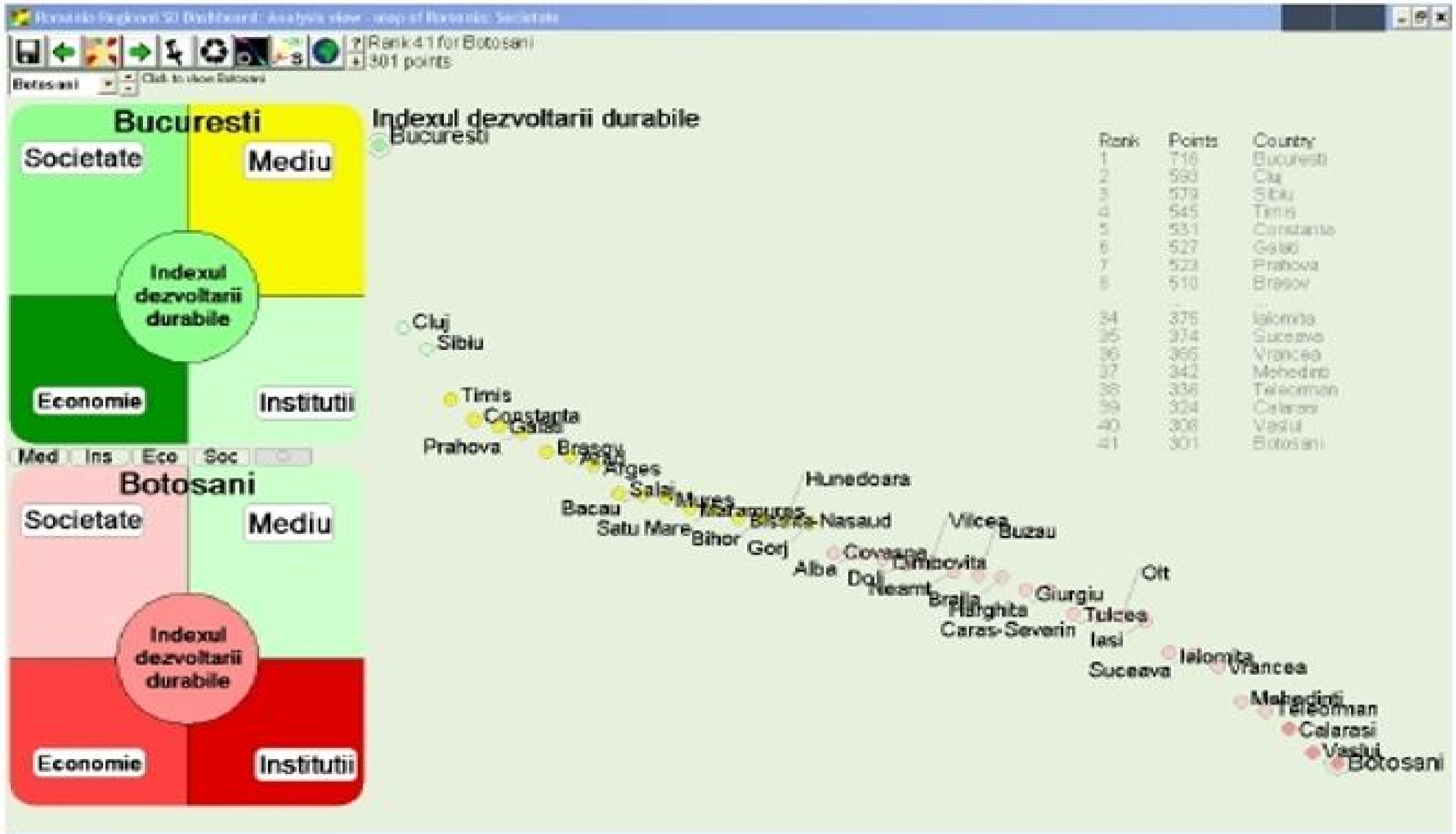

Fig. II.2 - Cities ranking according sustainability index

31 Romanian cities hierarchy

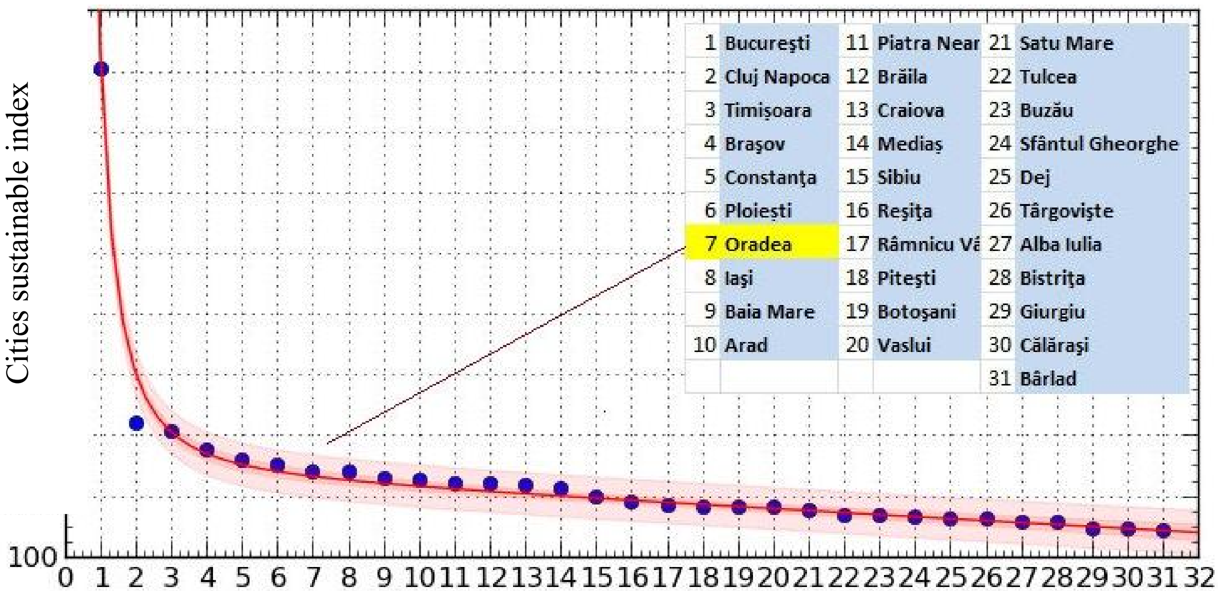

Fig. II.3 - Cities ranking according sustainability index

Conclusion after analyzing the distribution of cities:

- sustainable development synthetic indicator indicates a very good rank for Bucharest, followed by Timisoara and **on the 7th rank by Oradea**.
- Oradea has a higher position than the rest of the cities presented in statistical ranking last in the ranking being Barlad:

1	**Bucuresti**	903,974354
2	**Cluj-Napoca**	319,711981
3	**Timișoara**	307,8584912
4	**Brașov**	276,0110745
5	**Constanta**	258,4163814
6	**Ploiești**	251,1330653
7	**Oradea**	241,5302613
8	**Iași**	240,181843

The difference in position between Oradea and best ranked city in Transylvania (Cluj-Napoca) is 32.60 percent.

The difference in position between Oradea and proximal city on the 6th rank in the hierarchy - over Oradea - (Ploiesti) is 4.10 percent.

The difference in position between Oradea and the next city in the hierarchy - under Oradea - (Iasi) is below one percent.

Analysis of the sustainable development - from the perspective of passengers urban public transport – ilustrating the inequality present situations between cities, can set for Oradea, which is the **target to which the sustainability criterion still guides the current policies of local governments**.

The purpose of the above detailing is to clarify the status data and evolutionary horizon which to ensure a responsible decision in order to maintain Oradea at least in the top 7 or even to advance its position; this goal can be achieved by **establishing a target of measures in the favor of „transport” as general form of contact between people:**

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It is not desirable nor safety to set a percentage value ("to make sure that we achieve the plan"): it will not be achieved improvements in mobility (and there is the danger of reaching and overcoming by cities ranked at the time of the analisys after Oradea).

It is undesirable or unrealistic to set a higher percentage values ("to overcome others") will not actually achieve the goals, especially that mobility is not a problem solved independently by solving general technical, technological, social, environmental problems.

At the question specifically formulated „what would be the percentage" it is possible to respond only at the moment of VISION , moment which will come after the development of the scenarios for the next period[5].

As a first conclusion, summarizing a number of other materials that treat transport problems can be highlighted the following:

- numerous European directives and regulations have an impact on urban transport and their coherence must be ensured by a specific approach of the urban mobility;
- the issue of urban areas can not be treated by modal policies, but through behavior that focuses on users and on the offer of integrated transport systems;
- there is a need for statistical information to be available (if they can be more reliable and systematic, but first of all to be) to allow assessment of local public policies;

[5] But in the public debate any person or legal entity can come up with decent proposals, proposals which will be taken in analysis of municipal institutions as decisions making on population mobility.

- it is mathematically proved that the city's population will increase systematically with tens of thousands of people (so that travel needs will increase).
- the trend is obvious - confirmed by the history of Western cities – the establishing of the largest part of the population in urban area, the urban population growth emphasizing previous conclusion, especially because general heritage of the infrastructure and the architecture can be hardly „made more flexible” so as the public road to become enough for the traffic.
- in terms of life quality - at the concrete level as a result of variation in better concerning the general level of living - it can be seen that the average life expectancy of residents increased by more than five years, that means the mass of potential passengers increases.
- the electric transport can be credited with an increase relatively immediate benefit activity by approx. 7% - 14% which is not negligible values in calculations of the necessary fleet and railway transport network.
- concerning the transport by pollutants means, it can be seen that statistics „betrayed” and the actions for identifying the trend are inconclusive.
- actions - intentional or random – of the authorities and/or entrepreneurs have brought the transport of general administrative or economic concerns (as decrease in total activity is only 1.70, decrease being less obvious than "fall" of transport by 2.8 times).
- in terms of the urban streets, reality - respectively some qualitative improvement rather than a quantitative one in the number of km. made available - can not compensate for the combined effects of population growth, urbanization, the growth of life or lack of investment.
- sustainable development synthetic indicator indicates a more than satisfactory rank for Oradea city: Oradea is still on 7th out of 31, compared to the rest of the

cities analyzed in terms of sustainability (with an emphasis on transport and mobility).

THE BACKGROUND: THE INDICATORS OF THE MOBILITY

Given the objective reality of the area which is part Oradea - facts presented in the tables below - it can be considered that the **good state evolution of Oradea population** depends on how sustainability principles will be included in local policies. Restricting researched area to urban mobility issues there are to revealed are the following indicators (Table II.5)[6]:

- Length of roads, road density, the length of railways, railway network density and length of modernized urban roads placed in the extreme of 'good' values of the indices, but
- The number of public transport vehicles is – in comparison - unsatisfactory leading to placing of the next indicator, the **number of passengers by public transport, approx. third part of the number of passengers by the public transport recorded in Cluj county**.

[6] The information is taken from the material presented in "workshops with representatives of local communities in Northern Transylvania" by the North West Regional Development Agency

Tab. II.5 – Development indicators

Indicator	TOTAL	REG NW	BH	BN	CJ	MM	SM	SJ
GDP per inhabitant (PPS)	11000	10100	10200	9000	13900	7600	8000	8600
Number of industrial parks	55	7	2	0	4	0	0	1
Budgetary revenues of APL (millions lei)		5368,5	1245,8	616,4	1505,5	870,3	653,7	476,8
Budget expenses of the Local Public Administration APL (milllions lei)		4991,4	1180,3	542,8	1389,9	817,6	630,3	430,5
Structural Funds accessed by APL within 2007-2013 (millions lei)		1466806665	274690942	246582670	256918441	271016907	151173544	266424161
The population connected to water supply	11931011	1591467	311555	142096	622247	230888	187078	97603
The population connected to sewerage networks	9354902	1149533	249648,00	92385,00	425529,00	165208,00	140168,00	76595,00
Life expectancy at birth (years)	73,47	73	72,27	74,14	74,85	72,93	70,51	72,23
The rate of natural increase (‰)	-2,2	-1,5	-1,80	0,60	-1,50	-1,20	-2,50	-2,30
Fertility rate	39,4	40,5	42,8	43,3	39,6	38,1	37,9	42,7
The employment rate of the population	62,8	64,9	71,4	59,7	69,5	58,4	60,1	63,4
Unemployment rate per county	4,6	3,9	3,5	4,3	3,8	3,7	4,1	5,1

Tab. II.5 – Development indicators

Indicator	TOTAL	REG NW	BH	BN	CJ	MM	SM	SJ
Number of students	673001	96998	17497	1680	57595	5728	1776	425
Number of pupils	2682489	84701	82406	44010	76905	68693	48463	32566
The length of roads (km)	82386	12322	2975	1509	2699	1778	1647	1714
Roads density (km/100 kmp)	35,1	36,5	39,4	29,5	40,8	28,3	37,3	45,3
The length of railroad network (km)	10785	1668	500	320	240	207	218	183
Railroad density (km/100 kmp)	45,9	49,1	66,3	59,8	36	32,8	48,7	50,7
Number of the public transport vehicles		814	208	46	370	95	47	48
Number of passengers transported by the public transport (thousands)	1819191	264098	58357	3768	165718	17141	7018	12096
The length of the modernized urban roads (km)		2332	538	217	577	571	267	162
Green areas (ha)	22005	2782	355	184	1228	533	368	114
The average labor productivity (lei)	59583,5	50065	47384	48418	62734	42087	42226	45197
The average labor productivity (deaths per 1000 inhabitants)	12,1	11,8	12,5	10,5	11,6	11	12,4	12,7

Tab. II.5 – Development indicators

Indicator	TOTAL	REG NW	BH	BN	CJ	MM	SM	SJ
Infant mortality rate (deaths under 1 year per 1,000 live births)	9,8	8,9	9,5	9,1	6,1	10,5	10,5	9,5
Number of hospital beds	130691	17937	3978	1390	6658	2852	1741	1318
The share of Romani population	3,2	4,6	6,1	4,4	3,4	2,7	6,9	5,3
Number of retired persons	4717473	624181	159812	54126	159040	113939	79498	57766
The exports value (FOB - mil. Euro)	36479916	5875985	1385150	474800	2378537	667432	672628	297438
The share of population employed in agriculture	29,15%	31,55%	33,05%	33,97%	22,09%	37,16%	37,81%	35,35%
The share population employed in industry	20,71%	23,00%	24,70%	23,02%	20,58%	23,68%	24,04%	23,43%
The share population employed in constructions	7,50%	6,34%	5,04%	6,87%	8,43%	5,54%	6,40%	3,80%
The share population employed in services	42,65%	39,11%	37,22%	36,13%	48,89%	33,62%	31,75%	37,41%
Total number of accommodation places	311698	26103	9152	2626	6960	4368	1616	1381
The net use index of accommodation capacity (%)	25	23	38	19	17	13	35	17

The first indicator of mobility for a city - Oradea - is ... population mobility. To describe population mobility it is necessary to start from the source that generates the trips: transport potentials. There are:

- an active potential of the city;
- an inactive potential of the city;
- a transit potential;
- a penetration potential.

The potentials are the expression of the possible actions, without being able to tell whether it will materialize or not. Materialization is reflected in population mobility. Mobility represents the average number of trips that a resident makes in a year. Theoretical analysis (confirmed by observations and surveys) shows that if people gravitate to a certain polarization center would distribute into groups by length of distance traveled, then, as the distance is greater, the group will be less numerous, which is explained by the fact that every city dweller aims to find the work place or rest and fun place somewhere closer to home.

The annual number of trips, reported only to active residents must be at least equal to twice the number of working days, with a reduction due to walking, but also increase due to other kinds of travel (compared to ones related work), ie:

(365 - 110)*2=510 round trips

In a big city, the walk is relatively low compared to the diameter of the city and this reduction consists, as shown in the curves of more than 25%:

510*(1 - 0,25) = 382 trips per year

In a small town, where walking is relatively high, the mobility is:

510*(1 - 0,36) = 326 trips per year

For mid-sized cities, it may be permitted an intermediate value:

510*(1 - 0,32) = 346 trips per year

Number of trips for daily needs, reported to all city residents, from the youngest to the oldest, it can be up to 2 per day, but with a walking area increased up to about 2 km, because lower importance of the time factor in these trips.

For a big city, it can be considered:

365*2*[1 - (0,25 + 0,21)] = 394 trips per year

For a small city:

365*2*[1 - (0,36 + 0,28)] = 262 trips per year

And for a mid-sized city:

365*2*[1 - (0,32 + 0,26)] = 306 trips per year.

Mobility should be calculated taking into account the coefficients w_1 and w_2 (tab. II.6):

- w_1 characterizes the amount of city transit transport: approx. 5% in cities, then approx. 10% in medium-sized cities and an insignificant percentage in small towns;
- w_2 characterizes the amount of city transport penetration: approx. 10% in big cities, then approx. 10% in medium-sized cities and an insignificant percentage in small towns.

Specifically:

1. Oradea can be in the border category between a small town to a mid-sized city (Cluj-Napoca is in the mid-sized city – 300,000 inhabitants; Bucharest is out of this category – 2,200,000 inhabitants);

Tab. II.6 – Calculation of population mobility

City type	% active pop.	% inactive pop.	Trips for job	Trips for personal interests	w_1	w_2	Total mobility per inhabitant
Big	50	50	382	394	5	10	0,5*382+394+0,1*382+0,05*394 = 642
Medium	45	55	346	306	10	10	0,45*346+306+0,10*346+0,10*306 = 526
Small	40	60	326	262	-	-	0,40*326+262 = 392

- so, mobility (of Oradea population) that will be satisfied by motorized transport is at least 392 trips/year/inhabitant and more than 526 trips/year/inhabitant[7];
- these values are converted into a number of daily trips, in relative accordance with estimates based on the relative statistical extrapolation:
- minimum $$mob = \frac{204000 \cdot 392}{365} = 219090$$ [round trips per day]
- maximum $$mob = \frac{204000 \cdot 526}{365} = 293980$$ [round trips per day]

[7] In Western Europe are even cities with 4 concerning mobility, in Oradea value is less than 1 (Bucharest has over 2).

From surveys conducted in Oradea resulted approx. 173,000 daily trips with public transport system, with over 20% less than the minimum value. To emphasize the mobility (reduced) revealed by the above calculations does not include trips by special lines - which have an amount not important, but significant (and which contribution to mobility will have to be taken into account)[8].

The public transport system should **provide individuals equal opportunities** in terms of spatial accessibility points that can satisfy the needs. Thus, the spatial accessibility can be treated as driver of spatial reorganization process and assumes its functions (social, economic and political) in a spatial system, in close dependence with relative changes of connectivity[9] and accessibility[10] of the system as a whole.

To determine accessibility, transportation network is represented by an undirected graph consisting of nodes and arcs is represented by a symmetric adjacency matrix M, consisting of 0 and 1. Therefore, the spacing between any pair of vertices (j, k) in the graph is defined as the length of the shortest chain of the arcs (the shortest path) from j to k. Determining the numerical values of accessibility for any nodes, nodes can ascending order, from the least accessible to the highest accessibility.

The node with the lowest value has the smallest topological accessibility (the most accessible), and the node with the highest value is the largest topological accessibility (the most accessible). Accessibility values for the nodes of the graph are within the range mentioned above.

[8] However the mobility level considered as value itself may not be modified except by a few percent.
[9] Conective = by which, from separate entities arise systems (which can be reached).
[10] Accessible = which is easy to reach.

In this context it was processed and the graph structure of Oradea area - 331 nodes, retaining only nodes representing each neighborhood. Results are summarized by Fig. II.4:

Fig. II.4 - Oradea's map – neighborhoods

Poor accessible neighborhoods

accessibility coefficient	code	neighborhood name	rank	first series	second series
0,363993	**15**	Iosia nord	20		
0,256684	**22**	Iosia sud	25		Penultimate
0,390731	**31**	Iosia	16		
0,283779	**42**	Europa	22		
0,746524	**45**	Univesității	4		
0,640998	**58**	Subcetate	8		
0,231373	**64**	Nufărul	26		Last
0,602852	**69**	Dorobanți	9		
0,381818	**75**	Salca	17		
0,419608	**77**	Grigorescu	15		
0,65205	**91**	Seleus	7		
0,267023	**93**	Dragos	23		Before antepenultimate
0,733333	**96**	Velența	5		
0,557932	**107**	Eminescu	11		
0,065597	**111**	Zona I Vest	29	Penultimate	
0,509091	**118**	Decebal-Dacia	12		
0,86631	**133**	Olosig	2		
0,701604	**156**	Podgoria	6		
0,25918	**159**	Doja	24		Antepenultimate
0,344029	**168**	Iorga	21		
0,146524	**177**	Oncea	28	Antepenultimate	
0,174332	**190**	Zona I Vest	27	Before antepenultimate	
0,819251	**198**	Orasul Nou	3		
0,572906	**206**	Cantemir	10		
0,376471	**208**	Tokai	18		
0,363993	**215**	Rogerius	19		
1	**300**	Calea Aradului	1		
0	**318**	Episcopia Bihor	30	Last	
0,507665	**320**	Calea Sântandrei	13		
0,444207	**338**	Sp. Crisanei	14		

- the most accessible neighborhood is **Calea Aradului** - thanks its topological aspect that puts it in the center of, and on the other hand, in the area where some routes serves the public interest centers (supermarkets);
- next are the neighborhoods: **Olosig, Orasul Nou and Universitate** which can consist as a north-south axis of the city;
- at the opposite side of the accessibility:
  - ✓the first seriprima series of neighborhoods among those with unacceptable accessibility:

    Episcopia Bihor – the last one

    Zona Industriala Est – penultimate

    Oncea – antepenultimate

    Zona Industriala Vest – before the antepenultimate

  - ✓the second series of neighborhoods among those with a poor accessibility:

    Nufarul – the last one

    Iosia Sud – penultimate

    Ghe. Doja – antepenultimate

    Dragos Voda – before antepenultimate

The assembly of neighborhoods indicates the directions in which transport system should be developed in a next step to raise the level of accessibility of city structure - Fig. II.5 and II.6.

ALSO HAS BEEN PROCESSED THE INFORMATION ON POPULATION AND RELATED EXTENSION OF THE NEIGHBORHOODS. The results are summarized by the following two figures.

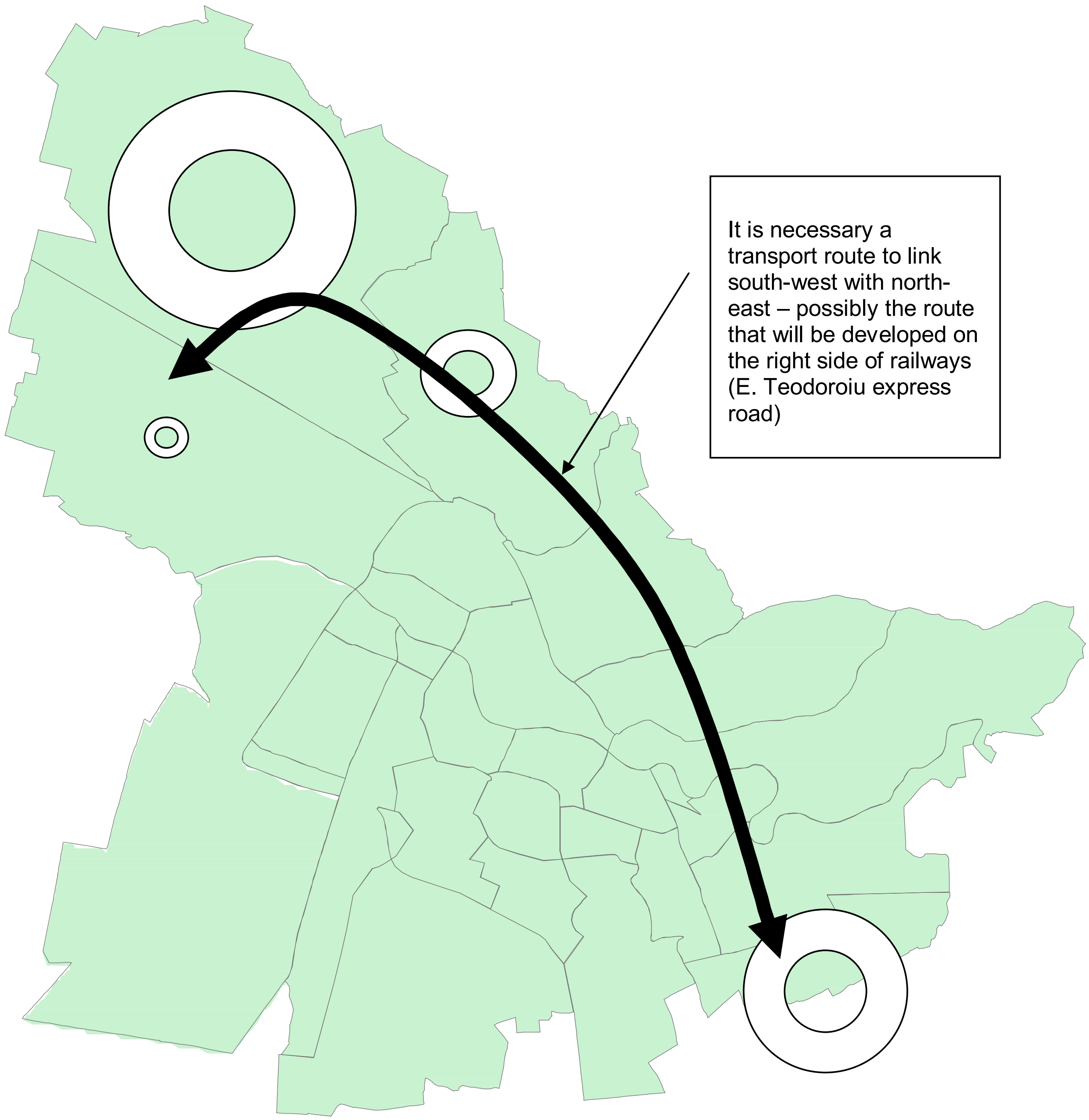

Fig. II.5 - The first series of neighborhoods with an unacceptable accessibility

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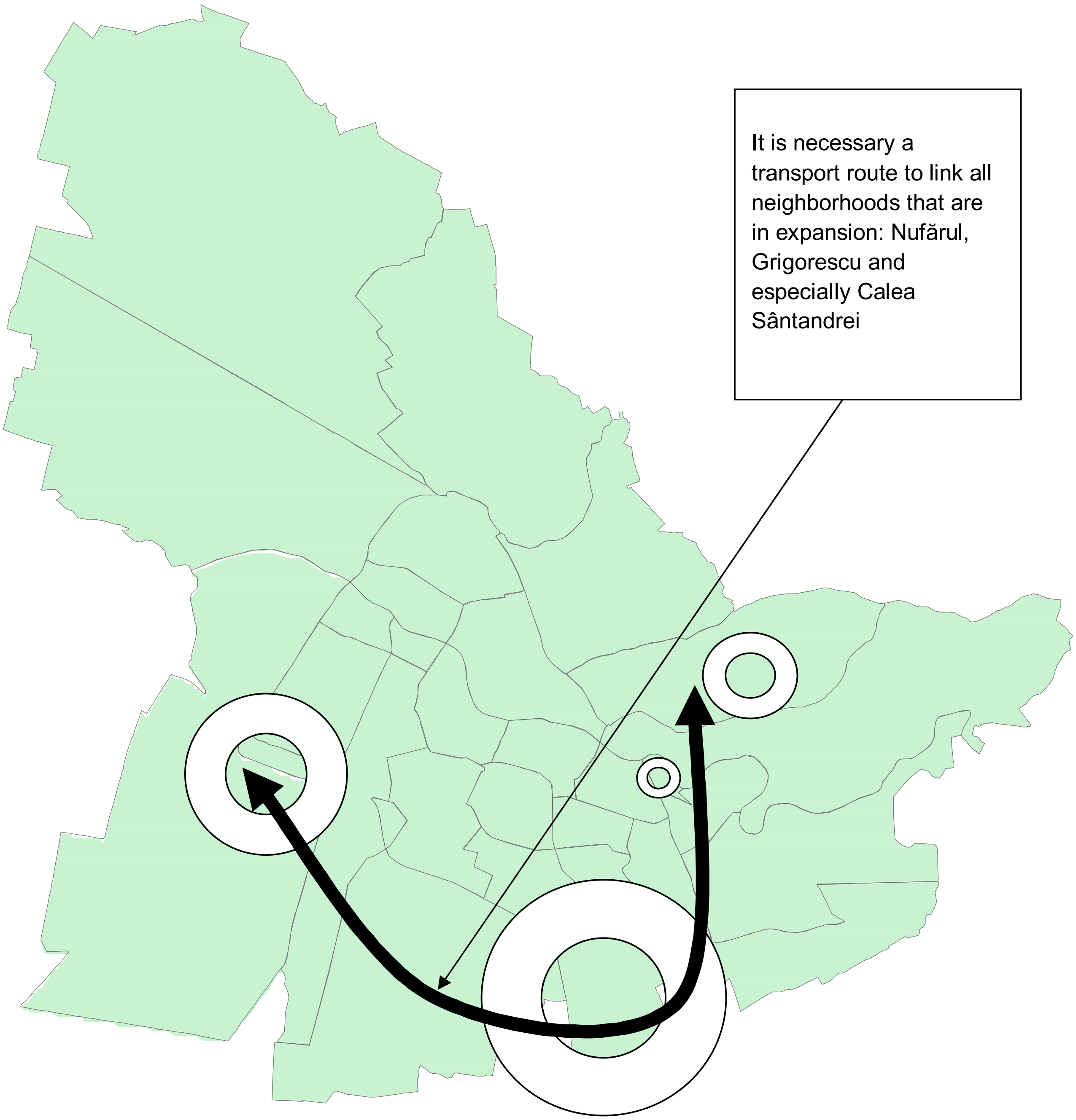

Fig. II.6 - The second series of neighborhoods with a poor accessibility

- Densely neighborhoods Neighborhoods
-

Neighborhood	Code	Population	Surface	Inhabitants / ha	Hirarchy	Series 1	Series 2	with low density
Iosia Nord	**15**	9577	52	184,18892	3	3		
Iosia Sud	**22**	55	40	1,3884	27			Preantepenultimate
Iosia	**31**	14445	208	69,450808	10			
Europa	**42**	212	16	13,28325	17			
Univesităţii	**45**	387	189	2,0512381	23			
Subcetate	**58**	1055	93	11,346065	18			
Nufărul	**64**	18191	377	48,252637	11			
Dorobanţi	**69**	7939	105	75,6144	9			
Salca	**75**	3678	125	29,425536	13			
Grigorescu	**77**	1634	798	2,0476692	24			
Seleus	**91**	2510	121	20,750975	15			
Dragos	**93**	1794	17	105,54353	5		5	
Velenţa	**96**	8162	79	103,32562	6		6	
Eminescu	**107**	2535	102	24,857176	14			
Zona I Est	**111**	0	282	0	30			Last
Decebal-Dacia	**118**	32915	88	374,04273	1	1		
Olosig	**133**	8769	217	40,411742	12			
Podgoria	**156**	1180	802	1,4714963	26			
Doja	**159**	3199	479	6,6800167	20			
Iorga	**168**	4639	502	9,2418167	19			
Oncea	**177**	4501	831	5,4171119	21			
Zona I Vest	**190**	355	1252	0,2840607	28			Antepenultimate
Orasul Nou	**198**	9088	115	79,032	7		7	
Cantemir	**206**	7148	60	119,1354	4	4		
Tokai	**208**	992	454	2,1854009	22			
Rogerius	**215**	46496	203	229,04654	2	2		
CAlea Aradului	**300**	6522	343	19,015382	16			
Ep. Bihor	**318**	3354	1984	1,6908206	25			
C. Sântandrei	**320**	419	1559	0,2692264	29			Penultimate
Sp. risanei	**338**	2131	28	76,133143	8		8	

- the neighborhood with highest density is **Decebal-Dacia**
- nest are: **Rogerius, Iosia Nord and Cantemir**
- and: **Dragos Voda, Velenta, Orasul Nou, Sp. Crisanei**
- at the opposite side of population density:

  Zona Industriala Est – the last one

  Calea Santandrei – penultimate

  Zona Industriala Vest – antepenultimate

  Iosia Sud – before the antepenultimate

The assembly of neighborhoods indicates the measures that should be developed transport system in a next step to raise the level of accessibility of city structure - Fig. II.7 and II.8.

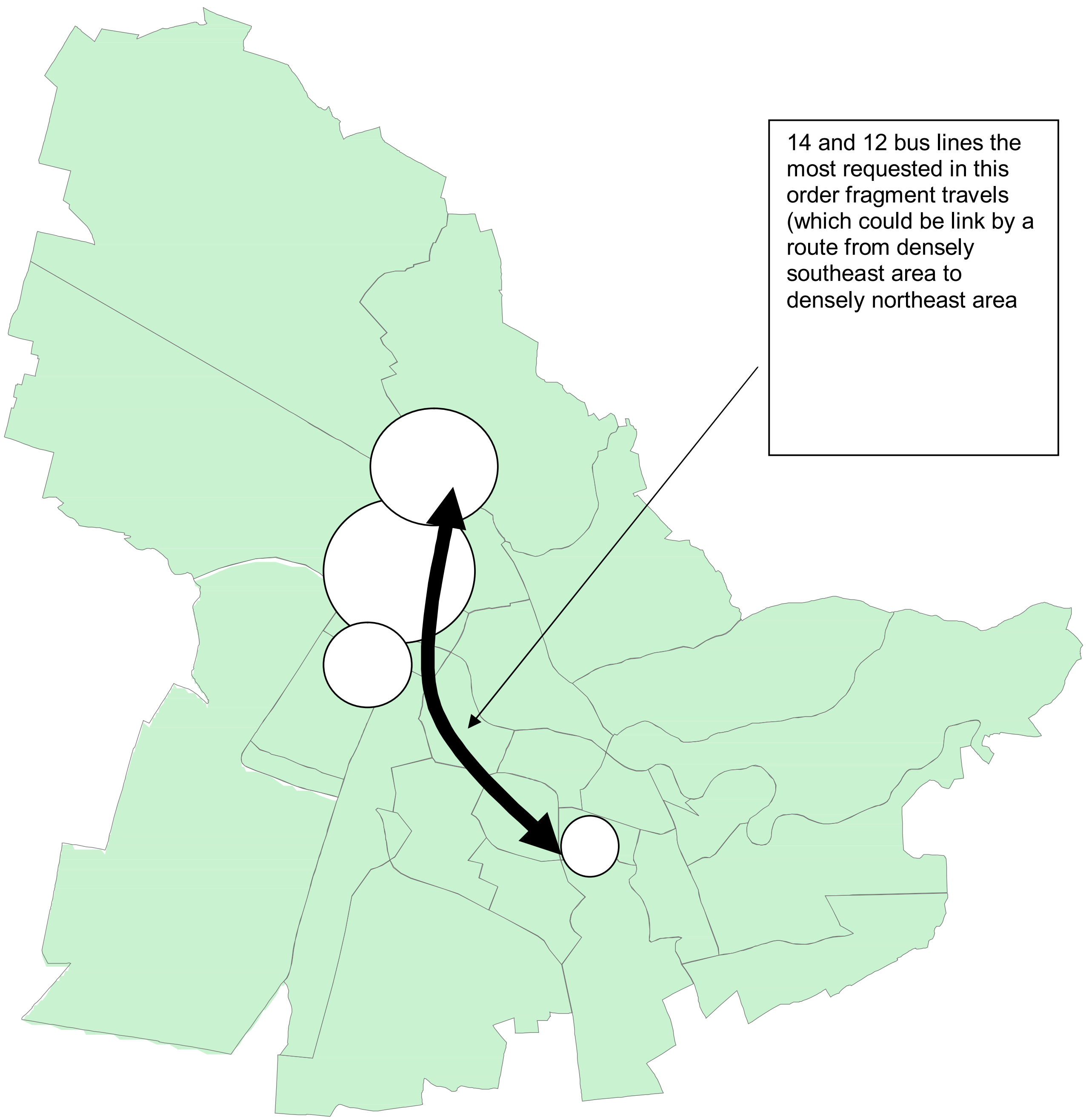

Fig. II.7 - The first series of neighborhoods with a high density of population

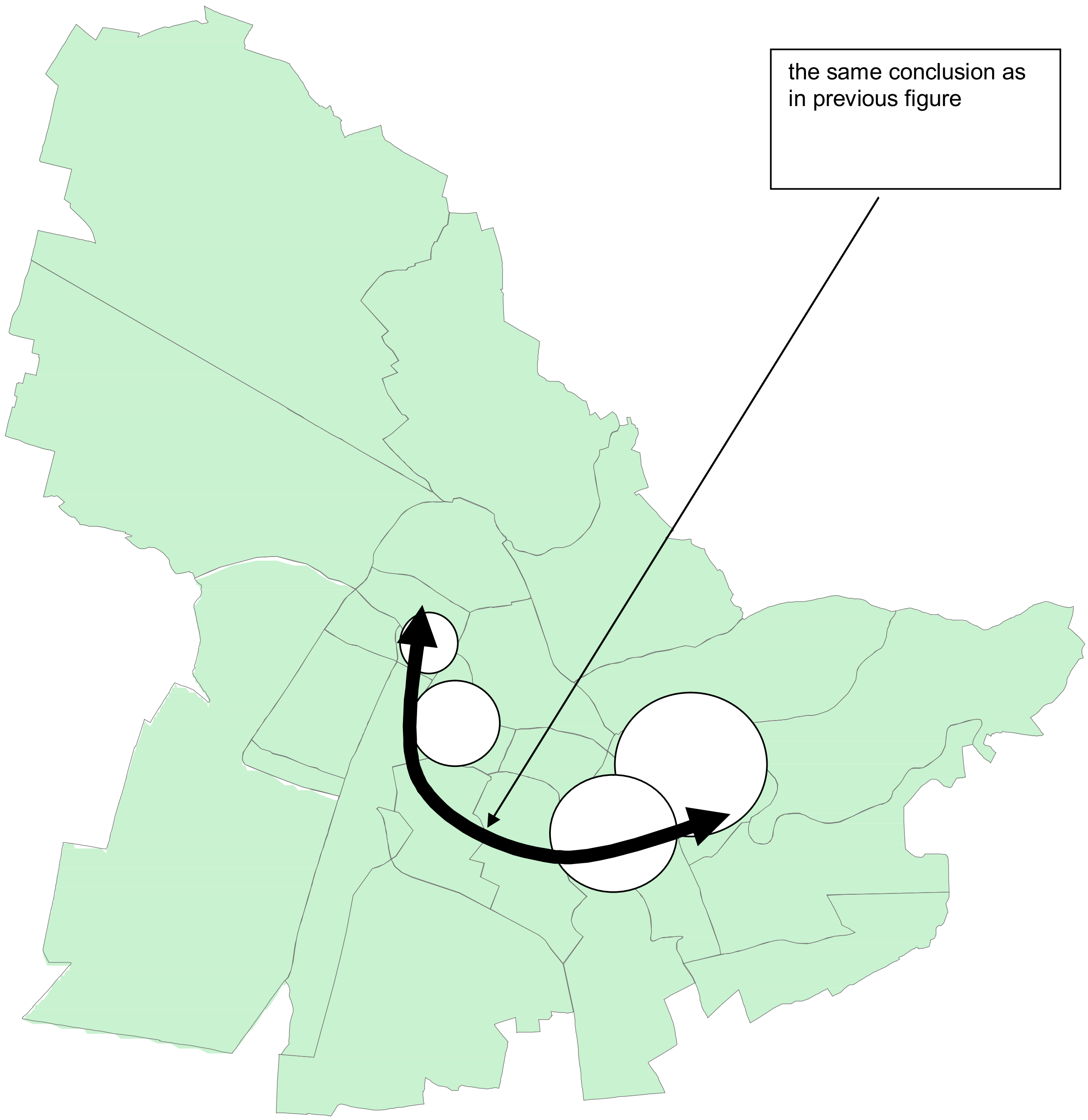

Fig. II.8 - The second series of neighborhoods with a low density of population

Conclusions:

- the analysis revealed that the city neighborhoods serving is made lack of justification based on objectivity:
    - dense neighborhoods without adequate transport service,
    - inaccessible neighborhoods without satisfactory transport service;
- International Union of Public Transport is among the most knowledgeable and credible **advocates of sustainable urban mobility** based on a global and dynamic urban policy, on traffic control of and parking and public transport development. The advantages of a sufficiently dense urban development, well irrigated by an efficient network of public transportation, have been clearly demonstrated by "Millennium cities database for sustainable transport". By this document, which gives an objective light on the evolution of the recent years economy of urban mobility, IUPT presented a diagnosis a deep diagnosis and made new proposals on the **three pillars of sustainable mobility: urban planning, traffic and parking, public transport**. Statistical analysis performed by IUPT showed that when population density is reduced by half (from 100 to 50 people + jobs per hectare), the cost for the community (expressed as a percentage of GDP) and energy consumption for urban trips increase by over 50%.
- In order to brake urban expansion - the determining factor of growth in transport costs and non-renewable energy - to preserve the historical and cultural heritage of cities, to foster economic dynamism and to combat segregation and social exclusion, IUPT recommends:
    - ✓ the preparation of urban development plans to slow construction of new areas on the periphery of cities,
    - ✓ include the public transport offer in all urban development projects to promote densification around stations - integrated urban planning,
    - ✓ apply a policy to encourage construction of sufficiently dense residential areas and proper maintenance of older buildings in urban centers and densely populated areas.

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Research on transshipment phenomenon imposed to passenger by current structure of public transport lines was initiated with a procedure for calculating the number of transshipment, which was established on the basis of gravity method for determining transportation needs. The mathematical model **to estimate the number of transhipments** assumes as basic law, there is a constant probability that a transhipment action may become necessary for a travel. For this, the number of transhipments are considered in order of size. In particular case this ordering was zero, one or at most two transhipments. Thus there was obtained:

21.78,4% of travels do not involve any transhipment;

22.16,9% of travels involve one transhipment;

23.4,7% of travels involve two transhipments.

Customizing these percentage values for the effective exchange of trips between neighborhoods could determine the amount of travel which have in their structure the action to change the means of transport:

- 26,468 with a transhipment;
- Lower than 100 of travels with two transhipments.

But it is to undeline that the largest amount of these trips is given by the efforts to achieve the goal of the trips in relation to some neighborhoods that lack adequate opportunities of means of transport[11]:

- Cartierul Grigorescu
- Zona Industriala Est
- Cartierul Nicolae Iorga

[11] What is a proof that the attention given by local administration of the municipality, the issue of mobility is not based on traffic studies to ensure to citizen the freedom of movement that he needs.

The counter-value (non-pecuniary) the most followed by the carrier is (must be) the customers loyalty and staff loyalty. Throughout development of services industry, it was shown a growing interest from researchers and specialists, understanding the methods of obtaining satisfaction and customer loyalty. Overcoming the difficulties in transport performance, it can be indirectly certified, if there is proof of obtaining satisfaction and customer loyalty and staff. **Research has shown that it is much harder to recruit new customers than to keep existing customers.** It was already enough argued that for all types of services, customers renouncement should be carefully observe in order to assess customer satisfaction. Based on the same ideas it was proposed a model of "profits from service chains" linking financial performance and customer loyalty system. This model is described as follows:

- Internal quality of the service causes employess' satisfaction.
- The employees' satisfaction causes the loyalty.
- The employees' satisfaction leads to work efficiency, to labor productivity.
- The employees' productivity determines the prices.
- The price determines the employees' satisfaction.
- The customers' satisfaction determines the loyalty.
- The customers' loyalty leads to profitability and development.

In this context it was developed a model known as "return to quality", which links the concepts mentioned above (Figure II.9).

As a result, the comparative analisys of ticket price highlights the extraordinary price practiced by SC OTL SA Oradea. Conclusion: The price can not be considered atractive,

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so that the passengers are entitled to choose - if they have the financial possibility – to travel with own car[12].

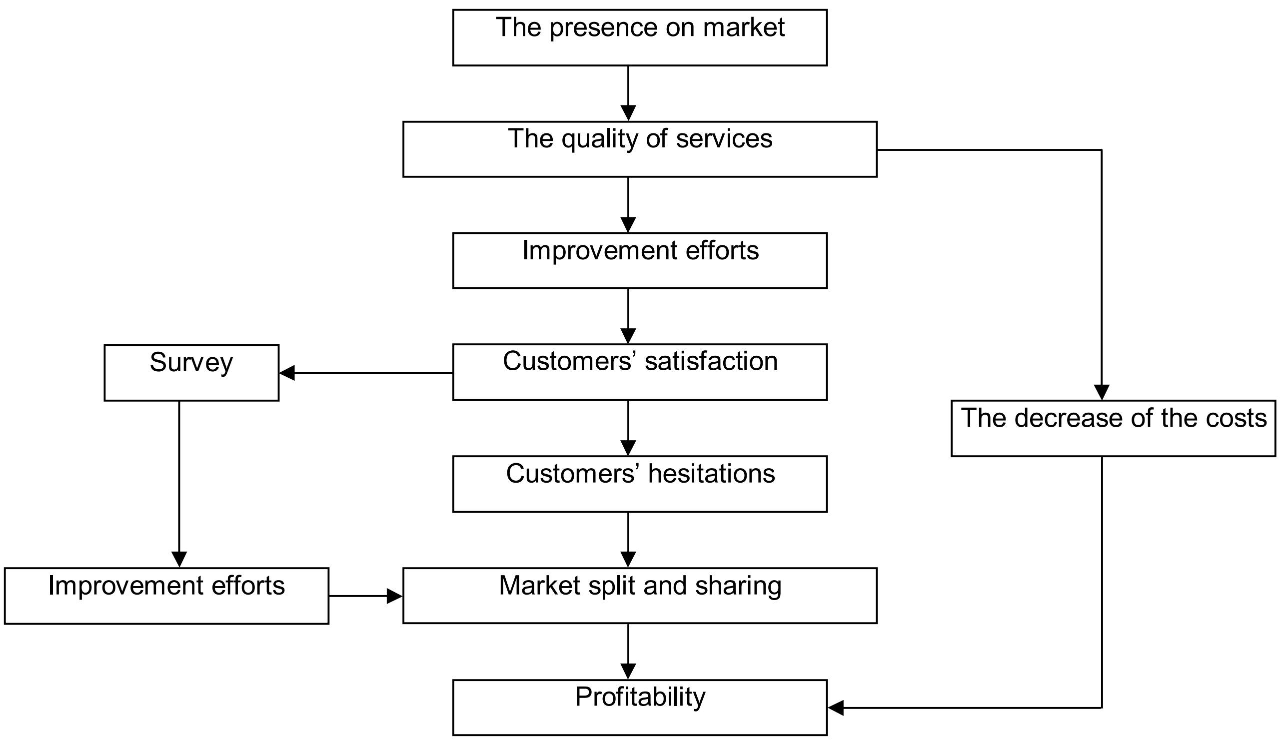

Fig. II.9 – Return to quality approach

[12] And an analysis of the usefulness of transport by taxis - approx. 2,000 permits issued - can point out that "the trend" towards sustainable development is relatively in Oradea.

Lugoj – free			
Medias – 1			
Braila – 1,2			
Bucuresti – 1,3			
Piatra Neamt – 1,5	Botosani – 1,5	Resita – 1,5	Buzau – 1,5
Targoviste – 1,5	Sibiu – 1,5	Sfantu Gheorghe – 1,5	Giurgiu – 1,5
Arad – 1,6	Ploiesti – 1,6	Baia Mare – 1,6	
Constanta – 1,75	Dej – 1,75		
Pitesti – 1,8	Alba Iulia – 1,8	Bistrita – 1,8	Barlad – 1,8
Iasi – 1,9			
Cluj Napoca – 2	Timisoara – 2	Brasov – 2	Craiova – 2
Ramnicu Valcea – 2	Vaslui – 2	Satu Mare – 2	Tulcea – 2
Calarasi – 2			
Oradea – 2,5-3			

CIRCUMSTANCES: URBAN POLICIES

Starting with the first decades of the twentieth century in the world is emerging the tendency for relatively large **metropolitan areas** within existing urban centers, although they keep their position as key players in the economic and social development, get to depend - especially in terms of workforce exchanges - on the new suburban communities (which develop in predominantly rural regions after a relatively uniform, but deficient in their ability to provide vital functions: easy access to centers commercial opportunities, for interaction between members of the community, leisure, etc..). This phenomenon has manifested itself more strongly in Western

Europe, it is widely met today both in developed countries and Eastern European countries. Urban and peri-urban development is a relatively recent phenomenon in Romania, which was almost ignored both literature and practitioners. The experience of other countries concerning urban-peri-urban development shows that there are negative effects associated with this phenomenon, especially when assembly planning is faulty or lacking. In the literature urban-peri-urban development is defined as a form of transition from urban to rural areas, which can occur both within city limits and in the surrounding rural communities; with a density typically reduced the ad hoc peri-urban development, with a unplanned character of surrounding rural communities of a city supports dependence on the automobile; and the car "introduced in the city" will contribute to congestion, pollution, etc.

In Romania there are too few studies that refer to this problem, and the terminology is interchangeable unit using concepts such as peri-urban development, suburban or commercial implantation, industrial, residential respectively to periphery of urban centers. But the main malfunction is the unplanned character of urban-peri-urban development all over the world.

In English was devoted a term that has negative connotations and refers to this phenomenon - **sprawl**: a possible translation would be expansion, uncontrolled expansion in and around urban areas. Urban-peri-urban development is seen as uncertain as final and requiring the intervention of the local authorities because of the negative effects it produces. Among these, the most discussed in the literature are:

- the loss of agricultural land when peri-urban development extends in neighboring villages/communes;
- the reduction of green spaces when peri-urban development takes place mainly on the limits of city areas that were previously intended for entertainment (forests and outdoor areas);
- **increasing the number of people who commute;**

- reducing opportunities for building large projects in the future;
- pressures on local budgets by the need to finance infrastructure in areas increasingly distant;
- aesthetic issues;
- creating a major discrepancies between downtown, existing neighborhoods and new suburban areas.

Worldwide it has been emerged since the 1960s two movements or political trends within metropolitan planning which attempts to reconcile two conflicting objectives:

- the need for further development and expansion of cities on the one hand and
- concerns for the environment, providing adequate public services and aesthetics on the other hand;

these two political currents are:

UDM = urban development management and

IPD = intelligent peri-urban development.

Although many authors consider now that these two movements overlap, must be mentioned that there are some differences in color that are relatively important.

UDM (originally appeared in the 1960s, but has expanded and implemented in practice in the coming decades) aims to conserve rural/natural areas at the limits of urban centers by imposing strict quotas for urban expansion in the future (for example it sets that for a period of one year it will be approved the construction of a number of new housing)**.**

IPD was occured in the last two decades and aims to control peri-urban development by imposing quality standards. For example, the development of new quasi-urban communities in rural areas, but it requires a compact design, integrated into the surrounding architecture, maintenance of unfragmented green areas etc**.**

There are critics related to these, which consider that are too broad, idealistic and do not take into account the current preferences. As a famous American author appreciate (Gillham, 2003), the subject is sensitive mainly to bring the discussion **on the one hand** the right to free initiative, property rights, consumer preferences, and **on the other hand**, the right of administrative structures to intervene and limit individual rights in the context that aims to accomplish the public interest[13].

It can be seen that:

- UDM insists on the „boudedness" of urban area while,
- IPD insists on „preparing" of rural area.

Theoretical analysis of the two concepts has led to their extrapolation to one, called extensive urban planning = EUP.

The idea is originated in the United States, where it was used for the first time by the governor of Maryland (Parris Glendening) to describe the strategy of state-level authorities to finance new investments in infrastructure only in those areas designated as desirable and at the same time to encourage land conservation in other designated areas. The concept was taken and used in many countries today who designates a set of strategies and policy instruments that actively seeks to redirect and urban and peri-urban development towards specific objectives in this regard, EUP appears as a response retroactive to the negative effects of **unplanned urban sprawl** and **uncontrolled peri-urban development**.

[13] Attention to the sense: the public interest is a objective goal, the public interest is a subjective goal.

The term EUP was perceived as highly attractive from the start, because it represents a bridge between the techniques and tools used to encourage the continued development of towns and the restrictive measures, which severely limits the unsustainable development possibilities of rural areas.

Urban Land Institute, a research center in the United States, which had an instrumental role in developing the concept, indicates that the major objective of **EUP** is to identify a common frame of reference for citizens, local authorities, environmentalists, investors, building contractor etc. In essence, this approach, although general, brings into question **the need for consensus among relevant stakeholders** and suggests three seemingly different dimensions of the process of planning and development:

- economic,
- environmental,
- social.

Another useful definition is: EUP encompasses a set of principles and practices in planning and urban development which have as a result a **more efficient land planning and transport system**; the most interesting conclusion: EUP concept can be applied in various locations, from city centers to suburban and even rural areas. This remark is important because often those who oppose PUE claim that these policies do not recognize or oppose development that occurs outside the boundaries of existing cities. Thus:

- for urban environment EUP focuses on projects that promote regeneration or refurbishment of existing neighborhoods, improving standards of design, including the creation of streets and pedestrian refuges, measures to ease traffic, creating an integrated transport system, the emphasis on facilitating pedestrian traffic, the cycling etc.;

- for peripheral area, EUP is translated by the integration of different sectors such as residential, economic services (this can be done by creating more focus points which are then connected by corridors);
- in the peri-urban area it can be considered the communities that from the outset are planned and created to meet the sustainability principles or communities that exist and where there is an incremental process of change (this is much more difficult to achieve);
- in the agricultural/rural areas EUP focuses on the concept of " node of polarization of the interest"; in fact, a well defined area, where are concentrated **those construction and activities which are not specific to rural area**, concurrently or subsequently, it will be used various methods to connect various utilities within the nodes of polarization of interest (eg via pedestrian paths).

It can be considered that for the complex situation of the area dominated by the city of Oradea, EUP = extensive urban planning is a viable alternative for the community - and for the city and its surroundings:

- first of all EUP represents deliberate and planned intervention of administrative structures by that it is sought to control the volume, the rate, the type and location of future developments in the metropolis;
- EUP seeks to maintain **a balance between development and conservation**, between new buildings / neighborhoods and available infrastructure between demand for new investment in infrastructure and utilities and available financial resources, between progress and social equity;
- It can be identified several features of EUP:
  - ✓ public sector plays an active role and which still exists in the early stages of urban development projects;

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- ✓ it is an activity undertaken by the public sector in order to direct and control public investment and urban development projects initiated and implemented by the private sector;
- ✓ the legitimacy of political administrative intervention is given by the general/public interest - unplanned urban and suburban development can generate profound negative effects for the whole community;
- ✓ is a dynamic process - EUP following to adapt constantly to changes that occur;
- ✓ it must anticipate the trends arising in connection with urban expansion and priori ito dentify these needs determined by future development;
- ✓ sustainable development programs have the difficult task of trying to find a balance between divergent goals and interests: **public interest versus individual rights and fundamental freedoms, economic development versus conservation of natural resources, social equity versus efficiency and so on**;
- ✓ not only the urban area, it is true that this policy came from the need to solve problems caused by local unplanned development: but the concept is applicable in any community, from highly urbanized to rural areas and (also it must be recognized: currently rural and urban terms tend to become increasingly difficult to separate, especially because a lot of space appeared to be placed somewhere between urban and rural areas, this is because the expansion of urban areas to periphery tends to disregard the political-administrative boundaries that separate different administrative-territorial units; moreover, certain local conditions that influence the nature or construction of new neighborhoods are the result of forces that occur at a higher level than geographically one);
- ✓ local objectives of EUP programs should always be designed in the context of the larger metropolitan areas or REGIONS.

Regarding the procedural dimension, it is considered that there are a number of distinct purposes:

• control the volume of new construction;

• direct the development to certain areas;

• sizing of public utilities (level, surface quality);

• reduce dependence on automobiles (measures and education);

• provide a transport system (effective rather than efficient);

• redevelopment of communities (utilitarian design inserts);

• changeattitudes toward the environment;

• encourage metropolitan cooperation.

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OPPORTUNITY: SUSTAINABLE URBAN MOBILITY PLAN

The idea of "sustainable urban mobility plan (sustainable urban mobility plan)" - is used with different meanings, depending on the area, with a lot of meanings of this clear concept: develop a predictive series of actions aimed to accomplish by planning, organization and phases the necessary and sufficient actions, a specific purpose reduced **only in declarative terms** TO MEET THE NEEDS FOR PRESENT AND FUTURE MOBILITY OF PEOPLE IN A BETTER QUALITATIVE CONTEXT FOR LIFE IN CITIES AND THEIR SURROUNDINGS.

Overcome the declarative stage it is found that SUMP will be inconsistent if mobility is analyzed in "transport down" in other words: the strategic plan that can bring solutions on mobility must consider **ONE= the principles of integration and TWO = participation;** explanatory:

- city gas supply means less traffic and environmental problems;
- opening a grocery store in a neighborhood lacking something like this means walking trips instead travel with mechanized means - their own or a public carrier;
- opening a kindergarten has an influence on decreasing the number of unemployed – because childrens' parents have gained mobility which allows them to increase the area in which they can fiind a job;

- to include in the cost of a theater ticket the cost of public transport ticket fare by public transport, means fewer problems with parking vehicles, private property, etc.

ONE

Essentially the **integration** must be understood as a condition that extends the boundaries of transport "up and multilateral" because:

- vertical approach - between different levels – of planning urban mobility for a urban area is a part of a wider transport framework, that exists at regional, national, even international level;
- territorial approach - a SUMP must relate to the territory for which it is made - but must take into account what means the teritory for traffic flow;
- horizontal approach - in the same level, between different policies/actors/departments[14] involved in the development and implementation SUMP allow concerted efforts toward a common goal;
- intermodal approach - a SUMP should provide links between different modes of transport (private car, walking, cycling) - provides a common development beneficial to non-urban transport systems: peri-urban, suburban etc.

[14] Departments responsible for spatial planning, the police, the institutionalized forms of human community (eg parents associations) involved in health structures, etc.

TWO

Citizen **participation** in planning SUMP is not only a requirement stipulated in EU directives and international conventions, it is the **fundamental duty of local authorities to ensure the legitimacy and quality of decision making**. This activity is the following of the clear link between **mobility** opportunities **offered** to people - and people's perception (not administration) about the quality of decision related to the **need for mobility**. The general objectives of participation:

1. Encourage citizens to join the debate and collective decision-making;
2. Ensure a maximum transparency and democratic and participatory decision-making along SUMP process;
3. Design sustainable solutions and support to improve the quality of life of every citizen and creating a public property of SUMP;
4. Improve the quality of SUMP generally by discussing with citizens the arguments of politicians, officials and technicians;
5. Strengthen the vitality of civil society and local political culture.

What methods are used for the development of such a plan? Cities differ in make decisions process, but their methods were developed more than "seeing and doing" than being formally prescribed. But now there are known three main methods**:**

- follow a vision,
- apply a logical scheme,
- pursuit of consensus.

The methods for vision pursuit involve an individual (usually the mayor or leader action planning) that must have a clear picture of what it is like to become the city and strategic tools necessary for this vision (in this sense: there were only a few cities which had a visionary leader, but those made the largest progress).

Methods of applying a logical scheme involve to establish the objectives and problems, adopting a process for prioritizing and identifying possible solutions to problems and selecting those which give the best results. Problems are seen as lacks in the current conditions or in those anticipated for the future, which break the reaching of goals.

This list of issues can be discussed with participants to see if they have the same or different perception of the problem. In this case, the targets are properly redefined periodically. The main drawback to this method is that many politicians and members are less familiar with abstract concepts than with specific problems.

The method of consensus pursuit involves discussions between the participants in order to reach an agreement at every level of the method for pursuit of plan:

- the objectives to be achieved and their importance,
- the approach of the problems,
- selection of appropriate policy instruments,
- how to combine and apply them in the context of the overall strategy.

What are the methods adopted by cities? Some of the studied cities have thought it better to not adopt only a method, but rather a mix of methods combined, to be agreed by all decisions makers.

What is the SUMP purpose: SUMP aims to achieve a sustainable urban transport system (as defined in the 2001 by EU Transport Council), addressing at least the following objectives

- Ensure accessibility for all people, provided by the transport system in line with the below objectives;
- Reducing the negative impact of the transport system on the health, safety and security of citizens, especially the most vulnerable;
- Reduce air pollution and noise emissions, emissions of greenhouse gases and energy consumption;
- Improve the efficiency and cost-effectiveness of passenger and cargo, taking into account external costs;
- To make more attractive the urban environment.

How does the SUMP action: SUMP is a way more efficient and effective approach to treat urban transport issues. It is performed based on existing practices and regulatory frameworks of the Member States. It is done through the interaction between the local factors of mobility. SUMP essential characteristics are:

Participatory approach – citizens and stakeholders involving before and during the decision making process of implementation and evaluation, building local capacity to deal with complex issues of planning, ensuring gender equity;

Guarantee of sustainability - balance between social equity, environmental quality and economic development;

Integrated approach - the practices and policies between the means of transport, the policy of sectors (eg spatial and urban planning, environment, economic development, social inclusion, health, safety), public and private agencies, levels of authority and between neighboring authorities;

Focus on achieving of measurable tasks - derived from short-term goals in line with the vision for transport and related with sustainable development strategy;

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Orientation on cost internalisation – reviewing of transport costs and also of benefits in sectors of policies, ie consideration of more complex social costs and benefits.

What problems have proven acute (with direct reference to transport)?

Tab. II.7 - Issues raised by the groups involved in the evolution of urban transport

Group	Interests	Perceived issues
Passengers	A reliable public transport system with low costs	Frequent accidents Frequent failures of vehicles Uncomfortable and/or dirty vehicles Slow routes that are not easy to use Actual service performed rarely
Non-passengers	Reduce traffic congestion	Frequent traffic jams
Public transport employees	Better working conditions	Low wages Extended work hours Vehicles in poor condition or unsafe Streets (rails) in poor condition
Public transport operators	The offer of essential public transport services, secure and efficient	The vehicles are old and difficult to maintain Complaints of passengers on routes, safety and frequency of public transport services
Administrative bodies	Reduce traffic congestion Improved conditions on the streets A reliable public transport system with decent grants	Insufficient budget Legislative and regulatory ambiguity

What measures have been proven adequate (with direct reference to public transport)? These measures include in order of success[15]:

- Active promotion of public transport in the suburbs;

[15] It can be seen that the first four measures of success does not involve massive investments.

- Provide dedicated public transport lanes;
- Priority for public transport at traffic;
- Average intervals of arriving between vehicles, with strict punctuality declared;
- Integrated ticketing;
- Tram and light railway routes;
- Clean vehicles;
- Use of real-time data to control the operations of public transport and to improve the planning;
- Parking fees in city center;
- Improve safety in vehicles and stations;
- Provide a website with detailed information;
- Integrate the public transport with cycling.

Both citizens and politicians are aware of the problems caused by urban sprawl and increasing car dependence, but limits and their evolution are less known. Generally people do not realize that transportation service for the community is obviously made with lower cost for medium and high density cities where this service is well organized.

One purpose of this SUMP is to highlight the correlation between spatial planning and modal choice on the one hand and mobility system costs on the other hand. Analyzed parameters must be the next:

- Urban characteristics: size agglomeration (urbanized area), the average density of the urban area (population and jobs per hectare) and the concentration of economic activity in the central area (percentage of workplaces).
- Choice of means of transport: public transport journeys by bicycle or walking.
- The average length of trips by public transport and by car.

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- Energy consumption per year and per capita, expressed in mega joules in order to group electric and thermal transport means.
- The economic indicator: the cost of transport for the community, as a percentage of GDP for the metropolitan area, allowing the comparison of cities (investment and operating costs for public transport, investment costs and maintenance of roads; costs with the use of private motorized means, including specific fees to avoid the infleunce of comparisons in favor of public transport). **It has to highlight that these costs are not purely financial and not incorporate "external costs" produced by transport (mainly car), such as urban land use, pollution, noise and traffic accidents.**

Less densely populated cities typically generates a large share of motorized trips and transportation cost is accordingly high. However, in these cases the modal distribution from private car to public transport would have a low effect on the cost of travel for the community because public transport is not adequate to serve low populated areas (except links to and from the city center). This means that urban travel costs are half in Singapore and Helsinki in comparison with Chicago, Melbourne and Newcastle. This discrepancy represents a saving of 2,000€ per year and capita in cities with a high degree of public transit and use of environmental resources. Some cities as Vienna or Zurich, Bern and Geneva in Switzerland, have chosen to offer to their residents a very high quality public transport (especially in terms of comfort and frequency). This decision certainly has an impact on cost, which remains extremely low compared to cities where the car remains the dominant transport mode. **The cost for the community is even higher when GDP per capita is low**. In developing or transition countries, economic and social life essential functions, such as transport, mobilize a greater share of resources than in developed cities, a rate that increases when private motorization level is high. Moreover, the cities with the highest costs for transportation spend very little public transport (less than 10 % of the total), while cities with good administration have better distribution costs (between 20 and 30% for public transport).

The cities that allocate the lowest amounts for mobility of their citizens are the cities with medium or high density, where trips are mainly made using public transport, walking and cycling. Community transport cost varies between 5% of GDP in densely populated cities with a strong use of public transport to 12% of GDP in less populated cities, where the car is virtually the exclusive means of transport.

For the time being Oradea is engaged in a relatively extended action which aims to resolve sensitive issues like:

• "The study of mobility and transport development plan for Oradea Metropolitan Area"
• "Achieving of sustainable urban transport plan in Oradea"

A first difference between the two projects under development in the same place at the same time appears: "The study of mobility and transport development plan for OMA" - initiator Intercommunity Development Association of Oradea territorial administrative units, has on the one hand a strategic (through component 1 = **street network configuration and sizing topological structure plan**) because:

- once implemented projected measures at the project’s end, their subsequent re-modification is relatively difficult and expensive;
- although there will be redesigned the whole network of streets, however by traffic phenomenon will affected the whole community;
- the purpose of the action is more intuited than set (not required - nor could ask for - a series of changes to improve, for example, commercial speed of means of transport by 30% and that because neither it can be known a priori if the value is achievable);

The same "study mobility and transport development plan for OMA" is on the other side a tactical (by component 2 = configure a unit network for urban transport in the area covered by OMA) because:

- measures to apply are organizational (a bus is actually a series of indicators which states the existence of a boarding-disembarking stations and extension of tram routes to belonging municipalities - which obviously can not provide the minimum amount of travels which can capitalize the electric transport - exceeds rthe ationality);
- it is unlikely to assume that local factors have put into service only bizarre transport lines on which the project will bring in feasible coordinated (in other words no one can venture to say that all lines will undergo radical changes);
- the purpose of the action is set: optimization – that means mathematical model with results.

"Sustainable urban transport plan for Oradea" - initiator SC OTL SA has a **strategic character** as solutions aim not only to sectoral issues, but also interpenetrated and corroborated issues targeting both actual movements and activities at the end of the trips (eg changing the start and end time for industrial or educational activities) solutions which, besides resistance will induce cascade phenomenon whose implications in time and space can be very hard to be brought back on the old track). **More: even later broken solutions will be felt long time** as their size is enlarged.

Strategic character is emphasized by the considered "part of organization": in a problem of type" urban transport plan" enter active players,institutions and authorities and public.

The objective of the solution does not appear among the demands made in front of "a sustainable urban transport plan" only in declarative terms: congestion to be decrease, to reduce pollution, to increase safety and security, to reduce consumption of energy, etc. **No sustainable urban transport plan does not hace a priori specified INDICATORS OF LEVEL for the required "product/service" and because indicators of level are set during solving.**

THE SECOND difference between the two projects is that resulting from the analysis **of the initiator's place on the vertical component of services and utilities**:

- the project "Study of mobility and transport development plan for OMA" **places the initiator on a higher level** compared to structures that are aimed by operational activities to be undertaken to achieve the objectives (measurements, calculations, extrapolations , etc. . within periuban urban transport service for passengers , so "under" initiator).
- the achieving of "Sustainable urban transport plan for Oradea" **places the initiator on a lower level** from structures that are aimed by the **strategic and tactical activities (possibly operating activities)** which have to be carried out to achieve the objectives (analysis, synthesis, estimates, and so on in areas dominated by institutions of local government, the public, business environment, etc.), so "over" initiator or in parallel with initiator. Thus SC OTL SA said that the entire project will be carried out on the basis of documents produced by the European Union - "**Guidelines - Developing and Implementing a sustainable urban mobility plan**" .

From a structural perspective, the differences (between a SUTP = sustainable urban transport plan and SUMP = Sustainable Urban Mobility Plan) relate to the scale**:**

- in case of SUTP, **the logic under which the activities are running is inductive** - the form of reasoning in which it starts from the effects obtaining causes (from particular to general) thus proposing solutions for these causes: observations solutions are derived from observations,
- in case of SUMP, **the logic under which the activities are running is deductive**– the form of reasoning in which the conclusion follows necessarily from the premises: community mobility needs require intensive or extensive measures in areas that already

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have proven that give people the higher freedom in mobility with the same cost - or less with the same time consumption - or faster and with fewer consequences for the natural or artificial,

being well known that inductive algorithms running (rising to the rank of general of particular situations is not for everyone) requires effort, resources, time, money, etc..

From the procedural perspective - the difference (between a SUTP = sustainable urban transport plan and SUMP = Sustainable Urban Mobility Plan) are trans-informational:

- in case of SUTP, the data and results should be accepted and checked by bodies placed in hierarchy, upper than the initiator, SC OTL SA;
- in case of SUMP, data and the information should be checked and accepted by even the initiator, SC OTL SA.

The main consequence of this series of considerations is that the transition from the SUTP to SUMP - obvious after completing of reading the paragraphs specifications for "Sustainable urban transport plan in Oradea" **transform the character** of the project initiated by SC OTL SA **from strategical in tactical one**.

In this context the approach will be focused on:

- identifying and solving problems that are part of the scope of the SUMP;
- highlight those issues which are part of the scope of the SUTP and for which validation procedure is applied within the deadlines of the project’s phases.

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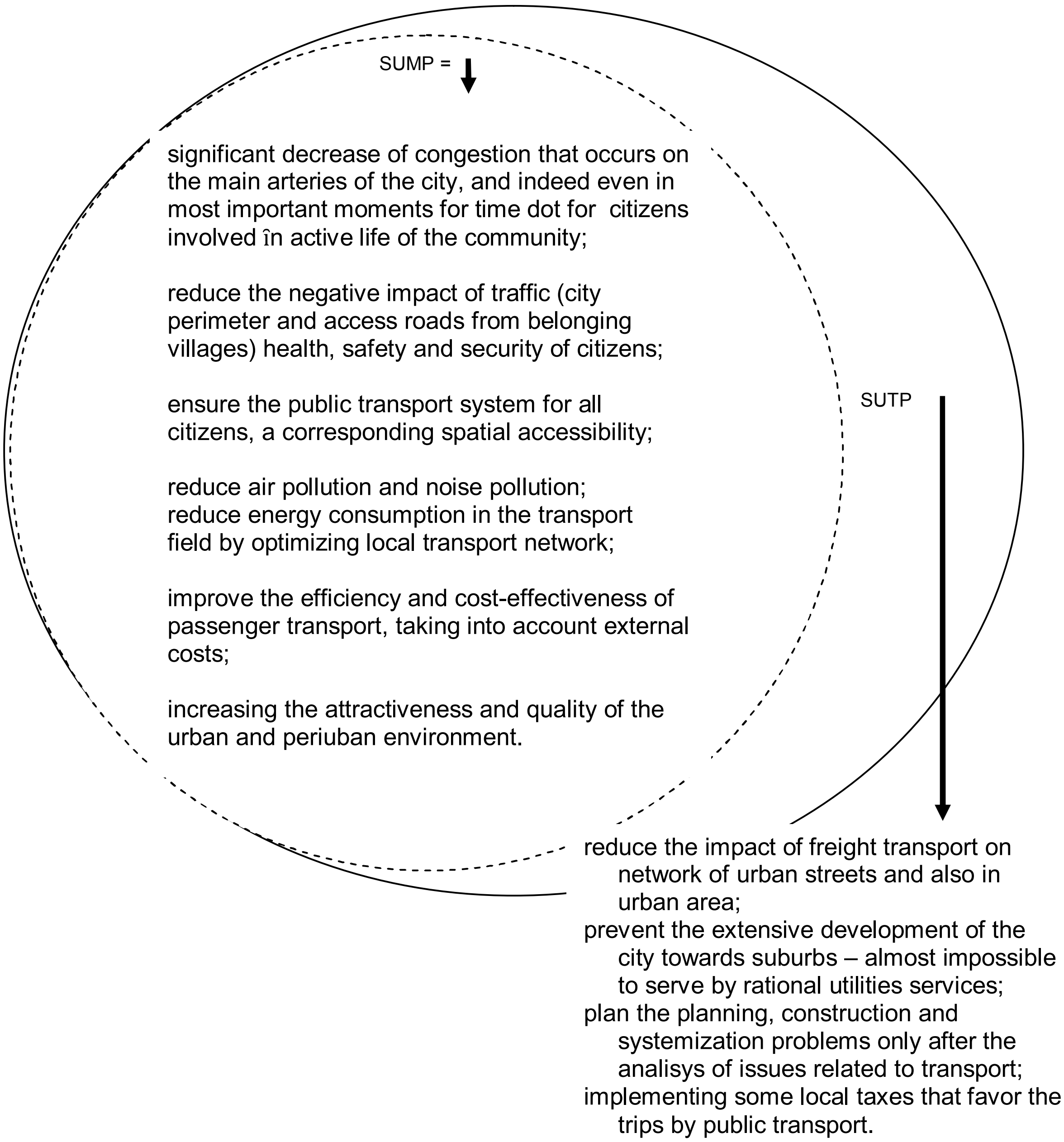

Fig. II.10 - Relatively significant differences between SUTP and SUMP

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THE ORIENTATION: SUSTAINABLE ATTITUDE, DECENT USE OF SPACE, EFFICIENT URBAN TRANSPORT

A number of materials:

• appeared following to the dissemination of experience (of institutions and bodies belonging to cities that have introduced in one form or another SUMP),

• respectively following to some considerations already inserted in the project or which are in preparation for the chapters to come,

lead to the finding that **transport of any type in the cities is a subsidiary of economic development and demographic trends**.

What links the economic and demographic development of an integrated transport system[16] is **the use of urban space**: knowing the parameters by which are performed planning and management of urban surface allows transport system to achieve a balance between demand and supply volume, in current operation and in the future. On the other hand "life" demonstrated that a SUMP is from the beginning unrealistic if not accompanied by a continuous intervention program consisting of **awareness and behavior change actions**. Together, these actions will transform the accumulation of knowledge on sustainable transport in effective measures that will lead to a modal shift towards more sustainable transport systems. Below is a list of actions with favorable impact on SUMP - resulted in the international, national or local level.

[16] A system that integrates also the trips by public transport and trips by private car, and by walking but from another perspective of a transport system which takes into account the generation of trips and transit trips and trips attracted and from another perspective of short-distance trips, suburban and interurban trips, work trips or leisure trips etc.

Tab. II.8 - The three orientations (priorities) of vision - in order of importance

awareness and change of behaviour	**the use of urban space**	**passengers public transport**
1	**2**	**3**
Local authorities should provide measures to restrict the access into neighborhoods in order to protect residential areas from unwanted problems due to traffic and for locating or concentration of housing in those areas (road specialization). Moreover, on the main routes officials should take measures to limit the speed of traffic and noise reduction.	Almost there is no document issued by central, regional or local planning urban structures not to recommend the following objectives: • density of the built area as a dispersed urban area does not allow a viable mass transit, density must be increased mainly around transit corridors (railways, metro or tram lines); but the reverse action is recommended: extension of the tram network – in case of Oradea – towards the areas where the density is increased; • diversity of functions to handle the problem areas with a single function which become inactive urban areas are after working hours; • proper location of activities, designed to encourage institutions with multiple services which is using sedentary personal in order to locate them close to major transit routes.	Local authority's documents will need to focus on a comprehensive approach and focusing on users' expectations in order to optimize the existing services with minimal financial resources, while providing clear results for passengers. There are mentioned measures as: ✓ Network extentionExtinderea retelei de suprafata ✓ The increase of services frequencies ✓ Improved quality ✓ Commercial speed improving ✓ Network configuration ✓ Ensure acess for people with reduced mobility ✓ Facilities for passengers ✓ Public informing ✓ Intermodal connection services ✓ Fleet renewal ✓ Reconversion to electric traction mode.

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Tab. II.8 - The three orientations (priorities) of vision - in order of importance

1	2	3
Promote a trip which is seif and comfortable, especially for those with reduced mobility, and should be guaranteed by regulations and awareness campaigns in and around facilities and public buildings.	A section of the regulations for urban planning should focus on rules reviewing and standards for parking areas out of the the road, set the maximum number of parking spaces depending on the number of jobs, business type, etc.	
SUMP has to envusage for the city an element related to development plan for cyclists (eg trips by bikes represent 10% of all trips). This can be achieved by the following measures: • launche information campaigns about cycling in the city; • create a regional system of bicycle routes that provide progressively more spaces for bikes on all roads; • equip the main mass transit stations with parking facilities for bicycles, even storage spaces.	Regional and municipal plans should encourage public interest facilities (shops, schools, hospitals, etc..) for their location in the center and not to periphery, in places easily accessible by mass transit and to ensure correct distribution facilities less important in other sectors.	

Tab. II.8 - The three orientations (priorities) of vision - in order of importance

1	2	3
Ensure the loading and unloading of freight vehicles out of the road to make them less annoying for traffic and local residents, and to ensure that they are held safely, security and high efficiency for contractors transportation itself. To reduce the number of trucks that park in residential areas, besides encourage transport contractors to obtain long-term parking spaces placed out of road, it would be necessary to make the supply by night.	A rational policy will require measures which aime the expansion of public space, so as the pedestrian not to be bothered. It is likely that these steps to encourage the citiyens to walk or to ride a bicycle instead using private cars. It will be searched different ways to remove the unwanted obstacles in front of pedestrian, as: 15. physical obstacles on the sidewalk (street lamp poles, street furniture, billboards, damaged pavement surfaces), 16. illegal parked vehicles (on the sidewalk, at pedestrian crossings, etc..), **17.** commercial or public institutions using public space (vendors, restaurants, etc.). In this context, the investments will have the following priority goals: • ensure that sidewalks and their surface to be in good condition to use (stability, slippery, curbs or bumps at intersections) • improving public lighting (proper uniform) • increase safety of areas around schools, by equipment which to ensure the safety of majority of vulnerable users.	

Tab. II.8 - The three orientations (priorities) of vision - in order of importance – end

1	2	3
The approach of commercial traffic consits in encouraging the trucks to use regional roads so that less harm to life's quality occurs. Since traffic flow depends greatly on the ability to eliminate congestion, the junctions of regional roads will be maintained as free as possible by restrictions on parking in the vicinity of major intersections during peak hours. Strategy was to ban traffic (freight traffic) to transit through cities and to be focused towards the ring road.		

THE LIMITS: TRAFFIC INFRASTRUCTURE AND GEOGRAPHICAL EXPANSION

In principle, the planning of sustainable urban mobility must be adapted to local situation. This includes as essential step to define the geographical scope of the plan, purpose which ideally should target a functional urban agglomeration. As a general rule, SUMP must refer to the specific territory on which will be implemented. Any definition it would be used for "urban agglomeration" there will be probably objections more or less justified; moreover: in the literature there is no refer that a specific territory on which it will be exercised mobility actions contained in the plan is reduced to "urban agglomeration". In any case, the area on which bus service operator runs - SC OTL SA - should be part of the structure of "urban area". Mandatory, this area – of the component parts of Oradea served the urban transport system - will be considered as the object of planning not only for the carrier SC OTL SA, but also for those local authorities (and perhaps regional) that are responsible for the future of the city[17]. In mod explicit, daca zona de proximitate a fiecarei relatii de transport acoperite cu vehicule de catre SC OTL SA se considera intinsa pe cateva sute de metri pe directia transversala liniei, aria de planificare pentru operatorul de transport – facand abstractie de orice fel de influente de tip administrativ arata așa – fig. II.11: Specifically, if the proximity of each transport link covered by transport vehicles of SC OTL SA is considered spread over a few hundred yards in the transversal direction, the area planning for the carrier – not taking into account any administrative influences looks like - fig. II.11 :

[17] Once again: if the whole responsibility is appropriated only by SC OTL SA leadership, planning can not solve the citizens' mobility because mobility is related to land administration – in or outside the city - and to tax and fees policy, to pollution and impact of new utilities introduced or not in neighborhoods that claimed those facilities, etc.

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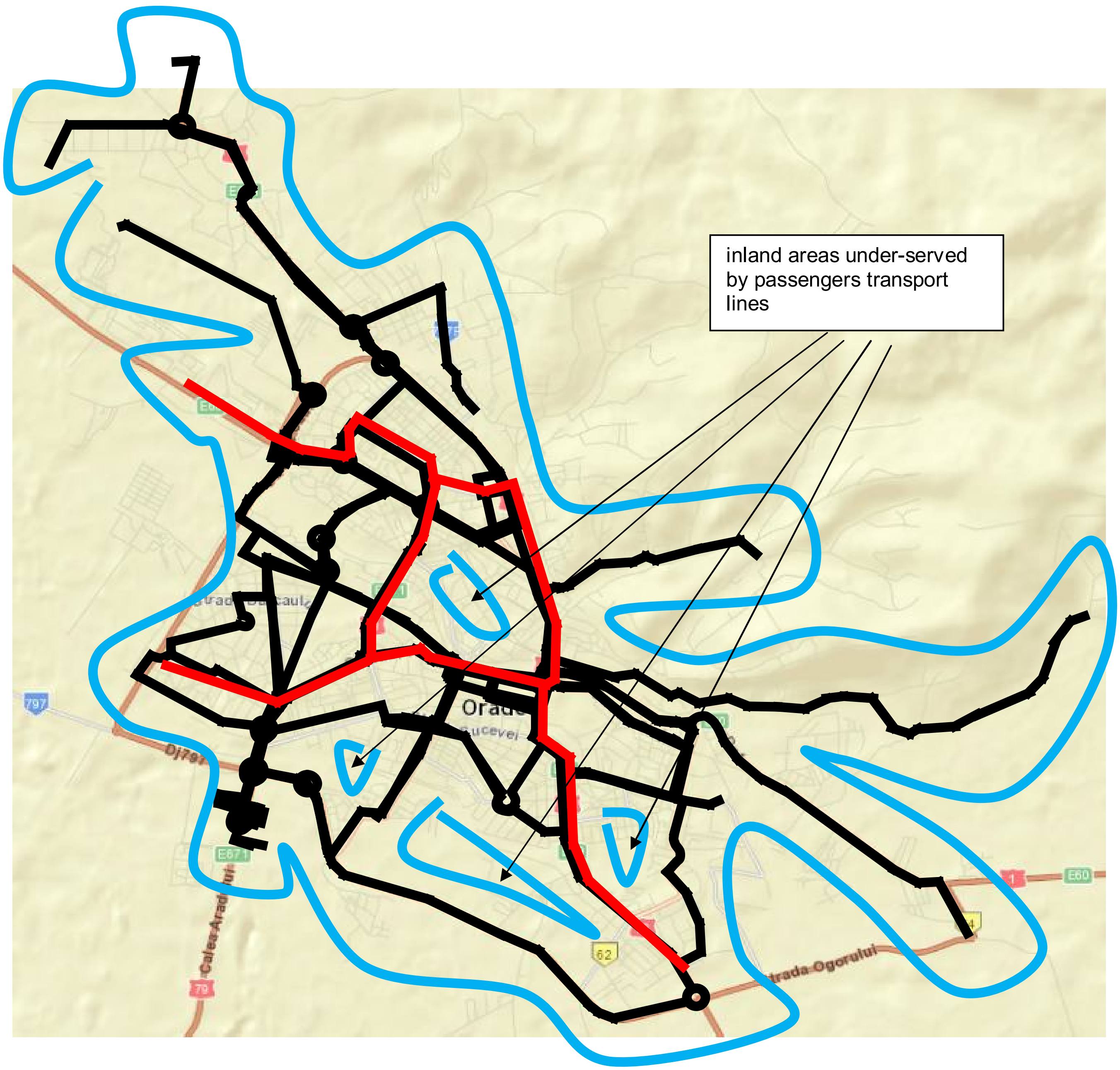

Fig. II.11 - The image of area "taken" by SC OTL SA (black = bus lines, red = tram lines, blue = surface area of the routes in operation)

which globally is not even the official territory of the city – fig. II.12.

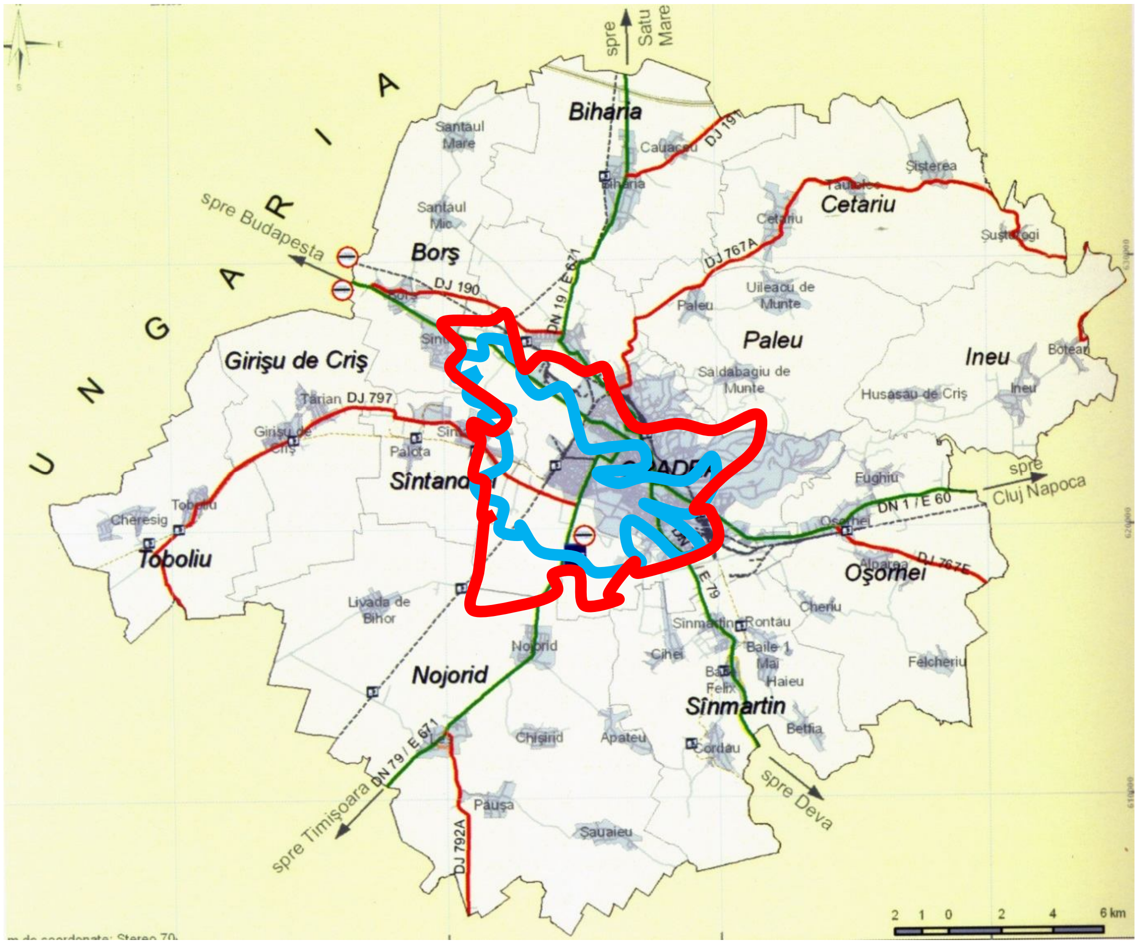

Fig. II.12 - The identity fairly relative between city area (in red)
and effective surface taken into the operating area of urban transport system
SC OTL SA (blue)

A mathematical justification of the need to extend the geographical area (above the currently covered by SC OTL SA and beyond the official city) may be brought by analyzing one by one the urban center and and its surroundings.

Most problems for the development of sustainable urban mobility in any municipality (including Oradea) lies in the fact that the ratio between area of streets and active area of the city is several times smaller than that of other European cities, in the absence of parking out of streets and a continuously increasing level of motorization. It has strongly to be revealed solution to protect city center and streets on which it occurs the canyon effect on the main axes crossing the zero point

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of the city (Independence Square). Next demonstration can remove mistrust concerning the above statement[18]; be three concentric zones on which it is trying to constantly keep the areas allocated to routes. If in the outer area is allocated, for example, a share of 10% for the means of transport, this surface is mathematically:

$$0{,}1 * \pi * (R^2 - r^2) = 2{,}5 * \pi$$

[18] Statement is synonymous with truth that any **measures taken at the same level of city area** which can not eliminate congestion on which the entities are submitted to, which are moving toward a “center” constituted by radial arteries.

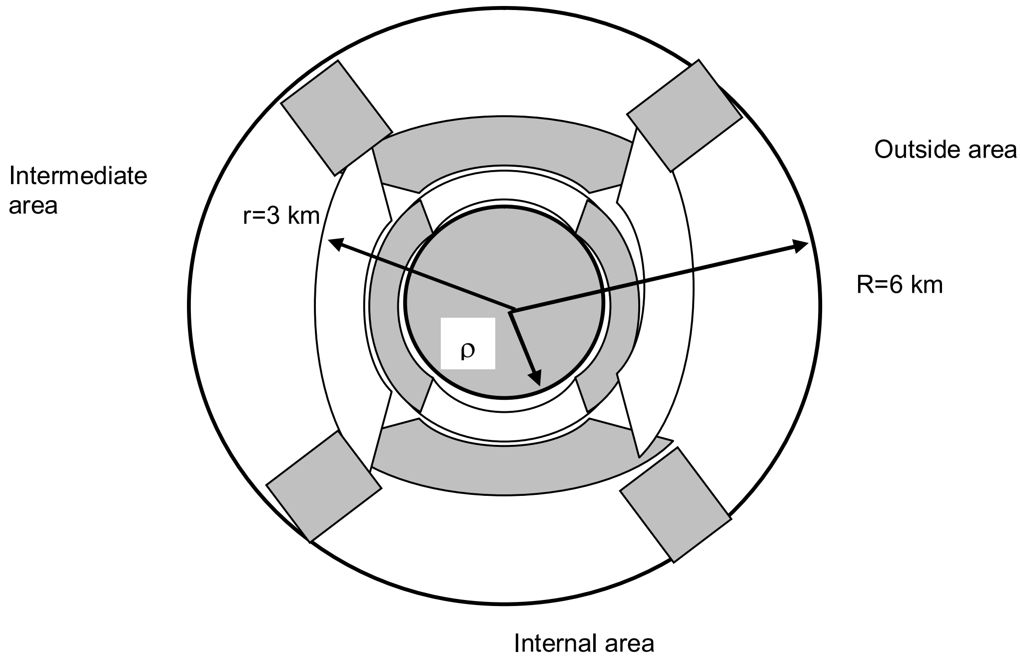

Fig. II.13 – Highlight the "lack" of transport lines in the city's center

At limit, equaling the above value with the surface of the central area is obtained:

$$\rho = \sqrt{2,5} = 1,58\ km$$

means:

- if outside area 10% respectively 90% is an acceptable split between transport routes and the rest of city buildings and facilities, then on a distance of over 1.5 km the city center should be empty: only streets and parking without any other kind of construction or development, if it is desirable to eliminate the traffic congestion; specifically (in relative terms) from the Cris Store to Peasant Market, from City Hall and up to Citadel from Independence Square and to the 22 December Market, the city should be free of any construction or buildings so as the transport not to be fenced (the same speed as on the streets located at the suburbs - fig. II.14);
- on intermediate area the keeping of constant surface allocated to transport routes splits almost equal the surfaces: 40% for streets, 60% for rest of utilities.

Obviously, such a split of the city area is not feasible: as a result, only by **harsh organizational measures**, it can be reduced traffic congestion on the routes distributed in the city center, otherwise the solving of mobility issues for the citizens of Oradea becomes a unattainable target - if economic demographic or social development, etc.. retains the current trend. In conclusion, since it is impossible to resolve congestion only acting in the city center, concerted actions are needed to locate the home "in more aut of center" to mitigate the effects of space lack.

The question "how out of center" should be localized the origin of actions in order to delimitate the corresponding geographical area for SUMP and can be answered to it analyzing **the whole area which generates passengers** in public urban transport.

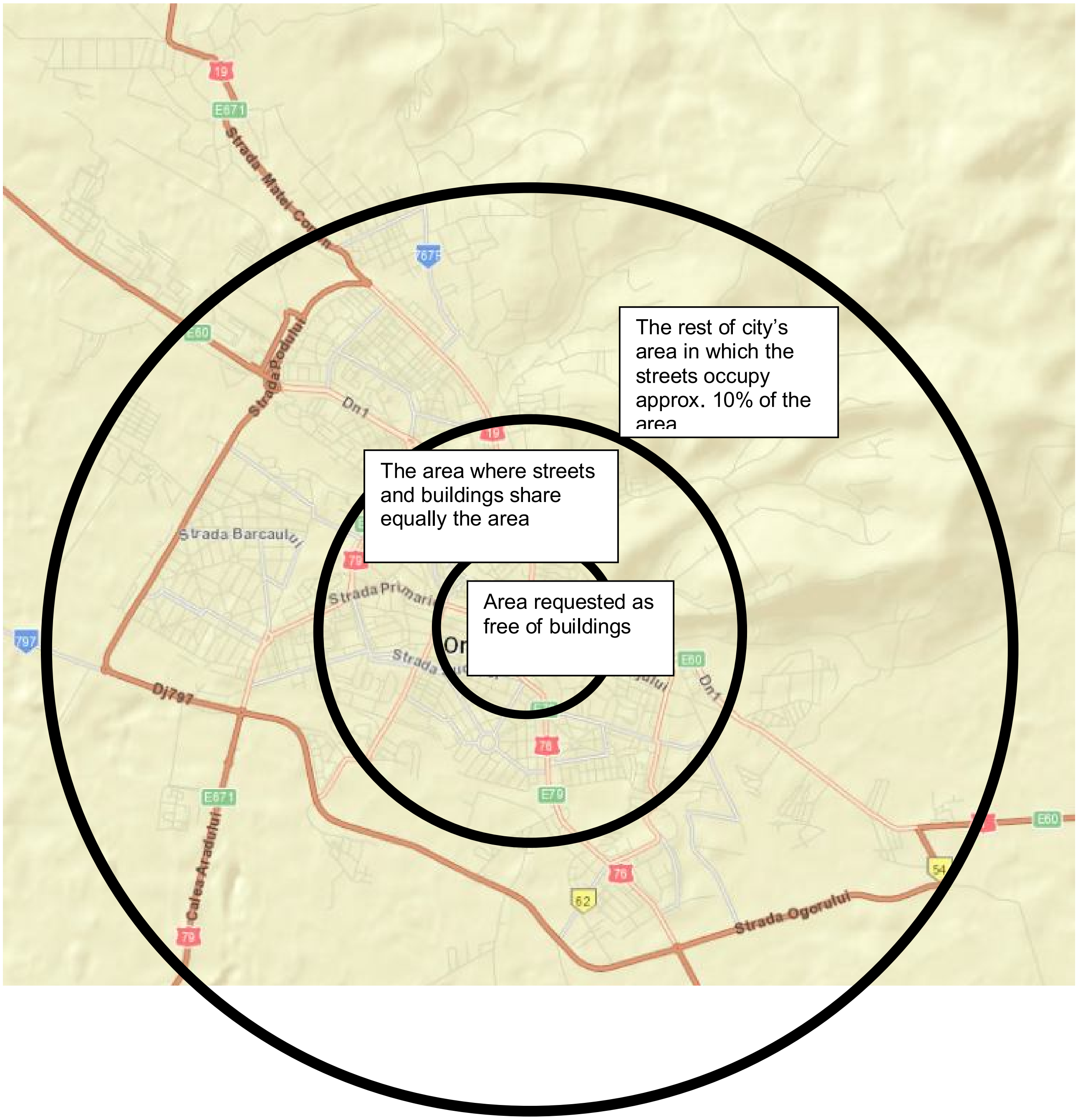

Fig. II.14 – Areas' distribution for a „constant" degree of traffic congestion

The travels are related to one single dimension of space (while the areas need two dimensions). This dimension is the distance up to it has to be examined transport issues starting from the center of the analysis – that means the center of Oradea. Functional interdependence between urban functional areas and surroundings area of Oradea is done by social and economic interdependence. These are materialized in five characteristics:

- interdependences between urban **planning** territory and passengers transportation service (transport demand, traffic flow);
- short and long terms interdependeces between urban **planning** and freight transport systems;
- interrelation between urban **planning** and the topics of human and material (one single vision, a whole vision for a city, not a mixture of independent perspectives);
- strenght feature: policy makers should be identified at different levels of territorial organization;
- coherence feature: to make completing of plans by the development of territorial coherence schemes including local urban plans and urban travel plans.

Basically, **the link between urban and rural space** is provided by the transport routes that directly facilitates the relationships between them. Therefore, it is necessary to analyze in details the existing transport ways and the extent to which they meet the needs of the urban area, suburban and interurban area of the city, the degree of correlation of the means of transport in the city area and vice versa. According to some theories recently developed the "area of influence of two close localities will expand up to limit to which in one influence on other is approching to zero". Based on this definition, the proposed method for determining the influence of Oradea urban areas will appeal to the principle of the two cities that attract **buyers on transport market** from a space proportional direct with the masses and inversely proportional to the square of the distance.

As at local and county level data are not centralized on total sales volume, to calculate the area of influence of Oradea was used formula proposed by Reilly-Converse (J. Beaujeau - Garnier,

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1997), which is based on the ratio of the distance measured on the transport routes and population, which can be expressed by the formula:

$$d_A = \frac{d_{A-B}}{1+\sqrt{\frac{P_B}{P_A}}}$$

where:

d is the disctance measured on transport routes;

A and B – cities;

P – population.

As a result, the area of influence of Oradea (A city) manifests itself differently from one adjacent village to another (Fig. II.15), but in relative values the extension goes up to 82-91% of spliting distance. In other words:

- almost entirely the link with **village** center is a „matter" of local transport of the city;
- reagarding the **„villages",** the care for links ensuring is a village duty.

Conclusions:

- the most appropriate area to achieve a sustainable urban mobility plan can not be summed to urban area;
- extending up to 26 km from the city does not have enough consistency because of the lack of economic localities which to gravitate around the city;
- the increase of distances up to SC OTL SA has an interest must include 7 of the 11 villages of Oradea Metropolitan Area: Bors, Bihar, Paleu Oşorhei, Sanmartin, Nojorid and Santandrei..

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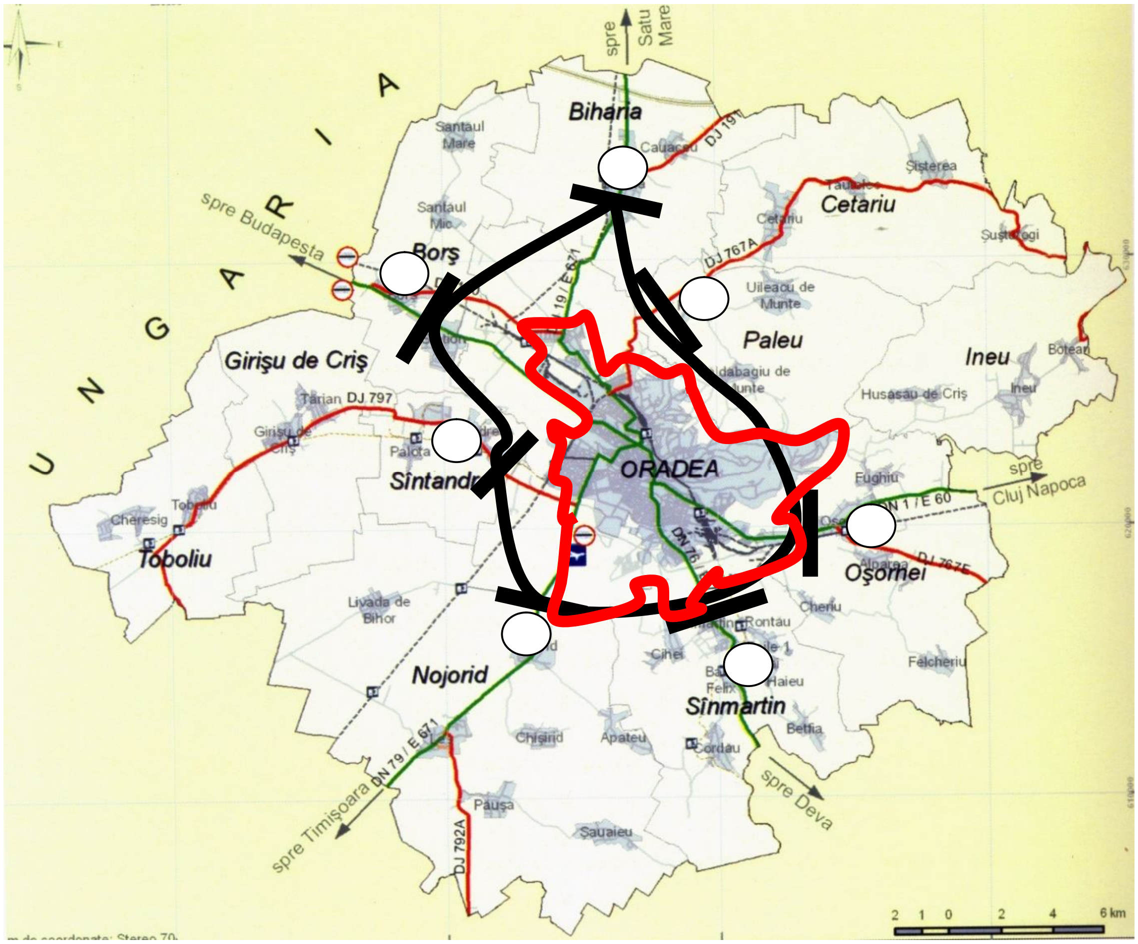

Fig. II.15 - Overlap - partial – of the geographical area of Oradea (red) with area of influence of Oradea to the neighboring villages (Bors, Bihar, Paleu Oşorhei, Sanmartin, Nojorid, Santandrei - black)

In terms of streets infrastructure of Oradea, traffic studies recently conducted conclude:

- The scheme by which is organized by the main network traffic in Oradea is one of the radial type, with five main directions (DN 1 - to Cluj Napoca, respectively Bors, DN 76 - to Hunedoara DN 79 - to Arad, DN19 - to Satu Mare) and the circulation tends to focus on a few major streets cross the central area of the city.
- The inadequate relation between the level of loading and transverse profile leads to overload or to the lack of use to whole capacity (street of minor importance, no transit traffic but with

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oversize profile). Interruption of important links for traffic network and traffic deviation lead to overload of links and intersections. Heavy traffic in residential areas or recreational areas have polluting effects (emissions, noise) and lead to rapid deterioration of road infrastructure and is a risk factor for pedestrians. Difficult route with improper angles and overlapping of traffic cars, of heavy vehicles and public transportation creates blockages and bottlenecks. At peak hours, especially in downtown areas in which there are concentrated large flows of vehicles, resulting in a decrease in fluency (low velocity, increased time of travels, queues etc.) and a increase of fuel consumption and emissions of pollutants.

- the lack of a ring road of the city in the north-east, makes transit traffic (for these directions) to be conducted on city's streets, with negative effects on road infrastructure, environmental (noise and emissions) etc..
- the lack of ring road which also serve as a link between municipalities OMA leads to high values of traffic on city's streets.

According to a few studies conducted in the last period, there is no exceeding of traffic capacity of the streets network in the city, the largest flows being recorded on streets with two or more lanes, but there are sections of the network that at peak peak hours where it is observed high level of occupancy (volume/capacity) such as sections of Roman Ciorogariu Street (86.25%), str Traian Mosoiu (84.67%), and sections of streets Endre Ady, Unknown Soldier, Tudor Vladimirescu and Onestilor, on that ratio volume/capacity is between 70-80%.

It was observed a tendency of forming queue on some sections of Decebal Bvd., Union Square, Mihai Viteazul Street, Dacia Bvd., Avram Iancu Street Independence, Sextil Puşcariu Street, Republic Street.

In terms of pollution, traffic arteries sections with high emissions (carbon dioxide, nitrogen oxides, volatile organic compounds and particulate matter) are: Three Cris Street, Decebal Blvd., Independence Street, Dimitrie Cantemir Blvd., Magheru Street, Republic Street, Unirii Square, Dacia Bridge.

In determining the level of service at the network junctions, the weakest level obtained was to C (corresponding to a movement acceptable, reduced queues and low speeds) in the intersections:

- Avram Iancu Street - Traian Mosoiu Street - Iuliu Maniu Street;
- Menumorut Street –Mihai Eminescu Street –Roman Ciorogariu Street;
- Traian Mosoiu Street – Mihai Viteazul Street.

Level B of service, but at limit toward C level was determined in intersections:

- Nufarului Street – Nojoridului Street;
- Sucevei Street - Avram Iancu Street;
- Republicii Street - Louis Pasteur Street.

In terms of pollution, intersections that have caused the highest values for pollutant emissions are:

- Dacia Blvd. - Eroul Necunoscut Street;
- Decebal Bridge –Menumorut Street - Sf. Apostol Andrei Street;
- Nufarului Street – Ogorului Street;
- Dimitrie Cantemir Blvd. – Sucevei Street;
- Republicii Blvd. – Louis Pasteur Street;
- Calea Clujului – Ogorului Street;
- Independentei Square.

Also there is to remark there is no good developed network of bike tracks, the existing ones are not linked, so there is no continuity of the mobility. Oradea pedestrian areas are few (a pedestrian area on a section of Republic Street and a few along the banks of Crisul Repede).

THE PROCEDURE: THE SUSTAINABLE DEVELOPMENT SCENARIOS

Big cities - also Oradea - are facing a severe shortage of space, associated with a sharp increase of individual mobility and the use of internal combustion vehicles. Traffic within the cities grew, so vehicles threat the cities with congestion phenomenon especially cars - many old - not only pollute but also occupy the space in detriment of pedestrians, children, and trees. Simultaneously, the price of public transport is in a continous increase. Trend supported by some of the residents and the city administration decision makers, regarding the priority that should be given to transport network, is in opposition with arguments that point out that these trends are inconsistent with proportional development of the cities' compartiments. Some of them:

• Endanger the health on long term due to cross densely inhabited areas and global environmental effects and long lasting. Construction of new streets contributes to increased traffic and, in consequence accelerate pollution city area, the congestion and insecurity, the destruction of the natural and ecological balance.

• Unequal treatment of transport modes by not including in the studies of investments, the external costs.

• Neglecting transport corridors type tram, light rail or underground, respectively, which had a rol in favor of using the bus, although the overall efficiency calculations have not yet demonstrated the advantages of the solution.

• Incorrect or incomplete information to the public about the consequences of investment projects in the development of new streets.

The analysis showed not only the current transportation system, overall, is not sustainable, but efforts to "sustainability"'s are still far from being significant. The strongest threat is caused by carbon dioxide emissions. Other problems are soil and water pollution, noise, congestion, misuse of urban space.

Environmentalists, debating ways to achieve a sustainable transport system proposed the following:

• to use the space so that the impact on the environment to be minimized;
• to use renewable energy sources such as solar, wind, water and so on;
• to reuse and recycle components of vehicles and infrastructure;
• to be admitted only emissions and waste which can be reintegrated in the environment.

THE TRANSLATION FROM „TRANSPORT" TO „SUSTAINABLE TRANSPORT" IS AN ACTION, FROM THE FORMAL POINT OF VIEW, NOT EASY, AND FROM THE PROCEDURAL POINT OF VIEW IS QUITE DIFFICULT. The following considerations will seek to milestone the ways of obtaining the characteristics that can motivate and support that transformation.

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First of all, transport is a service. Theoretically, linked to socio-economic environment, transportation is an attribute of the community, a public service in which it should dominate social considerations on the one hand, and on the other hand, it can be appreciated that the public transport is an economic business in which private initiative, competition and prices are the drivers. In fact, due to special attributes of transport it has made a mix of the two options (without being able to decide on whether transport is treated on geographical considerations, the economic features, the current political and social relations, different from one city to other and emphasizing the profitability or preferential service for the citizens' catagories.

Secondly, in order to understand the phenomenon of transport is necessary to clarify the relationships between transport system and system activities, and this is achieved only if the transport process is being attached a function which condition it. This function can be defined:

- in relation with production and consumption - which allows the connection between the development of transport and economic development;
- in relation to demography - which highlights the extent of transport modes;
- in relation to the area served - which highlights the role of transport in the structure of space;
- in relation to socio-economic activities (general, thus including education, leisure, etc..) - which highlights the link between transport and other services, in the first instance, but also the rest of the industrial activities.

Thirdly, the four fundamental public service obligations (duty transport - opportunity, continuity; the service obligation - rhythmicity, speeds; the obligation of advertising - rates, timetables; the equal treatment obligation – on the streets or points of interests) highlight the following dilemma: the potential user marginalized bothered by transport phenomena, have or not have the right **to a share distributed in any way** of the community costs, to enjoy the price and conditions of transportation that would put them in equal conditions with potential users advantaged by the system located in a heterogeneity of any urban conglomerates? There is no known formal answer given to these questions, nor local nor central.

Once appropriated the structure of function of conditioning, it can be realized the connection between satisfaction of the demands adress to transport system and technological possibilites of transport process, meaning between demand and offer. The assessment of the decisions regarding the modification of transport phenomena or of the assembly of activities, should be done in relation with the consequences on different groups interests:

A. users - characterized by number, geographic location, socio-economic category, the reason and nature of travel;
B. operators/carriers - differentiated in relation to the mode of transport and the nature of the activity;
C. riparians - affected by the physical presence of transport;
D. spatial development agents - differentiated by activities (political, economic, etc.) and responsible for the size and location of the activities;
E. communities - sensitive when social options are felt by taxpayers.

Fourthly, the anticipation of the consequences of decisions amending the transport system and/or activities is necessary to evaluate the strategy covered in the context in which options on the transport system and/or activities have effects on traffic: traffic forecast, given the existence a complex phenomenon of transport. As time passes, it becomes increasingly clear that the road systems (both urban and suburban one) will not be able to meet projected traffic levels and network extensions will exacerbate the negative consequences on natural and artificial environmental. Solutions to adapt supply to demand results do not seem to be able to provide and promote public transport and only selective traffic restrictions can - case by case - have limited applicability. SO IT HAVE TO BE SOUGHT SOLUTIONS THAT GO BEYOND TRANSPORT.

- **the zero key issue**: PASSENGERS SUSTAINABLE URBAN;
- **the first key issue**: SPATIAL PLANNING FOR TRIPS MATCHING SO AS TO BE SIMULTANEOUSLY ACHIEVED SEVERAL PURPOSES ;
- **the second key issue**: URBAN PLANNING SCHEME TO ENCOURAGE SHORT DISTANCES TRIPS (WHICH CAN BE CONVENIENTLY CARRIED ON FOOT OR BY BIKE);
- **the third key issue**: WORK AT HOME USING COMPUTER TECHNOLOGY ETC.

Some solutions, **advanced by services engineers** to achieve a sustainable transport system could include:

A. Reorientation of investments in roads towards urban railways (ie towards the tram or light rail), suburban and regional, so in general towards the mass transport of passengers.

B. Existing road maintenance instead new roads construction is generally satisfactory - on condition that at least two rings around the "historical center" and of the establishment of uneven crossing in several key points of the city.

C. Develop bicycle tracks in urban areas and beyond.

D. Full assessment of the environmental impact of any proposed transport infrastructure project.

E. Sustainable education transport programs in order to create new habits in choosing of alternative transport, friendly staff using public transport.

F. Adopt a new transport legislation favoring environmentally friendly modes and to limit noise emissions in Oradea.

Adopting this agenda, some European cities are struggling with the challenges of urban transport, starting from different positions on pressing specific issues of the institutional context and the availability of resources and tools. While some cities seem to have more success in this aspect, it can be identified a number of shortcomings that affect the ability and capacity of responsible factors involved in solving problems due to transport - for other cities. These drawbacks relate to:

- lack of participation and involvement of citizens and civil society (major companies, associations, NGOs) in all phases of the planning process - from problem analysis to define the objectives up to evaluation and implementation - and therefore low legitimacy of plans and projects = **fourth key issue**;
- lack of interdisciplinary thinking and mutual understanding between involved policy sectors (transport, land planning, environment, economic and social affairs, health, education, information technologies) and a real separation between sectoral planning practices and policies, usually rooted in respective professional fields, processes with "their" partisan education and training (civil engineering, spatial planning, environmental sciences, etc..) = **a fifth key issue**;
- deficit in the coordination and cooperation between neighboring (and city’s surroundings,

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urban areas on the border between different regions or countries) as well as between national hierarchy (local, regional, national) concerning the plans and policies of each = **the sixth key issue**;

- limited consideration of possible policies and measures for all relevant sectors that influence the effective and efficient development of transport and mobility = **eighth key issue**;
- lack of tools and practices to check progress and changes of plans and projects in progress = **the ninth key issue.**

This framework should enable stakeholders interested in the success of SUMP and no less the public, to evaluate the depth of plans and intensity of measures (tactical level) to ensure the city's mobility and for citizens a civilized environment. Therefore, the objective of the community should be thought as: **ensuring the conditions for an efficient, sustainable, flexible and secure urban transport system**, which to allow the city's residents to gain access to their own specific standard utilities of Western European cities.

And the starting point in this action is ENSURING AN UNRESTRICTED CONTACT BOTH WITHIN CITIES AND IN RELATION WITH THE EXTERIOR (objective that can be achieved not only by transport but also by the emergence of information points distributed in neighborhoods - belonging to official institutions, by multiplying dispensaries, schools and colleges, by reallocating general purpose stores, etc.). This goal recognizes the importance that an effective transport has for the development - of any type - urban area (neighborhood)[19]. A good transport system achieves this by:

- Increase the efficiency and productivity - through travel time savings and increased reliability-trips, including related logistics;

[19] There are not sold standing tickets for flights to create conditions that passengers to flutter without reason. Far to interpret the example as fighting for "land binding" outlined idea is that you have eliminated unnecessary mechanical movements (for a liter of milk for example) that crowded the streets, producing pollution and consuming time: here lies the essence of sustainable development policy.

• Improving of the efficient functioning of labor markets - transport may increase labor market flexibility and the availability of jobs in response to "move" the center of gravity of economic activities;

• Increase the trade by reducing of costs - can occur due to lower transportation costs and can boost internal trade;

• Supporting the growth poles and agglomeration of economic activities, social or tourism - transport can sustain productivity improvement areas that can occur in areas of interest, for example in industrial parks;

• Increasing of competition through access to new markets - improving of transport may allow companies to attract workforce from a larger area, increasing competitive pressures and offering consumers more options;

• Increased investment and innovation in business - by supporting productivity improvements and/or attractiveness for foreign direct investments.

To clarify the proposals that will be presented below it will be used two INSTRUMENTS: **scenarios** (to clarify the position of the contractant) and **alternatives** (to clarify the position of the contractor). A scenario is a complex prognosis - usually and in most part developed on the basis of logic, experience and vision, not based on purely mathematical models. Partly technical and economic scenarios mainly the so-called "variants of further study" which meet (preferably whole) required objectives. Alternative term is used to define different ways of assessing the achievement of project objectives within defined scenarios.

In other words, first, the scenarios are defined and then can be selected alternative scenario that fits properly (in order to put into practice later). It is to point out that selecting of the most appropriate options (inserted into the material) to achieve project objectives result from analysis and other parts of this project.

The development of scenario is an action prior to crystallization of a vision of the evolution of mobility in Oradea area; this component is aimed the synthesizing of the information gathered in the framework of the preparation and drafting of documents, part of the material - solution of SC OTL SA initiative and is intended to describe the dynamic context perspective, so that it can offer the possibility of **CHOICES** that lead to emerging development in the area analyzed in two situations:

- One that takes into account the starting point: the issue of data availability.
- Another that takes into account the trajectory to the point of destination[20]: attitude toward the future.

Tab. II.9 - Views that stake out scenarios development

Time	Behaviour (development characteristic)	Scope	Social and economic specificity of measures*
2016 (short) 2021 (medium) 2026 (long)	No actions = zero development **("do nothing")** Independent actions = inconsistent development **("as before")** Intensive/extensive actions = coordinated development **("minimalist policy")** Coordinated actions = sustainable development **("engaging policy")**	Mobility by public transport system stabilizing. Mobility by public transport system balancing.	Pessimistic **(decline)** Realistic **(neutral)** Optimistic **(growth)**

IN ADDITION THE FOUR SCENARIOS CHOSEN TO BE DETAILED WILL BE DISTINGUISHED BY DISTRIBUTION OF TASKS FOR ONE OR MORE PUBLIC TRANSPORT OPERATORS (scenarios can be developed combining the elements presented in the next selection: there are possible 3*4*2*3*2=144 scenarios):

1st Scenario – one single public transport operator is involved

- time: SHORT (2016)

[20] In principle the destination is known: let be better then now, regarding mobility.

- socio-economic specificity: in a PESSIMISTIC context
- development characteristic: NO ACTIONS
- scope: mobility by STABILIZING of public transport system and the city's traffic.

2nd Scenario – one single public transport operator is involved

- time: MEDIUM (2021)
- socio-economic specificity: in a OPTIMISTIC context
- development characteristic: INDEPENDENT ACTIONS
- scope: mobility by STABILIZING of public transport system and city's traffic.

3rd Scenario – several public transport operator is involved

- time: LONG (2026)
- socio-economic specificity: in a REALISTIC context
- development characteristic: INTENSIVE/EXTENSIVE ACTIONS
- scope: mobility by BALANCING private public urban transport system and freight transport within the city.

4th Scenario – one single public transport operator is involved

- time: MEDIUM (2021)
- socio-economic specificity: in a REALISTIC context
- development characteristic: COORDINATED ACTIONS
- scope: mobility by BALANCING private public urban transport system and city's traffic while land-use policies converge with sustainable development objectives.

The alternatives that are available – related to the specified scenarios - institutions authorized to amend the city's social and economic aspects - not just SC OTL SA, but the County Council, Town Hall, Prefecture Bihor etc. – are:

• non-intervention - the alternative which defines itself, competitive economic environment is being allowed to regulate transport market based on supply and demand for travel;

• minimum intervention - a situation in which are carried out only successfully employed projects or those that have secured funding;

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• intervention on economic sustainability - a situation in which there are followed and added to to actions list the projects that could provide profitability to transport service, including subsidies (when this effort falls into the local conditions and is justified by the social importance of service made to the community);

• intervention on economic sustainability, social and environmental - in which case it completes the agenda of alternative economic sustainability, giving priority to projects that aim to ensure equal opportunities for citizen of the suburbs and downtown, that aime to improve the natural environment.

Setting up a plausible future for local passenger transport development in Oradea is made - in most of the technical perspective - the idea of including of points of view so as to facilitate the choice of options by the decision makers of the city.

Insert the actions of the input variables - first impact variables being **the population, the economy, the revenues of public transport, city’s limits**, **type and pollution** - allow by a relatively less extensive modeling, to analyze the probable effect on a reality fig. II.16, II.17, II.18, II.19.

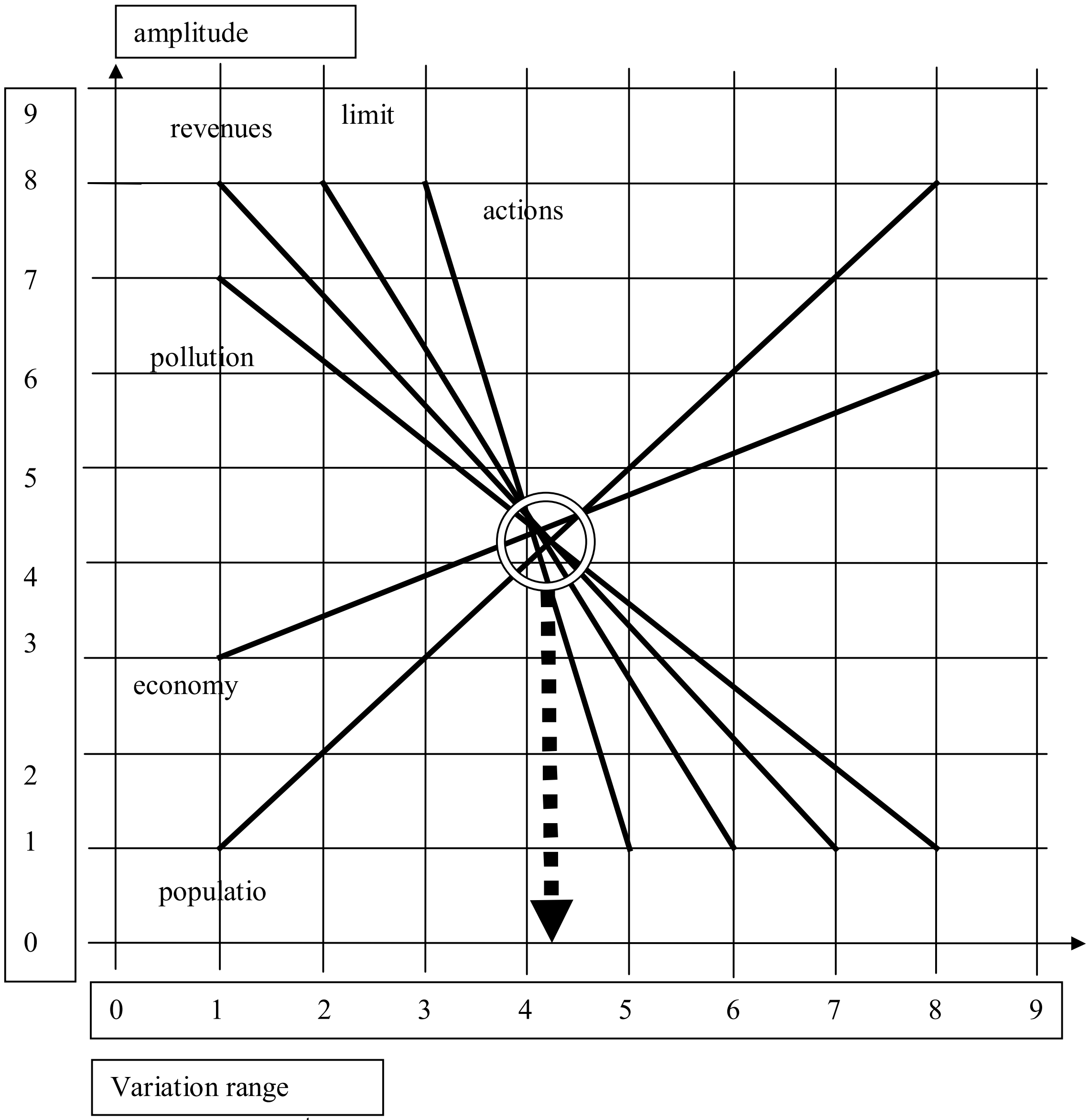

Fig. II.16 – 1st Scenarios: multidimensional analysis of the results – x-axis, in relation with amplitude of variations – y-axis (the effect is placing in variation field in the formal defined area as being over 4)

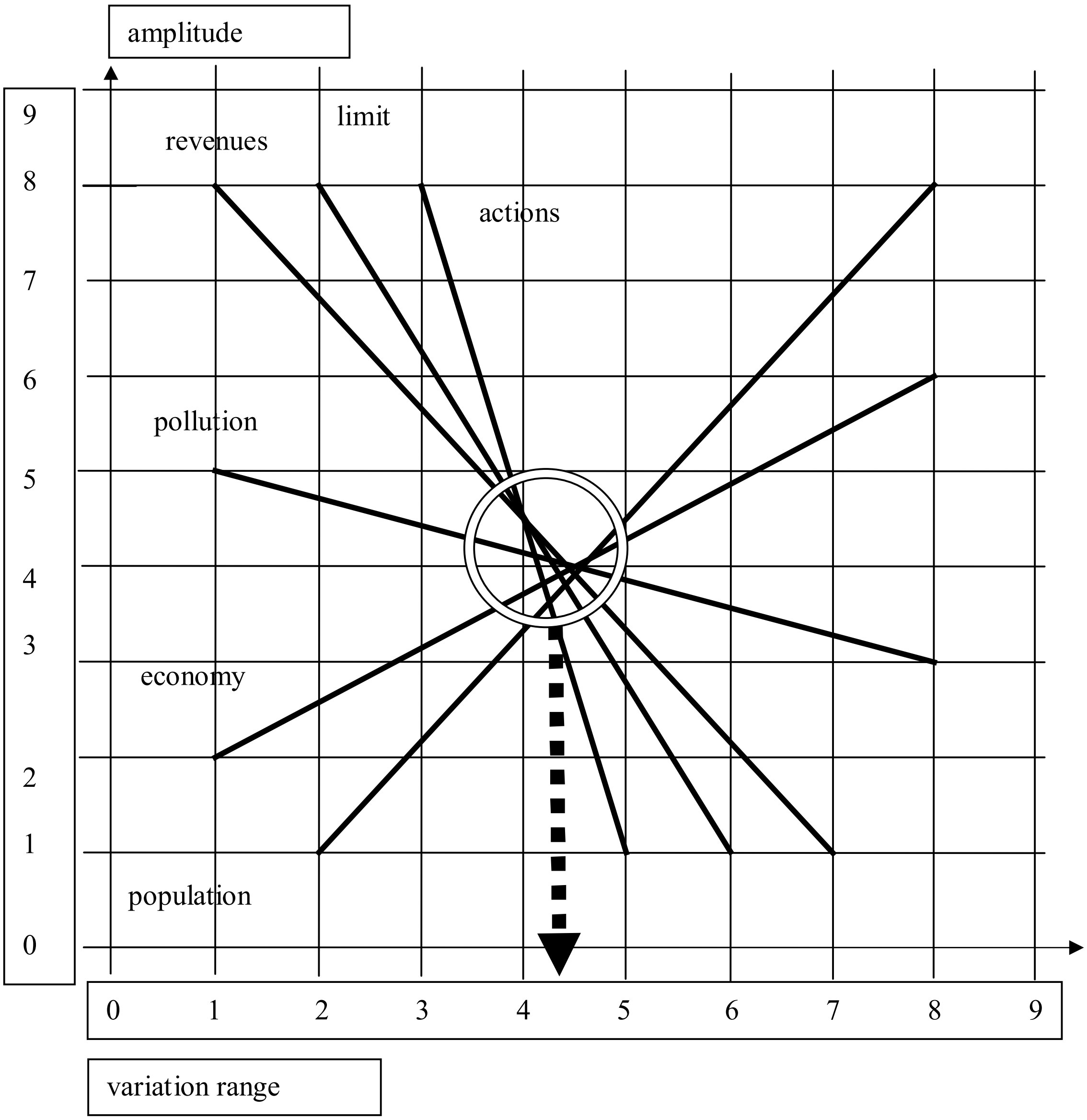

Fig. II.17 - 2nd scenario: multidimensional analysis of the results – x-axis, in relation with amplitude of variations – y-axis (the effect is placing in variation field in the formal defined area of approx. 4.5)

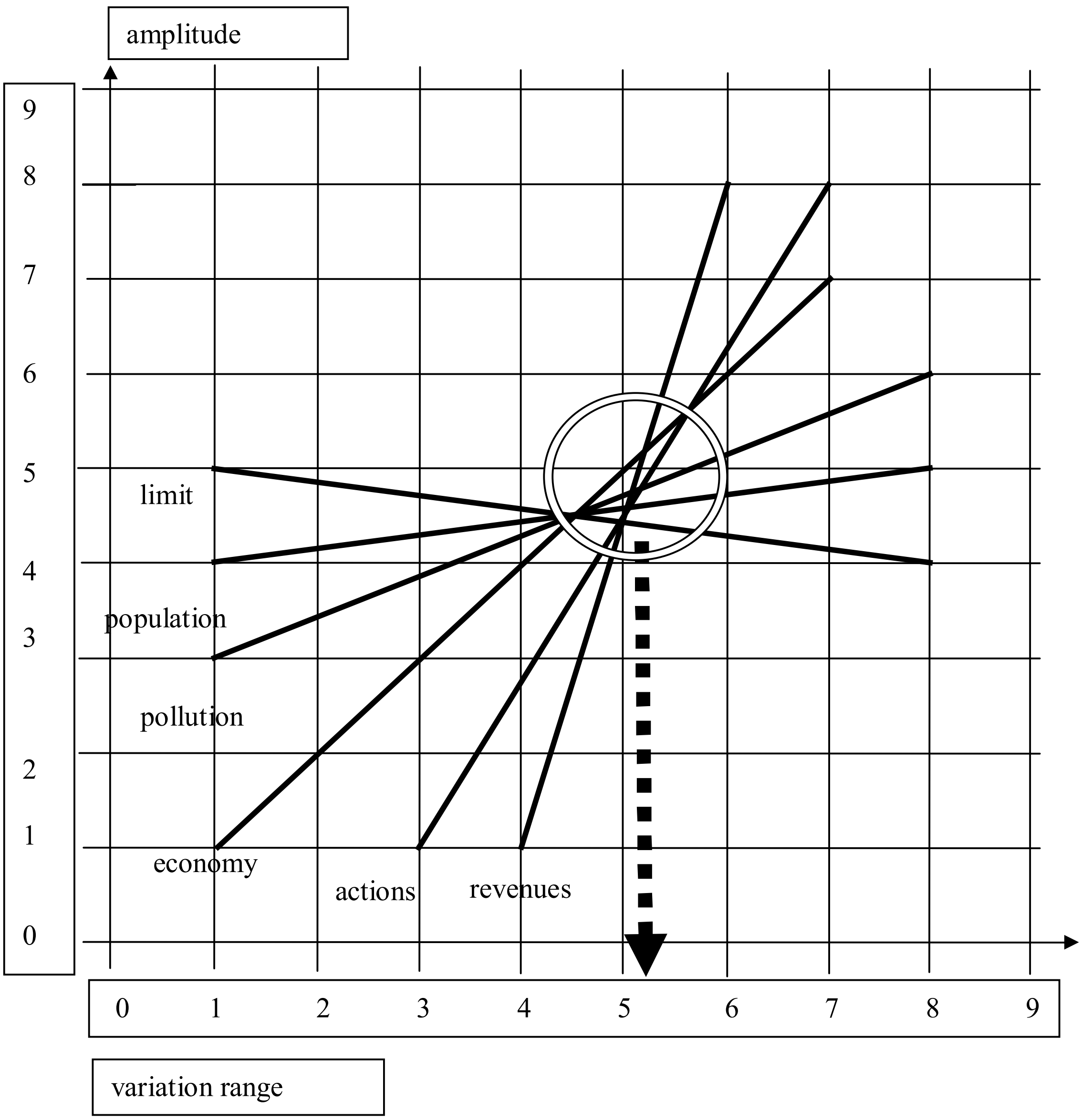

Fig. II.18 – 3th scenario: multidimensional analysis of the results – x-axis, in relation with amplitude of variations – y-axis (the effect is placing in variation field in the formal defined area as being over 5)

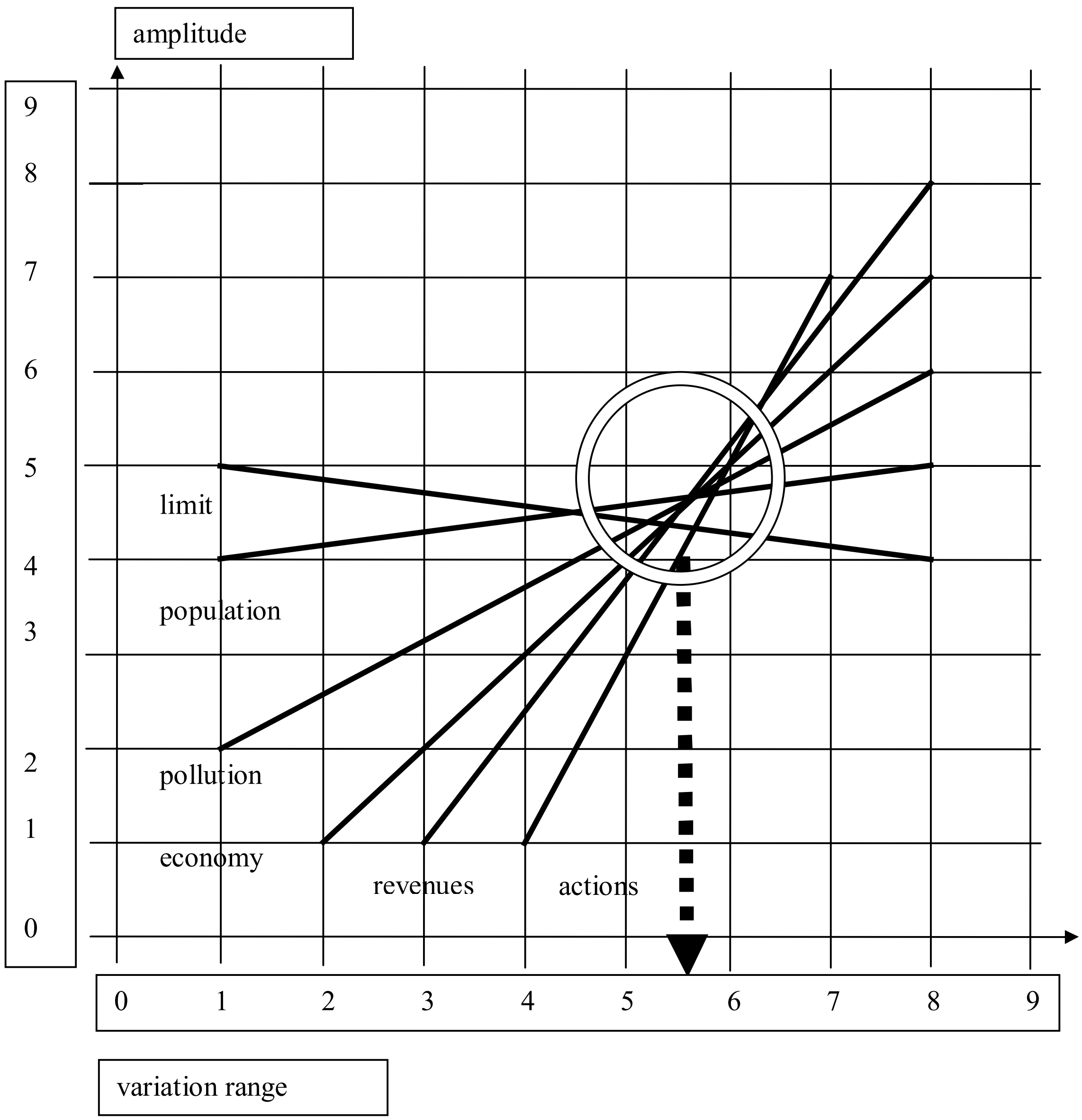

Fig. II.19 - 4th scenario: multidimensional analysis of the results – x-axis, in relation with amplitude of variations – y-axis (the effect is placing in variation field in the formal defined area of approx. 5.5)

The four graphs show the alternatives which are available for SC OTL SA. These are:

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- non-intervention - **is excluded**, the present project is a proof of the concerns of the carriers;
- minimum intervention - this project is part of an attempt to identify new opportunities and resources for improving urban transport activity, ie, minimal intervention (SC OTL SA) **is mandatory**;
- intervention on economic sustainability - a situation in which the focus is on projects that could provide return transport service, including subsidies - it may be a good choice **too ambitious at the first attempt**;
- intervention on economic, social and environmental sustainability - **can be a choice entitled to be applied** in later stage in that measures of SC OTL SA reached their.

Reviewing:

- SC OTL SA strategy is to achieve a modern, performant, public urban passenger transport, primarily to satisfy the needs of the population of public institutions staff and economic agents belonging to the municipality through quality services;
- The tactics in municipal transport should be represented by referential framework for local policies adressed to passengers public transport and to private/public/freight transport logistic, to cooperation between public authorities responsible with public utilities.
- **means to achieve the goal of SC OTL SA – form the passengers public transport**[21]**:**
  - to achieve a modern infrastructure which to allow a safety traffic;
  - to enable public authorities and local institutions in organizing and function of any type transport service;
  - to involve the public;
  - to become a performant carrier, which to respond promptly to public demands and to legal requirements.

Predictable evolution - assuming the limit on some traits of the four scenarios should benefit by mathematical and financial support.

Mathematical support

[21] Although it seems theoretically, they are practical means at disposal of SC OTL SA.

Among the data received officially from County Statistics are the following:

Tab. II.10 - Summary data on the evolution of economic indicators for carriers

	2008			2009			2010			2011		
Activity	Number of active units	Turnover	Average number of employees	Number of active units	Turnover	Average number of employees	Number of active units	Turnover	Average number of employees	Number of active units	Turnover	Average number of employees
Passengers urban and suburban transport	25	32.894.324	725	12	27.873.470	700	8	23.733.808	699	6	24.891.702	713
Freight transport	644	632.871.278	3.315	679	636.397.355	3.221	648	751.570.150	3.307	633	947.946.726	3.726

Obviously and without any prognosis:

1. the decrease from **25** active units in passenger transport up to **6** active units is a concern related to the prospects of transport markets in which competition has to regulate the activity and prices;
2. the decrease from **32,894,324** of turnover in 2008 to **24,891,702** in 2011 indicates the reason of the phenomenon: it is not about the capital concentration but insovency or at least guidance to other activities;
3. the maintaining of an approximately constant number of employees demonstrates that:
   - ✓ or the share of activities that are not commensurate with performance (indicator passengers*km) is large and so the fleet and logistics carriers are outdated;
   - ✓ or burdening carriers with taxes is exaggerated.

CONSEQUENTLY, THE IMAGE OF FLOURISHING DEVELOPMENT IS RELATIVELY FAR FROM REALITY.

Financial support

Given the implications of the budgets of the factors mentioned in the measures, so as the scenarios have a certain consistency, the development - through direct route to the actions that explaining 4th scenario is obviously difficult to put into practice; there are objective and subjective reasons - but no less real, in the **romanian socio-economic context**:

- lack of money for improvements at the municipal level;

- lack of civic discipline and carriers' involvement beyond immediate and direct revenues - feature more difficult to obtain for various reasons.

Maximal profit for Oradea, obviously not referring only to money, is to obtain in two steps:

- 2nd Scenario is put in the work and it has relatively favorable conditions for implementation;
- it goes to 4th scenario when it was obtained the "fruition" benefits from 2nd scenario[22].

In accordance with the line that specifies the logical deductions which are scenarios 2 and 4 result:

THE VISION

structured on the three already mentioned above guidelines.

guideline 1: AWARENESS AND BEHAVIOR CHANGE

Number of cars decreases by „Rabla" programs type that exceed the number of registrations (there is still an "attitude" of sustainability) ... The number of cars is maintained, but from qualitative point of view there is a trend to vehicles with low pollution - EURO 4 or more (there is an "attitude" of sustainability).

RESULT:

for SC OTL SA: **procurement of low pollution vehicles - EURO 4 or more;**

for the municipality: **accelerate the „Rabla" program; the modification of taxation (increase tax for non-EURO vehicles);**

Appear signs of a "critical mass" of pedestrians who can „push" the measures to reduce car use or to economically drive ... "critical mass" of citizens requires some radical measures: days without cars, penalties for imprudent drivers to prohibit use of the car for 1-2 months, etc.

RESULT:

for SC OTL SA: **an active collaboration with the citizens (parents, seniors, youth, persons with disabilities, etc.);**

[22] Warning: lack of political will to accede to scenario 4 may be a premise to reject the feasibility of SUMP.

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for the municipality: **city council involvement for this resolution; dynamic the department responsible for business associations;**

Appear car-sharing companies, but they tend not accept this type of trip.

RESULT:

for SC OTL SA: **organize meetings with amateur drivers in the idea of revealing the advantages of using cars in this system;**

for the municipality: **tax incentives for such firms;**

spreading the use of vehicles in this manner;

Population increase, but the economy is stagnant: there are no conditions for measures which reduce the need to travel ... stagnant population, but the economy grows: are conditions for measures which reduce the need to travel (work at home, resolve some administrative issues or transfer values, and so on).

RESULT:

for the municipality: **taking measures to solve current issues - pay taxes, issuing of various documents, etc. - by electronic means and data transmission channels;**

General health will not worsen due to public transport ... overall health will improve because the security will be imposed by stringent standards.

RESULT:

for the municipality: **there are applied strict safety standards for vehicles - in the interest of passengers;**

There are no changes in regulations on taxation – in increase - of passenger transport vehicles ... there are introduced regulations on taxation – in increase – of passenger transport vehicles.

RESULT:

for the municipality: **changes in taxation (lower for passenger transport vehicles);**

The mobility provided by private transport decreases.

RESULT:

for the municipality: **public transport promotion;**

Less crowded traffic leads to decrease the number of accidents.

RESULT:

for the municipality: **reallocation of health resources;**

Facilities for pensioners are reduced to one or two periods of off-peak.

RESULT:

for SC OTL SA: **justified proposal to shorten the time of gratuity;**

for the municipality: **campaign to inform the retirees;**

Resources are acquired only within the city: as a result of segregation phenomenon is amplified from Oradea Metropolitan Area ... Resources are shared through distribution and cooperation and geographical areas related to city: preintegration of the OMA.

RESULT:

for SC OTL SA: **prapare transport schedule for sub-urban areas;**

for the municipality: **there are necessary legal arrangements takeover activity outside the legal boundaries of the city;**

Without actions in order to decrease the discrepancies city-village can not be taken in the suburban transport the cost relations of Felix and Baile 1 Mai type ... relations like Felix and Baile 1 Mai and towards borders are taken in suburban system.

RESULT:

for SC OTL SA: **re-evaluation of transport programs of this type;**

for the municipality: **analyze the legal framework concerning the undertaking of some transport route from county transport;**

The city did not take advantage of his position as a intermodal regional center: consequently it occurs a decrease of revenue of tertiary sectors of the economy ... The city takes advantage of its position as a regional center intermodal: consequently the revenues grow in all sectors.

RESULT:

for the municipality: **along with revenue's increase there are necessary actions to increase the mobility regarding what means Oradea for the rest of the county;**

There are not seen measures to reduce the need to travel ... the measures to reduce the need for travel are beginning to appear.

RESULT:

for SC OTL SA: **periodic analysis of reducing the need to travel and adapt operational exploitation;**

for the municipality: **drawing up a set of steps that lead to reduced need for travel;**

There are still no actions that to have as a final the pollution standards: the city is aired on the base of decreasing the number of cars ... Appear actions which have as a result pollution standards: the city improves its natural habitat naturally and also consciously.

RESULT:

for the municipality: **implementation of concrete actions against polluters;**

There is a easy decrease of car dependency ... these are for quitting car use to go to job.

RESULT:

for the municipality: **besides the previous measure, the administration can doactions in order to encourage these trends;**

Fight against pollution - lack of coordinated action – has no finality: for example, no campaigns in favor of the use of bicycles, it emphasizes sedentariness, which contributes to congestion of means of transportation ... the fight against pollution achieves many purposes: cycling appears, it is set a protected area in the city's center, there are developed bike rental centers, thare are impelemented systems such as "park and ride" and "park and bike".

RESULT:

for the municipality: **take a decision in order to grant facilities to companies that will apply this type of system;**

Without actions, the freight vehicles will continue to congest the streets, increasing the congestion….. Appear actions ... that vehicles to carry cargo supply at night, diminishing more the congestion and pollution.

RESULT:

for the municipality: **passing through a series of city council decisions which to limit penetration of freight vehicles in the city - during the day;**

guideline 2: USE OF URBAN SPACE

ParkingS will reduce the size of the width of the streets dynamics: transit capacity decreases, in combination with higher speed traffic, random parking involve a general mobility at the same level with a start point ... Parking will not be allowed on the surface of active road, in combination with higher traffic speed, rational parking involves a high overall mobility.

RESULT:

for SC OTL SA: **prepare a proposal;**

for the municipality: **city council has to discuss this decision;**

There are not necessary new parkings.

RESULT:

for the municipality: **take the decision to stop the extension of the parkings – especially in central areas;**

There are real opportunities for small street commerce to flourish introducing pedestrian barriers (a phenomenon that will diminish the mobility of this category of road users) ... There are removed all obstacles to pedestrians, in addition with measures to facilitate the mobility of people with disabilities (eg vehicles with low floor).

RESULT:

for SC OTL SA: **purchase vehicles with enhanced opportunities for access;**

for the municipality: **issuance of regulations that do not allow an arbitrary sectioning of pedestrian paths along the sidewalks;**

Only boarding-unboarding stations in „air” ... appear modern boarding-unboarding stations.

RESULT:

for SC OTL SA: **initiate a project for boarding-unboarding stations;**

for the municipality: **approve a staging of stations improvement;**

The street handles with traffic flow (although there are no measures to improve the infrastrucutre)… the street is rebuilt (enlargement, correction of curves, uneven passages).

RESULT:

for the municipality: **promote a program to reconstruction some of the infrastructure elements;**

There is no discussion about „black spots” improvement on urban streets… thare are brought improvements on „black spots” on urban street.

RESULT:

for SC OTL SA: **identification of black spots from the SC OTL SA perspective;**

for the municipality: **works plan and costs for re-design and infrastructure improvement;**

Lack of traffic management leads to lack of in real-time data processed developed by SC OTL SA: late and poorly executed interventions to reinstate... traffic management is introduced which improves regularity and reduces traffic congestion.

RESULT:

for the municipality: **local budget to achieve a general dispatch for transport in Oradea;**

The lack of "intelligent" traffic lights contributes to the decrease of public transport vehicles regularity of general flow of vehicles ... There are implemented "intelligent" traffic lights, first on light railways and then in the entire city.

RESULT:

for the municipality: **local budget to develop a integrated traffic lights system;**

There are no intermodal points (the station-urban transport or airport – urban transport)… There are developed intermodal points (the station-urban transport or airport – urban transport).

RESULT:

for SC OTL SA: **organize the transport schedule in accordance with other means of transport schedules;**

for the municipality: **project for intermodal points implementation;**

The neighborhoods brought to an acceptable level of the utilities (light, sewerage).

RESULT:

for the municipality: **combined utilities projects for each neighborhood;**

The policy of institutions do not reach the issue of road specialization: so, transit through the city increases... the institutions regulate the road specialization issue: following transit through the city is removed.

RESULT:

for the municipality: **regulate transit through the city - after the completion of the infrastructure works for the ring road, especially after the appearance of the road that connects the villages of OMA without to cross the city;**

Without action, locating of „day by day" utilities will be randomly done increasing discrepancies between new and old neighborhoods and generating unnecessary movements in other conditions: the phenomenon of artificial mobility appears ... there are implemented measure lo locate take steps to locate „day by day" utilities: there are uniform the discrepancies between new and old neighborhoods (no unnecessary movements occurring and artificial mobility phenomenon diminishes.

RESULT:

for the municipality: **there are prepared maps for utilities distribution and next implementations will be done only on the principle of equal distribution in the territory;**

There is no passing to conservation of monuments (tourist interest decreases, there are lost financial flows in the city budget, it can not be increased the subsidy to the carrier) ... Pass to the conservation of monuments (increase tourist interest, financial flows are obtained for the city budget, it can be increased the subsidy for SC OTL SA).

RESULT:

for SC OTL SA: **prepare reserve programs to meet additional requests - tourist routes, ecumenical routes, and so on;**

for the municipality: **the development of a rehabilitation program for monument buildings - for tourist interest;**

guideline 3: PASSENGERS PUBLIC URBAN TRANSPORT

There are implemented dedicated lanes for public urban transport vehicles: the atractiveness of the public transport increases.

RESULT:

for SC OTL SA: **prepare a proposal;**

for the municipality: **discuss in the local city this decision;**

The number of trips by passengers public urban transport increases.

RESULT:

for SC OTL SA: **purchase the vehicles with low level of pollution – EURO 4 or more;**

Customer structure diversification.

RESULT:

for SC OTL SA: **purchase vehicles of different capacities;**

Mobility ensured by public transport increases.

RESULT:

for SC OTL SA: **transport timetables reconfiguration;**
the extension of working hours for the vehicles;

for the municipality: **some streets become streets of I and II category for new public transport routes;**

Speed of traffic vehicles increases.

RESULT:

for SC OTL SA: **increase the reliability of vehicles by high quality level revisions and repairs;**

for the municipality: **analyze the sections of the streets on which traffic speed to be increased;**

Transport system is stabilized at a level slightly higher than that registered in 2011 ... Transportation system is balanced for a supply-demand area to a higher level from the achievements of 2011.

RESULT:

for SC OTL SA: **the financial resources allow to implement measure regarding to internal problems=quantitative for SC OTL SA (after that it can be covered other external issues=qualitative);**

for the municipality: **there are initiated periodically measures to recalculate the subsidy to SC OTL SA - surplus cash allow administration to act in other directions of sustainability;**

Additional routes are introduced in low served areas… additional lines are introduced in all areas of the city..

RESULT:

for SC OTL SA: **re-design of the passengers public urban transport network;**

for the municipality: prepare studies which to rank the neighborhoods on public transport service;

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New public transport vehicles develop higher speeds: the time for origin-destination travel shrinks ... New public transport vehicles develop speeds comparable wit cars' speeds: the time for origin-destination travel decreases.

RESULT:

for SC OTL SA: **reconsider the limits of vehicles productivity;**
traffic timetables redesigning;

Time availability of citizens increases: recreation, social and cultural contact are multiplied (generating in trips).

RESULT:

for SC OTL SA: **there are introduced routes having as destinations places of entertainment;**

for the municipality: **redirect the resources to culture and to open spaces;**

Social phenomena occur which raise public satisfaction (with impact on general health) and the level of knowledge increases.

RESULT:

for SC OTL SA: **programs to refresh the knowledge of SC OTL SA employees;**

for the municipality: **budget rectifications in favor of less advantaged citizens;**

No additional services for passengers ... With additional services (multi-annual cards transport, lines for students).

RESULT:

for SC OTL SA: **develop a strategy to improve the operation of fleet;**
implementing of specialized lines;

Urban transpot trip taxation is in line with economical trend…Urban transport trip taxation is reduced.

RESULT:

for SC OTL SA: **justified proposal for reducing of the amount of travel tickets;**

for the municipality: **there are periodically initiated measures in order to recalculate the subsidy to SC OTL SA;**

There are no measures to promote loyal passengers ... introduce measures to promote loyal passengers.

RESULT:

for SC OTL SA: **prepare aproposal to amend the transport regulation;**
commercial resolution of the situation;

There are no main express lines – which to develop higher speeds in comparison with secondary lines with low speed … Thare are introduced main express lines – which develop higher speeds in comparison with secondary lines with low speed.

RESULT:

for SC OTL SA: **restructure the transport network and the introduction of two service systems;**

for the municipality: **extra budgetary effort for vehicles;**

Justification deserved subsidy is based on the mobility of citizens ... The justification of the subsidy is based on proven trips devices charged via electronic transmission to the control center.

RESULT:

for SC OTL SA: **tightening controls to detect fraudulent passengers;**

for the municipality: **there are periodically initiated measures recalculate the subsidy of SC OTL SA;**

SC OTL SA can not - in principle - the force required to implement light rail or trolley lines… SC OTL SA has the force required for the introduction of light rail tracks (2-3 routes); it is opened the first trolley line.

RESULT:

for SC OTL SA: **prepare the activity diversification (tram, light rail, bus and trolley);**

for the municipality: **properly budget to new requirements;**

Is likely to occur early ticketing system - a situation that will improve the situation of passengers, but intermodality will continue to suffer) ... Ticketing system is unified with the one for suburban transport.

RESULT:

for SC OTL SA: **prepare specialized programs, then implementation and function of ticketing system;**

for the municipality: **properly budget to new e-ticketing system;**

It is possible that SC OTL SA to put in place a system to inform passengers: unnecessary tripswill will be diminished, with advantages for the fleet capacity and therefore higher quality urban transport ... It set up a passenger information system.

RESULT:

for SC OTL SA: **set the specialized work teams;**

for the municipality: **properly budget for new informational system;**

Start-finish trajectories are optimized, population density increases, opportunities arise for public transport.

RESULT:

for SC OTL SA: **periodic review of the opportunity to serve every neighborhood (even for quitting service);**

Highest quality level utilities of the beighborhoods will allow activities on a long time in a day: the time to withdraw transport vehicles up to late hours.

RESULT:

For SC OTL SA: **re-evaluation of transport programs;**

For low usage lines are taken measures to make them profitable (vehicles with capacity in accordance with the demands, service function concentrated only in the periods which justify themselves in terms of economic needs).

RESULT:

for SC OTL SA: **re-think the transport programs and the equipping of the routes according minimum profitability principles;**

It start the transport service for low density neighborhoods (decrease the importance of individual transport).

RESULT:

for SC OTL SA: **analysis of the opportunity to introduce new routes in neighborhoods with low density;**

INSTEAD CONCLUSIONS

How SUMP respond to strategic demands of PUG Oradea? Approached themes of the vision and different areas of interest of Oradea’s citizens are: qualitative public services, functional networks of public utilities, safe and affordable, the existence of a unpolluted city, cultural and recreational activities. Building on these requests, SUMP vision includes two of the three guidelines of PUG intervention:

- The first direction is to reduce disparities, Oradea, a city of cohesion, for which there are formulated policies in order to reduce the spatial disparity between urban infrastructure and population groups in terms of equal opportunities and integration of disadvantaged groups in social and economic life of the city.
- The third direction, **Oradea, functional and secure city** consists in integrated network of urban infrastructure of transport and public utilities, in terms of energy efficiency, through what Oradea became a attractive urban territory for economic activities, housing, recreation or sightseeing[23].

[23] The second direction of development (economic), Oradea, competitive city, goes beyond the SUMP.

The extent to which this vision is in the line provided by PUG Oradea can be determined relatively easy by reference to the four **URBAN DEVELOPMENT POLICIES** already adopted by PUG:

Tab. II.11 – The way how SUMP guidelines overlap on strategic objectives PUG

PUG	**SUMP**
Strategic Objective 1 – Oradea, accessible city	Guideline 2 = use of urban space Guideline 3 = passengers public urban transport
Strategic Objective 2 – Oradea, competitive city	**(partial)** Guideline 1 = awareness and behavior change
Strategic Objective 3 - Oradea, functional efficient city	Guideline 2 = use of urban space Guideline 3 = passengers public urban transport
Strategic Objective 4 - Oradea, well manages city	Guideline 1 = awareness and behavior change Guideline 2 = use of urban space

In the same vein, it is clear that the vision for SUMP guidelines are consistent with the priorities of the European Territorial Agenda, 2020, seeking to approach a concept - custom - integrated, consisting of:

(1). Polycentric and balanced territorial development;

(2). Integrated development in urban areas and their areas of influence;

(3). Territorial cooperation in urban-suburban border areas;

(4). Ensuring global competitiveness based on strong local economies;

(5). Improving territorial connectivity for individuals, communities and enterprises;

(6). Management and connecting areas with environmental values, culture and landscape/urban design.

In the following figure there are developed relevant information for Fig. II.1 of the paper, indicating which is the perspective – in the process of SUMP development – in order to complete it: the vision will allow the development of some **objectives** (accompanied by adequate indicators), which on their turn will create conditions to specify **the measures** which can transform the intentions into realities.

....

THE REASON – THE CONTEXT – THE CIRCUMSTANCES – THE OPPORTUNITY – THE ORIENTATION – THE LIMITS – THE PROCEDURE

DOES THE VISION RESIST TO INSTITUTIONAL ANALYSIS?

DOES THE VISION RESIST TO CITIZENS' CRITICS ?
YES NO

MEANS TO ACHIEVE THE VISION

Vision is a qualitative description of the desired future. The vision has to be detailed by concrete OBJECTIVES, which indicates the type of desirable changes Finally, these changes should be measurable. This requires to establish a set well tought of MEASURES in order to focus on:
The proportion in which it will be focused the efforts in four different areas of application;
city's center;
close suburbs;
distant suburbs;
metropolitan area.

dosage intensity efforts on four key elements to any transport strategy;
transport need reduction;
car use reduction;
public transport improvement;
traffic network improvement.

DOES THE MOBILITY HAVE REAL CHANCES TO FAVORABLY EVOLVE ?
YES NO

THE RESULT: SUSTAINABLE URBAN MOBILITY PLAN IMPLEMENTING

Fig. II.20 – Details of SUMP scheme

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4.2 Actively inform of the public

In Annex 22 there are presented public information materials on the development of SUMP Oradea. Leaflets and flyers were edited for each category of traffic users, and also a poster which presents elements related to vision's development and the main elements of sustainable mobility plan, a leaflet and flyers which purpose was to promote public meetings. The informative materials were disseminated among Oradea's citizens. The development of these informative materials is presented in Element 3.2.1. The development of the common vision, Activity - Actively inform the public of SUMP Guidelines.

On 22.08.2013, at the SC OTL SA headquarter was held the meeting of working groups involved in development of sustainable urban mobility plan in Oradea. The agenda was: the SUMP developer – INCERTRANS receive the observations on the materials previously submitted for consultation, presentation by INCERTRANS of the state of SUMP, presentation of VISION on mobility, prepare the public meeting for 30.08.2013, discussions.

During the first consultation with the public on 30.08.2013 there were no comments from the stakeholders, namely the public. To this public meeting was also attended decision-making factors of the Oradea Municipality, Metropolitan Area and SC OTL SA. Public information was accomplished through interviews and tv appearance, in press, radio and local television. Along with these materials can be found a summary of four pages with appendices that include a summary of the first phase of work aimed at SUMP Oradea and common vision on mobility developing. Summary and annexes were submitted to all members of the Municipal Council of Oradea Deputy by Ovidiu Muresan, the local coordinator of the process of ustainable urban mobility plan developing = Oradea SUMP to obtain political acceptance.

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Cap. 5 – Set priorities and measurable targets

5.1 Identify the priorities for mobility

The **vision** is a qualitative description of a desirable future; this approach is not sufficient, however, for consistency of SUMP-which may not be a quality construction;

- SUMP will be implemented: in the context of the relevant estimates,
- with differentiated impact values for specific areas of the city,
- carried out in the specified domain,
- with appropriate intensities tailored targets identified as lucrative,
- on the basis of identified resources,
- Depending on the paths that can turn the mobility situation in line with sustainable development,
- etc.,

but the explanations must be quantitative-even if the action revolves around a certain degree of uncertainty. **to be** quantitative, even if the actions revolves around a certain degree of uncertainty.

The vision must be viewed as an overall "LEGISLATURE" of sustainable mobility for Oradea; the natural continuation of the vision must be "IMPLEMENTING RULES", that is territory that framework specifying the priorities, **to highlight the results that characterize the implementation of the vision into reality** (in an acceptable margin of error): generic objectives, indicating the type of change desired-and finally, the changes made-must be measured parameters, thus being able to correct/managing the process (and this requires selecting a well thought-out set of indicators).

Definition of mean specifying those areas social, environmental or economic development mobility, specifying as precisely what must be **"RULED OUT", "LOW", "MAINTAINED", "ENHANCED" or "INTRODUCED".**

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The objectives are the goals of higher level of the SUMP (i.e., reducing congestion caused by vehicles), while measures (for example, building a new light rail route) are the means to achieve them[24]; In addition: the measures should be temporal, not goals.

Reanalysing the vision guidance (awareness and change behaviour, the use of urban space, urban public passenger transport) INCERTRANS research team has concluded that it can be placed between the OBJECTIVES the following 12 areas:

(on the awareness and behavior change)

- reducing congestion (including by reducing overall traffic-road)
- Elimination of road traffic during the peak of the day together with the renewal of the registration of vehicles at the municipal institutions;
- reducing the need for travel
- the development of forms of sustainable transport (cleaner): walking and bicycle use
  reducing carbon emissions (including traffic management)

(on line use of urban space)

- the planning discipline of building spaces (and utilities made by authorities)
- innovation management parks (such as "Park and Ride")
- improve road safety
  improvement of the road infrastructure of the city

(on line public transport)

  - the development of the local public transport system:
  - network
  - means
  - traffic program
  - concentrated support (mechanical transport Depot-Depot)
- support spread (boarding-landing stations)
- extending the operational local transport market (commuters plan)

24 It is to notice that this fact contrasts with a „planning" type approach, which focuses on supply of systems and infrastructure, without reffering on higher level objectives.

- ensuring conditions for a greater intermodality of transport services which are carried out in the city benefit (i.e. metropolitan transportation interoperationalitatea, possibly County).

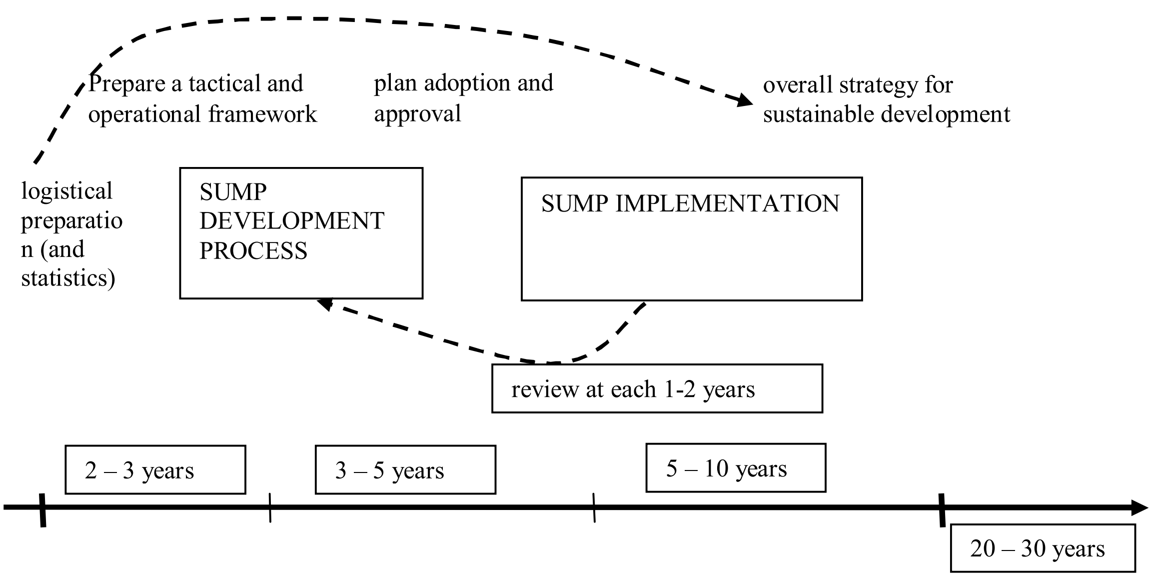
Although the list is extensive and all-encompassing, truth seems is not so:

*0 could easily be found areas that become targets (for example: supporting economic growth, the implementation of a system of information on traffic, toll and tax systems to benefit users "well behaved", systems that can benefit users of type "carpooling" redevelopment of sidewalks to ensure freedom of movement of pedestrians, the restructuring of the crosswalks for pedestrians, solving the problems of people with disabilities, rehabilitation programs of architecturespecialization, strict conditionality on-street purchase a car through the obligation to have a home, car, etc.).

*1 physical time had available **for the first variant of the sustainable urban mobility** master plan was and is scant; the chart below summarizes the sequence in developing the PILOT manual SUMP.

*2 financial resources for supporting a vast ensemble of measures cannot be a priori never considered sufficient.

Fig. II.21 – Overview on a full SUMP process



Detailing:

I. **reduce congestion (including reducing of general traffic)**

At the European level it can be seen lately increased needs for mobility, intensified suburbanization, increasing traffic flows and irritant congestion damaging to the economy and population. Customizing: this phenomenon has led to poor accessibility in many areas of the city and to exacerbating of artificial factors that negatively affect the environment. As always, **the major reason of streets' congestion is the more accentuated use of private cars.** Economic growth and progressive expansion of the material conditions facilitate the use of motor vehicles. In the present a situation well-known is the one of intensive traffic due to multitude of relationships which arise in the society. This creates special problems of flow of traffic due to the fact that cities concentrate most of the fleet.

In terms of Oradea's traffic, the recent conducted traffic studies have concluded:

- The traffic tends to concentrate on a few main streets which cross the central area of the city.
- The inadequate relation between the level of loading and transverse profile leads to overload or to the lack of use to whole capacity (street of minor importance, no transit traffic but with oversize profile). Interruption of important links for traffic network and traffic deviation lead to overload of links and intersections. Heavy traffic in residential areas or recreational areas have polluting effects (emissions, noise) and lead to rapid deterioration of road infrastructure and is a risk factor for pedestrians. Difficult route with improper angles and overlapping of traffic cars, of heavy vehicles and public transportation creates blockages and bottlenecks..
- At peak hours, especially in downtown areas in which there are concentrated large flows of vehicles, resulting in a decrease in fluency (low velocity, increased time of travels, queues etc.) and a increase of fuel consumption and emissions of pollutants.
- The lack of a ring road of the city in the north-east, makes transit traffic (for these directions) to be conducted on city's streets, with negative effects on road infrastructure, environmental (noise and emissions) etc.

- The lack of ring road which also serve as a link between municipalities OMA leads to high values of traffic on city's streets.

According to a few studies conducted in the last period, there is no exceeding of traffic capacity of the streets network in the city, the largest flows being recorded on streets with two or more lanes, but there are sections of the network that at peak peak hours where it is observed high level of occupancy (volume/capacity) such as sections of Roman Ciorogariu Street (86.25%), str Traian Mosoiu (84.67%), and sections of streets Endre Ady, Unknown Soldier, Tudor Vladimirescu and Onestilor, on that ratio volume/capacity is between 70-80%.

It was observed a tendency of forming queue on some sections of Decebal Bvd., Union Square, Mihai Viteazul Street, Dacia Bvd., Avram Iancu Street Independence, Sextil Puşcariu Street, Republic Street.

In determining the level of service at the network junctions, the weakest level obtained was to C (corresponding to a movement acceptable, reduced queues and low speeds) in the intersections:

- Avram Iancu Street - Traian Mosoiu Street - Iuliu Maniu Street;
- Menumorut Street –Mihai Eminescu Street –Roman Ciorogariu Street;
- Traian Mosoiu Street – Mihai Viteazul Street.

Level B of service, but at limit toward C level was determined in intersections:

- Nufarului Street – Nojoridului Street;
- Sucevei Street - Avram Iancu Street;
- Republicii Street - Louis Pasteur Street.

Solving these situations - yet not dramatic, but tend to be critical - it can be done by "mobility management"; (MM) is a concept that promotes sustainable transport and treat the problem of demand for cars by changing the attitude and behavior of the individual. In the center of the project MM there are "soft" measures, such as information and communication, organizing services and coordinating activities of various partners. These types of measures often intensify the effectiveness of actions related to urban transport infrastructure (eg new lines of tram, new road and bike lanes). The Mobility Management measures (in comparison to existing infrastructure) does not necessarily require high financial investments and may have a favorable cost-benefit. To achieve the goal, MM put into practice:

- Campaigns and promotions that support walking, cycling or public transport.
- Travel consulting is offered if a persone wants to know where he/she is and how can reduce the use of car.
- To job: the employer will pay the costs of travel by public transport to encourage the employee not to use personal vehicle in order to come to work.
- Home: You can benefit from a "car sharing" service, available on the street where you live.
- At school of your children: if you use public transport when traveling you could have access to consulting services provided by the regional center of transportation.

- Building permits may be connected by certain rules so as to allow minimization of transport to the new location, for example: developing a sustainable transport plan for employees' mobility, visitors, promoting the use of environmentally friendly modes or by limiting of the number of allocated parking places.
- Normally, MM measures are rarely implemented isolated, they are more structured in package of measures (measures combined with infrastructure projects, financial rules and regulations).

MM is focused on demand - and not on resources. This means that developing of new tram lines, bike tracks, streets, etc.. are not considered as MM measures, all these measures are related to resources.

The measures for infrastructure can support measures for MM. In several countries, MM is seen as a measure based on a location-connected to a traffic generating location, such as a business, a school, a local attraction. For a hospital or a business, a complex package of measures for MM may include in relation: bike parking, tram stations, parkings.

Sustainable transport plans are not MM, but should contain MM. MM does not include the entire spectrum of traffic and transport planning. Transport plans are part of MM when established at the location as plans to travel to work or school. The official attributed term is **mobility plan**. Lanes for high occupancy vehicles = car-pooling, taxes for peak hours, parking management and road tax are typical measures oriented to demand, so they are not MM, but can support measures for MM.

Traffic management system is not considered MM. However, some components of the traffic management that have as purpose to influence demand and to change attitudes, particularly if they make it look more attractive alternative transportation options, whether there are information services via SMS or email to the citizen about departure and arrival times of trains, so they can be considered MM.

Awareness of what sustainable transport means, education, mobility, marketing alternatives are considered part of MM. Some MM theorists consider these measures as distinct. In reality, however, is almost impossible to establish boundaries between them.

MM may include transportation of goods, with one condition: to be achieved on short distances and the measures related to goods are part of a mobility plan that also includes passengers. However, this includes the transport of passenger's luggage. If these conditions are not met, organizing transport of goods is considered a logistic tool for that already it already exists an extensive specialized industry.

Legislation, financial incentives or measures to reduce costs are part of MM, whether these support concrete measures which fulfill the conditions described above.

Below it is tried to be an accessible list and a ditribution on categories of these measures, which can to lead to reduse traffic congestion.

a) Informational measures

These measures are mainly based on the demands of passengers and provides information required by (potential) passenger by any possible means. Examples include:

- Information and travel tips of your local transport.
- Travel information transmitted through technological means, before and during the trip.
- Marketing sustainable methods through advertising or promoting the use of alternative techniques such as distributing flyers door to door.

b) Promotional measures

This category of measures centers on the idea of encouraging voluntary behavior change by raising awareness, promoting environmentally friendly alternatives to the car and provide information. So, this group of measures does not propose any new alternative means of transportation, but rather trying to encourage the use of existing one. The measures are:

- Personalized travel assistance: help the passenger to know how to reduce car use on his travel route.
- Advertising campaigns and other type of promoting (eg Oradea Day without cars) to help encourage people to try walking, cycling or public transport.
- Promote alternative means of transport and to reduce individual car use in specialized environments. This can include collaborative projects between transportation agencies and students or projects on residential neighborhoods by providing them resources such as guides to transportation, shopping, thus encouraging people to change their mode of transport used.
- There are examples that include these types of measures such as the "bike to work" that has been implemented widely in Denmark, Germany (cycling to work campaign: www.eltis.org) and Austria. In addition, in Munich has implemented a program to increase awareness and to change transportation options for new residents.

c) Measures of organization and coordination

As the name suggests, this category offers, organizes and coordinates various types of mobility management services that provide alternatives to individual use of a car:

- Services at regional or local level that facilitates a car sharing by people who have the same destination and are willing to share a car to get there.

- Zonal rental services. They can be an alternative to cars (or bikes) by providing some vehicles can be rented from many regional centers. Requiring registration or membership cards these rental services are a fast alternative because it is done more often online, and access to the car is via modern means using remote access (remote, chips).

- Upon request, transport companies can provide so-called "paratransit" vehicles (eg in Germany/Austria, Switzerland there are called Anrufsammeltaxi in the Netherlands Treintaxi - railway taxi).

d) Measures for education and trening

This category refers to the introduction of MM in education or training staff on MM topics. Examples include:

- Training hotels or shopping centers staff to offer customers information on alternatives for mobility.
- MM courses for specialized groups such as staff coordinators of Mobility Centres.
- Education for mobility, where mobility and how it can reduce car use, become part of educational programs taught in schools.

e) Local measures

In several countries, MM is mainly a punctual activity related to a center traffic generator such as a company, school, concert, stadium, fair, hospital administrative centers, places of entertainment, etc.. In these cases MM purpose is to manage how people choose to travel to the site. This class includes an extensive series of measures:

- A mobility plan for a school is similar to any MM plan, just usually requires a higher level of involvement of the child and parent/employees and employers both in terms of planning and in terms of implementation.
- Local infrastructure services - chosen to suit the nature of the destination and the people who travel to this - such as bicycle parking facilities for pedestrians, tram stations, connecting lines, minibuses.

f) Telecommunications and flexible organization of time

Certain measures can be taken by organizations, not only to reduce the need to travel by replacing trips by means of transport or by reorganizing work practices. Examples include: Modificarea numarului de vizite pe care pacientul trebuie sa le faca la spital pentru o anumita procedura. Masura a fost deja incercata cu succes la Gelre Hospitals din Olanda.

- Change the number of trips that citizens must do towards administrative buildings to perform certain procedures such as obtaining birth certificates, property papers etc..
- Shoppings, socializing, or solving various problems by phone or internet at home, so no longer need to travel for them. In Greece for example, birth certificates can be obtained by mail while 10 years ago it took three trips to the City of Athens to get the same document.
- Change the schedule of some institutions to reduce excessive congestion at peak hours by introducing flexible hours or reduced work week. In this case employees should work longer hours in a small number of days, thereby reducing the total number of trips made.

g) Actions to support / integration

These measures may not be directly implemented to manage mobility, but have a significant impact on the efficacy of MM. They can influence the cost of travel by car or other means, or can more permissive the environment for introducing the MM.

These actions can not be predicted by the final beneficiary, but they will definitely have an impact on the choices of the trip. For this reason they are listed as support actions:

- Parkings management (cost, number, limits, collecting) in order to reduce the availability of parching places and thus reduce the number of people who choose to travel to destination by car.

- In many countries, the DEVELOPMENT requires some form of approval from the public before it escalates. In some countries this agreement is obtained through a process connected with certain requirements to the developer to implement one or more MM measures.
- Changes of taxes to make employers to provide benefits in terms of travel costs. For example, turning a parching place offered by the company in a space for which the user pays a tax would reduce the attractiveness of it and could convince the employee not to drive to work. In some countries there is a tradition in cancel the costs of commute in contrast with the taxes, to enable the the cost of commute done by sustainable means to be canceled in a higher proportion of those done by unsustainable means.
- Effective mortgage rates according to location, where the interest rate is lower for buyers who choose the house in areas that would reduce car dependency in travel to job.
- Charging congestion (for streets that were available in the moment of use).
- Integrated rates – examples:
  - ✓ Integrated rates for different type of public transport in a region, trams, buses, metro etc., all these being accessible with a single ticket (which is common in many EU countries, but still unusual in others).
  - ✓ Ticket to a concert, sport event etc. to be available as ticket for transport network (through an agreement between the Municipality, the transport company.
  - ✓ Multifunctional card that gives discounts on public transport and vice versa for renting of bicycles (eg bicycle transportation OV-Fiets in the Netherlands).
- The introduction of charges for the use of road infrastructure in areas where traffic congestion is occurring. This is a measure that has proven effective in many cities. In London it was introduced the first scheme on congestion charging (after Singapore, a city which applied it in 1970). Then came the Stockholm and Oslo. No developing country has not yet consider this measure/tax, but many of them are exploring this possibility and certainly in the next years, more and more cities will embrace tax system as a form of traffic management as an alternative to simply building new roads.

The measure is very important, so worth a discuss. 100 years ago, horse-drawn carriage at the time, average speed was 11 miles per hour. Most times, the streets were so crowded that vehicles have only crawled or not move at all. A familiar situation for drivers of large cities around the world - frustration for the individual and business losses. In February 2003, London has taken an important step to solve this situation. It was introduced traffic congestion tax in the busiest areas of downtown. The desire was to reduce congestion and raise funds for London's transport system, which had been neglected in recent years. **Opponents predicted chaos and confusion**. They said that London will become a ghost town and transport system will not cope. Now, it is clear that they were wrong. Drivers are charged £ 8 to enter the area or driving inside it. There are cameras filming the registration numbers of each car, so no one escape without paying the tax. This scheme was able to reduce congestion. Traffic in the area, for the time of collecting of taxes (7 a.m. - 6:30 p.m.) decreased by 18% and delays by 30%.

The limited traffic in the area and the decreased level of pollution and the number of accidents caused the center of London to become a more pleasant place to live, work and travel. Since this system has been introduced , the average speed of 14 km/h increased to 17 km/h, the emissions of gas, nitrogen oxide has been reduced by 12%, and by 19% for CO_2 . Citizens have noticed an improvement in terms of the environment. Every year, there were less 70 recorded accidents. Tens of thousands of people now travel by buses. These took the overwhelming majority of passengers who now leave their cars at home. Of course buses run at high frequency and are safer. It also increased the number of people who ride bikes, by 20% in each of the three years. It is a fast method of transport, cheap, healthy, do not harm the environment and looks more attractive when the traffic on the streets is lower.

There were some who said that the project will affect businesses in Central London. The fiercest were retailers, saying they will lose customers, preferring to go elsewhere, or if they still continue to seek their services will no longer spend as much. Objective analysis and economic data shows that the impact on business performance was in neutral zone. Now, more than 90% of those who get in the center, take public transport, although increasingly many prefer to walk or use bicycles.

This project has brought – in the first three years of implementation - a net income of 100 million pounds, amount of money then invested in transportation system. Improvements were for example, introduced 450 new buses on 12 routes. It is now easier that payment to be made electronically, there are discounts for monthly and annual payments and a reduction for companies that pay for their employees.

83% of subscribers say they are satisfied with the experiences that have had, related to this scheme. In addition, later it was possible to pay the next day fact requested by many drivers. Therefore, the scheme becomes easier to use and **citizens understand it better**.

OBJECTIVES TO INCLUDE:

OBJECTIVES THAT REQUIRED THE REDUCTION OF THE SCALE/SIZE:

OBJECTIVES FOR WHICH THE SCALE MUST BE MAINTAINED:

- electronical payment systems (for for taxes and fees);
- measures of systematic education in schools - the idea of forming a culture of sustainable development;

OBJECTIVES THAT REQUIRED THE INCREASE OF THE SCALE/SIZE:

- dynamic the business department activity with citizens' associations;
- innovation in administration area to reduce the number of trips of the citizen at institutions;
- to analyze the sections of streets on each it can be increased the speed, or on the contrary, it should be reduced (effectively reduced by traffic calming devices);
- ring road in north of the city;
- bicycle parkings;
- promotional campaigns for cycling

OBJECTIVES TO INTRODUCE:

- create the legal conditions and carrying out promotion activities related to systems of using private car: car-sharing and car-pooling.
- SC OTL SA must initiate actions for cooperation with public passenger urban transport, ie regular meetings with amateur drivers;
- It would be recommendable that the Oradea Municipality to develop rules that not only allow , but to ensure this public decisions regarding the community;

- develop a transit regulations of the city - after the completion of works on infrastructure and ring road which connects the villages without crossing the city;
- prepare distribution maps drawing utilities of first necessity (these implants will be made only on the principle of equal ditribution in the territory);
- transition (planning and funding) of some streets to upper categories - possibly one-way streets;
- installation of over-passages or building underpasses passages for pedestrians on streets with heavily loaded traffic - instead pedestrian crossings - where the traffic light program is insufficient for combined vehicle-pedestrian flows;
- taxation of cars which enter in the „protected ring" of the city's center;
- change the daily beginning hours of activitivity for economic agents on the same street or the same point;
- parking spaces owned by enterprises (available to employees): **paid** by the enterprise;
- tickets to concerts or sporting events, etc. should have included the price of two trips by public transport - and therefore provide the right to travel;
- Develop a center equipped with a general traffic management in the city;
- Introduction in the city of "no car day" (monthly);

II. **remove freight traffic at peak hours** simultaneously with fleet renewal

About '70 transportation specialists have found that "any urban area depends on a large flow of goods to the interior, exterior and within its borders. However, transport of goods remains a forgotten aspect of the study of transport "but by the middle '80, issues of congestion caused by freight transport has been the attention of researchers and politicians.

Freight transport system involves several categories of actors, the most important being grouped in the following categories: shippers, carriers, consumers, public administration. Each of these categories has its own goals and also their views on the situation. Depending main goal pursued by these actors may join as follows: consumers and public administration on the one hand and the other shippers and carriers. Public Administration and consumers have some common views, such as accidents, congestion, noise caused by vehicles transporting goods because they affect quality of life and the urban environment. On the other hand, shippers and carriers have totally different views of consumers and public administration, they want to carry goods with cost saving to be able to maximize their profit.

The importance of urban transport of goods lies in:

- generated effects on the environment;
- significant cost of freight transport and physical distribution;
- direct impact on the efficiency of the economy;
- the role of urban transport of goods in the industry and trade;
- contribution that an efficient goods transport sector has on local bussiness competitiveness;
- employment generation;

but it is worth to notice that urban transport of goods is essential for maintain the urban lifestyle.

Distribution of goods is a highly debated topic, especially in recent decades. Origins of goods distribution and its concerns, however, is identified with the the first forms of products marketing. The importance of this topic derives from complexity, a process with a heterogeneous structure and diversity of participants. Its complexity is due to the broad scope of activities that involve interference of a extended range of associated problems, the large number of restrictions, but perhaps most importantly, the complexity is determined by the need to obtain solutions that provide the most effective response to transport demand.

The complexity of urban distribution is caused by:

- wide range of activities that involve;
- the emergence of a large number of associated problems;
- large number of restrictions;
- the need to obtain the most effective solutions to satisfy buyers.

On the other hand, freight transport, especially traffic on streets is very competitive and reacts very quickly to stimuli received from the market, which means that all additional costs imposed on them (carriers) will be felt in cost of transport and hence the final price of the products.

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As cities grow (both in number of inhabitants and the area), the need for transport (goods or passengers) in a small space also increases. It is necessary to impose new rules, otherwise, vehicle density increases continuously and will lead to long traffic jams.
These will lead to congested urban centers, where will be the preferred small transport means; this will make the task of urban logistics specialists very difficult.

In 2011, the vision of material expected from the EU on urban transport of goods contained:

- minimize the distances necessary for collecting / delivery of goods;
- use environmentally friendly vehicles;
- increased and effective use of intelligent transport systems;
- reduce noise caused by freight vehicles.

Considering the 1974 classification of Stopher's Meyburg on goods flows in cities, we can identify four types of travel:

- transportation of goods in an area to be consumed in that area;
- transport of goods outside the area in which they were produced;
- collectings and deliveries between cities and local transport in which the origin and destination of the route of the vehicle are inside the same zone;
- transit (goods crossing an area or goods that are temporarily stored for later to be transported into a completely different area).

But because of the restrictions of urban areas the goods distribution in cities has become a complex process. To analyze the distribution of goods and its optimization should be taken into account elements of urban economy. Although the structure of the urban distribution system and the distribution system outside urban areas are similar in urban areas can identify the following difference: high traffic and limited infrastructure. Limitations are relative to the type, technical characteristics, capacity, vehicle emission require a transfer of physical goods between different modes of transport or between transport vehicles belonging to the same mode of transport, but of dimensions and different characteristics. Such transfer may be perceived as disadvantageous causing additional financial resources, additional time, generating a number of additional risks.

The efficiency of urban distribution is reduced due to the prolonged delivery times due to traffic congestion and access to delivery points, the inability of goods delivery vehicles to fit into predetermined intervals of time due to emergency situations. It's needed to be taken into account a number of issues related to the distribution of goods: the uncertainty of different parameters, the necessity to avoid long return journeys with empty urban vehicle, to ensure a high load factor and correlation of transport plans of the supply to the needs of collecting returned products.

For urban distribution, specialized firms need permanent and updated information on distribution supply processes and traffic problems (accidents, congestion, works, etc.) to solve problems encountered in developing the distribution process.

The implementation of geographic information systems, the GPS underlies the development of applications in urban distribution of goods. Vehicle tracking using GPS, identifying of addresses and their characteristics, the analysis of the transport and distribution, tracing flows of goods, management of goods vehicle trips on congested streets, reducing the number of delays in delivery of goods, fleet management are among immediate benefits of the introduction of new information technologies in urban distribution of goods.

In the same direction, to increase efficiency of freight transport can fit components of intelligent transport systems:

- Freight transport management systems;
- Traffic management systems.

However in some cases these benefits are not enough. In urban transport, freight vehicles generally have more emissions/km than other motor vehicles, which is caused by a higher power.

Urban transport of goods plays an important role in the economy of urban centers, but it also has negative effects:

- congestion;
- decrease of air quality;
- greenhouse gases;
- noise pollution;
- safe.

Depending on how it aims to reduce congestion in urban areas can be identified following methods of reducing congestion in cities:

- regulations;
- market-based measures;
- measures based on space planning;
- infrastructure-based measures;
- new technologies;
- management.

Regulations are most easily to implement by local authorities. In essence, they constitute a set of rules and restrictions specifically designed to control the activity of carriers in cities, in order to improve traffic conditions. You can include these types of regulations:

- ✓ the times for deliveries of goods are usually set mainly for older urban areas with important historic and pedestrian areas. It should be considered that times not to coincide with peaks hours of traffic so it doesn't get exactly what it is desirable to be improved (traffic flows), but also be large enough to allow deliveries. In addition, should take into account the fact that the area where these restrictions apply must not be very large and that the area must be places for parking and space of uploading.
- ✓ Restrictions on vehicle's weight and length. Since most European cities have developed around the old urban centers, there are required tonnage related restrictions in order not affect the infrastructure and old architecture and restrictions related to the gauge in order to avoid bottlenecks in these areas, especially where the streets are narrow. Also bear in mind that these restrictions will not be applied to a wider area than it is necessary in order not increase the number of freight vehicles.
- ✓ Low emission zones are those urban areas where the access vehicle of goods is conditioned by achieving of certain standards in terms of emissions; usually are found in large urban agglomerations, where concerns about air quality are a priority. These areas have a good effect on the environment because they allow access only for vehicles that meet emission standards EURO 3, or more, depending on the policy of each city.

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Market-based measures are the fees. Cost changes have a direct impact on transport because the carriers and other stakeholders must take action in order to remain competitive. FEES FOR CONGESTION CAN STIMULATE THE CERRIERS TO RENEW THEIR FLEET and implement sustainable urban distribution techniques. Note that these implementation costs of this system are high; also attract the high cost from carriers.

Measures based on space planning are within the competence of local authorities. Measures based on space planning can significantly influence how traffic will evolve in certain urban areas. Through these measures, local authorities and planners, with urban logistics specialists can determine how it will further develop the city without having a pressing issue in terms of congestion caused by freight vehicles.

Measures based on infrastructure. Transport infrastructure is very important, especially within cities because goods can be brought inside the urban centers or near the client (which is still in city) and by rail (trams or trains) or navigable waters crosstown not only on the roads. While transport of goods is the most flexible, must not neglect the other modes because by using them can reduce congestion, air pollution and the noise, etc.. Railways and inland waterways can provide important support for urban distribution by transporting goods from a logistics area outside the city to a center for urban distribution.

New technologies have an important role in our lives. In terms of urban transport of goods, these technologies relate to reduce CO_2 emissions through the emergence of electric vehicles or hybrid. Some of the current carriers - but especially in Western Europe - use at least one of these two systems as cost/benefit ratio is in their favor.

Management.

There is a continuing debate about the optimal size of the vehicles involved in urban logistics operations. People who are involved in organizations environment protection require that in urban areas to use for freight transport small vehicles. According to research done by the University of Huddersfield, vehicle size is closely related to the issue of consolidation of goods. There are three limitations related to supply and collecting og goods:

- Weight;
- Volume;
- The driver's effort.

The first two constraints are related to the capacity of vehicle, and the third can effectively work as a driver during the program (loading, unloading, delivery confirmation, etc.).

While the load level is high, it can be observed the benefits of using high size vehicles; if it is not used the load capacity to optimal limits, then it is recommended to use the vehicles with a smaller size. Although in some European cities is absolutely necessary to use goods transport vehicles small (because architecture: narrow streets, historic monuments, foundations, old underground tunnels and so on which may suffer from heavy vehicle movements), it should not be generalized (because transport companies purchase their fleet not only for urban transport, so they can not afford to purchase one single type of vehicle).

There are several kinds of restrictions that can be imposed to vehicles that deliver goods in cities:

- Deliveries at night (imposed by local authorities);
- Restrictions during loading/unloading;
- Restrictions on access in certain times for vehicles transporting goods in pedestrian areas;
- Trade restrictions on days of week.

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Deliveries at night usually occur between the hours where traffic is sparse. It was noted that in this way the required number of vehicles for goods delivering decreased. In terms of overnight deliveries may be placed two types of regulation:

- Specific time in which it can be done deliveries and collectiong to a particular client;
- Rules governing the vehicles mobility on the streets network around the city or just in a particular sector.

Important aspects in terms of deliveries at night:

- If overnight delivery rules are too severe, it can lead to increased costs along the supply chain;
- Rules of overnight delivery should focus particularly on issues of noise produced by transport vehicles and cargo handling.

Besides these issues must be taken into account and others: it is necessary to find drivers willing to work at night, during the night increase payroll costs, for overnight delivery it can be required special actions or if stores are close city’s center, the noise may disturb local residents.

In Oradea there are recorded approx. 30,000 vehicles belonging to legal entities and although only half are vehicles to transport goods, however daily city boundaries are affected in a lesser or greater extent (length and duration) of 30,000 vehicles carrying cargo - vehicles considering that another registration center and arrive/depart to pick up or deliver goods.

The observed congestion on some of the city’s treets is a consequence of this type of traffic, and measures to reduce congestion need to consider reducing or eliminating of freight traffic on most of the main streets for traffic city. Guided by London's congestion pricing system of "city"[25] (applied to all vehicles) some EU proposals to reduce congestion were the main theme of expanding the scope - of congestion taxation - for goods vehicles. The following two alternatives are available to officials:

- it is forbidden to enter (or leaving, parking, stationary) in a area well specified – centered in downtown, possible just on „protected ring” – of any transport or freight

[25] 8 pounds per day for a day of travel in the city mean 2 minimum wages (foe each vehicle on month).

vehicles, regardless of destination, reason, owner etc between hours of 06:00-18:00 a.m.;

- **it is established a „cityvignette" (for each vehicles) for freight carriers with the same originnation interests in the same area mentioned above (it covers the entire logistics that is related to a such organization)[26].**

OBJECTIVES TO EXCLUDE:

OBJECTIVES THAT REQUIRE THE SCALE/SIZE REDUCTION:

- freight traffic on a part of Oradea's territory has to be spatially and temporally limited;

OBJECTIVES THAT REQUIRE TO MAINTAIN THE SCLAE/SIZE:

OBJECTIVES THAT REQUIRE TO INCREASE THE SCALE/SIZE:

OBJECTIVES TO INTRODUCE:

- a „cityvignette" system in a central area of the city;
- prepare a working group formed by local institutions and freight carriers in order ti schedule on days and neighborhoods the freight transport in the city;
- established a system of fees that benefit the carriers who modernize the fleet;

III. to reduce the need of travel

Reducing the need for travel can take a variety of forms and can be modeled according to some local conditions, being achieved mainly by:

- reduce the number of trips;
- reduce the number of vehicles*km decreasing the length of the journey;
- reduce the number of vehicles*km, by decreasing the number of vehicles involved in travel;
- reduce of vehicles*hours by traffic in off-peak hours (considered an alternative form of travel demand reduction).

In all these cases the volume of travel is reduced, although the activities that generated the mobility is effectively done. Therefore, INDIVIDUAL MOBILITY IS NOT RESTRICTED, meaning

[26] Also cityvignette could represent a source of revenues in order to implement the measures concerning the mobility.

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that the access to activities and services is not suppressed and the travel area of individual is not restricted but are encouraged the existing activities, but their performance is done by minimizing the movement.

One way to reduce the mobility is to use the **spatial planning technologies** that facilitate the correlation of trips so that several goals to be achieved or urban planning scheme to encourage short distances (this can be done conveniently on foot or by bike). Below is a series of measures to reduce the need to travel, which can be divided formally in traditional measures and unconventional measures.

Some of the known traditional measures which targets the transport are:

- improve road capacity;
- investment in public transport capacity;
- prioritization of public transport and spatial planning;
- access control in certain areas;
- parking fees and parking restrictions;
- the introduction of fees in road transport;
- scheduling policy regarding start times for service companies;
- Priority to non-motorized transport.

Unconventional measures fall into two categories:

- Some planning measures – which use the spatial planning and other usual urban tools:
  - ✓ develop the public transport up to renouncement of private car using;
  - ✓ urban concentration.
- some technological measures – which use advanced technologies of communications and information:
  - ✓ deliver goods and service to dwelling-place;
  - ✓ teleactivities and teleworking.

Progress in computing and communication techniques has made possible the introduction of teleworking and telecommuting, to eliminate the need for travel. Studies and analysis have led to the idea that teleactivities and teleworking benefits for all parties involved and including society.

There are so many potential measures to reduce the need for travel. These solutions consist of **change and substitution** mechanisms through which travel is modified and reduced. Travel changing mechanism attributes restates certain components of any travel without removing it (change modal, temporal and location).

The solutions that appeals to substitution have impact on number of trips made, replacing a lot of trips with another lot of trips, which involves the mobility reduction, and the use of new forms of communication to completely rule out the need for travel.

One of the ways to change individual behavior may be related to cyclical trips related to shopping activity. Concretely, the activity of a family for supplies shopping can be oriented towards weekend by analyzing the behavioral characteristics of individuals and by adopting an appropriate program of stores - with predilection for those that have their headquarters in central area of the city. In relative terms, the number of those who make shopping in both days of the weekend is three times higher than those who shop each working day, which leads to the conclusion that the there is approximately equal sharing between weekdays on the one hand and weekends, on the other hand. In this context , it is clear that there is a favorable environment which expects only a punctual intervention that could move some of the trips during the working week on Saturdays and Sundays with favorable repercussions on the flow of traffic in cities. Statistical studies undertaken in this direction have shown that a high frequency of shopping trips in weekdays reduces the likelihood of trips on weekends. The problem of transfer trips weekdays to Saturdays and Sundays proved to be an administrative matter, as big part of the community seems to have understood the necessity and appropriateness of this action, those who have convinced to adopt an attitude are administrators stores. Policy makers need to adjust the schedule of these stores (not many) located on central streets, to hours which to oblige the traffic corresponding to shopping activity to emerge from delicate periods of peak hours.

The actions in the Netherlands and Japan have shown that sales have not decreased if the number of hours in which stores were opened was reduced by 1 hour on weekdays (with the appropriate extension on Saturdays and Sundays), but with beneficial effects on circulation in areas subject to temporal changes of trips' attributes.

A synthesis of all these considerations:

- restrictive measures can be progressively used to reduce traffic in an area, but the results depend on the socio-economic region;
- individual and group behavior analysis can reveal direct changes regarding travel scheme;
- mos of the cases of travel reduction refer to elimination of car use or to travel distance reduction, reflecting the attention given to measures targeting a minimum of car use. In this case the traffic volume can be reduced by changing the individual transport means with one with higher occupancy, resulting in a smaller vehicle*km.

OBJECTIVES TO EXCLUDE:

OBJECTIVES THAT REQUIRE THE SCALE/SIZE REDUCTION:

- decrease use of private car

OBJECTIVES THAT REQUIRE TO MAINTAIN THE SCLAE/SIZE:

- develop public transport;
- priorities given to unmotorized transport;
- deliver goods and services to dwelling-place;

OBJECTIVES THAT REQUIRE TO INCREASE THE SCALE/SIZE:

- change the schedule of great retailers;
- procedures for increase the urban density;
- staggered programming of start times for service companies;

DOMAINS THAT REQUIRE TO INCREASE THE SCALE/SIZE OF ONJECTIVES:

- create a framework to develop teleactivities and teleworking, also including ways to reduce taxation for companies which practice teleactivities and teleworking.

IV. develop sustainable forms of transport (less polluting): walking and cycling.

One of the solutions to decrease traffic congestion is to encourage cycling with beneficial effects on both the environment and the infrastructure.

A viable community is one that provides multiple opportunities for travel of its citizens: public transport, walking and cycling should be given the same importance as well as travel by car. Even if traffic values are not very high and do not lead to congestion, however they must be minimized as much as possible to increase air quality, energy conservation, accessibility and quality of life in urban environments.

By combining the measures which promote walking, cycling and public transport, cities can achieve a reduction of motorized traffic. Trips on short distances are very well suited for these modes of travel (walking and cycling), as long as all conditions are provided for them. Cycling can improve road safety, while having beneficial effects on health. The growing use of bicycles lead to the creation of spaces - the one required parking space for a car can fit 7-9 bikes, obviously lower cost.

The city would receive benefits with the development of a well set network of bike tracks as:

- reduce the number of cars in general traffic;
- increase the attractiveness of public transport for commuters;
- improve quality of life (reduction of air pollution, noise, etc.)
- new possibilities for the use of space;
- increasedtraffic due to the reduction of the central area;
- preservation of historical monuments and reduce their maintenance costs;
- reducing costs and investments in street/road infrastructure.

Promotion campaigns and investment in cycling infrastructure are closely related and also complementary. However, before any investment made in such infrastructure must to analyze the local situation to a more efficient use of resources. Thus, a network of smaller bike tracks but interconnected and functional promotes itself cycling, helping to attract new users of this means of transport.

First It should be encouraged cycling to work and to school, especially that for changing attitudes towards mobility of employees or students are not required large financial investments, but rather small stimuli which to have a positive impact in most cases, great effects - for example provide bicycle parking at work, locker rooms to change the specific equipment for winter, etc.. Cycling to work has become a common practice in many countries and cities in Europe.

Bike or other comparable modes of transport were for long time and often frecquently necessary means to reach (some) public transport routes in cities under development and are also the only means of transport available to many people. Pre-transportation functions that bike performs in this way must retained and promoted. This can be done for example by ensuring safe tracks for bicycles and shelters for them. It is essential that low-speed vehicles to be so recognized and to prevent as much as possible the idea of prosperity identified with owning a car (image problems). A combination of walking, cycling, bus and para-transit modes is often appropriate mix of transport modes in developing cities. This ensures flexibility and easy expansion into new areas.

Cycling should become part of the intermodal transport. Thus, when the length of the trip is something more we can talk about "bike & ride" or "ride & bike" using both bicycle for a part of the trip, and public transport to the other part of the trip. Taken separately the two modes are not effective due to the limitations faced, but together they can successfully compete personal vehicle, allowing the travel "door to door" over long distances. Promoting cycling as a mode of transport in cities also means creating facilities for cyclists. Services for cyclists include a wide range such as information booklets and maps, integration with public transport schemes and share and bike rental, bicycle parking, online services and mobile phone.

Public bicycle rental system. There are a variety of bike rental systems with different technical and institutional solutions. For cities, bicycle rental system can serve as a support for the development of this mode of transport (including as part of intermodality) leading to the need for investment in infrastructure. For users, the ability to rent a bike offers the opportunity to try cycling and because of the advantages: 24/7 availability, spatial flexibility, accessibility and easy maintenance.

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Bicycle Parking Services. Bicycle parking facilities must be located in residential areas, workplaces, universities, schools and other points of interest, especially in intermodal nodes. Cyclists facilities as an existing a supervised bicycle parking and the ability to carry bikes on the train, tram or subway for a reduced fee are items that can ease the decision to use public transport and change individual transportation mode to the public. Bicycle facilities should also be provided on the vehicle, for example, part of vehicle can be fitted with clamps / simple bicycle racks so that passengers do not have to hold his hand on it when the car takes a curve.

Network of bicycle tracks currently exist in Oradea measures about 18 km. This network has the great disadvantage that the tracks are not interconnected, not ensuring continuity of movement. It should be noted that it is in various stages of design, execution, etc.. still approximately 42 km of cycle paths, plus other about 30 km proposed in recent studies. Their implementation would interconnect existing tracks and links to the Hungarian border and main villages of OMA (Sanmartin - including Baile Felix and Baile 1 Mai, Santandrei and Oşorhei) and lead to the formation of a well-developed networks.

The main pedestrian area in Oradea is the Republic Street, between Iosif Vulcan Street and Dima Vulcan Street. Also, there are landscaped pedestrian areas and on the banks of Crişul Repede. According to GUP, there is a redevelopment project of Union Square by which to provide more generous pedestrian traffic areas. There is also a proposal to extend the pedestrian zone on Route Republic Street to the intersection with Gen. Magheru.

OBJECTIVES TO EXCLUDE:

OBJECTIVES THAT REQUIRE TO REDUCE THE SCLAE/SIZE:

OBJECTIVES FOR WHICH THE SIZE SHOULD MAINTAIN:

OBJECTIVES THAT REQUIRE TO INCREASE DE SCALE/SIZE:

OBJECTIVES TO INTRODUCE:

- purchase a medium size vehicle - but electrically operated - by initiating a tourist route (ecumenical) within the city[27];
- facilities for companies performing bike rental
- Oradea Municipality action to eject any remaining obstacles on sidewalks or pedestrian paths required to move.

V. reduce carbon emissions (including traffic management)

The main environmental problems are related to the predominance of oil as fuel, which generates CO_2, air pollutants and noise. Transport is the most difficult to manage in terms of CO_2 emissions. Despite progresses in automotive technology, the increase of traffic and the "off-on" jerky way - to drive in urban areas shows that cities are a major and growing source of CO_2 emissions that contribute to climate change. Climate change causes dramatic changes in the global system and requires the adoption of urgent measures to keep impacts to a manageable level. European Council set a target to reduce emissions of greenhouse gases in the EU by 20% by 2020.

CO_2 emissions from new cars sold in the EU fell by 12.4% between 1995 and 2004 as a result of a voluntary agreement between the European Commission and the automotive industry. To enable the EU to reach its target of 120g by 2012, the Commission outlined a comprehensive new strategy in a Communication in February 2007. A legal framework should provide 130g CO_2/km by improvements in vehicle motor technology, and a further reduction of 10g CO2/km by other technological improvements and by an increased use of biofuels. Pollutant emissions from vehicles have also been successfully reduced through a gradual tightening of emission standards EURO. In the past 15 years, since the adoption of the first EURO standard, despite rising traffic

[27] It is necessary a prior testing: SC OTL SA should test a touristic route like this.

volumes were achieved continuously, as a result of the EU regulatory framework, low limits for new vehicles, an overall reduction of 30-40 % of nitrogen oxide emissions and dust from traffic.

HOWEVER, despite these improvements, environmental conditions are still poor: local authorities are experiencing difficulty in meeting the requirements on air quality, as well as the limits of particulates and nitrogen oxides in ambient air. They have a negative impact on public health.

Noise reduction measures were also encouraged by the European directive on noise mapping. Based on the information collected in the noise directive, local authorities are now in a position to compose noise reduction plan and implement concrete measures. Noise reduction plan can benefit from an exchange of information at EU level. According to stakeholders, the noise reduction to source could be achieved by strengthening the EU standards for noise emissions generated by vehicles on roads and railways and by tires. Underground transport systems also contribute to reducing noise in cities. Extension, rehabilitation and upgrading of clean urban public transport , such as trolley, buses, trams, metro and suburban rail and sustainable urban transport projects should be further promoted and supported by the EU.

In Romania transport contribute about 5% to GDP and create over 5% of all jobs in the national economy, representing a major consumer of energy, materials and finished products, while transport is a major producer of waste and residues. Adding propagated effect of transport efficiency on other economic sectors, namely taking into consideration its social efficiency as an attribute of civilization in relation to environmental impact, strategic objectives in the field of transport can only be an analysis of the entire social activities and economic that takes place in Romania. As a consequence, closing the global physical and spiritual values circuit appeal through a feedback effect, intentional or imposed changes in service areas. As a result, decisions on environmental protection bring the decision in the tertiary sector of the economy, resulting in the construction of mobile devices in the infrastructure and also in the service function (technical and commercial) transport system. In fig.II.22 an image that shows some of the main links between the entities and processes that are influenced and influence the environment protection activities in terms of transport.

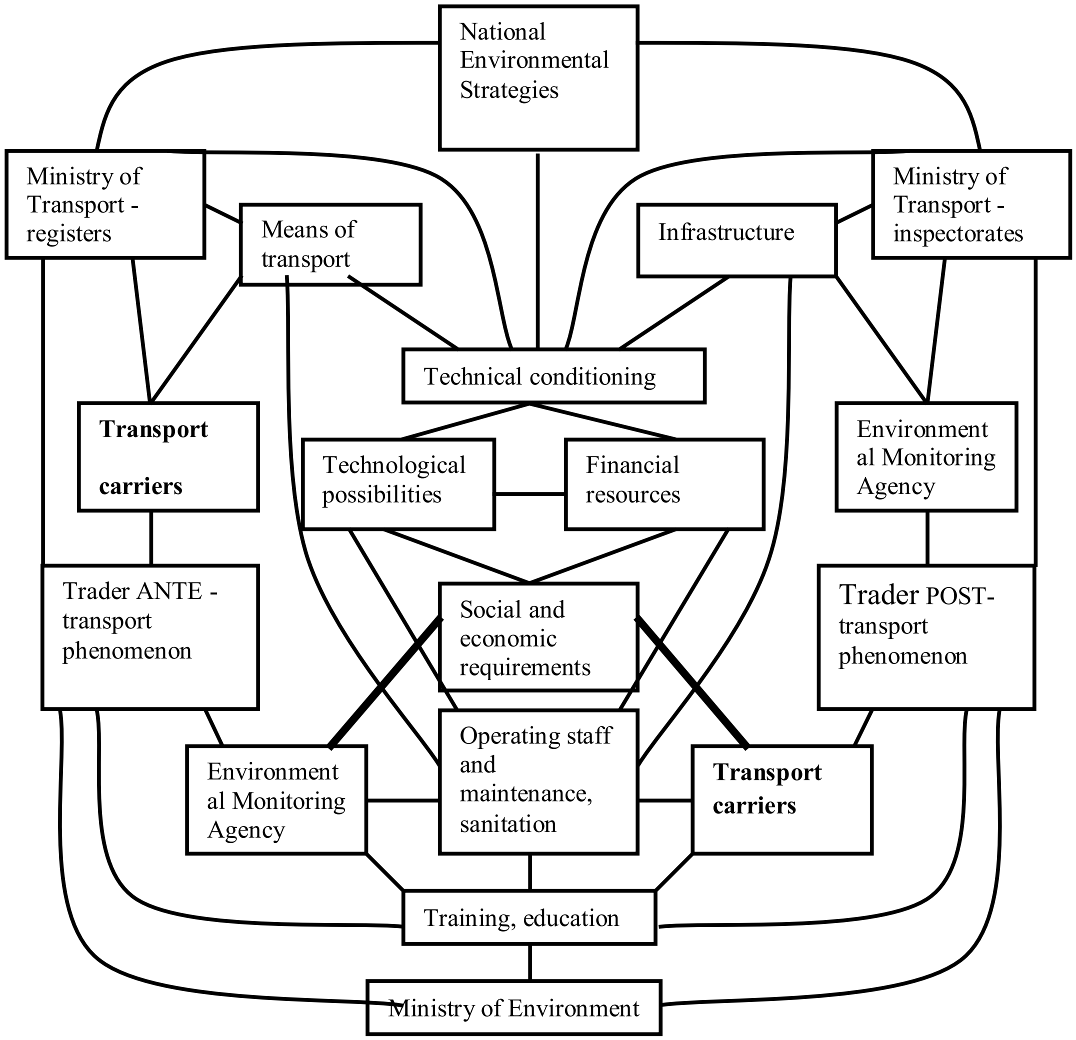

Fig. II.22 - Scheme of the main activities of environmental protection in transport

Objectives, projects and programs through which are accomplished the concrete actions for environmental protection in transport activities represent a significant part of the overall framework that provides national transportation system integration conditions, in the European system. Moreover, dysfunctions that will occur due to gaps between the technical state and local leadership and those provided and the continental level will have a negative sensitive impact caused by competition, in an environment dominated by consumption.

Therefore it is necessary to insist on converging measures in order to transpose the known coordinates on positions that ensure compatibility between processes running in the country with on-going processes beyond, in order to match the requirements of the civilized world.

Some of these measures relates to environmental protection by:

- Promote a portfolio of impact studies, projects and specific legislative acts, that milestone the way from the current state to one that includes the transport among the branches which are in agreement with nature;
- Implementation of EU regulations and of other existing international organizations in the sphere of environmental protection, in a phased action plan to achieve a transport system and the systems in series - upstream or downstream – so as the resulted phenomena from transport service to become neutral in the nature;
- Introduce remediation technologies regarding the pollution that are specific in administrative activities of infrastructures and management of these processes (provision of vehicles in accordance with sustainable development, maintenance utilities through organic processes, use of storage equipment, handling and processing of specific waste area, the multiplication of alternatives to satisfy transport requests by electric transport, recycling waste, mobility control by unconstrained methods - internet, tele- shoping, pay by card, decentralization of local administration, etc.).
- Prepare a information program transport for transport companies regarding the demands for transport means, infrastructures and traffic management activities;
- Perform an action to educate the public and permanent business.

Oradea falls into the category of urban agglomerations characterized by a medium generated by own development and that is a source of pollution in air, water and soil. Existing facilities of everyday life in a city leads to the emergence of a multitude of sources of air pollution - which is in the category of typical urban sources - and of which emerges first even traffic .

The aggression of polluted environment on human entities manifest in many aspects (physical, mental, and social), mainly lead to remove the individual from nature. In this context, the most rational approach of the state of the atmosphere in a city can be materialized through a series of actions such as :

1. constant surveillance of pollution;
2. correlation of experimental data with specific processes that generate pollution (industrial type in the home and in the field of transport);
3. mathematical modeling of pollution phenomenon;
4. develop a strategy for environmental quality;
5. identify solutions for protecting human community of that area;
6. develop an action plan to reduce emissions of pollutants;
7. implementation of measures of protection and self-protection;
8. promoting educational campaigns on civil society contribution to reduce environmental pollution.

Air quality in Oradea has the following features:

- air pollution has a decisive influence on the climate system;
- performed measurements have revealed a good correlation between the degree of pollution and lack swirl (swirls of air);
- according to a report on air quality in Bihor county there were no exceeding of SO_2 , NO_x, O_3 (ozone), CO, C6H6 (benzene), Pb, instead there were overruns on dust (PM10);
- rainfall acidity is due both to the long distance transport of pollutants, and especially local contribution;
- since pollutant emissions from motor vehicles occur in the vicinity of the soil, the impact on air quality is consequential in the most direct way to the human breath, and the absorption through the skin;
- sidewalks are most vulnerable affected areas due to gas exhaust, the concentrations being spectacular;
- particularly high increase of traffic intensity correlated with immobility of infrastructure - far surpassed in terms of capacity to ensure traffic flow, led to an appreciable increase in emissions of NO_x, CO, Pb and critical worsening pollution in downtown.

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It must be emphasized that these increases of pollution are found on the background of noticeable decrease of industrial activity, by elimination, the cause being the congestion of urban streets. The effects of air pollution on human health is manifested by increased morbidity and mortality through:

- cardiovascular effects;
- neurobehavioral effects;
- effects on birth;
- effects on hemoglobin biosynthesis;
- nervous system effects;
- effects on blood pressure;
- respiratory effects;
- carcinogenic.

The findings on air pollution due to traffic can be obtained only through concerted action performed on stratified levels of detail.

It is believed that various particular conditions lead to following environmental areas strict neighboring to areas of emissions:

- high traffic street;
- average traffic street;
- low traffic street;
- pedestrian area near a street;
- another way for pedestrians;
- facade of a building;
- terrace;
- land, school, hospital;
- plain area near vegetation of uniform or varied height.

Correlation of these environmental areas with a number of classifications of traffic leads to detail necessary to identify the transport component contributions in all of the pollution factors. The criteria of location of environmental areas recommended for measurements are:

- by type of artery/stret:
  - large;
  - canyon;
- by volume of traffic:
  18. low: <10000 veh/24 h;
  19. high: > 10000 veh/24 h;
- by traffic speed:
  20. low speed < 30 km/h;
  21. average speed 30-60 km/h.

The impact of pollution on human receptors is one of the reasons that lead the Oradea's traffic to be known as prohibitive. This finding supports through the proved fact that namely traffic in Oradea is one of the significant sources of pollution and what is worse, this source show an obvious tendency to increase. Causes:

- increase since 1989 of the number of private vehicles at a rate becoming higher (over 90,000 cars registered);
- overwhelmingly increase of number of old vehicles not equipped with reduction systems of pollutant emissions;
- increasing the use of private cars for short trips;
- maintain heavy traffic on many urban street;
- outdated road infrastructure;
- deplorable (often) condition of the road;
- old public transport fleet;
- the existence of a high traffic on canyon artery which favors the accumulation of pollutants in a small volume of air;
- maintain heavy traffic in the central area by administrative immobility.

Conclusions based on measured pollution levels.

Traffic is a major source of atmospheric pollution of major urban areas, with severe effects on the health and living conditions of the population. Because the emissions of pollutants from

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motor vehicles occur in the proximity of the soil, the maximum impact of these on air quality occurs in the close proximity of traffic arteries on the human breath. The most common situations of traffic leading to population's health damage are short-term exposures (tens of minutes) at high concentrations. Central areas of Oradea are typical areas of impact on air quality for sources characteristic to urban perimeters.

Maximum concentration levels allowed in our country are:

Tab. II.12 - Maximum acceptable levels of pollutants

Pollutant	Maximum allowable concentration (mg/m^3)	
	Average on short-term (30 minutes)	Average on long-term (daily)
Nitric acid	0,4	-
Hydrochloric acid	0,3	0,1
Aldehydes	0,035	0,012
Ammonia	0,3	0,1
Arsenic	-	0,003
Cadmium	-	0,00002
Chlorine	0,1	0,03
Chromium	-	0,0015
Nitrogen dioxide	0,3	0,1
Sulphur dioxide	0,75	0,25
Phenol	0,1	0,03
Hydrogen sulfide	0,015	0,008
Carbon oxide	6,0	2,0
Oxidants	0,1	0,003
Lead	-	0,0007
Sulfur suspension	0,03	0,012
Particulate matter	0,5	0,15

In terms of pollution, traffic arteries sections with high emissions (carbon dioxide, nitrogen oxides, volatile organic compounds and particulate matter) are: Three Cris Street, Decebal Blvd., Independence Street, Dimitrie Cantemir Blvd., Magheru Street, Republic Street, Unirii Square, Dacia Bridge.

In terms of pollution, intersections that have caused the highest pollutant emission values are:

- Dacia Blvd. - Eroul Necunoscut Street;
- Decebal Bridge –Menumorut Street - Sf. Apostol Andrei Street;
- Nufarului Street – Ogorului Street;
- Dimitrie Cantemir Blvd. – Sucevei Street;
- Republicii Blvd. – Louis Pasteur Street;
- Calea Clujului – Ogorului Street;
- Independentei Square.

Regarding noise, according to noise map prepared for Oradea, values above those allowed by law are due to traffic and are recorded along the following streets: Borsului, Densusianu, Podului, Matei Corvin, Aradului, Ogorului, Clujului.

The proposed measures in the "Plans of action for noise reduction" are:

- introduce of a traffic management;
- limit the tonnage and/or speed on certain streets or streets sections;
- set new pedestrian areas;
- larger green surrounding spaces around dwellings;
- green spaces with hedges along traffic arteries;
- avoid placement of new houses near the railway alignment;
- rehabilitation of runway tram;
- renewal of transport fleet;
- rehabilitation of road infrastructure.

OBJECTIVES TO EXCLUDE:

OBJECTIVES WHICH REQUIRE TO REDUCE THE SCALE/SIZE:

OBJECTIVES FOR WHICH THE SCALE/SIZE SHOULD BE MAINTAIN:

- set new pedestrian areas;
- rehabilitation of railways tracks (also grassing of embankment);
- rehabilitation of streets infrastructure.

OBJECTIVES WHICH REQUIRE TO INCREASE THE SIZE/SCALE:

- green spaces with hedges along traffic arteries;
- renewal of transport fleet;

OBJECTIVES TO INTRODUCE:

- accept within the city only investments that prove able to protect the environment;
- carry out punitive actions against polluters;
- acquisition of non-Euro vehicles - extra charged.

VI. Discipline the planning of buildings areas

a) Management of urban sprawl – in what way have to be managed the all city's constructions.

- It is recommendable the restriction of urban expansion: to be fixed a "belt" which surround the city in order to delineate it from rural area; the belt that can not be overcome on demographic reasons, not for economic reasons.
- It is necessary to strictly denote the city's neighborhoods (by categories such as: residential, industrial, commercial, cultural, recreational and agricultural possibly).
- It is required that any type infrastructure construction not only encompass the areas for motorized access routes, but areas for cycling, walking and green spaces.
- For a more transparent decision process is necessary to establish without doubt areas where local authorities will provide the infrastructure and utilities.
- The municipality will establish an urban growth rate expressed as a percentage, which determines how many new homes or how many square feet of commercial/ industrial spaces will be allowed in a year (depending on the rate of development will be determined number of construction licences) if realities lead to a greater number of applications for construction licences than the rate established will develop a multi-criteria where points are awarded for the design, surrounding green spaces, link to the treets network etc.

From the perspective of organized transport or only independent human trips these objectives:

- preserve for a long time the neighborhoods' specificity and therefore determines the **intensity of service activity** (which may be zero - if threshold is insufficient to support service activities);

- stabilize the **transport routes** – about what it can be a priori said if they will be dedicated or available only for certain users;
- provide demographic knowledge, that allows the evaluation of the level of investment in mobile means of transport or infrastructure to support the service.

b) Attitude on environmental conservation – what areas have not to be accepted for city's expansion.

- City may allocate funds for the purchase of urban land important from the point of view of environmental protection.
- A variation of this action would be not to buy land in question, but to create conditions for a type of public-private partnership: local authorities and owners sign a contract which states that the owner continues to own the land, but gives in return for compensation, the right of local authorities to develop that land for the benefit of the environment.
- Nearly should not be called into question the establishment of networks composed of natural areas - watercourses through Oradea – for walking and bike tracks (these networks as non-motorized infrastructure systems are a source of oxygen for city residents, as was grounded on college campuses).
- It is recommended to prepare standards on air pollution and environmental with application "from now on": in other words, if a project has a potential negative impact on these standards, it will not be approved unless there are components which demonstrate that measures will be taken to correct the situation.

From the perspective of organized transport or only independent human trips:

- pollution standards relate directly also to fleet owned by transport carriers and private individuals, as a consequence: the orientation of urban carriers to clean transport, not only the purchase of Euro 3, 4, 5 vehicles.
- all in this regard, carriers must establish lines of recreational special routes with special timetables dedicated to round trips in protected areas, routes that usually will not be in the area of interest of passengers urban public transport.

c) Ways to connect the new built neighborhoods' infrastructure

- Oradea Municipality is able to condition the issuance of new licenses for construction depending on the existence of necessary infrastructure: if an area is not served by necessary infrastructure then it will be not approved building licenses in the area until the municipality will have the necessary funds or these will be approved with condition that those carrying out the project to pay for them.

- It is possible to organize a system of incentives for the location of new schools, shopping centers, etc. near residential areas so that they to be accessible without using the car.

From the perspective of organized transport or only independent human trips:

- incremental impact that it has every new building built on the sewerage system, garbage collecting, the traffic, etc. can easily be generalized also on the urban public transport system (SC OTL SA benefits from a kind of subsidy from some hyper-markets);
- establishment of shopping centers for example, in one neighborhood where there are not so many shopping centers will lead to decrease of pressure on the transport system - obviously by decrease the number of trips to other neighborhoods.

d) Encourage the actions in which new buildings respect construction standards. Oradea preserves traces of the past in the architectural landscape internationally valuable; for such areas it should be introduced regulations which to favor the tourism (and conservation: it may provide a variety of grants to owners of these areas to ensure that these buildings will not degrade - eg money for painting/renovating facades, loans without interest or low interest for renovation/rehabilitation).

From the perspective of organized transport or only independent human trips:

- the establishment of "protected areas" can support the reducing of congestion in the center of localities: the draft PUG of Oradea proposed such area;
- by developing the idea, it would allow a system " park and take a bike ":
    - streetscape consists of a central ring route Suceava Street - Magheru Blvd - Petofi Street - Menumorut Street – Decebal Blvd. - fig. II.23.
    - in the "protected area" the entering of private vehicles is done through high taxation but through parking fees reduced to the outer limit;
    - in addition those interested could get a free service for rental bicycles for travel within central perimeter.

e) Techniques trying to promote social equity.

Local administration should reserve money so that investors to include, for example in the residential neighborhoods a number of low-cost houses for those belonging to disadvantaged groups.

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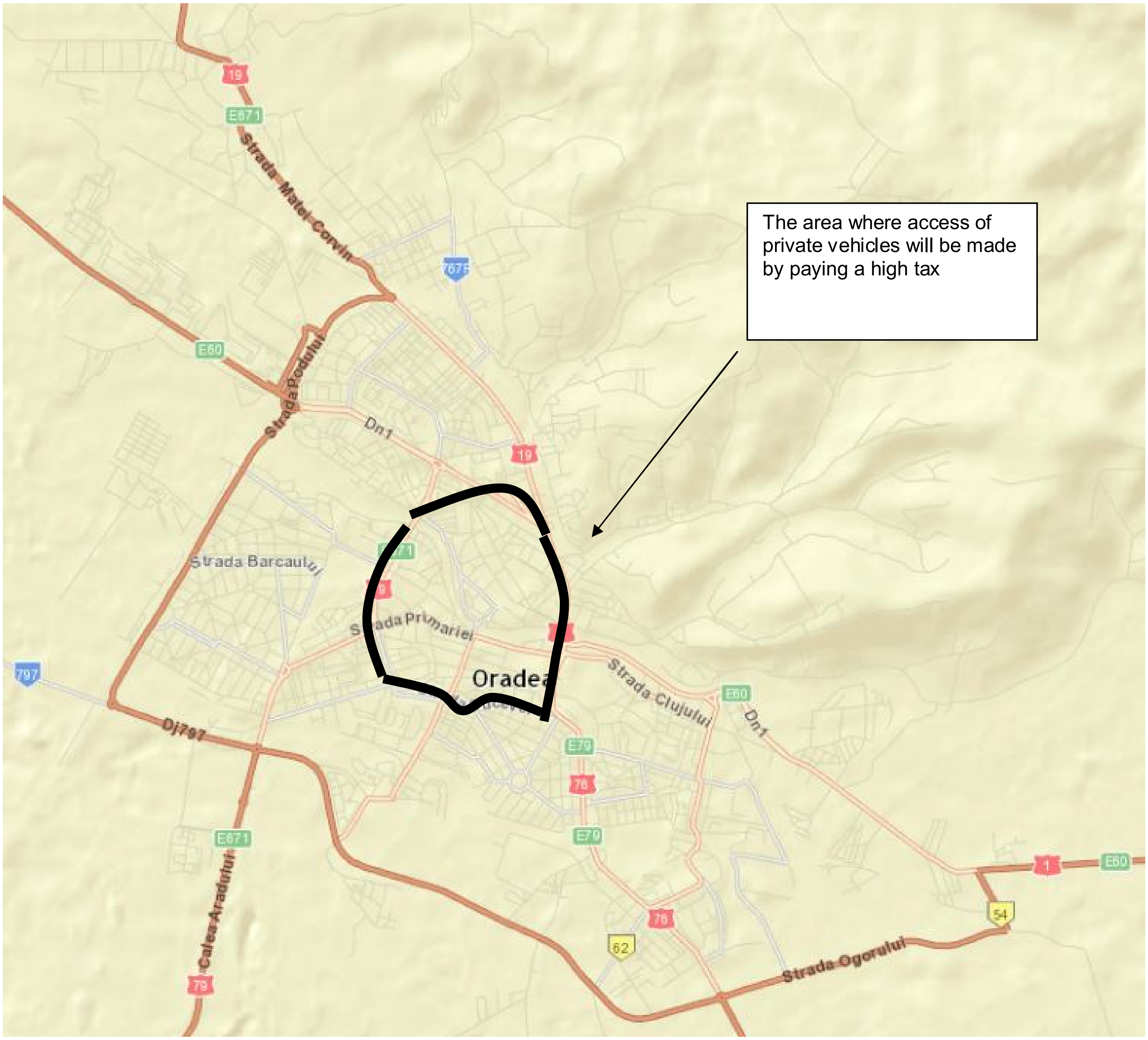

Fig. II.23 – Set the “clean” area of city’s center

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OBJECTIVES TO EXCLUDE:

OBJECTIVES WHICH REQUIRE TO REDUCE THE SCALE/SIZE:

OBJECTIVES FOR WHICH THE SCALE/SIZE SHOULD BE MAINTAIN:

OBJECTIVES WHICH REQUIRE TO INCREASE THE SCALE/SIZE:

- final stabilization of city's ring (20-30 years);
- establish the green networks[28];
- correlated projects to insure the utilities for each neighborhood;

OBJECTIVES TO INTRODUCE:

- obligation to form a tandem construction - infrastructure for motorized and non-motorized access and green space (for any new construction);
- preparation of standards on air pollution and environmental with application "from now on";
- incentives for the location of new schools, health centers, shopping centers, etc. within or near residential neighborhoods.

VII. Parching management innovation („Park and Ride” systems)

Passengers and goods transport within urban agglomerations is a very important to the sustainability of cities, and parkings are inevitable consequence. Parking management is influenced by urban policy as function of the area affecting traffic volume, modal distribution and demand for parking spaces. Suburban parking policy is characterized by the existence of a sufficient number of parking spaces, while in central areas they are in most cases limited especially for those in transit.

Parking problems are caused mainly by the difference between supply and demand. Demand is influenced by the function of buildings, type of area and quality of offered public transport service.

The main objectives of policy parking are:

- reducing the gap between supply and demand for parking spaces. This can be done either by constructing parking facilities (especially outside the roadway) or by changing the modal split in favor of public transport, so parking demand to decrease;

[28] Example: the entire esplanade of Crisul Repede but also for Peta.

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- reducing the gap between supply and demand for parking places by focusing on specific target groups. Ensure parking is given to certain groups of users such as residents or supply vehicles. This means that the other groups (such as those in transit) will find difficulty parking place or will have to pay more;
- in addition, parking policies should attempt to change modal split to ensure sustainable development and improved quality of life for future generations.

To achieve these objectives the following measures can be implemented:
- parking control - for example through the introduction of standards which define the minimum/maximum number of parking spaces depending on the location and function of the area;
- measures for priority groups - without restrictions of time and/or lower rates for residents and businesses;
- encourage the limitation of time parking in central areas of the city; parking a longer duration to be able to do only off-road parking located outside the street or in suburban areas;
- Different pricing schemes depending on the area, with multiple payment options;
- Large fines for violating regulations on parking, vehicle immobilization or lifting;
- Management of parking (cost , number, range, collecting) in order to reduce the availability of parking and thus reduce the number of people who choose to travel to the destination by car;
- Changesof taxes to make the employers to provide benefits in terms of travel costs. For example, turning a parking offered by the company in a space for which the user pays a tax rate would reduce the attractiveness of it and could not convince the employee to drive to work. The settlement of a greater share of travel by public transport to the detriment of the car could increase the use of the train.

Parkings management is a powerful mechanism that can influence how people travel to a location. If there are fewer parking spaces than required, the following solutions are available**:**
- All or part of some users may be charged for use, by day, week, month or year, or fixed fee determined according to criteria such as salary, quality of parking etc..
- Access may be restricted (eg, each employee will have access to the park four days of five).
- Best places can be booked for shared cars in order to stimulate employees to travel in groups.

- Parking spaces may be granted based on certain criteria such as age, duration of transport to work by car compared by public transport, etc..
- Access may be restricted (eg parking works only after 10 am to prevent its use by commuters).
- Employees can be paid in order not to use their parking.

In addition, a location with limited parking places which faces an excess demand can be forced to cooperate with local authorities regarding management of street parking around the venues to avoid overcrowding.

With Oradea Municipality parking services help it was conducted the parking inventory. Total paid parching places, existing at the end of 2012 was 7008, of which 1798 places are limited to 2 hours duration.

Parking spaces are clearly delineated by white or yellow markings that make them easy visible. The rate for the entire city is 2 lei/h and can be paid either to existing parking meters in every paid parking or by purchase parking tickets by from newsstands or by sending an SMS. Short-term parking places limited up to 2 hours are arranged in the center and other crowded areas of the city. They are marked with yellow markings in order to distinguish it from others. However, the rate is the same (2 lei/h) as for the other, with the observation that transport cards are not available. In residential areas, on the alleys between blocks are arranged parking places for neighborhoods with individual houses the parking problem is acute because each such house has ensured at least a place within their court. Central evidence of these is not owned by any local government service.

If everywhere and at any time there would be sufficient available areas for circulation and parking, the private car would be superior to any system of public transport in terms of speed, convenience and the ability to vary the route and to occupy as single a vehicle. These considerations should not be overlooked when by planning urban traffic it is intended to introduce the "park and ride" transport system. The system consists, for passengers, in allowing of trip from home or by private car to boarding point of public transport (where it is possible to park the car up to return), the rest of travel being ensured by public transport on the way to work and back to the

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parking. The appropriateness of introducing such a system, whichl behaves a transition to a public vehicle is very often uncertain. In case the passenger will think he will get an advantage - even subjectively by using all the way his own vehicle, he will try to avoid the restrictions that are imposed and will not use public means of transport. This is the main reason for which the action of finding rules and criteria for making the decision whether to introduce the "park and ride" or not, faces real difficulties. However, in time, parking constraints and circulation of private vehicles in the center of big cities will become increasingly difficult, which will cause the system to become - at one time - a necessity for such cities. The following 18 criteria indicate on which one can assess whether the introduction of a city of the "Park and ride" is appropriate or not.

A. From the point of view of the city and environmental protection

- Monocentric structure of the city.
- Relatively small center with high concentration of businesses.
- The number of residents of the center does not exceed 10-20% of the total.
- The surrounding area relatively densely built, especially including so-called "accommodation centers".
- The area between a circle with a diameter of approx. 6 km overlapping center and the limit where people come to work comprises at least several hundred thousand people.

B. From the point of view of the transport network

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- Proper established timetable as needed, with a maximum of 15 min. between vehicles.
- Public vehicle velocity is at least 35 km/h.
- unitary system charging for all public transport.

C. From the point of view of the streets network and parking spaces

- The ratio between the number of people using private cars and public or private parking places of car parks available in the center is about 2:1
- Limited number of streets with high capacity (no urban freeways).
- Usually occurring of traffic crashes (stops of 3 ... 5 min) in some points.
- Travel by own car from the center to the city's suburb, or vice versa, takes about as that made by the public transport system.

D. From the point of view of parking lots allocated to the system

- The parkings are temporary (and behave good visibility of entry and exit).
- The parking is equipped with repair shop and fuel supply.
- Minimum capacity of 50 seats per location (to provide minimum initial 5-10 points organized at the boundary between the central area of the city and the rest of the city).
- Possibility to park the car in unorganized way in many places is restricted and even punished.
- Installation of a system of signs in parking, possibly indicating the occupied places and the possibility to drive around them.
- Continuous propaganda for "park and ride".

Based on the exposed premises, the assessments on the viability of the system are:

- if less than ten premises are fulfilled, the system will not be viable;
- if 10 ... 12 premises are met, the system will be viable, but will not reach a volume which help decongest traffic in the center;
- if there are satisfied more than 12 premises, the success of "Park and Ride" is most probably assured.

Some features exclude from the first the viability of "Park and Ride" sustainability, for example, **if public transport is performed by trams which doesn't use a separate lane of traffic and**

therefore whose punctuality is not assured[29]. An indirect favoring of this system is to establish a tax system on vehicles according to mileage or **by a graded parking fees outside parkings of the system** so as long time stationary in the center of the city to be very expensive. Besides these methods, of course the system would be enhanced by setting in the downtown of an pedestrian area defended against noise and gas pollution. For Oradea, there was found to fulfill the criteria:

- A 1, 2, 3, 4
- B 6
- C 10, 11, 12
- D 13, 16

Means, 10 of the specified above criteria are met. It is to be noted that some of the criteria, ie B 8 and D 18, can be added with relative ease, leading - to limit - to advantageous consequence:

- it is not excluded at all the implementation of the system;
- taxation measure is diffcult to discuss, but to grade the parking is perfect feasible, **that means there are favorable conditions for action to be initiate.**

OBJECTIVES TO EXCLUDE:

OBJECTIVES WHICH REQUIRE TO REDUCE THE SCALE/SIZE:

OBJECTIVES FOR WHICH THE SCALE/SIZE SHOULD BE MAINTAIN:

OBJECTIVES WHICH REQUIRE TO INCREASE THE SCALE/SIZE:

- Municipality should develop a decision to reduce the possibility of parking on the carriageway;
- the restructure of parking system (by introducing a progressive type of payment as time goes on, differentiated on peak hours and off peak hours and even on target groups - for example, small capacity vehicles the tax may be reduced);

OBJECTIVES TO BE INTRODUCED:

- allocation – in case of public institutions - of parking spaces for their employees should be done on the principle of distance from the institution;
- regulate the "park and ride"transport system.

[29] This will ne a measure required by SUMP.

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VIII. improve road safety

Road safety is defined in the legislation as lack of dangers on the roads; road safety is a sense of calm and confidence for traffic participants, as drivers, passengers or pedestrians, in order to know safe from danger. To have this sense each must act both in the direction of increasing their safety, and the fact that their actions must not jeopardize the safety of others.

Any unpleasant traffic event involves road expenditures, not just for those that produce it, but for all others who are directly involved in the event and even for the local authorities and for companies that manage street furniture. The local public transport carriers suffer damage that must be covered (vehicles, the pillars of networking, the shelters, the infrastructure, the station signs, etc..). Sometimes road events end people's lives or affect health. These events and other unpleasant social consequences: medical leave, disability, depressions, decreased ability to work.

In recent years, the EU has been involved in improving road safety (especially) the so-called passive safety: dampers, belts, brakes, lighting. The target of "The White Paper on European Transport Policy for 2010" is the 50% reduction of road accidents. Here's an excerpt from the document: "In Europe, the price paid for mobility is still extremely high. On average in each of the first twenty years of the millennium, road accidents killed over 40,000 people in the EU and 1.7 million were injured. One person in three will be injured in an accident at some point in his life." The cost of accidents, directly measurable, is 45 million euro per year. Indirect costs are three or four times higher; the annual value is approximately 2% of the GDP in the EU.

Every EU citizen should be able to live and to be able to move in urban areas safely and securely. When walking, cycling or driving a car or truck, people should have to do this with minimal risk. This requires a good design of infrastructure, especially at intersections. Citizens are becoming increasingly aware that they must act responsibly to protect their own lives and to protect the lives of others. Factors that cause a high degree of traffic safety and to be encouraged are summarized below.

Attention. Vehicle drivers must be tested (not to be tired, or under the influence of alcohol) before being allowed to drive.

Respect traffic rules. When employing on the driver position, candidates must be tested in terms of the theoretical and practical knowledge of road laws. Also, this check is done periodically.

Professionalism. It is not enough that a driver of public transport vehicles to have theoretical and practical knowledge on road laws and its implementation. A driver of the vehicle has to have "professional conscience". Therefore, when hiring, they will follow a psychological test. Especially board crew is working with the public, which is itself a stress. Stress can easily lead to inattention and from there to an undesirable event, there is only a small step.

Preventive driving. The notion itself is included in the road laws. All vehicle drivers know what law provides in chapter of preventive driving. These provisions must be applied every second vehicle when the driver makes his profession. Therefore, at the departure, the dispatcher who allows the driver to get into the vehicle, will remind him not to forget to apply these rules.
Concerning driving, the concept of preventive behavior involves effective self-control on own behavior so that it can be successfully avoided the own mistakes, and also the ability to anticipate and cancel the negative effects of errors committed by other drivers. Civilized road behavior is based on accurate knowledge of traffic laws. Strict observance of these regulations is the main condition of preventive behavior.

Modernization and development of road infrastructure (signs, signals, tracks trams, contact network) and implementing of ITS (Intelligent Transport Systems) are necessary measures in this stage of development of transport in order to reduce the risk of accidents.

Sometimes unwanted events occur due to inadequate technical condition of infrastructure. Technical responsible of public transport operators must carry out all necessary steps to convince policy makers on the need for modernization of road infrastructure.

One of the major causes of the events traffic is heavy traffic, and the lack of prior information of drivers about the situation along the route on that they will have to go. Congestion in the streets creates bottlenecks, drivers get mad, rushing, attention decreases and the result is the increase in the number of accidents.

STI is vast and still finds new and new applications in the field of transport. One of the STIs subsections which through implementation can substantially reduce unwanted traffic events is car park management:

- geographic information systems through GIS (Global Intelligent Systems). An example is the location of all vehicles not more than 800 m from a certain geographical position. This system allows the dispatcher to warn his vehicles on issues such as: traffic too crowded or an accident in the area and request the intervention of vehicles in close proximity, etc.. This contributes to traffic congestion and thus reduce the risk of accidents.
- software for transhipment operations. Such programs allow passengers to know exactly what are the transhipment possibilities, which is the most appropriate route to reach the destination, where to get , what to do, etc.. Provide information to passengers, they will be satisfied, will be calmer, more attentive, they will not pass through dangerous places and finally they will expose less to risk of accidents.

The main factors affecting road safety in Romania are:

- traffic jams;
- physical and mental condition of road users;
- poor state of roads, ie. unfinished road works;
- inappropriate signaling works;
- insufficient street lighting;
- damage road traffic lights and even the lack of road signs.

On a mileage of 5,072 square km in 2009, traveled by public transport means of SC OTL SA, most events were due to technical defects which caused traffic crashes. Thus, there were 548 defective trams on the rails, 1241defective buses in traffic, which totaled a total of 135 hours of immobilization. Other types of traffic events recorded during 2009 of SC OTL SA means of transportation were:

- derailments 15
- damages of contact network 11
- crashes between trams and other vehicles 117
- crashes between buses and other vehicles 9

but also:

- accidents with injuries 12
- fatalities 2

Of all road events that may cause road accidents, person's accidents are always the worst, even if the accident resulted in "only" slight injuries. In Oradea, in 2009 (the latest year for which statistical data are available) and considering only the accidents which involved local public transport operator, the situation has registered 12 cases (about 4 cases per million km. traveled). The average cost of an person's accident is very difficult to calculate because besides actual costs of repairs of damaged vehicles there are hospitalization costs, costs of sick leave, cists for trail, costs of hiring and training replacement staff (if it is necessary) and costs of recycle after each accident (especially when guilt belongs to operator staff).

Among the major causes of road events are: excessive speed, inappropriate distance from the vehicle in front, irregular overtaking, wrong maneuvers, driving of defective vehicle, driving under the influence of alcohol, driving in fatigue, driving in a state of aggression. Also, the combination of heavy traffic, violation of the traffic rules and the weather is an important cause of the events. Bad condition of roads leads to several traffic events. Aggression is one of the causes that lead to ignorance and non-compliance of legal provisions on public roads, rules of conduct preventive and increase the number of road events. One of the main causes of aggression is frustration. There are multiple sources of frustration:

- slowness of traffic when you are in hurry;
- danger represent by other road user who do not give priority (especially when you are entitled to receive);
- inadequate roadway stationing of large vehicles;

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- another vehicle incorrectly exceeds you
- a road user or a passengers, verbally assaulting you or otherwise;
- inappropriate pedestrian crossing in places without to ensure;
- pedestrians who cross through allowed places, but do it with a slowness that seems to defy you;
- roadway (slime, ice), etc..

These are situations that those who drive a vehicle encounter routinely. The question is why do not all react by acts of aggression and that why the drivers who do this, do not proceed the same every day. The answer to this question is the fact that the relationship between frustration and aggression is an automatically direct relationship. This means that not always when there is a situation of frustration occurs unconditionally a manifestation of aggression, so not just any frustration produces aggression. Importantly, the level of frustration that can be caused by some extreme situation to which the driver of the vehicle is exposed or may be the cumulative effect of several cases of this kind.

Another element to be taken into consideration is the threshold of tolerance to frustration of the driver or in other words, low inhibition and thus inappropriately control of self behavior in such situations. Low tolerance may be caused in some cases by a state of irritability and nervousness of the driver of the vehicle caused by family conflict situations or superiors or simply other discomfort such as health, torrid heat, too much noise etc.. The objective of urban transport operators is to help to find some mechanisms to protect their adaptation and situations that might cause them to lose firm self-control of behavior.

Fatigue leads in most cases to an accident or other easier event. Fatigue can be defined as temporary discomfort, caused by excessive or prolonged activity. The main feature is manifested by decreased functional potential of the body. Fatigue reduces exercise capacity and mental capacity or attention concentration or its distribution. Fatigue is a major risk factor in modern traffic. The feeling of exhaustion as a fatigue feature alters major neuropsychiatric and motor constant reactive. A tired driver will not be able to analyze traffic intensity, the position of the vehicle in a given situation, which would allow him an immediate decision to avoid a dangerous situation.

Other causes of fatigue (except of excessive or prolonged activity):

- a reach meal, indigestible food (food abuse induce sleepiness sometimes hard to beat).
- noise pollution - surpassing approx. 65 dB (high blood pressure occurs, feelings of dizziness, decreased field of vision).

Another way of manifestation of fatigue is "depression." In this state, the activities undertaken are slower, hearing declines, vision can become blurred. Prior depression disorders are pessimism, negativity, and lack of interest for activity. Dispatchers have a duty to stop to drive those drivers of vehicles who experience these symptoms. If at the moment of shift, a driver of the vehicle shows such a state, he will be sent to recover (sleep, rest, enjoyable recreational activities).

Measures and directions for prevention events affecting road safety can be divided into:

- technical;
- organizational;
- psychological (and medical).

Briefly technical measures are:

- technical inspection;
- improve the technical performance of vehicles;
- provide an intelligent communication system with dispatch center which gives the driver the assurance of a competent and prompt assistance in case of need;
- repaire and upgrade roads and the rest of the infrastructure;
- create a pleasant working environment in-cab (easy access to controls; damping of vibration and noise, modern design).

Some of the organizational measures that can be taken to minimize the risk of traffic events are:

- strict limitation of working hours for drivers;
- compliance with minimum breaks at the ends of the route, at the middle of workday;
- daily inform of drivers to adapt to weather conditions;

- avoid setting routes on narrow streets;
- create traffic lanes.

In terms of psychological and medical measures: improving of the operational behavior of drivers in order to reduce events and increase road safety are the main objective pursued by teams of psychologists of psychological laboratories serving the public transport operators. The activity of "improving of behavior" is held individually. The stages of activity are:

- Identify and taking into account the cases that require treatment.
- Study the information on each case. Psychologist forms himself a picture of the "case" after that, depending on the situation, he establishes the approach that he will have in the relationship with the patient.
- Investigation of maladjustment factors involved: personal, social, professional, family.
- Psychological assistance itself. It covers a period of several months in which the driver of the vehicle, together with psychological sessions will be kept under observation, his behavior is continuously monitored.
- Issue the final opinion accompanied by the psychologist’s recommendations based on the evolution and results of each case.

According to data provided by the Police Inspectorate - Bihor Road Police, on Oradea territory there is no "black spots" (areas with high rate of accidents resulting in serious road accidents with deads or serious injured). Streets with the highest number of traffic accidents in 2012 were Ogorului, Cluj and Decebal. Full situation is shown in the following figure:

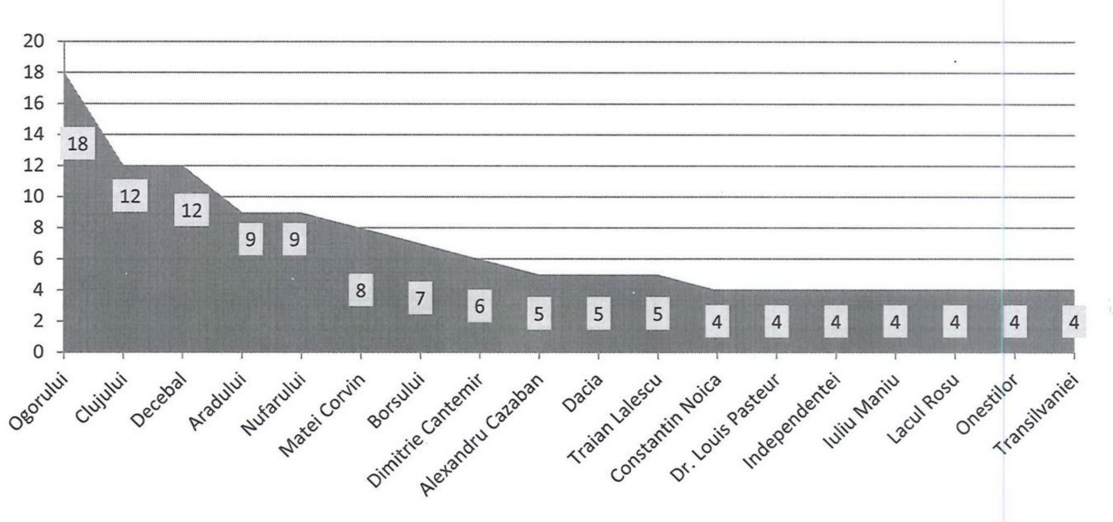

Fig. II.24 - The streets that occurred most accidents in 2012

The first two streets in this ranking (Ogorului and Cluj) have a higher speed limit than other streets of the city, which explains the higher number of accidents. These are followed by the main streets of Oradea, where the risk of accidents occurs mainly due to high traffic flows, and points of conflict between motor vehicles and tram rails that is either on the side of the street or in the middle of it (hence the large number of intersections between tram and vehicles).

In terms of streets infrastructure, the main points of conflict generating potential accidents are shown in the following figure.

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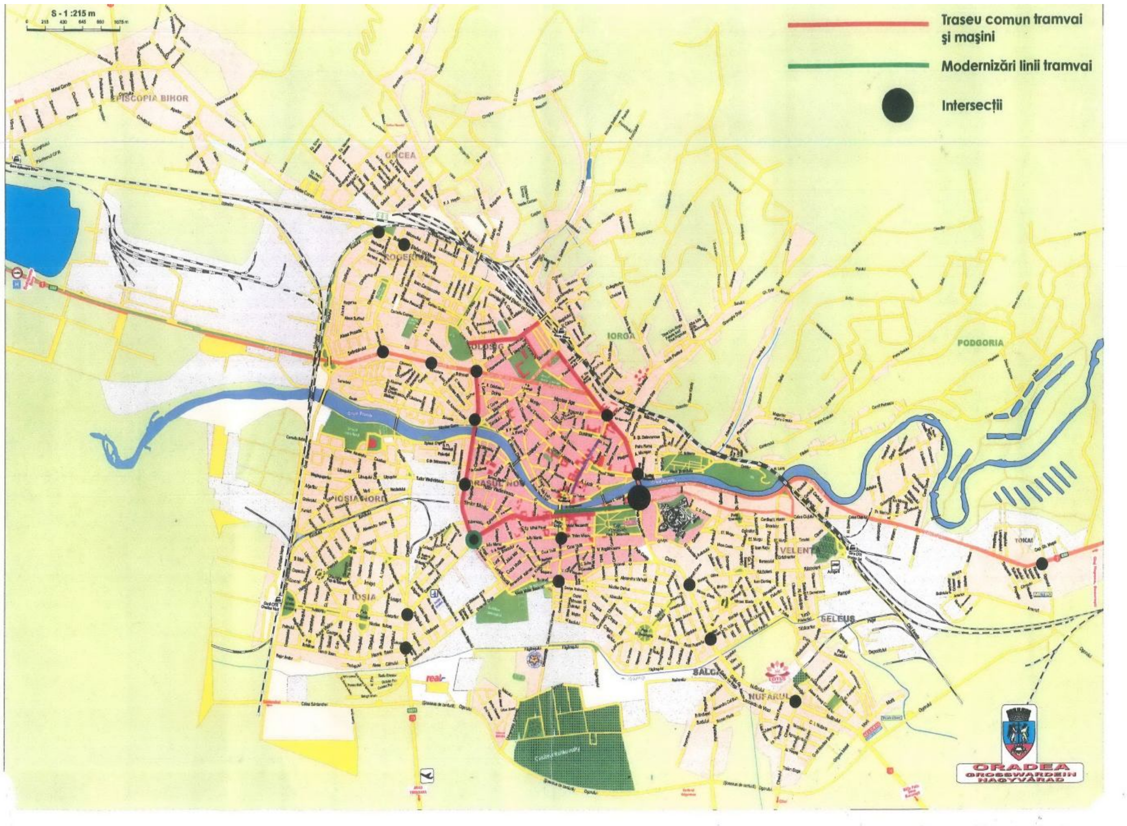

Fig. II.25 - The main points of conflict

OBJECTIVES TO EXCLUDE:

OBJECTIVES WHICH REQUIRE TO REDUCE THE SCALE/SIZE:

OBJECTIVES FOR WHICH THE SCALE/SIZE SHOULD BE MAINTAIN:

- the local authority should prapare a plan to design, redesign and to improve streets infrastructure and trams infrastructure;

OBJECTIVES WHICH REQUIRE TO INCREASE THE SCALE/SIZE:

- the main shareholder of SC OTL SA should introduce higher standards regulation for public vehicles;
- the periodical analysis of „becoming black spots” from SC OTL SA perspectives;

OBJECTIVES TO INTRODUCE:

IX. improve city's infrastructure

At the beginning of XXI century humanity is confronted not only with the problems arising from population's growth, but also the problems arising from the process of urbanization and socio-economic activities in urban areas. One of the main consequences of this phenomenon is the increasing needs for transport of goods and people. Today transport problem arises because new forms of satisfying travel needs of safety, speed, comfort, economy and environmental protection. Compliance with these requirements of travel contradicts mainly with:

- infrastructure, designed and built in the past that no longer meet the present standards, and the more future period;
- lack of funds due at the moment, to economical state;
- desire to preserve the buildings and the impossibility of enlargement of streets arranged along major traffic flows.

For the future it is expected that traffic needs of road traffic and transportation to grow due to two important factors:

- increase the level of motorization;
- increase the mobility.

Taking into account the need to meet current needs, but especially those of the future, urban traffic organization which aims to provide transport functions of goods and people, gets priority because:

- transport of goods are required for both the production and service activity, and to supply the city with consumer goods necessary to population;
- passenger transport should be a priority, especially to meet the needs of traveling in home-workplace relation, as the difficulties encountered in this area have repercussions on production activity and thus the economy in general.

Transportation and urbanization are an interactive system in which the two elements influence each other. This seems obvious, but due to the interaction between transport and urban development is difficult to make quantifications due to the complexity of urban mechanisms that do not allow to isolate causes and effects.

The process can be described simplified by three main considerations:

1). *transformations of spatial structures* made either by extending (development along axes or by creating of peripheral housing areas) or urban tissue thickening (the volume and distribution of travel needs are changed);

2). *to satisfy the needs of traffic* involves to create an infrastructure to make more affordable and more attractive some areas of urban space;

3). e*ach action* (locate the urban functions or create road infrastructure) triggers effects that change the state of the system, satisfying a need or creating a new need or reviving an existing situation.

Rapid transformation of the spatial distribution of residential areas and those with production and service makes changes in geography of origin-destination trips, the traffic flow intensity and length of trips.

In principle, governments seek to create infrastructures and transport means to cope with increasing traffic needs, but the increase of demands for transport of people and goods is generally accompanied by a close adaptation of the transport system in the sectors most required of the urban system. Constraints that arise are due to: limited resources, high costs for the infrastructure of urban transport, political, administrative and institutional obstacles, opposition of neighboring collectivities.

The considerations presented above lead to the need to correlate actions with the systematic upgrading of urban traffic networks, both must be based on detailed studies.

Because of this fact there is a need of a major road networks to ensure high traffic volume and proper speed, located in the vicinity of major urban units of a **penetration-diffusion network** situated inside these units in order to ensure local traffic access characterized by size and low speeds. Thus arises the need for a new organization of cities in order to face these problems of different categories of transport. In these circumstances it occurs the issue of execution of large arteries, the systematization of intersections, the execution of bridges, overpasses, etc.. THE TRAFFIC THERAPY IS DETERMINED ON THE BASIS OF DIAGNOSIS AND PROGNOSIS:

- Development and improvement of road infrastructure
- Technical equipment required to guide traffic
- Organize traffic carrying

Movement therapy is a systemic analysis with the multifunctional objectives in order to ensure operational, technical, economic and social efficiency. The major objectives of the study of traffic therapy:

- ✓ the overall network of traffic and connection to city's borders
- ✓ general traffic in areas (sub-areas)
- ✓ arteries and streets of different functional categories
- ✓ parkings, garages and supplies for traffic
- ✓ intersections, hubs and traffic square
- ✓ passages
- ✓ pedestrians and cyclists

In terms of Oradea's infrastructure recently conducted traffic studies concluded:

- The scheme depending on which is organized the main network traffic in Oradea is one of the radial type, with five main directions (DN 1 - to Cluj Napoca, respectively Bors; DN 76 - to Hunedoara; DN 79 - to Arad; DN19 - to Satu Mare) and the circulation tends to focus on a few major arteries cross the central area of the city.
- Relation between traffic load and inadequate transverse profile of streets leads to overload or lack of use (streets of minor importance, no transit traffic but oversized streets). Interruptions of important links for traffic network and the deflection of traffic lead to overuse of links and intersections. Tortuous route, improper angles and overlapping traffic of cars, heavy vehicles and public transportation creates blockages and bottlenecks.
- Lack of city ring road in the north- ast make transit traffic (for these directions) to be conducted on city's streets, with negative effects on streets infrastructure, environment noise and emissions) etc..
- Lack of city's ring which also serve as link between villages of OMA leads to high values of traffic on the city streets.
- It is also worth to note that there is no developed network of bike tracks, the existing ones are not connected, thus there is a no continuity of movement .

- Oradea pedestrian areas are few (a pedestrian area on a section of Republicii Street and a few along the banks of Crişul Repede).

The measures that can be applied to improve the infrastructure are:
- Construction of new streets, primarily the city ring which also serve as link between villages of OMA;
- Streets widening, changes of curves, etc.;
- Change the geometry of intersections to increase the level of service;
- Construction of passages;
- Build bike tracks and pedestrian areas;
- Construction of pedestrian passages.

OBJECTIVES TO EXCLUDE:

OBJECTIVES WHICH REQUIRE TO REDUCE THE SCALE/SIZE:

OBJECTIVES FOR WHICH THE SCALE/SIZE SHOULD BE MAINTAIN:

- develop a network of byke tracks;

OBJECTIVES WHICH REQUIRE TO INCREASE THE SCALE/SIZE:

- promote a program of reconstruction of some elements of streets infrastructure (street widening, change the curves, change the geometry of intersections to increase the level of service, etc.);

OBJECTIVES TO INTRODUCE:

- develop projects that aim to increase the network capacity of main network of streets – beginning with streets that now have the lowest capacity to take over the traffic flow.

X. develop the public local transport system:

- **support (depots)**

The preparation of transport means (or only their parking during activity’s interruption) is not done - in public transport - by distribution of tasks along the network. To prepare means is necessary to exist a concentration of activity centers. The idea of unspread activity involves problems of internal organizational of transport service stations, as **it has to be chosen locations in wich concentration will be done**, and also the structure of these locations. In transport efficiency, an important role is that of the location of all targets in transport activity, location which is based on the following considerations:

- ✓ technical (access roads, the existence of electric power network, sewer and water);
- ✓ economic, which are based on reducing the distance between the points of parking and boarding-unboarding of passengers;
- ✓ urban and sanitary, which take into account the chemical and noise pollution and ensure proper mobility of pedestrians.

Organizing of a carrier required the existence of subunits: depots (plant type), sections and workshops for maintenance and repair and, in some cases, specialized schools and training (and still: exercise polygons, lines testing, design and modernization bands, etc..).

The most representative unit of transport operators is the depot. Depot is a subunit of economic production, without legal personality, with the objective of organize the transport of general urban park provided. Location of the depot will be in an area with great transport requests, respecting standards on distances of surrounding targets set by systematic rules. Objectives depot (depot) are:

- maintenance, scheduling, highlighting, guidance of vehicle’s activities, performing transport tasks and regularity of service,
- establish the tasks of plan and observe the achievements on routes and board staff,
- observe and highlight the fuel comsumption,
- highlight the way to use working time of board staff and the calculation of wages for them.

These general consideration are necessary in order to understand the situation (espeacially) of Nufarul-Salca Depot. Simplified, the scheme for the sole depot infrastructure of the city look like in Fig. II.26, which in terms of graphic summarize the following operational representation:

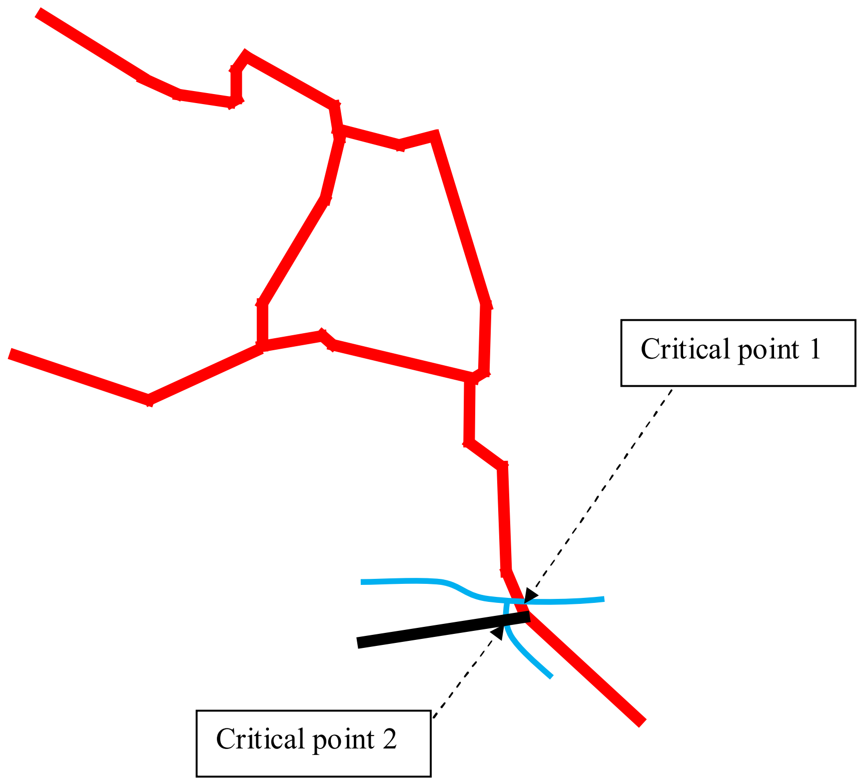

Fig. II.26 - Graph of tram network including the link with the depot

Although it seems that the network is decisive for urban public transport service of passengers, the entire infrastructure of Oradea analysis shows that there is an accumulation of critical situations that can transform the current operation in a failure, not only by the existence of a single location in which are parked the vehicles of local transport operator, but by the existence of a single link between the tram depot SC OTL SA and assembly lines served.

In other words the tramway network and the vehicles access to transport network are one and the same problem - at least in the south of the city. In this context: it is required a second exit from the depot in the context in which it is analyzed the graph in the figure above in terms of viability – the probability that critical points 1 or 2 (which in mathematics means sum of probabilities) to become insurmountable does exists and public transport service is impossible.

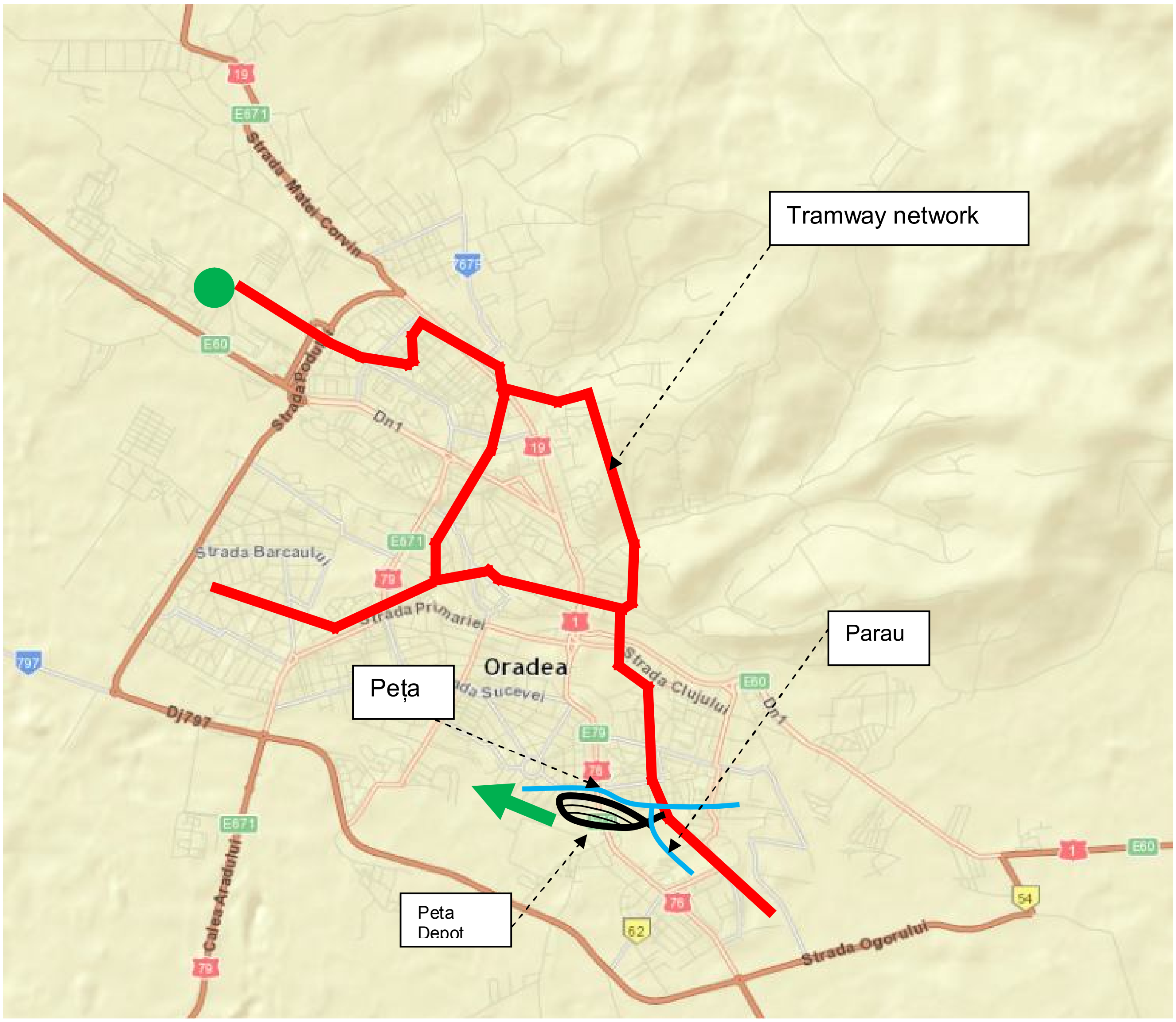

Fig. II.27

Corroborating this finding with topographical situation of the south area of the city, respectively with the depot device lines, result that the new exit has only one position: towards west, in diametrical location of current exist to the current location diametrically = green arrow in Fig. II.27.

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This aspect, of necessity to rise functional reliability of tram depot (trams runs approx. 75% of the passenger traffic of the city) will put its mark on how to restructure the public transport network of the entire city (in this Chapter). Moreover, if the economic revival that municipality expects it will focus on the growth of industrial park from the west of the city, is is possible that a „trams shed" to become useful in the other side of the network: see fig. II.27 - the green dot.

- **Spread support (boarding-unborading stations)**

A stop-start of a bus (with corresponding stationing of approx. 1 min.) induces the same pollutants as the movement on more than 5 km in economic driving of the same bus. Therefore, the **development of a boarding-unboarding stations is a more complex operation** than enrolling of the bus line number. One can imagine a model for the approach of qualitative positions, to determine the range of vehicle, approach based on the expectation theory, provide a detailed analysis of the phenomena that occur in an bording-unbording station. It is found that in a boarding-unboarding station almost all conditions are met in a queuing system:

- passengers' arrival intensity can be controlled by multiplication or reducing the number of boarding-unboarding stations (if the flow for station before an intersection is too large, set another station after intersection; also the serving intensity can be changed by using vehicles with more or fewer doors);
- if there were no costs of waiting, any carrier would organize urban transport process on his lines with large vehicles that run at big intervals; it is found, however, that just the cost of potential passengers' waiting force transport operator to rise the qualitative level through service at rational intervals, in order not to lose the cusomers.

Next, it is accepted the hypothesis that future passengers' arrival follow a Poisson law, and time of service follows a negative potential law; there are S stations. In addition it is assumed that the following condition is fulfilled: if an unit can come into contact with service station, before waiting a τ time, it remains waiting until it is served, regardless of the fact that total waiting time (on route + service time) is bigger τ; if the unit wait a time which is greater than τ and it is not yet in contact with serving station, then, it leaves the system (**the model has undisciplined units**). There are two results due to expectancy theory, which can not be avoided in any alternative to approach the phenomenon regarding the interval between the vehicles:

- the probability that an unit to wait a time that exceeds τ (a unit is a passenger arrived in boarding-unboarding station):

$$P(\tau)=\frac{\dfrac{\rho^S}{\dfrac{\rho^S}{S!\,(1-\frac{\rho}{S})}+\sum_{k=0}^{S-1}\dfrac{\rho^S}{k!}}}{S!\,(1-\frac{\rho}{S})}\,e^{-S\mu\mu\left(1-\frac{\rho}{S}\right)}$$

- the probability that a unit to leave the system at the end of a waiting time at the same τ value (it is done by the following calculation, if $\rho \neq S$):

$$P(\tau)=\frac{(\rho-S)\rho^S e^{\mu\tau(\rho-S)}}{(\rho-S)S!\sum_{k=0}^{S}\dfrac{\rho^k}{k!}+\rho^{S+1}(e^{\mu\tau(\rho-S)}-1)}$$

Obviously, in a system with intermittent service such as the one by independent vehicles which move on a passenger transport route, it will be always waitings. The problem is that the waitings not to cause potential passengers that today to renounce to trip and tomorrow to renounce to system.

There are used the following notations:

λ - the number of arrivals in stations for trip/minute;

μ - the number of servings, meaning the number of completed boarding actions/minute;

ρ - the ration between the above mentioned parameters named the traffic intensity.

There are known (for S = 1):

- the probability that a unit to wait in station a time greater than τ :

$$P(\tau)=\rho e^{\mu\tau(\rho-1)}$$

- the probability that a unit not to leave the system although it waited more than τ :

$$P(\bar{\tau}) = 1 - \frac{\rho(1-\rho)e^{\mu\tau(\rho-1)}}{1-\rho^2 e^{\mu\tau(\rho-1)}}$$

The graphic representation of the two functions (the probability that a unit to wait, the curve has an ascending line, respectively the probability not to leave the system after a waiting time, the curve has a descending line) shows as in fig. II.28.

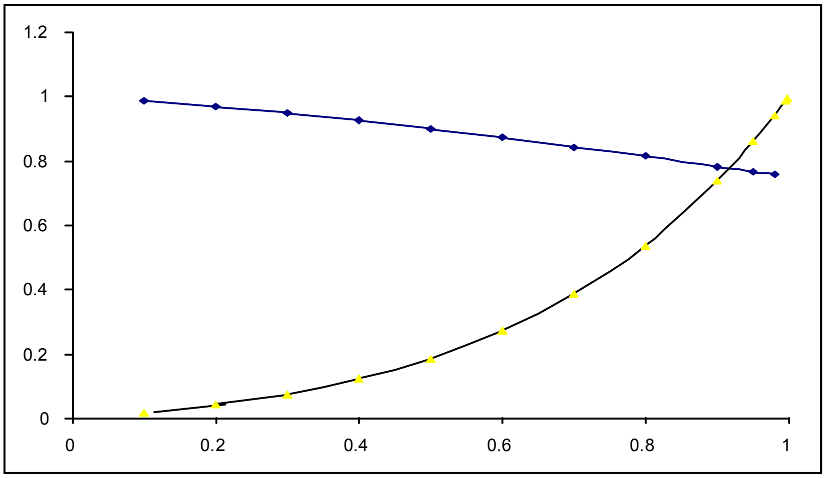

Fig. II.28 - Variation of the two analyzed probabilities along the abscissa (ρ value)

Ideally it would be that in any situation:

$$1 - \frac{\rho(1-\rho)e^{\mu\tau(\rho-1)}}{1-\rho^2 e^{\mu\tau(\rho-1)}} \geq \rho e^{\mu\tau(\rho-1)}$$

Noting the following target: the waiting time τ for the next vehicles to arrive in station to be fixed so as the potential passenger not to renounce, although he waits. Therefore, to give a degree of generality to results, the calculations will be carried in limit case in which $\mu\tau \rightarrow 0$.

The last relation becomes:

$$1 - \frac{\rho(1-\rho)}{1-\rho^2} \geq \rho$$

or

$$f(\rho) = \rho^3 - 2 * \rho + 1 \geq 0$$

and conduct to :

$$0 < \rho \leq \frac{-1+\sqrt{5}}{2} \approx 0{,}618$$

According to graphic representation

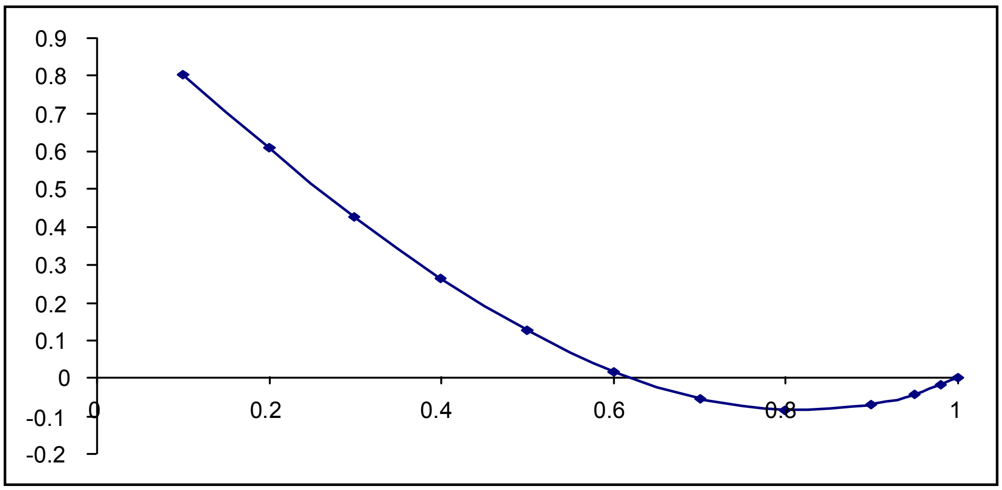

Fig. II.29 – The function $f(\rho) = \rho^3 - 2 * \rho + 1$

results which fix the limit of traffic intensity through station of mass serving:

$$0 \leq \frac{\lambda}{\mu} \leq 0{,}618$$

So, there are arguments in order to consider the value:

$$0{,}618\,\mu \geq \lambda$$

as the limit from which it is no longer possible to decrease the frequency of service without repercussions.

It is necessary to indicate how to interpret the μ parameter of average intensity of servings in relation with **d** value of the effective time to board in the vehicle. Obviously that boarding action lasts only few; more, the diferences between times achieved by passengers are so small, that serving phenomenon should be consider, at first view, as being governed by quasi-uniformity. In fact, the real phenomenon of future passengers serving is achieved in intermittent and variable conditions that already encumbered results and conclusions obtained so far. To lift this ambiguity was used following mathematical artifice[30]:

- it is used a mathematical relation for stationarity = the average number of potential passengers who wait have to remain unchanged, while the arrivals through the (I + J) tracking interval to be annihilated by „boardings” in the vehicle = under the relation (*) which define now a unitary process; in other words, the uninterrupted unitary process which starts in the moment in which a vehicle arrived in station and continue by serving process which run up to doors closing, to leave „behind” the average number of passenger, the number envisaged tin the mass serving theory; at least one of passengers who remained in station will be consider as being in ungoing serving up to next vehicle arrival (**in this way it is lifted the objection of discontinous phenomenon**);

$$\frac{\rho^2}{1-\rho} + \lambda \cdot I + \lambda \cdot J - \frac{1}{d} \cdot J = \frac{\rho^2}{1-\rho} \qquad (\,*\,)$$

- on the other side, the time effective registred for boarding are corroborated with this unusual duration of swerving the ’’last’’ passenger and the average is calculated depending on new statistical population (**in this way it is lifted the objection of not to fit in negative exponential coordinates for servings**); on phases:
  - for a certain λ , there is a μ which arise to λ / 0,618 value
  - ✓ it is noted with N the number of passengers who board in the minute of stationarity of the vehicle in the station;
  - ✓ the interval between succesive arrivals of the vehicles is N / μ or 0,618·N / λ
  - ✓ the real duration for a boarding can be calculated with relation d = 1 / N
  - ✓ the average duration of boarding, in the condition of (*) relation is 0,618 / λ
  - ✓ in order to check it is used the relation:

$$\frac{N \cdot \frac{1}{N} + (\frac{0.618 \cdot N}{\lambda} - 1) +}{N+1} = \frac{0.618}{\lambda}$$

sau

[30]The entire mathematical relation is conceived for a single station of serving.

$$\varphi = \frac{0.618}{\lambda}$$

where φ is the additional time, hypothetical introduced, for the last mentioned passenger, time which is subject of a double limitation (the below 2 value result from the extreme condition, in which i twill be allowed waiting at least the second vehicle for this last passenger):

$$\frac{1}{N} \leq \frac{0.618}{\lambda} < 2$$

equivalent with:

$$N \geq \mu$$

always true (’’the number of real boarded passengers is bigger than average number of passengers considered served in a minute’’), respectively:

$$\lambda > 0.309$$

which conduct to a important consequence: **if the target point as stop station do not induce in system at least 3 passengers at each 3 minutes, it is not recomended to create a boarding-unboarding station.** More explicitly: for 16 hours of service, each way of a relative low line, from the traffic perspective, should bring for 10 stations, for example, a revenue of at least 96*3*10*3 = 8640 lei in order that the service to be acceptable – in condition of subsidy exists. THE ABOVE DISCUSSED IDEA: **create a boarding-unboarding station is not done only on base of civic or institutional demands-pressure, respectively a subject desire**.

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- **network**

A method to identify of „what have unsatisfactory” the current public transport network is that in which it is analyzed also other unfulfillments thereof (unless availability unequally ensured number - not great, but significant of transshipment etc.); and the way to get some of the unfulfillments initiates through a synthesis of the results of network: each route „communicates” the capability by number of trips in an average day of service. **Following thare are the results of transport lines** up to individual values on which the passengers resource is under the significant value: 2880*2 = 5760 trips in 16 hours of[31].

Tram line 1N

Route with single end: Pod CFR end of line –Dacia Blvd. – Corneliu Coposu Street – Olimpiadei Street – Republicii Street – Gen. Magheru Street – Independentei Square – Unirii Square – Primariei Street – Decebal Street – Corneliu Coposu Street – Dacia Blvd. – CFR Bridge end of line.

[31] With an acceptable error of 5%.

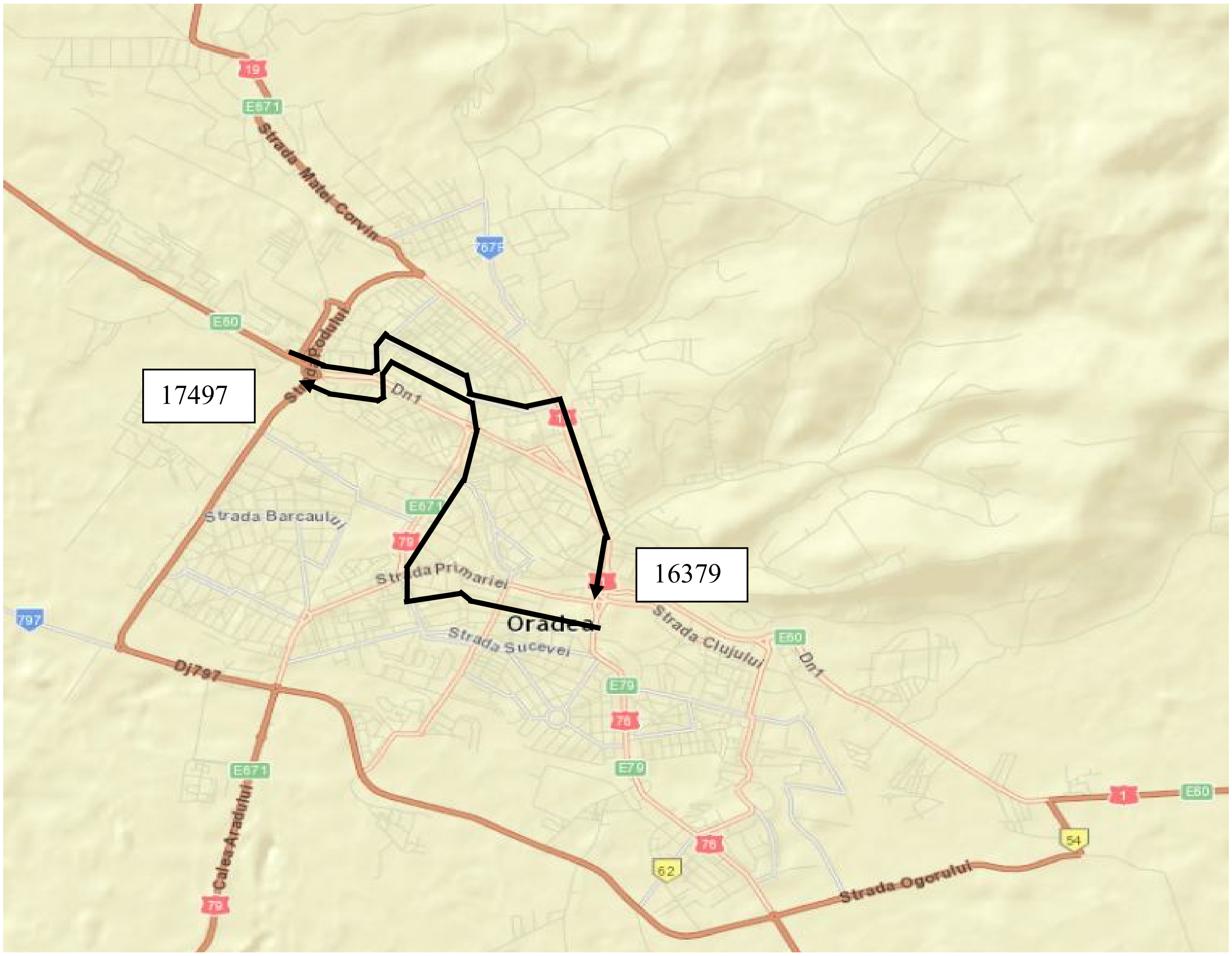

Fig. II.30 – The traffic on 1N line

Service characteristics on tram line:

- 10,7 km
- 11 stations/ one way - 12 stations / back;
- 10 vehicles to peak of demand
- 150 seats/transport unit
- 1500 transport capacity (transported passengers in an hour and one way)

Tram line 1R

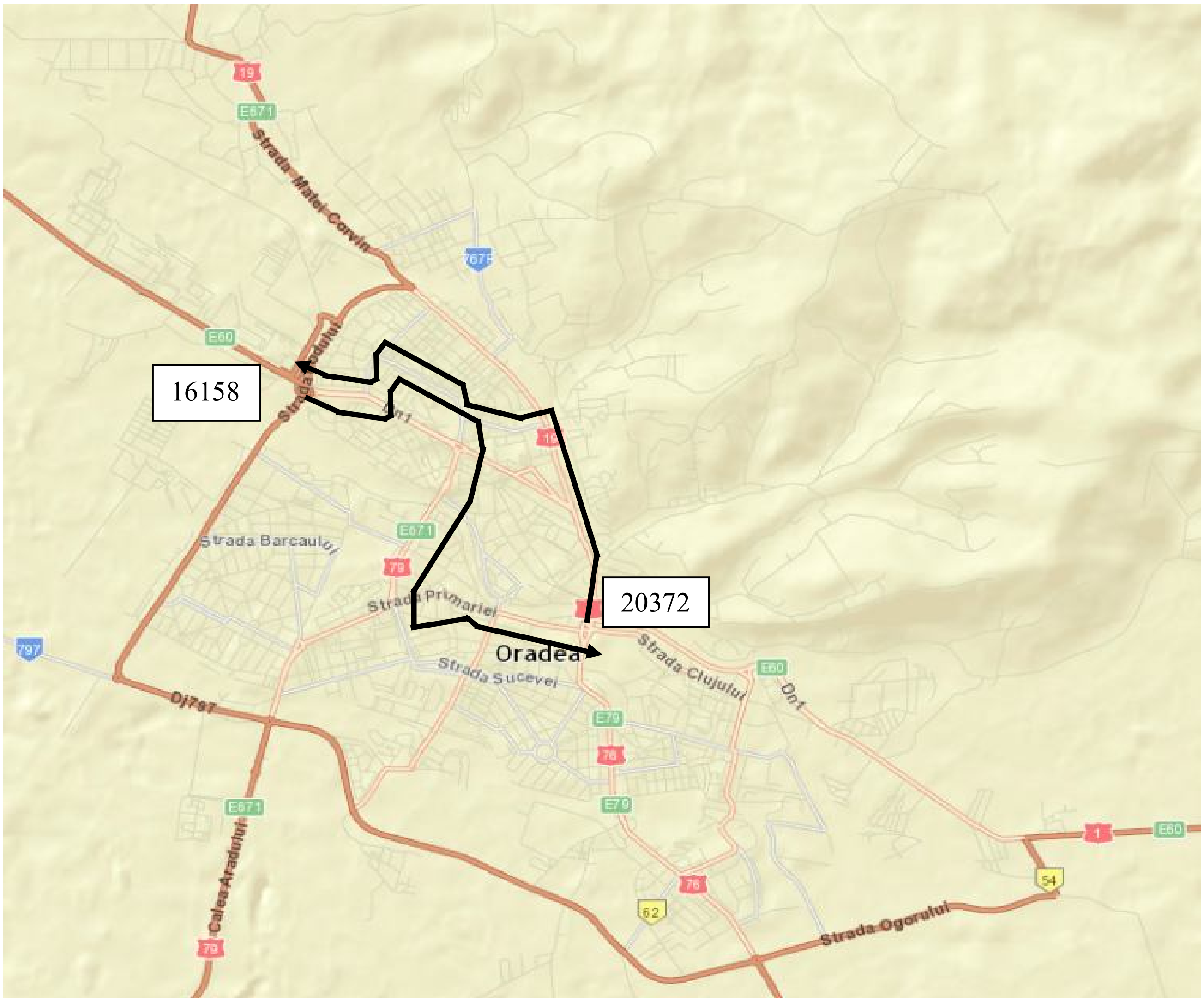

Fig. II.31 - The traffic on 1R line

Route with single end: CFR Bridge end of line – Dacia Blvd. – Corneliu Coposu Street – Decebal Blvd. – Primariei Street – Unirii Square – Independentei Square – Gen. Magheru Street – Republicii Street – Olimpiadei Street – Corneliu Coposu Street – Dacia Blvd. – CFR Bridge end of line.

Service characteristics on tram line 1R:

- 10,7 km
- 13 stations/one way - 10 stations / back;
- 11 vehicles to peak of demand
- 150 seats/transport unit
- 1650 transport capacity (transported passengers in an hour and one way)

Tram line 2

One way: Nufarul end of line – D. Cantemir – Cetatii Square – Independentei Square – Unirii Square – Primariei Street – Calea Aradului Street – Aviatorilor Street – Lipovei Street end of line;

Back: Lipovei Street end of line – Aviatorilor Street – Calea Aradului Street – Primariei Street – Unirii Square – Independentei Square – Cetatii Square – D. Cantemir - Nufarul end of line

Service characteristics on tram line 2:

- 14,5 km
- 17 stations/one way - 17 stations/back;
- 5 vehicles to peak of demand
- 150 seats/transport unit
- 750 transport capacity (transported passengers in an hour and one way)

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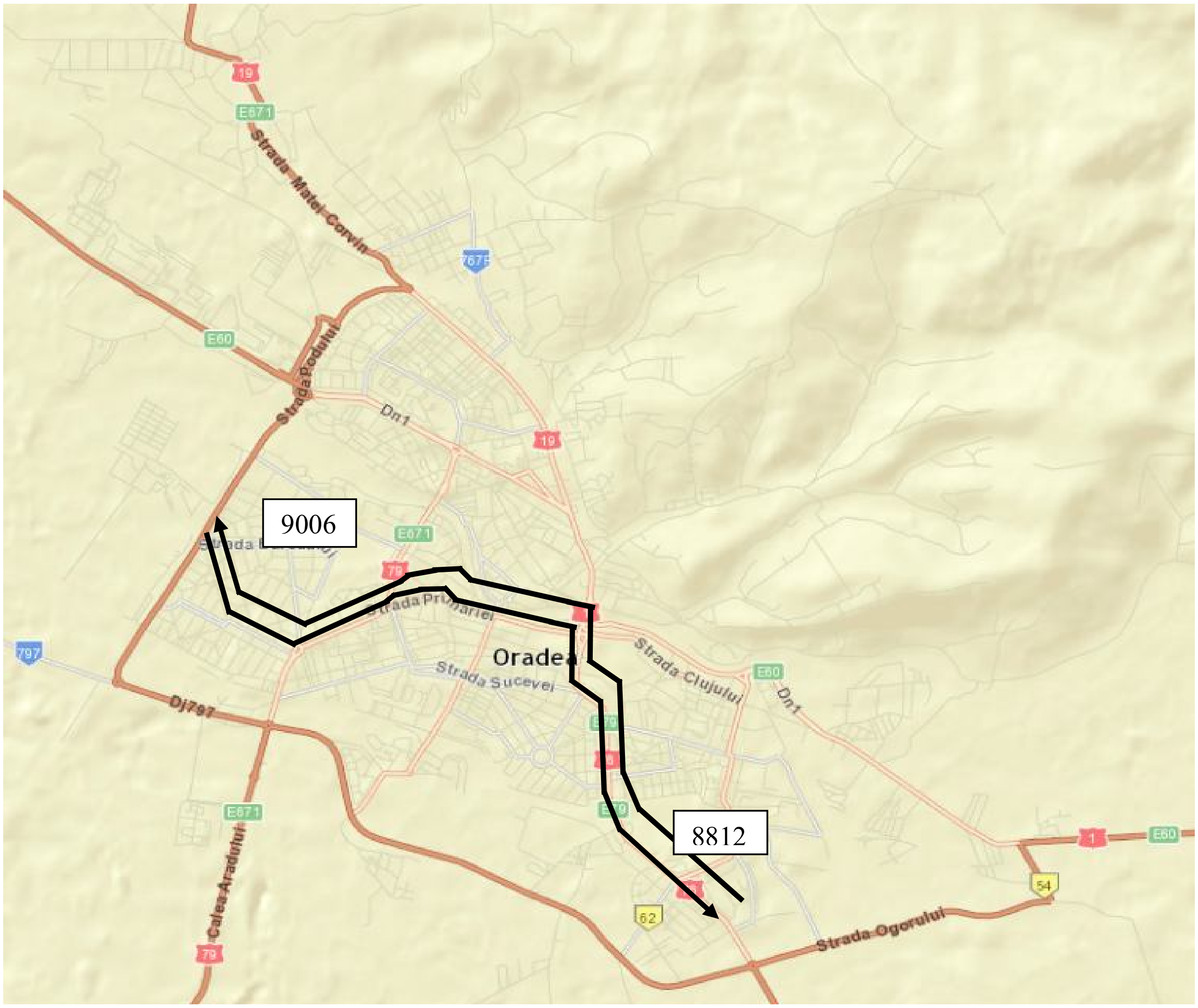

Fig. II.32 - The traffic on line 2

Tram line 3N

Route with single end: Nufarul end of line – D. Cantemir –Cetatii Square – Independentei Square – Unirii Square – Primariei Street– Decebal Blvd. – Olimpiadei Street – Republicii Street – Gen. Magheru Street – Independentei Square – Cetatii Square – D. Cantemir - Nufarul end of line

Service characteristics on tram line 3N:

- 13 km
- 17 stations/ from suburb to Central Station – 10 stations/from Central Station to suburb;
- 8 vehicles to peak of demand
- 150 seats/transport unit
- 1200 transport capacity (transported passengers in an hour and one way)

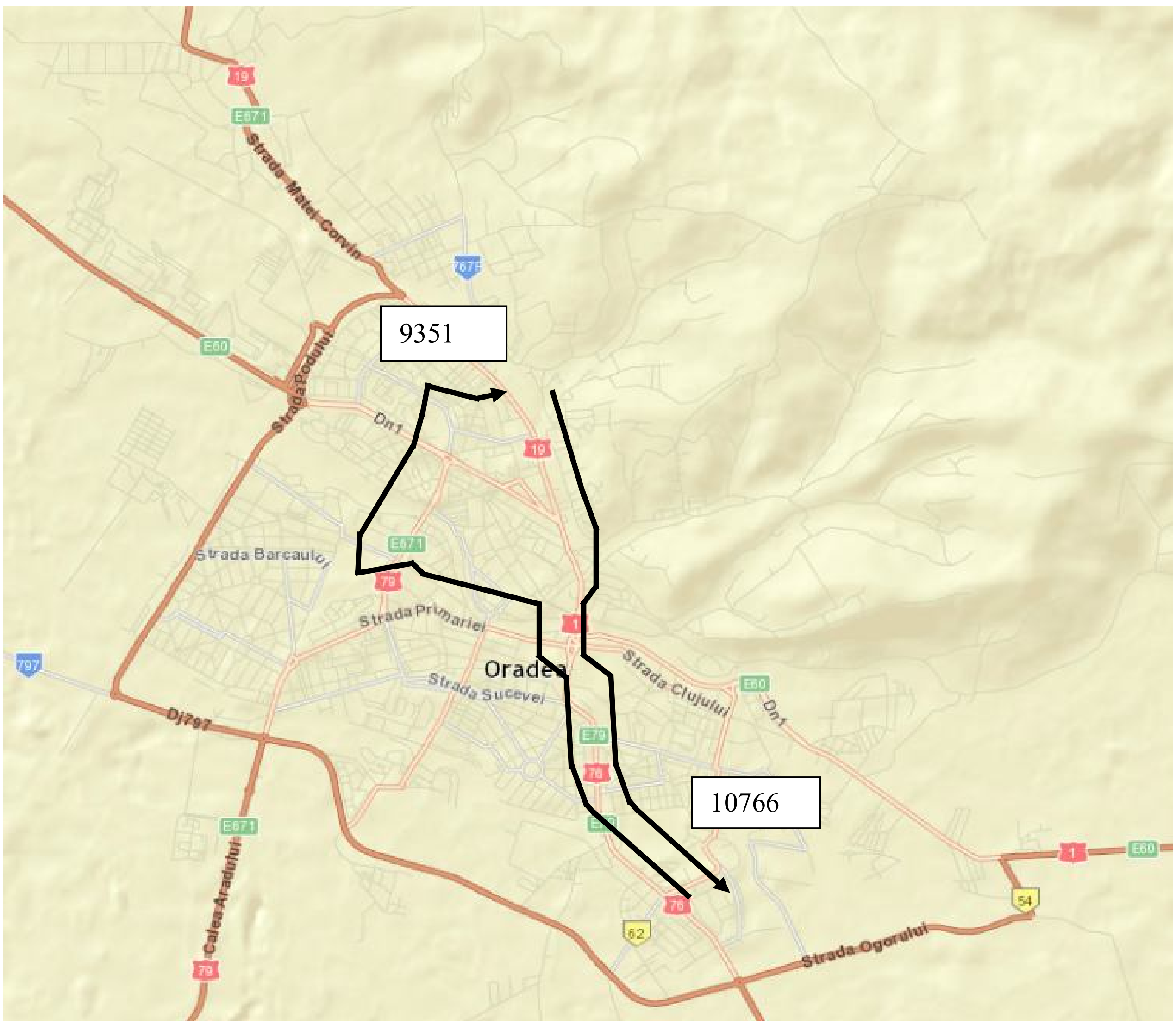

Fig. II.33 - The traffic on line 3N

Tram line 3R

Route with single end: Nufarul end of line – D. Cantemir – Cetatii Square – Independentei Square – Gen. Magheru Street – Republicii Street – Olimpiadei Street – Decebal Blvd. – Primariei Square – Unirii Square – Independentei Square – Cetatii Square – D. Cantemir - Nufarul end of line

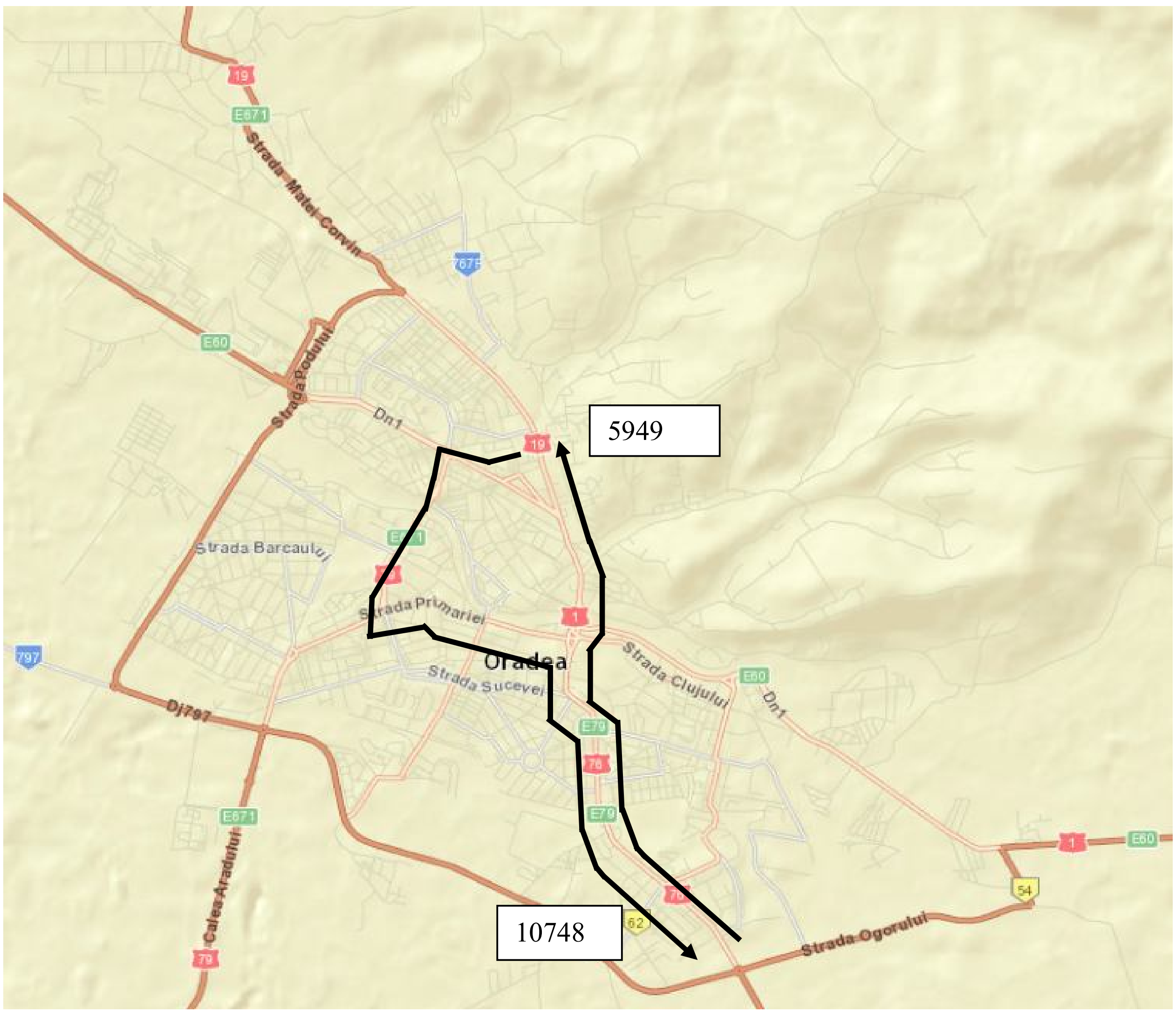

Fig. II.34 - The traffic on line 3R

Service characteristics on tram line 3R:

- 13 km
- 10 stations/from Central Stations – 17 stations/from Central Station to Central Station;
- 8 vehicles to peak of demand
- 150 seats/transport unit
- 1200 transport capacity (transported passengers in an hour and one way)

Bus line 12

Route with single end: Nufarul – Morii Street – Bumbacului Street – Seleusului Street – Razboieni Street – Muntele Gaina Street – D. Cantemir Street – Independentei Square – Unirii Square – Avram Iancu Street – Horea Street – 22 December Park – Costaforu Street – D. Cantemir Street – Muntele Gaina Street – Razboieni Street – Seleusului Street – Bumbacului Street – Morii Street – Nufarul Street

Service characteristics on bus line 12:

- 11,5 km
- 9 stations/one way - 10 stations/back;
- 11 vehicles to peak of demand
- 100 seats/transport unit
- 1100 transport capacity (transported passengers in an hour and one way)

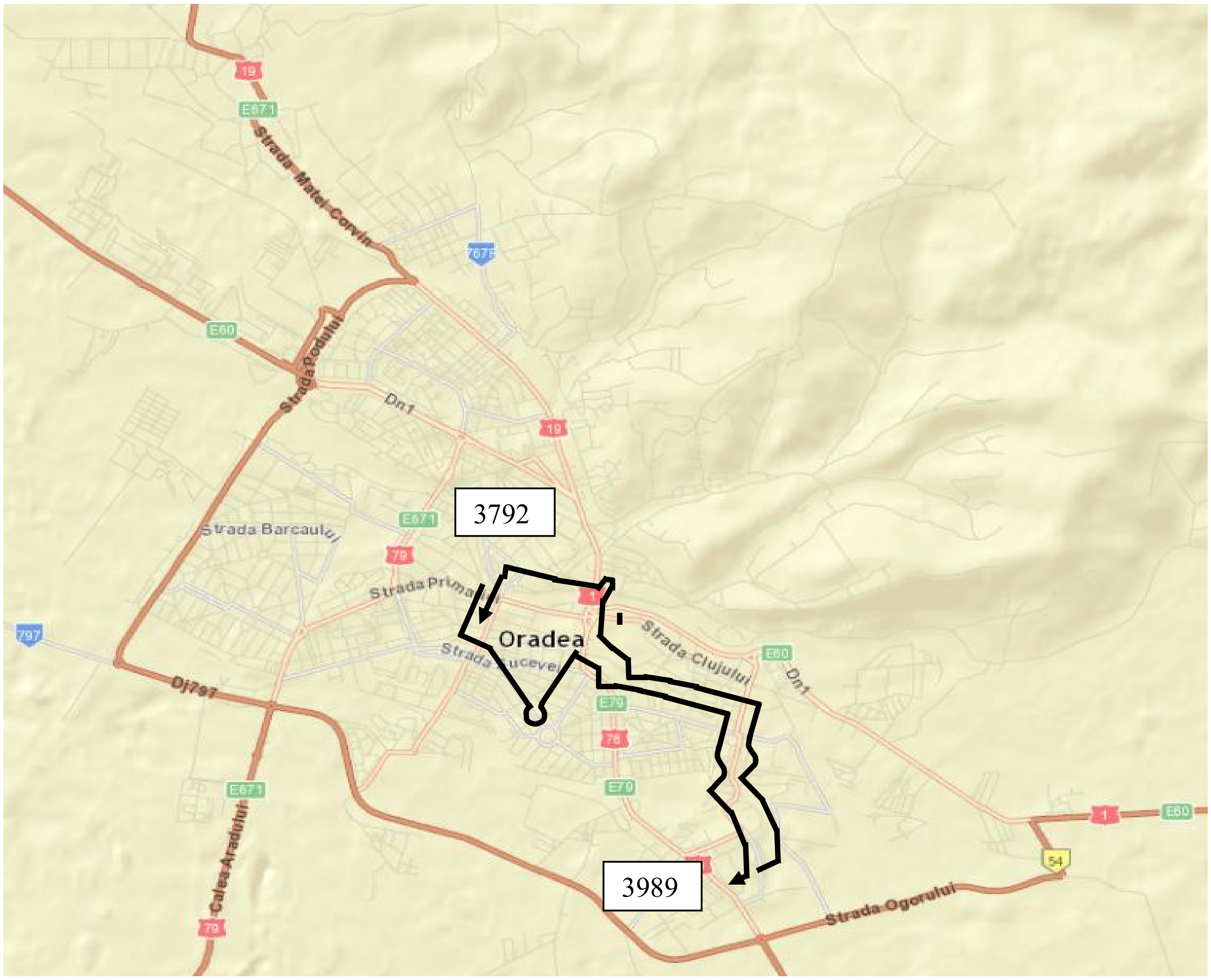

Fig. II.35 - The traffic on line 12

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Bus line 14

One way: Universitatii Street – Calea Armatei Romane Street – Avram Iancu Street – Unirii Square – T. Vladimirescu Street – Alexandru Cazaban Street - Ovidiu Densusianu Street - Podului Street;

Back: Podului Street - Ovidiu Densusianu Street – Alexandru Cazaban Street – T. Vladimirescu Street – Unirii Square – Avram Iancu Street – Calea Armatei Romane Street – Universitatii Street;

Service characteristics on bus line 14:

- 12,0 km
- 12 stations/one way - 11 stations/back;
- 11 vehicles at peak of demand
- 100 seats/transport unit
- 1100 transport capacity (transported passengers in an hour and one way)

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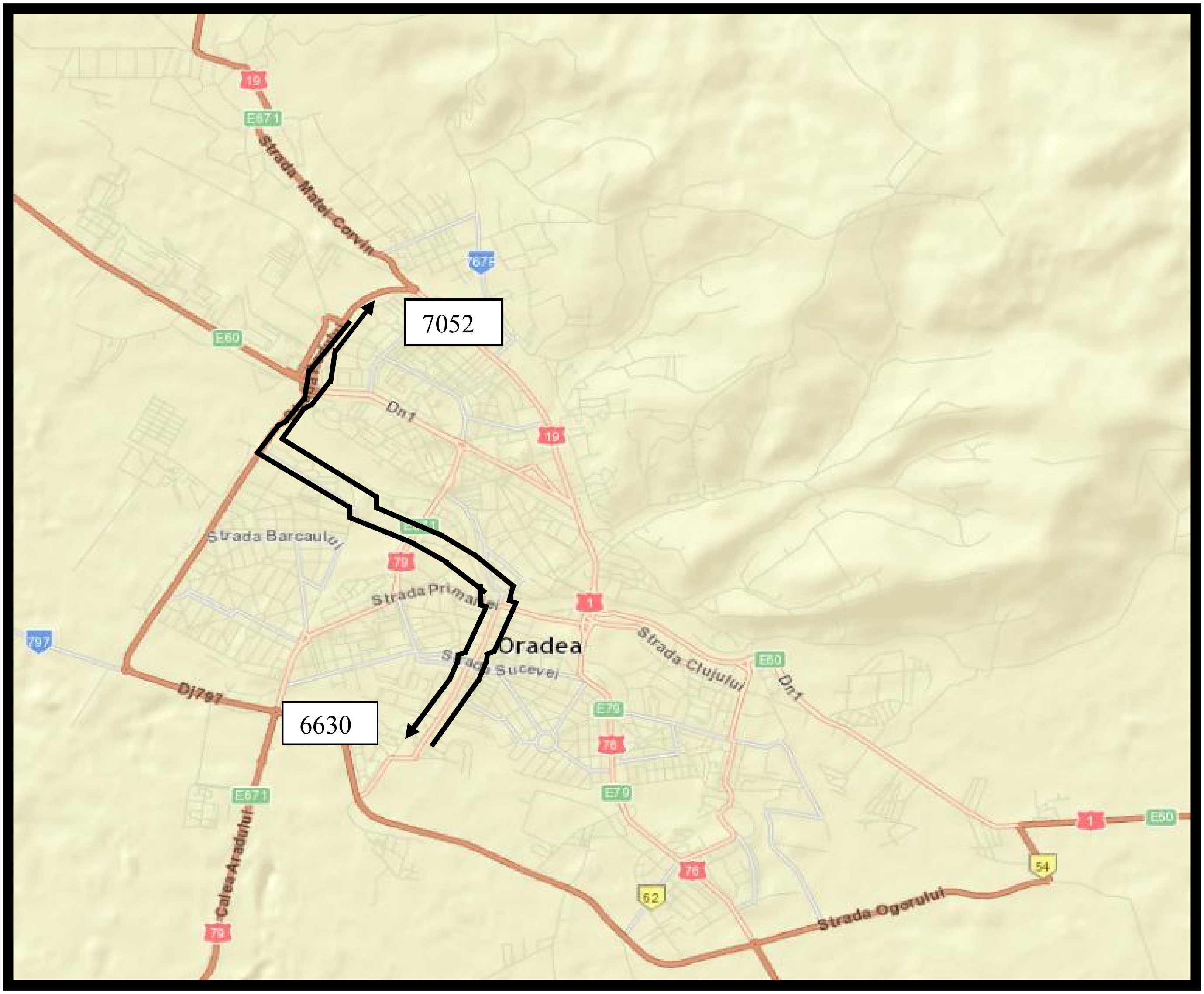

Fig. II.36 - The traffic on line 14

Bus line 16

Route with single end: Calea Clujului - Dragos Voda Street – M-sal Alexandru Averescu Street – 1 December Square – Independentei Square – Calea Clujului Street – Seleusului Street – Dragos Voda Street – Calea Clujului Street – Ogorului Street - (George Bacaloglu) – Tineretului Neighborhood

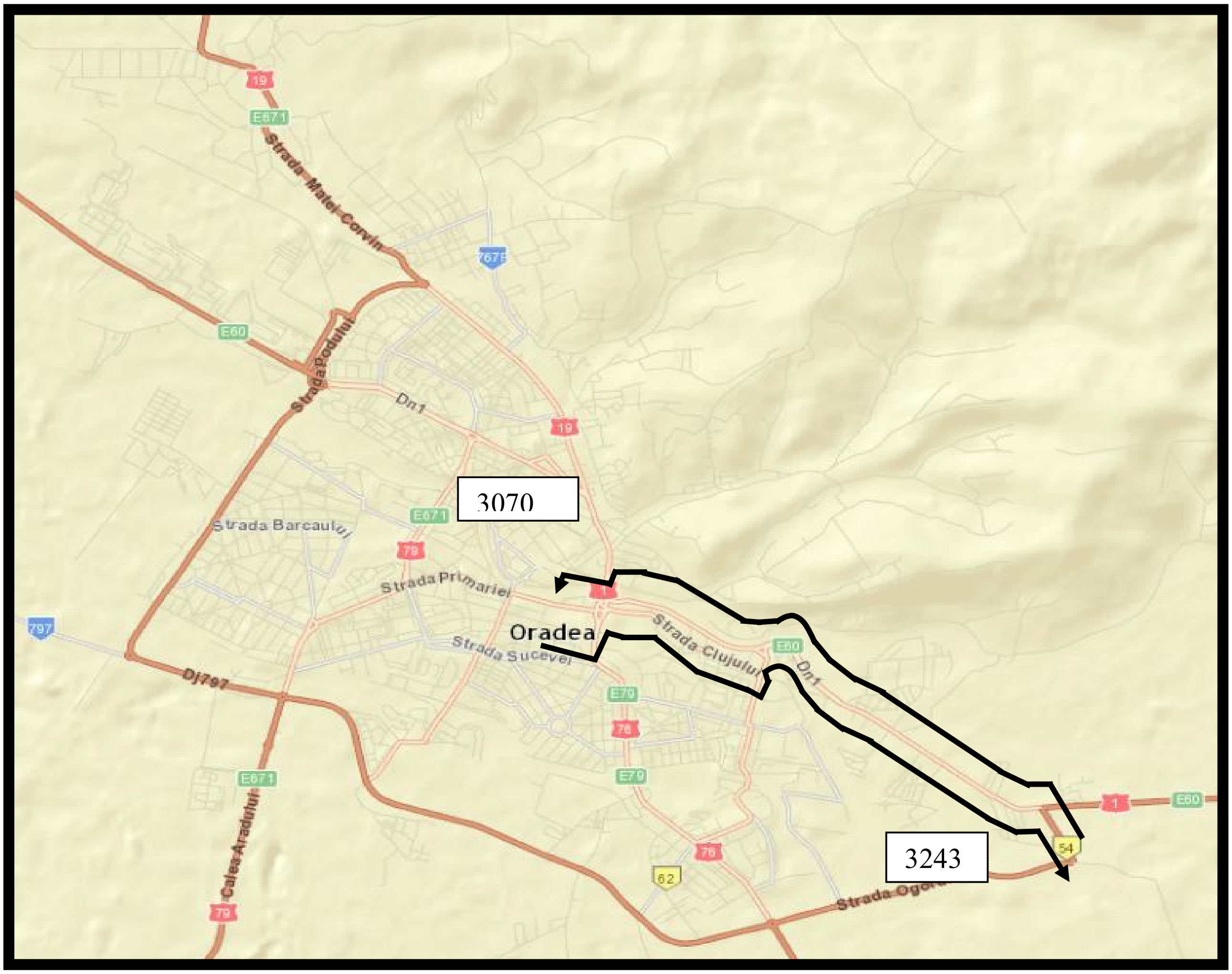

Fig. II.37 - The traffic on line 16

Service characteristics on bus line 16:

- 9,6 km
- 14 stations/one way - 14 stations/back;
- 5 vehicles at peak of demand
- 100 seats/transport unit
- 500 transport capacity (transported passengers in an hour and one way)
- **In combination with transport demand variation, the bus line 16 extends with 4 more stations (11,8 km), respectively with 8 stations (13,3 km)**

Bus line 17

One way: Dacia Blvd. (CFR Bridge) – Petofi Park Street – Republicii Street – Gen. Magheru Street – Calea Clujului Street – Seleusului Street – Razboieni Street – Oradea East Station;
Back: Oradea East Station – Razboieni Street - Muntele Gaina Street – D. Cantemir Street - Independentei Square – Gen. Magheru Street – Republicii Street – Muzeului Street – Dacia Blvd. (CFR Bridge).

Service characteristics on bus line 17:

- 13,8 km
- 15 stations/one way - 12 stations/back;
- 8 vehicles at peak of the demand
- 100 seats/transport unit
- 800 transport capacity (transported passengers in an hour and in one way)

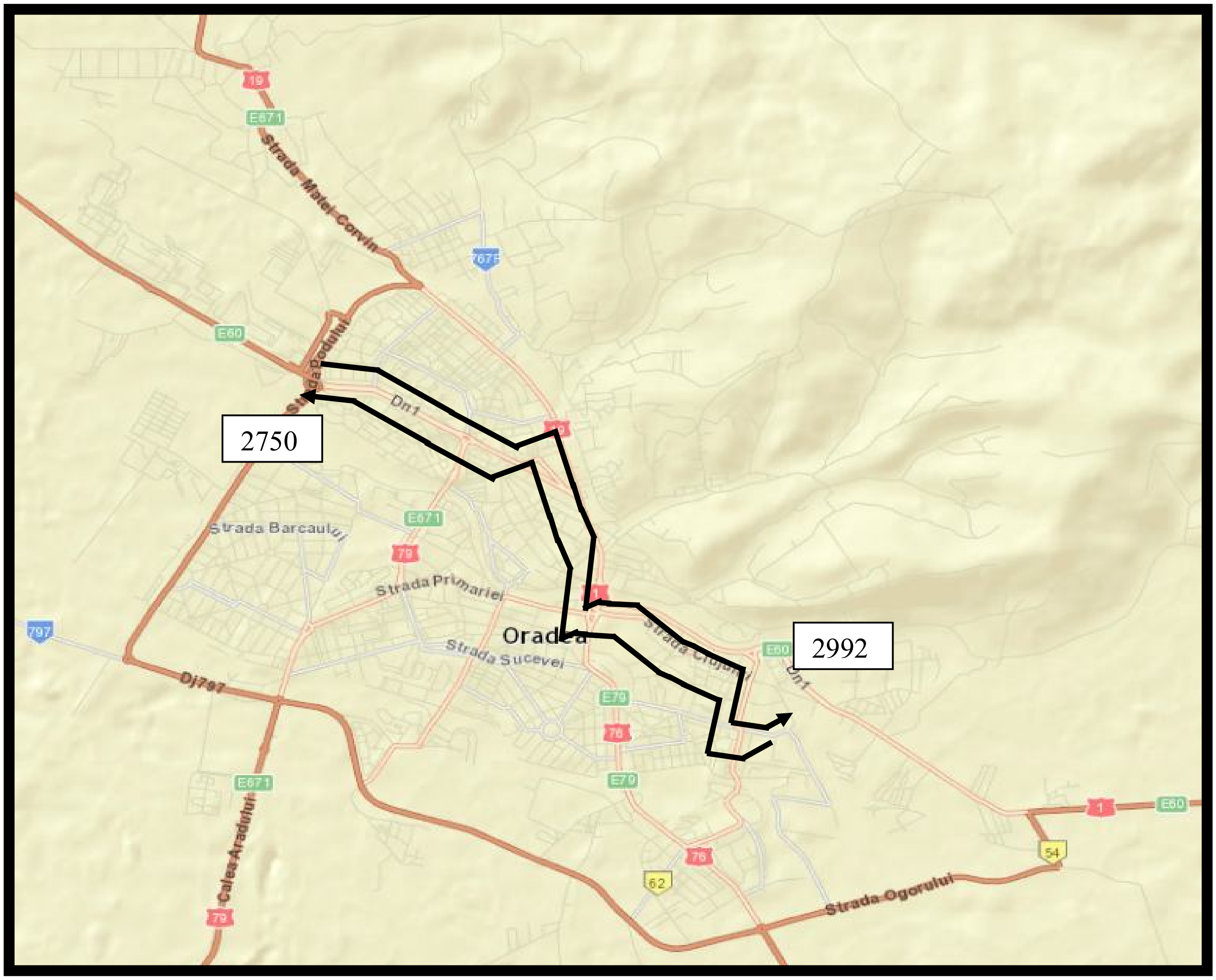

Fig. II.38 - The traffic on line 17

In the following table are included summary data on the service provided by the 5 (6) tram lines, respectively the 17 bus lines.

The data estimated average for weekdays indicate:

- Distribution on modes of travel:

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- 3/4 of service activity is carried out by the electrical transmission system;
- 1/4 of operating activitiy is carried out by diesel based transport system;

- The value expressed by all trips, means 174,027 trips/day, leads for monthly total to 5,220,810 trips, in comparison with data of January 2013 (for SC OTL SA) which were 4,831,238 trips, to a difference of 389,527which is within the margin of error and whose origin is in the 10 days of holidays of the month.

Tab. II.14

Line	To center	To suburbs	Whole	Transport system	Total to center	Total to suburbs	General Total	Percentage on system
1N	**16379**	**17397**	**33776**	**Trams**	**62.294**	**65.250**	**127.544**	**73.28%**
1R	**20372**	**16158**	**36530**					
2	**9006**	**8812**	**17818**					
3N	**9351**	**10766**	**20117**					
3R	**5949**	**10748**	**16697**					
1NR	1237	1369	2606					
12	**3792**	**3989**	**7781**	**Buses**	**22.721**	**23.762**	**46.483**	**26.71%**
14	**6630**	**7052**	**13682**					
16	**3070**	**3273**	**6343**					
17	**2992**	**2750**	**5742**					
10	1396	1245	2641					
11	1731	1716	3447					
13	829	1093	1922					
15	321	321	642					
18	402	388	790					
19	335	496	831					
20	272	137	409					
21	191	180	371					
22	358	593	951					
23	140	252	392					
24	43	98	141					
25	140	137	277					
26	79	42	121					
General total	**85.015**	**89.012**	**174.027 trips in a workday**					

Conclusion: there is defining „framework” of trips in the city, framework that consists in tram lines 1N, 1R, 2, 3N and 3R, respectively bus lines 12, 14, 16 and 17, whose image is represented in the below figure:

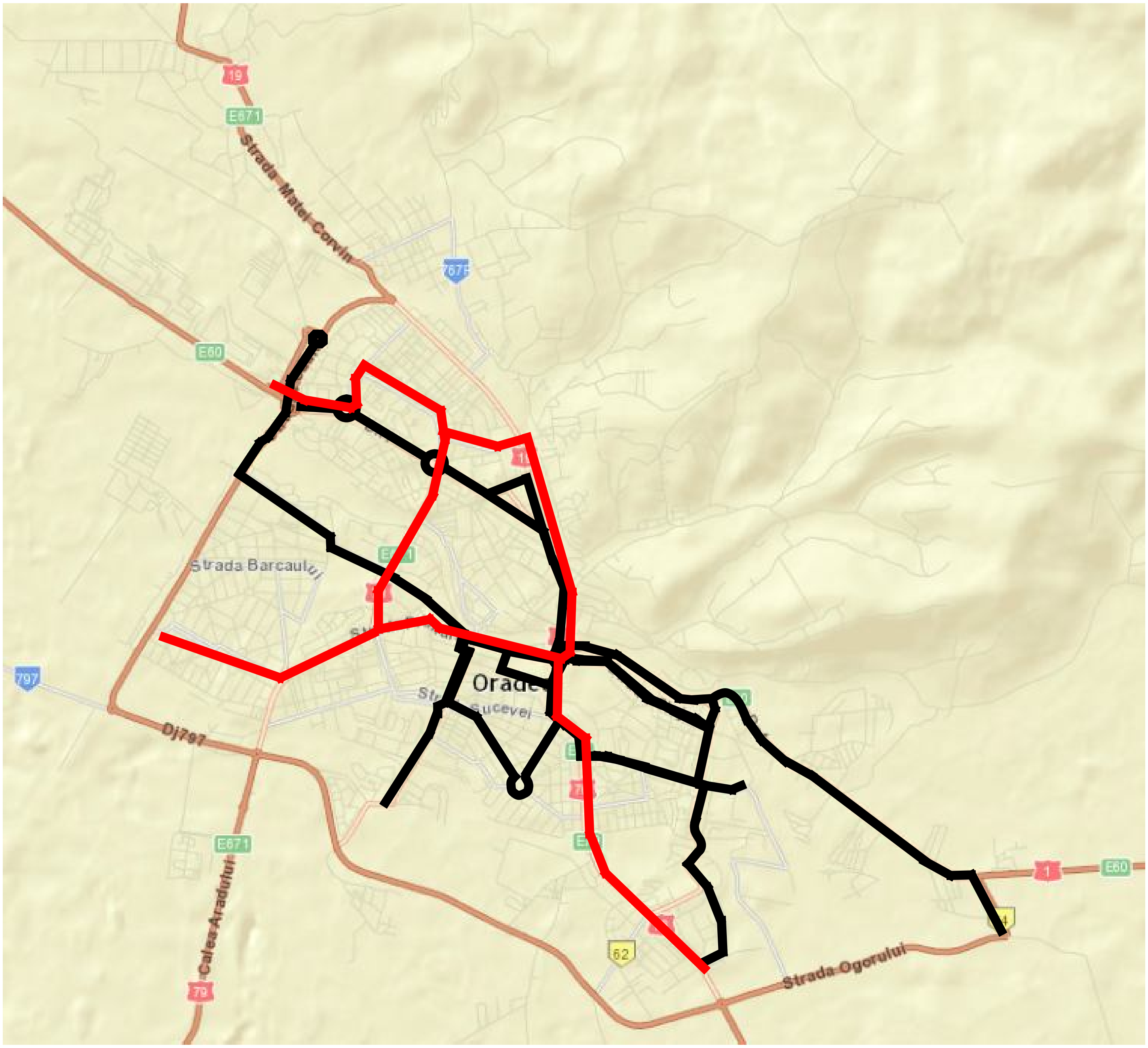

Fig. II.39 – The defining framework of major necessity of transport in Oradea city

The idea was discussed above:

- there are clear differences between major routes – the above represented – and the rest of the routes (secondary);
- on bus lines highly requested it has to be developed the ordinary service of transport – with low commercial speeds and stops in each station – respectively the extraordinary service – by express lines with high speeds and stops only in point of polarization of public interest;
- in accordance with the issues of increase of functional reliability of trams depot, the development of railways transport should be made in the south of the city – see fig. II.40:
    - ✓ the second exist of the depot has a obvious extent to Calea Aradului[32]
    - ✓ the link through the south of the city on Calea Aradului will impose the implementation of the third triangle in the intersection between Decebal Blvd. And Calea Aradului so as the service of electric system to get the necessary elasticity (in this case the tram routes will get another aspect – fig. fig. II.41 so that the inside of the „protected ring" to benefit by the speed transport at its outer limits);
- in these conditions, the line 14 – the most requested bus line – can be extended to south, possibly reaching Grigorescu Neighborhood – for which in envisaged an strong;
- in addition: it is to consider a way of adding of transport lines (12+14 for example or 16+17, another example) which would create conditions for crossing the center by vehicles, faster and by elimination of some ends of routes);
- and perhaps most of all it is necessary to eliminate the self-competition between transport system based on electric power and transport system based on fuel: IT HAS TO BE FIIND SOLUTIONS TO ELIMINATE THE PARALLELISMS BETWEEN BUS LINES AND TRAM LINES.

[32] Note that PUG proposal which envisages the tram line on Calea Universitatii can not be supported by the street, especially on A. Iancu Street – due to inappropriate width.

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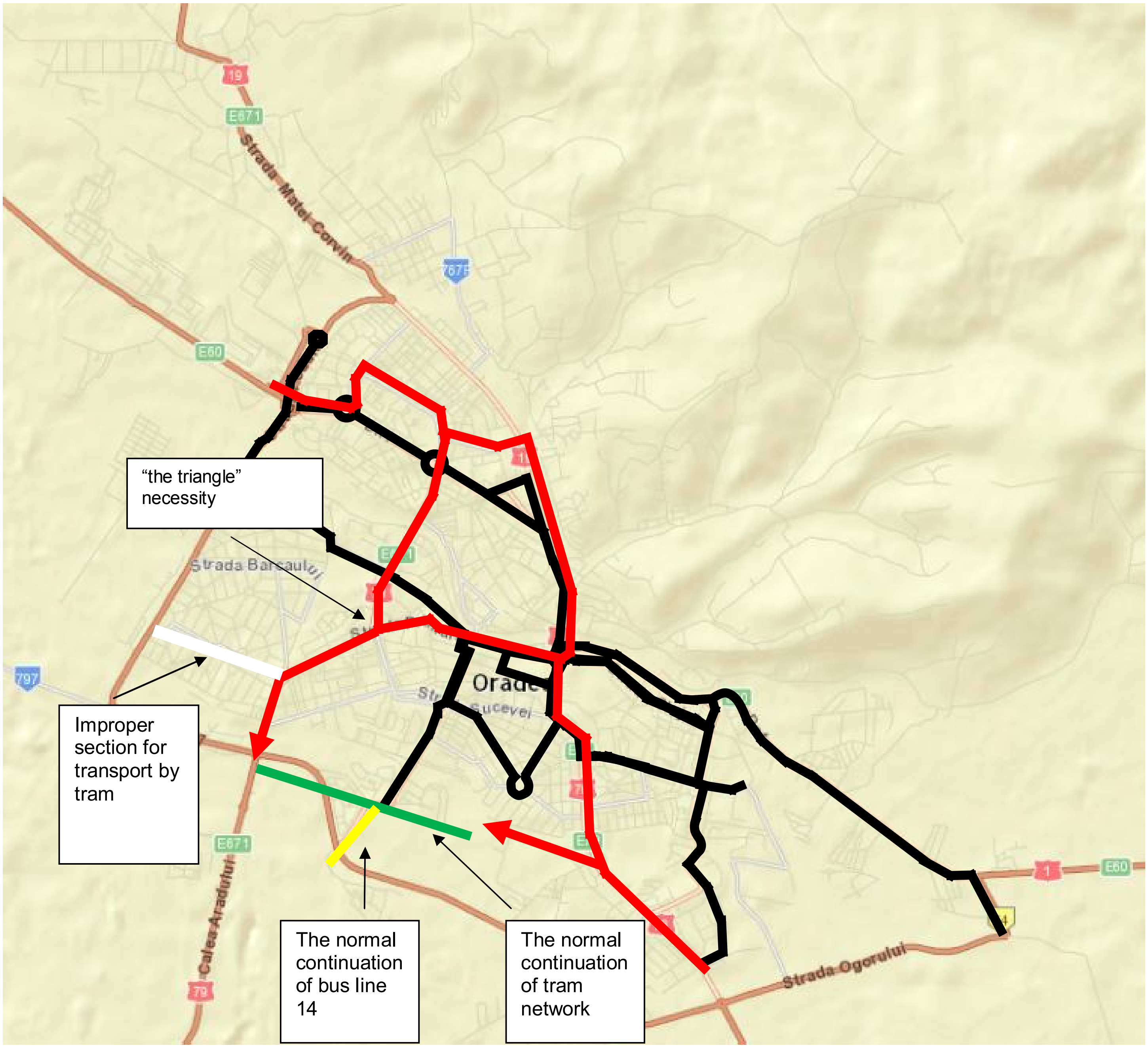

Fig. II.40 – The defining framework of major necessity of transport in Oradea

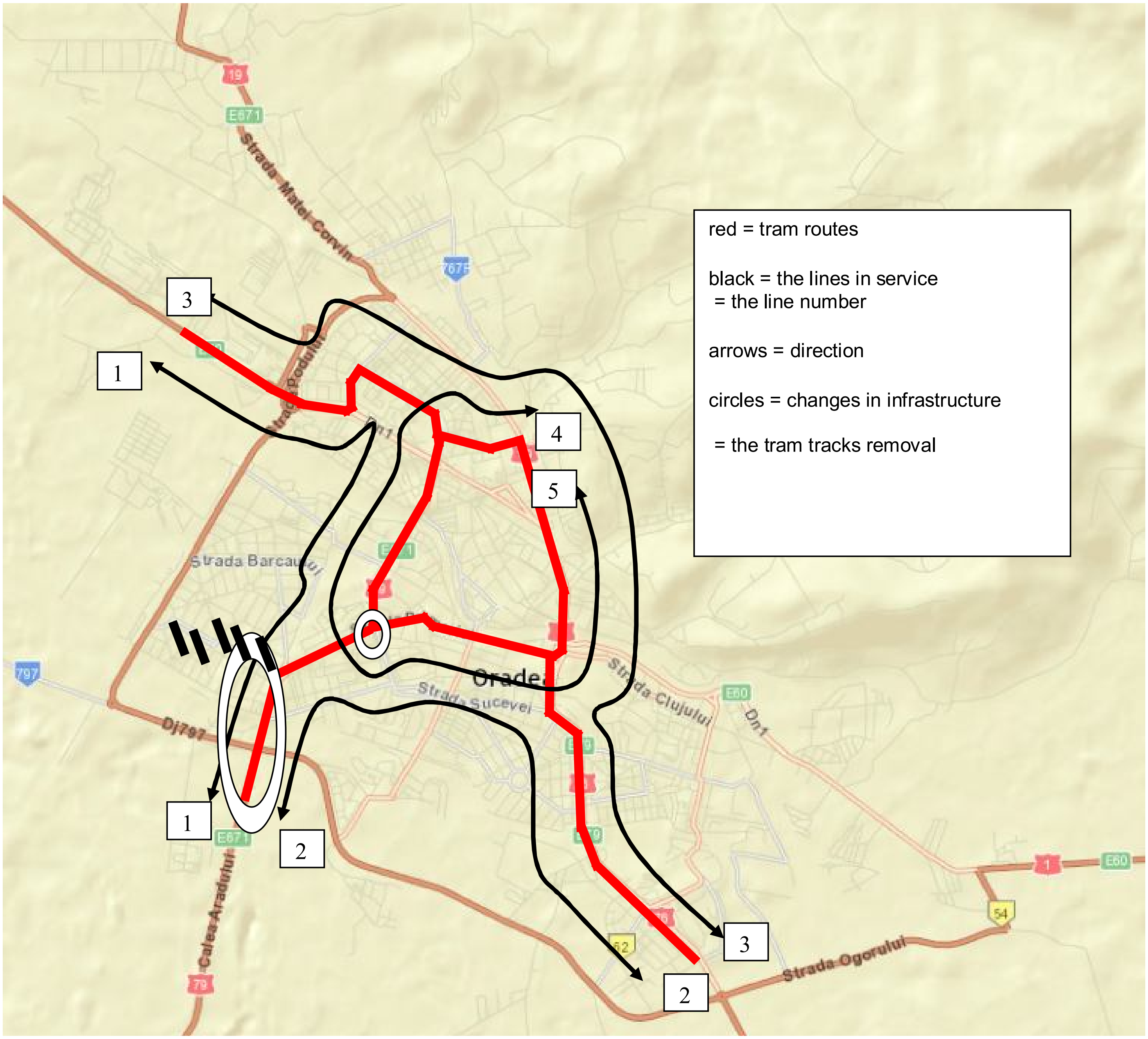

Fig. II.41 - Method of providing a fast transport tram network
(to reach the any end of the tram network will be in the reduced times)

Finalizing: present project does not have as an object to establish in detail the configuration of the transport network, this task is of SC OTL SA or local authority. It is obvious that the existence of a line that runs over 36,000 daily trips and the existence of another line that runs 100 trips suggests a heterogeneity impossible tomanage in conditions of cost-effectively the transport service.

On the other hand, the extension of the tram lines - except the necessary functional reliability of depot - is unfeasible because the secondary bus lines indicated in the table above have no way to become "sources" of passengers if instead the bus it will function a tram (**of course we find ourselves in a material that prioritizes mobility of the population, but to assume that transport demand will increase by 5000% is not unrealistic, is fantastic**). SPECIFICALLY: TRAM NETWORK REACHED ITS LIMIT IN RELATION WITH THE DEMOGRAPHIC AND ENGINE POSSIBILITIES, AND THE PROGRESS TOWARDS SUSTAINABILITY CAN NOT BE OBTAINED ONLY THROUGH THE NETWORK OF TROLLEYBUSES. LOCATION, STRUCTURE, LINE LENGTH, ETC. WHICH LEND ITSELF TO TRANSPORT TROLLEY MAY BE DETERMINED AT THE TIME OF THAT DECISION.

- **means**

In passengers urban transport, to establish the required railways transport is done in two assumptions:

- for design transport operation in a general context of service organization;
- for exact distribution of railways transport on each route and depot.

In first assumption, the calculation is done based on average parameters (in relation with entire network) and taking into account the total number of annual trips, without considering the distributed real values of passengers traffic flow on routes and lines.
These parameters are:

Mob population’s mobility, in trip/year/inhabitant;
Pop city’s population;

d the average distance of a trip;

L nominal average capacity of rail vehicles (for a rate of 5 ... 8,5 passengers/m^2);

h the average number of working hours of the vehicles in a day (14-16 hours);

v average speed, in km/h;

c the completion factor of the vehicles, considered in relation with nominal capacity for the entire network and all day (average completion of the vehicles depends on the spatial unevenness of passenger traffic on the entire network and temporal unevenness - throughout the day, this coefficient is for rail transport approximately equal to 0.60 to 0.80, and for transport without rails, 0.70 to 0.90);

u the coefficient of fleet use (CUP) equal with 0,80 - 0,95;

η the coefficient of unevenness transport demand in relation to season (seasonal inequality).

Using these coefficients, one can obtain the following elements:

- annual mileage of a vehicle, in km: 365*v*h*u
- the annual number of passengers transported by each vehicle of fleet, 365*v*h*u*L*c/d
- so, the fleet is calculated by using the equation:

$$PK_i = Mob*Pop*\eta*d / 365*v*h*u*L*c$$

Only an estimation – as no measurements were made for all equation parameters, for SC OTL SA the formula could indicate[33]:

$$PK_i = \frac{365 * \frac{173000}{204000} * 204000 * 1{,}5 * 3{,}5}{365 * 14 * 14 * 0{,}9 * 120 * 0{,}6} = 71$$ vehicles (average capacity)[34]

The conclusion is the following: before to determin the necessary vehicles – vehicles that are taken into account, whether if they still correspond form the sustainability point of view – as the

[33] **INFORMATIV: Regia Autonoma de Transport Bucuresti are un parc de peste 2000 vehicule si pentru reinnoirea acestuia are nevoie in urmatorii trei ani de circa 760 de milioane de lei,** potrivit planului de administrare elaborat de noul consiliu de administratie al Regiei si care urmeaza sa fie supus aprobarii Consiliului General al Municipiului Bucuresti. De acesti bani ar urma sa se cumpere circa 100 de tramvaie, 200 de troleibuze si 400 de autobuze – **adica o treime de parc va fi inlocuit de noile achizitii in urmatorii 3 ani.** Potrivit documentului, parcul RATB are un grad de uzura de 60-90%, unele tramvaie fiind in exploatare din anii 1970.

[34] In prezent SC OTL SA are 48 de autobuze de cca. 100 locuri si aproximativ 46 tramvaie de cca. 150 locuri.

difference between calculated values and the fleet of transport operator, **it is necessary to determine exactly the values of parameters which are consider in equation.**

A picture of the polluting transport means shows:

- currently, the urban bus fleet in Romania has approximately 5,000 vehicles. 70% of these buses are aged 8-10 years, and the rest falls into a range of 4-6 years. In terms of pollution standards, most buses have engines EURO2 and EURO1. Only 30% of the park are EURO3 and only the last lot of buses is EURO4.
- also presently, the bus fleet of SC OTL SA has 48 vehicles:
  - ✓ MERCEDES Conecto = 20 (2004)
  - ✓ SOLARIS Urbino = 10 (2011)
  - ✓ VOLVO ALFA Localo = 12 (2010)
  - ✓ Rocar, Renault, etc. = 22 (1996 - 2002)[35]

regarding tram fleet – motor wagon and trailer – the situation is:

- ✓ TATRA T4D + B4D = 43 (1975 -1985)
- ✓ TATRA KT4D = 20 (1977-1980)
- ✓ SIEMENS ULF = 10 (2008 - 2009) }

The sencon assumption is necessary when determination of fleet is made (fleet necessary to cover the transport demand on each route)[36].

- **transport schedule**

The transport schedule of public transport vehicles should be redesigned so that every decision be based on a mathematical model - condition for any further discussion of proposals - most often forced to "up" or "down"requests. One of the issues raised by the passengers ("our customer, our master" but whom – many times the customer doesn't know the financial aspects of put in practice his proposal) is the one related to the interval between vehicles. Next it shows such a model.

[35] The total of 64 vehicles encompass the fleet.
[36] And obvious it not concern the present project portofolio.

The solutions provided by queuing theory can be applied on boarding-unboarding station as the point in which vehicles of transport line are presented to support a specific activity: operations of changing the structure of the passengers in the vehicle room. The problem in question is that of number of vehicles that can be made available on a transport line, from the point of view of most requested station.

Be a statistical phenomenon in which the arrivals of vehicles in the station corresponding to a Poisson distribution, and the space destinated to boarding-unboarding station to a negative exponential distribution.

Although expert opinion regarding the compliance of such conditions are split, it can be brought an argument that, although it not assures the sufficiency it is necessary: it can be seen that the average interval between arrivals of vehicles at the station (a few minutes) has a value substantially equal with not respecting this average; or a process which involves the meadia and dispersion to be equal, has all chances to be Poisson. So: it is recognize that available space do not allow only the presence of n vehicles in station. The probability of occupancy is determined with below relation, in which:

M is the total number of the vehicles which will affect, in the peak hour, (simple or repeated), the boarding-unboarding station;

J the average time of vehicles stationarity in the station.

$$P(n) = \frac{\frac{1}{n!}\left(\frac{\ell}{m}\right)^n}{\sum_{i=0}^{n} \frac{1}{i!}\left(\frac{\ell}{m}\right)^i}$$

where:

$$\ell = \frac{M}{60}$$

$$m = \frac{1}{J}$$

Using these information, it can be ilustrated that the number of vehicles which should enter in sequence with position number n , means on the last position to use – form the spatial point of view – it can be calculated with below relation, **and as objective of the process, it is considered** that the number of the vehicles which will be found only on n position in station, to be less than one, certifying the wish that simultaneously, not to arrive in station area only a number of vehicles which not block the proper service (mean $V_n \leq 1$):

$$V_n = M[P(n-1) - P(n)]$$

Sp, for a station for which, although it will be space for 2 vehicles, it is not allowed only the presence of a single vehicles between its limits, result:

$$V_2 = M\left[\frac{\frac{MJ}{60}}{1+\frac{MJ}{60}} - \frac{\frac{1}{2}\left(\frac{MJ}{60}\right)^2}{1+\frac{MJ}{60}+\frac{1}{2}\left(\frac{MJ}{60}\right)^2}\right] = 60\ell \cdot \left[\frac{\ell}{1+\ell} - \frac{\frac{\ell^2}{2}}{1+\ell+\frac{\ell^2}{2}}\right]$$

Calculated for a 1 minute stationarity at stops. The inequality solving, of third grade, conduct to the reference value:

$$\ell \cong 0{,}14$$

Which indicates that a frequency of hourly arrivals of 8-9 vehicles, so as not to find the double presences (simultaneous) of vehicles in the area of station.

The limit acceptable situation for a station which, although there would be space for three vehicles, it is not allowed more than two in the presence of the circumference, resulting from considerations of block a vehicle between other two (with implications on traffic capacity and transport lines serving the station). To resume the procedure, it can be determined that in this extreme case:

$$\ell \cong 0{,}37$$

Shows a maximum frequency of hourly arrival of 22-33 vehicles, so as no to find a triple presence (simultaneous) of vehicles in station.

Since only exceptionally, the vehicles of the same line can reach each other, the consequences of these two approaches are the following:

- line can be organized so that in time of maximum intensity of the traffic, to affect the most requested station with no more 8-9 vehicles, which is equivalent with statement that **intervals of approx. 7 minutes are, objectively speaking, normal**;
- no more than three lines can be organized in order to distribute the demand of a particular station (22-23 split 8-9), given that the intervals between successive arrivals must oscillate with the measure, around 3 minutes. Over the three lines, any addition will lead: one, to block the vehicles in stations, between other two and irritants displacements of the passengers along 40-50 meters finding a boarding door, and second, the reduction of capabilities provided by transport lines

The debated idea is: to provide a transport schedule which to admit a following interval of 7-8 minutes – no more or less – is in the line of rational service.

OBJECTIVES TO EXCLUDE:

- remove the tram line of Iosia Sud Neighborhood – which, due to neighborhood specificity it does not justify the function;

OBJECTIVES WHICH REQUEST TO DECREASE THE SCALE/SIZE:

OBJECTIVES FOR WHICH THE SCALE/SIZE MUST BE MAINTAIN:

the „Rabla” program should be unroll without gaps of any kind (organizational, financial etc.);

the local authority has the obligation to take measures to periodically calculate the subsidy of SC OTL SA;

OBJECTIVES WHICH REQUEST TO INCREASE THE SCALE/SIZE:

SC OTL SA should make fast progress to align the fleet to sustainable development requests (projects for fleet renewal, but especially for EURO 3 and 4 buses);

to increase the actions that lead to regularity and punctuality of transport – according to transport schedules;

OBJECTIVES TO INTRODUCE:

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- it can get a high elasticity in public transport operation if is made the third „triangle" to serve line 2;
- it is necessary to ensure the second access to trams depot; in the same vein: it is to consider a "shed" for trams in order to reduce the travel distances for the withdrawn trams at the end of the peak hours[37];
- from the point of view of efficency the single trams line which cand be created is between the second access of depot and Calea Aradului[38];
- SC OTL SA has to redo the schedule for public vehicles so as the intervals at peak hour to reach 7-8 minutes between the vehicles of the same line/route;

the local authority had the obligation to tax to lowest level the vehicles of SC OTL SA;

SC OTL SA has to aim the purchase of vehicles with enhanced access possibilities (of different capacities, with low floor etc.);

general interests of the citizens – not those specific to a part of the citizens – request to reassess the gratuity award system for retirees (the gratuity may be a right but using this for the time during students are traveling by public transport can not be tolerated);

the local authority should initiate a compaign to inform the retirees in order to consciously accept the obligations arising from the right to free movement;

SC OTL SA has to make a project proposal for the first lanes dedicated to public transport;

it is recommended to initiate a project for modern boarding-unboarding stations (to standardize – to customize these contact points between the public transport operator and the public);

SC OTL SA should fiind resources in order to make viable a proposal to reduce the price of the transport ticket;

it is necessary to modify the passengers transport regulation, taking into account the reward of loyal passengers;

it has to be implemented and then generalized the transport system by express lines (or maxi-taxi) along normal lines;

it is necessary to redesign the bus routes so as to be excluded the parallelism of the two modes of transport;

37 Zero mileage = km between depot and ends of route where public service starts

38 Attention = the proposal is in disagreement with 2013 PUG proposal.

in line with the above objective: it is necessary to reconsider the set of public transport stations for boarding and unboarding;

take into consideration the possibility to implement the transport system by trolley;

it is necessary that some of the trams lines to be transform in light rail lines;

in order to make profitable the SC OTL SA activity, it should be defined the threshold between social transport and solitary transport r;

XI. operational extension of local transport market (plan for commuters)

Urban dispersion of Oradea towards villages situated in proximity caused:

- “forced” mobility occurance,
- the lack of integrated metropolitan transport network,
- the lack of coordination at the level of data, policies and plans between local transport and peri-urban transport.

The analysis found that the majority of commuters are from the 11 villages of Oradea metropolitan Area. More than that, there are similarities between the phenomen generated by the commuters, similarities which assembled the 11 villages in this way:

- Biharia (that is not served espeacially by any transport line)
- Bors
- Osorhei – Ineu
- Nojorid
- Paleu – Cetariu
- Sanmartin
- Santandrei – Girisu de Criș – Toboliu

Studies made for Oradea Metropolitan Area had showed that the following shifts of passengers between the city and area of major influence:

The peri-urban transport relation Oradea – Biharia (it is not served by any line). The localities of Oradea Metropolitan Area are not served only by line which ensure the county transport. So, the calculations regarding the service characteristics are made on the base of the values obtained on the base of the lines which tranzit OMA.

There are to retain:

The beginning hour of the program is:

- from Oradea 6.10
- from Biharia 5.45

The final hour of the program is:

- in Oradea 18.20
- in Biharia 17.30

The beginning hour of the program is:

- din Oradea 7.00
- din Cauaceu 5.10

The final hour of the program is:

- in Oradea 18.00
- in Cauaceu 19.00

The passengers traffic flow to Biharia

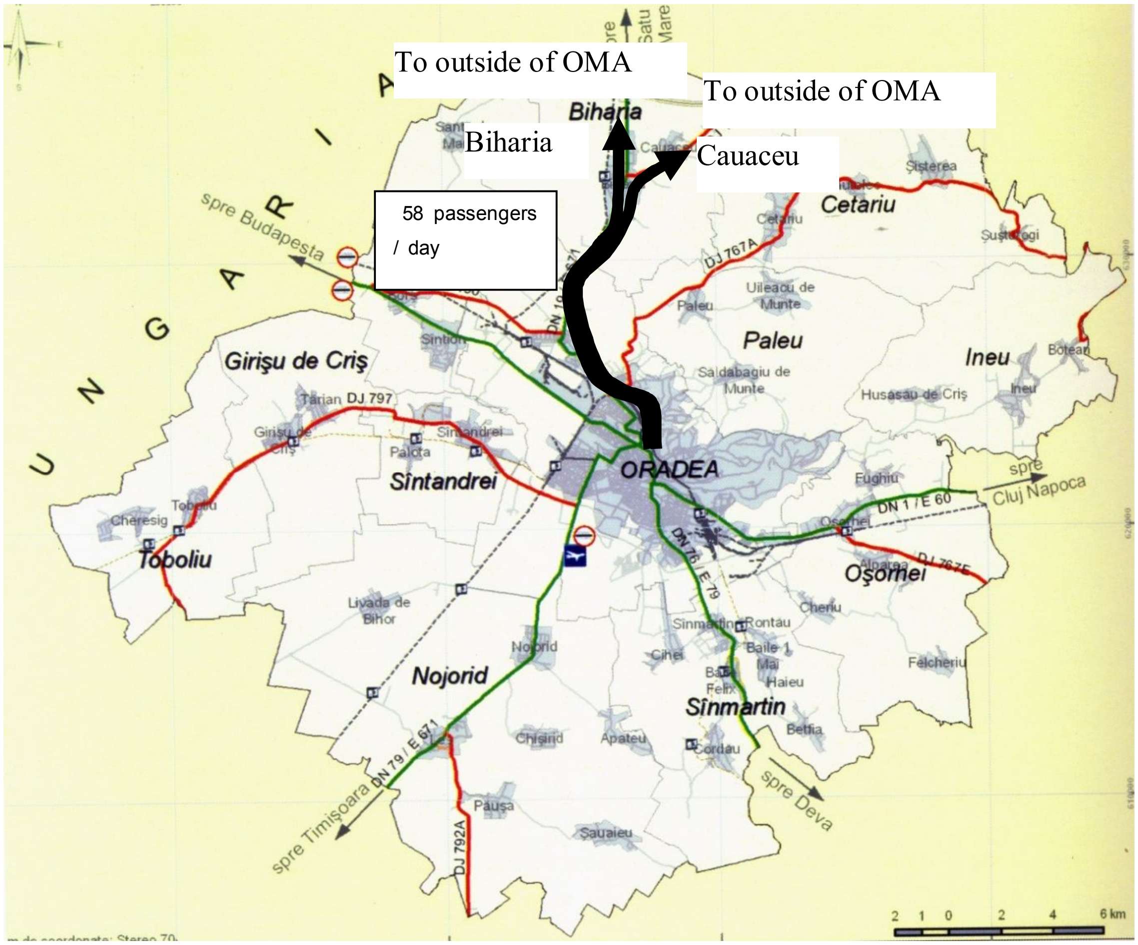

Fig. II.42

The peak hours are:

- the morning peak is insignificant
- 14.00 – 17.00 the peak of the afternoon

The passengers traffic flow to Oradea

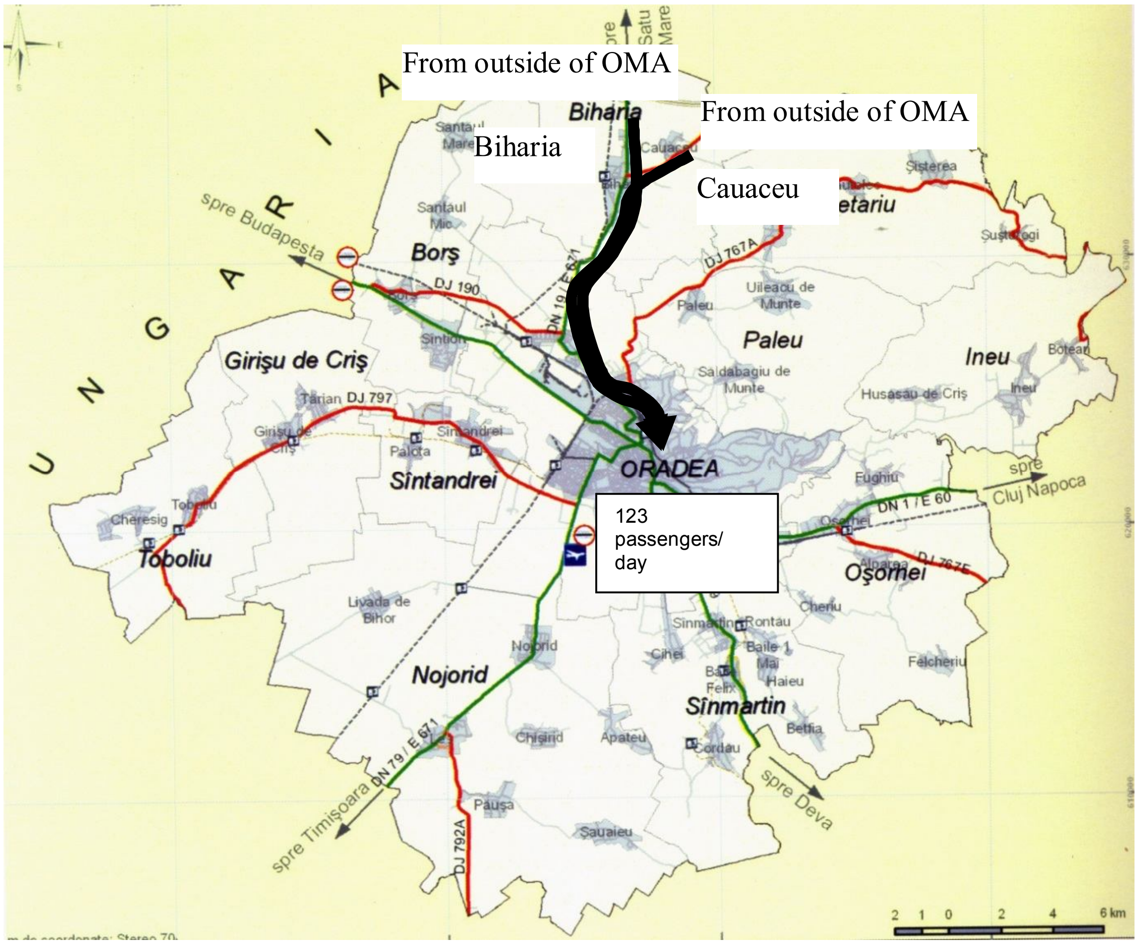

Fig. II.43

The peak hours are:

- 5.00 – 7.00 the morning peak
- the afternoon peak is insignificant

The peri-urban transport relation Oradea - Bors

There are to retain:

The beginning hour of the program is:

- from Oradea 5.30
- from Santaul Mare 4.45

The final hour of the program is:

- in Oradea 20.30
- in Santaul Mare 19.50

The beginning hour of the program is:

- from Oradea 7.30
- from Bors 7.00

The final hour of the program is:

- in Oradea 19.30
- in Bors 19.00

The passengers traffic flow to Bors

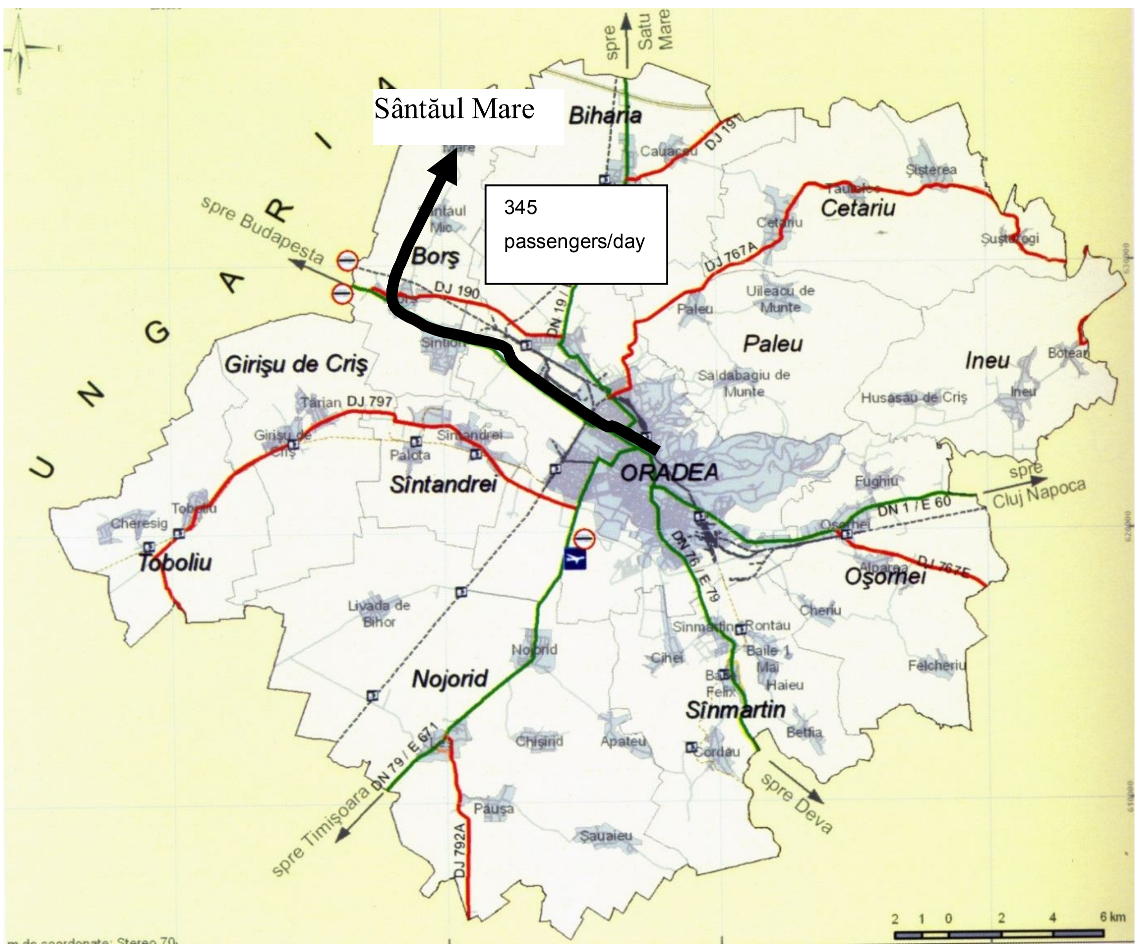

Fig. II.44

The peak hours are:

- 7.00 – 8.00 in the morning (conventional of 100%)
- 13.00 – 18.00 in the afternoon (in comparison with more than 500%)

The passengers traffci flow to Oradea

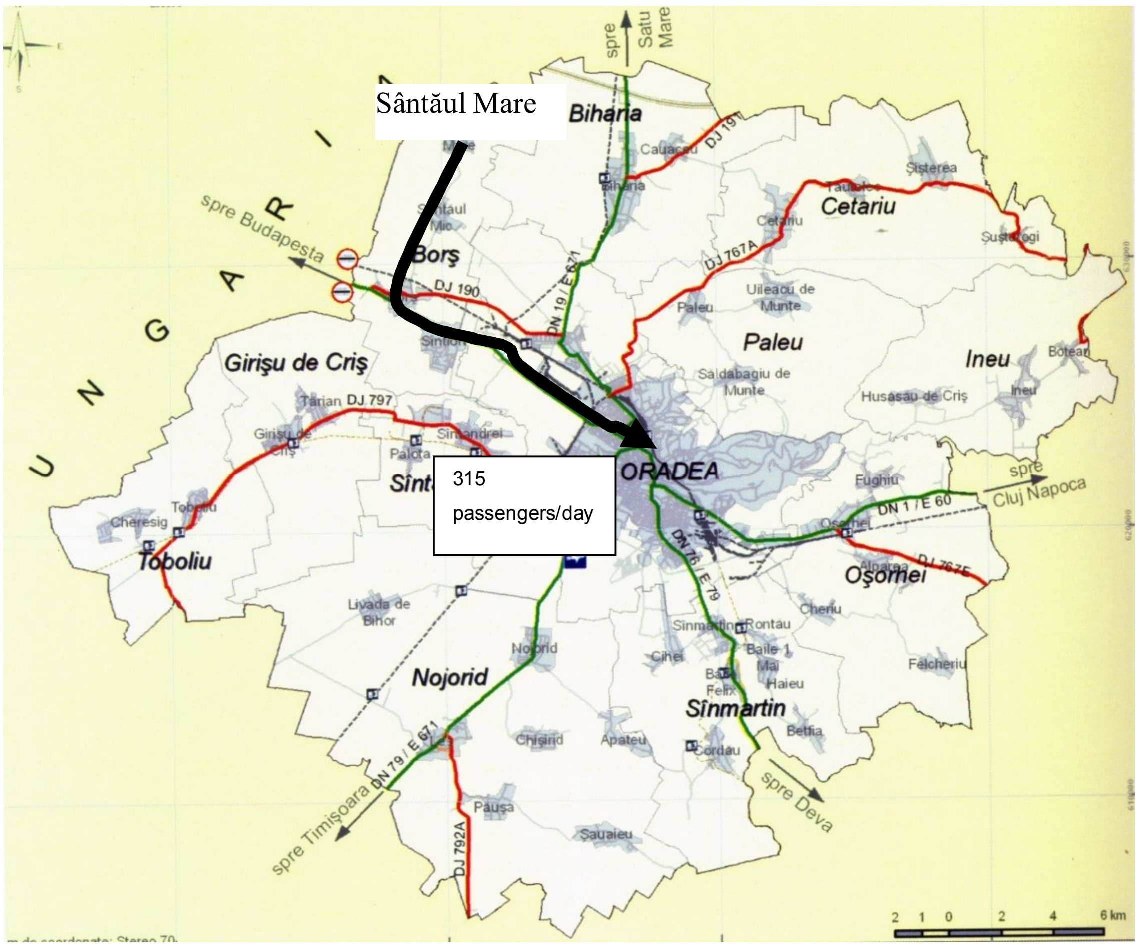

Fig. II.45

The peak hours are:

- 6.00 – 8.00 in the morning (conventional by 100%)
- 14.00 – 17.00 in the afternoon (in comparison with more than 125%)

The peri-urban transport relation Oradea– Osorhei – Ineu

There is to retain:

The beginning hour of the program is:

- from Oradea 6.30
- from Cheriu 6.00

The final hour of the program is:

- in Oradea 15.20
- in Cheriu 17.00

The beginning hour of the program is:

- from Oradea 5.30
- from Botean 4.50

The final hour of the program is:

- in Oradea 18.00
- in Botean 21.00

The beginning hour of the program is:

- from Oradea 6.00
- from Ineu 5.45

The final hour of the program is:

- in Oradea 22.45
- in Ineu 23.15

The beginning hour of the program is:

- from Oradea 5.30
- from Felcheriu 4.45

The final hour of the program is:

- in Oradea 22.45
- in Felcheriu 23.15

The beginning hour of the program is:

- from Oradea 5.30
- from Fughiu 5.00

The final hour of the program is:

- in Oradea 18.30
- in Fughiu 18.00

The beginning hour of the program is:

- from Oradea 5.30
- from Husasau 5.00

The final hour of the program is:

- in Oradea 22.45
- in Husasau 23.15

The passengers traffci flow to Osorhei – Ineu

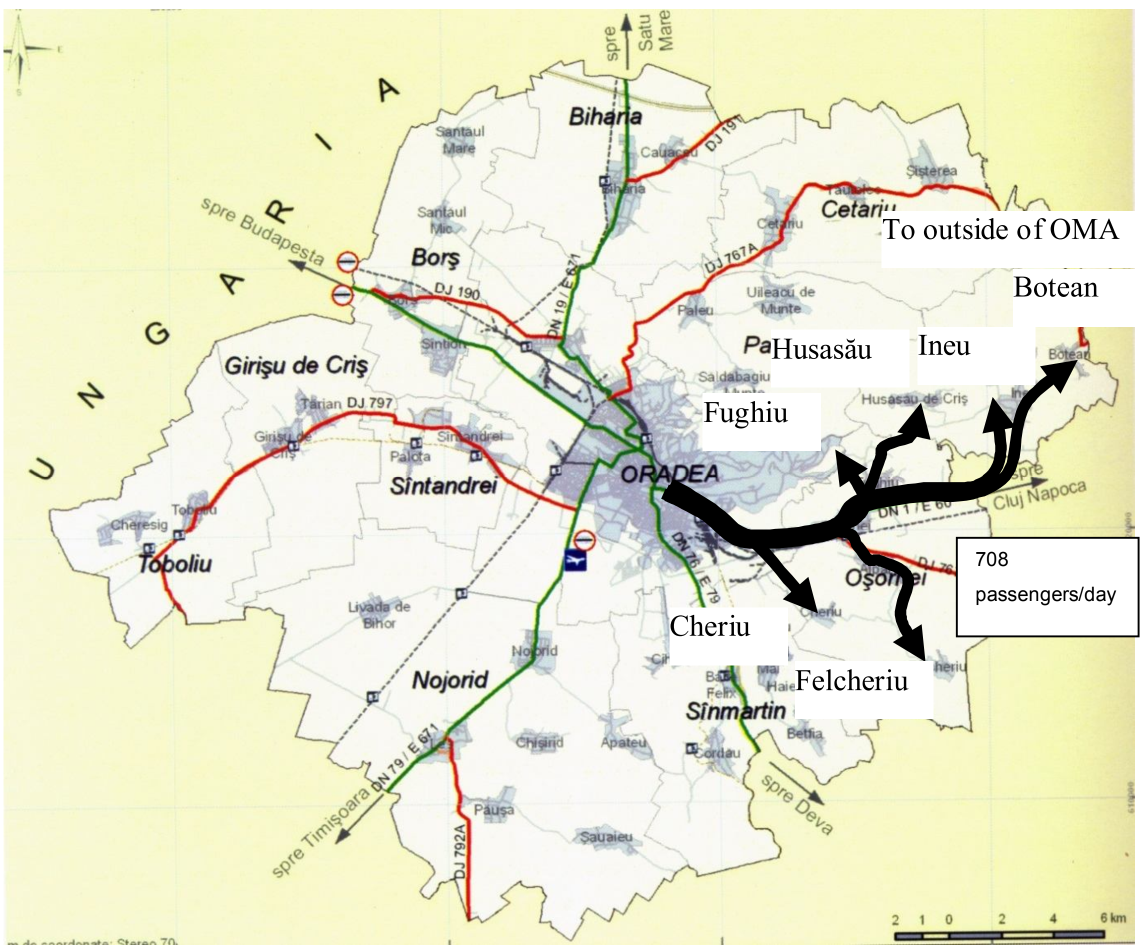

Fig. II.46

The peak hours are:

- 7.00 – 8.00 in the morning (conventional by 100%)
- 13.00 – 16.00 in the afternoon (in comparison more than 300%)

The passengers traffci flow to Oradea

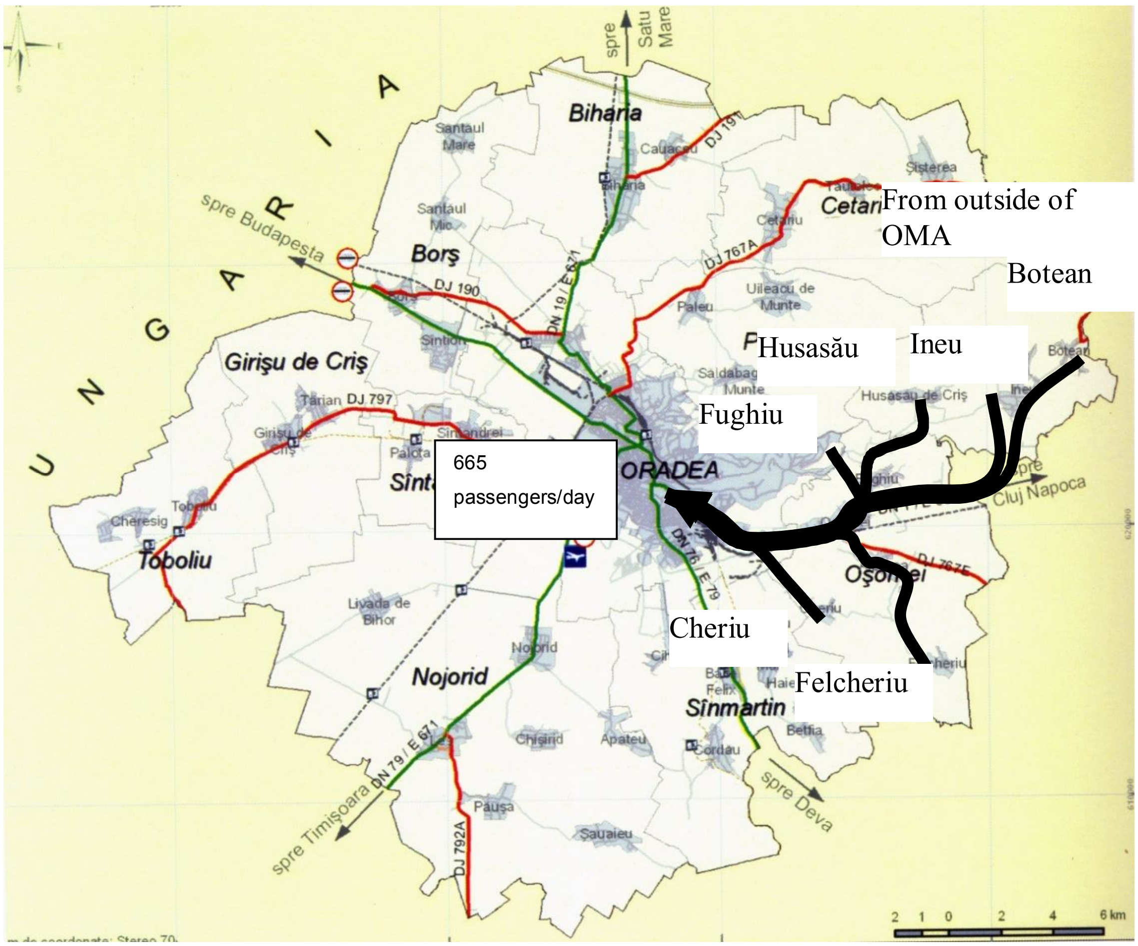

Fig. II.47

The peak hours are:

- 5.00 – 9.00 in the morning (conventional by 100%)
- 14.00 – 17.00 in the afternoon (in comparison of approx. 25%)

The peri-urban transport relation Oradea – Nojorid

There are to retain:

The beginning hour of the program is:

- from Oradea 5.30
- from Nojorid 5.00

The final hour of the program is:

- in Oradea 21.15
- in Nojorid 20.45

The beginning hour of the program is:

- from Oradea 5.30
- from Livada 5.00

The final hour of the program is:

- in Oradea 21.25
- in Livada 23.00

The beginning hour of the program is:

- from Oradea 6.00
- from Sauaieu 7.00

The final hour of the program is:

- in Oradea 14.00
- in Sauaieu 15.00

The passengers traffic flow to Nojorid

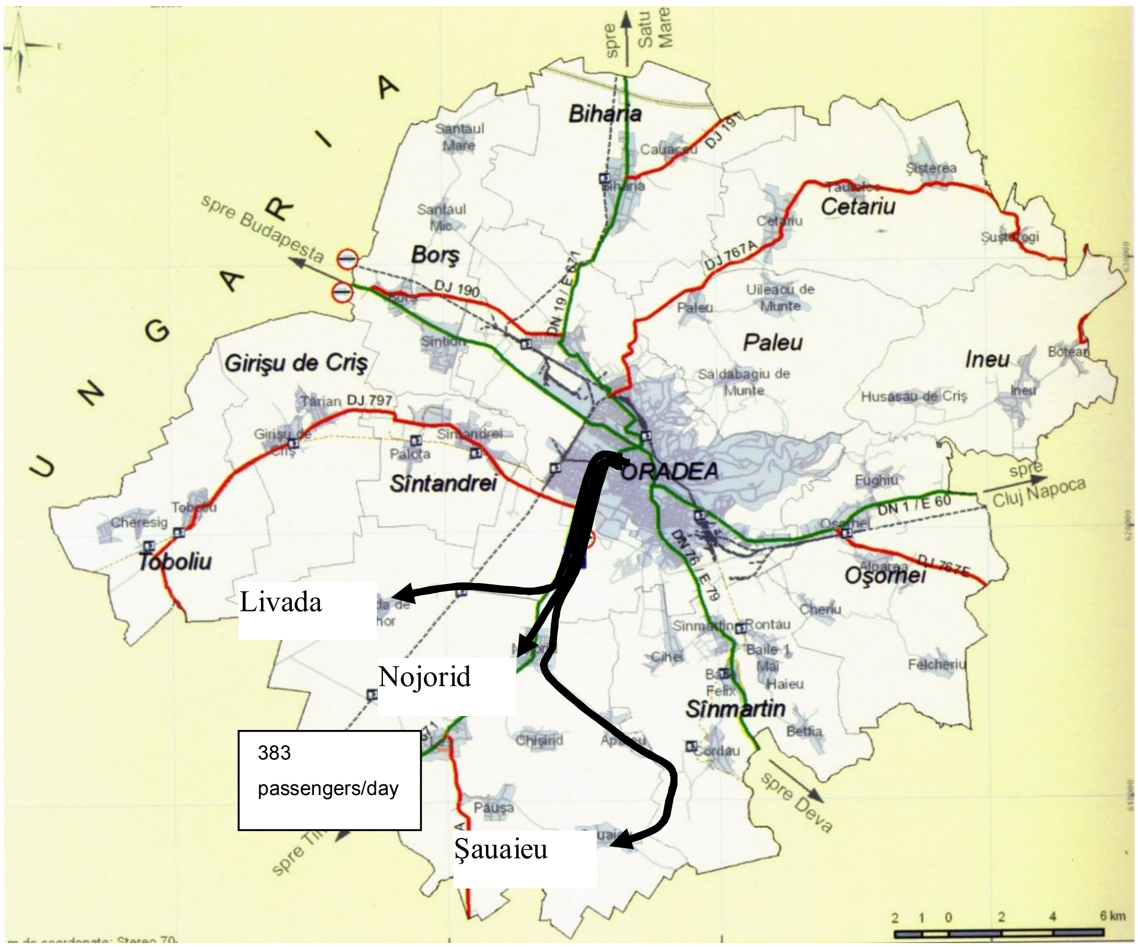

Fig. II.48

The peak hours are:

- 6.00 – 9.00 in the morning (conventional by 100%)
- 13.00 – 16.00 in the afternoon (in comparison with more than 200%)

The passengers traffic flow to Oradea

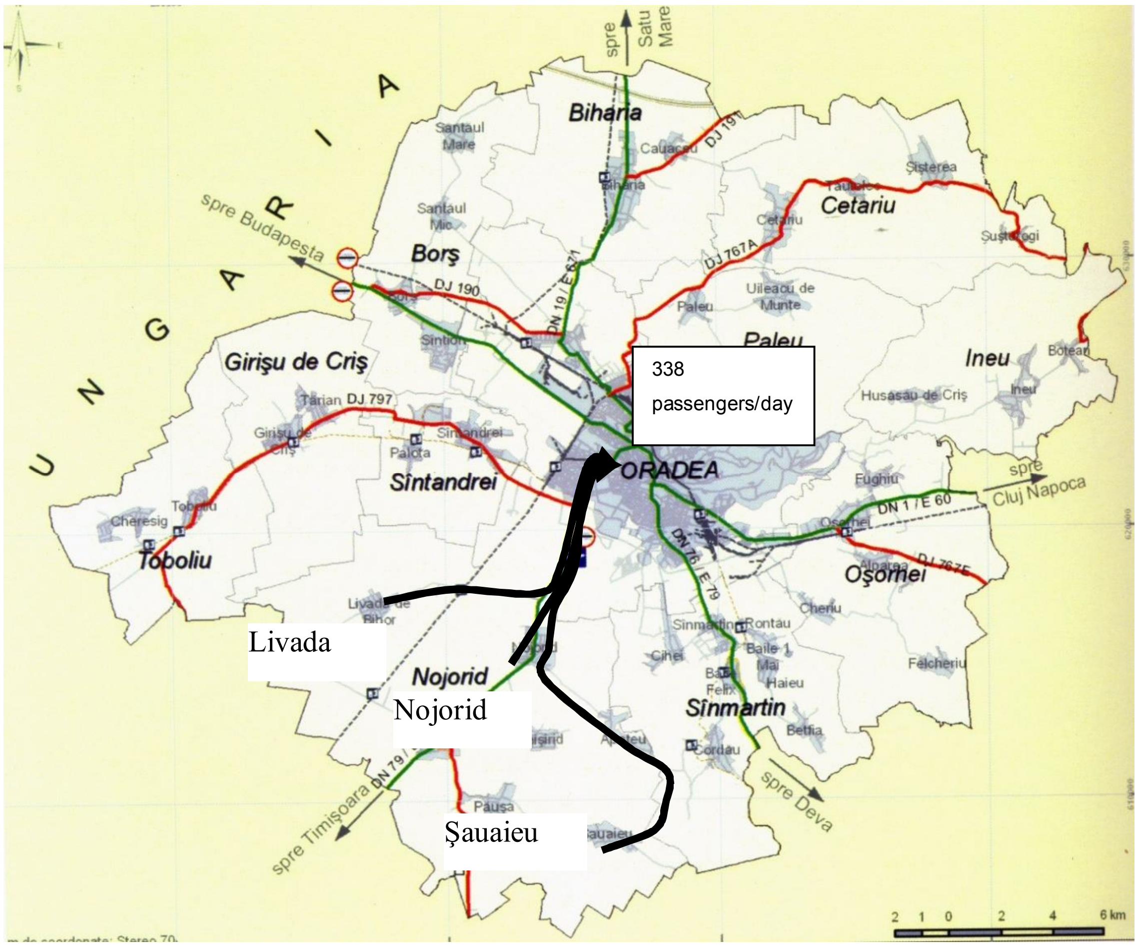

Fig. II.49

The peak hours are:

- 6.00 – 9.00 in the morning (conventional by 100%)
- 11.00 – 18.00 in the afternoon (in comparison with more than 30%)

The peri-urban transport relation Oradea – Paleu – Cetariu

There are to retain:

The beginning hour of the program is:

- from Oradea 5.00
- from Cetariu 5.45

The final hour of the program is:

- in Oradea 17.20
- in Cetariu 16.00

The beginning hour of the program is:

- from Oradea 6.50
- from Paleu 8.00

The final hour of the program is:

- from Oradea 18.20
- from Paleu 18.00

The passengers traffic flow to Paleu and Cetariu

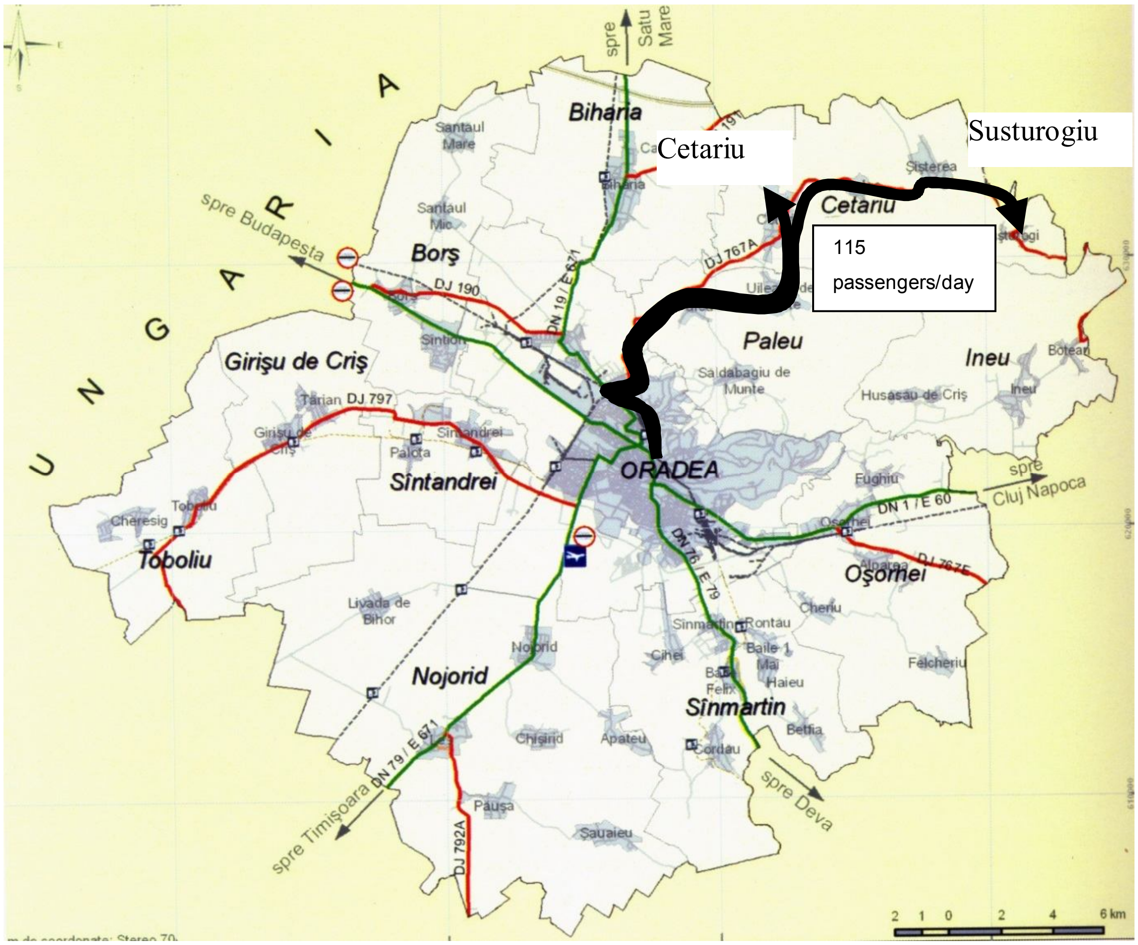

Fig. II.50

The existence of peak intervals is questionable because the need for transport (demand) are subordinated to offer - which is reduced to a few courses, such as the distribution of time intervals has a improper analysis.

The passengers traffic flow to Oradea

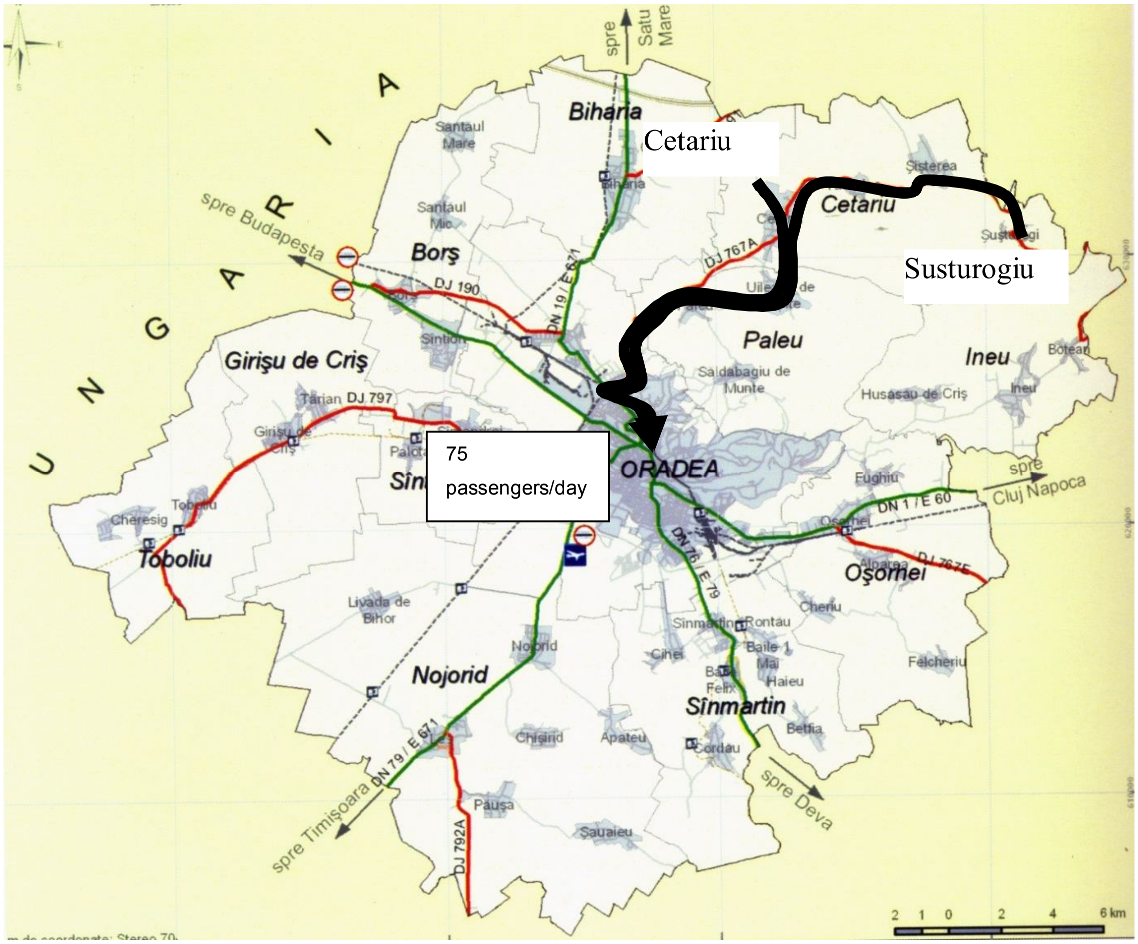

Fig. II.51

The existence of peak intervals is questionable because the need for transport (demand) are subordinated to offer - which is reduced to a few courses, such as the distribution of time intervals has a improper analysis.

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The peri-urban transport relation Oradea – Sanmartin

There are to retain:

The beginning hour of the program is:

- from Oradea 4.50
- from Baile Felix 5.00

The final hour of the program is:

- in Oradea 22.00
- in Baile Felix 22.15

The beginning hour of the program is:

- from Oradea 5.45
- from Baile 1 Mai 5.00

The final hour of the program is:

- in Oradea 20.20
- in Baile 1 Mai 20.30

The beginning hour of the program is:

- from Oradea 5.30
- from Betfia 5.00

The final hour of the program is:

- in Oradea 22.45
- in Betfia 20.00

The beginning hour of the program is:

- from Oradea 5.30
- from Cihei 5.00

The final hour of the program is:

- in Oradea 22.45
- in Cihei 21.00

The beginning hour of the program is:

- from Oradea 5.30
- from Cordau 5.00

The final hour of the program is:

- in Oradea 22.45
- in Cordau 20.30

The passengers traffic flow to Sanmartin

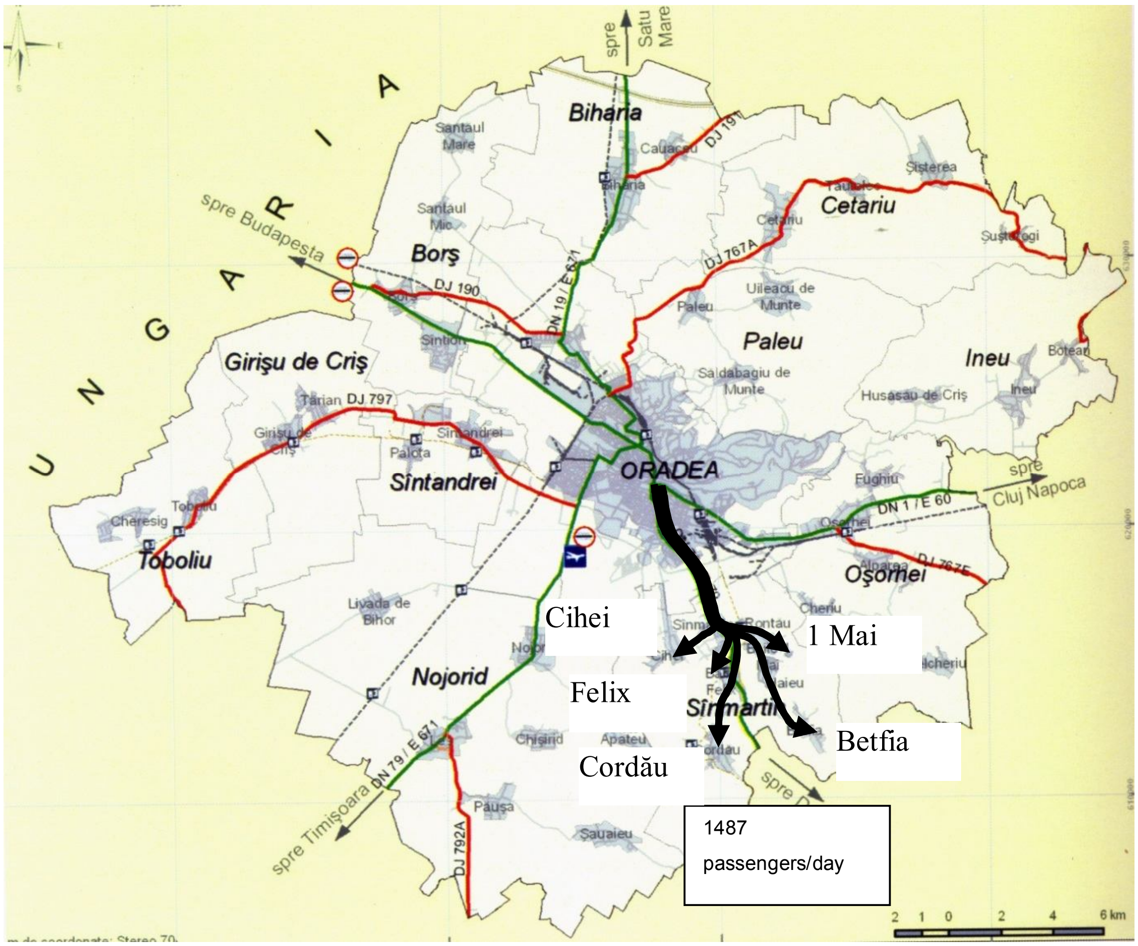

Fig. II.52

The peak hours for the two resorts Baile Felix and Baile 1 Mai:

- 7.00 – 10.00 in the morning (conventional by 100%)
- 14.00 – 17.00 in the afternoon (in comparison lower than 50%)

The peak hours for the theree villages Betfia, Cihei and Cordau are:

- 5.00 – 9.00 in the morning (conventional by 100%)
- 12.00 – 17.00 in the afternoon (in comparison by approx 500%)

The passengers traffic flow to Oradea

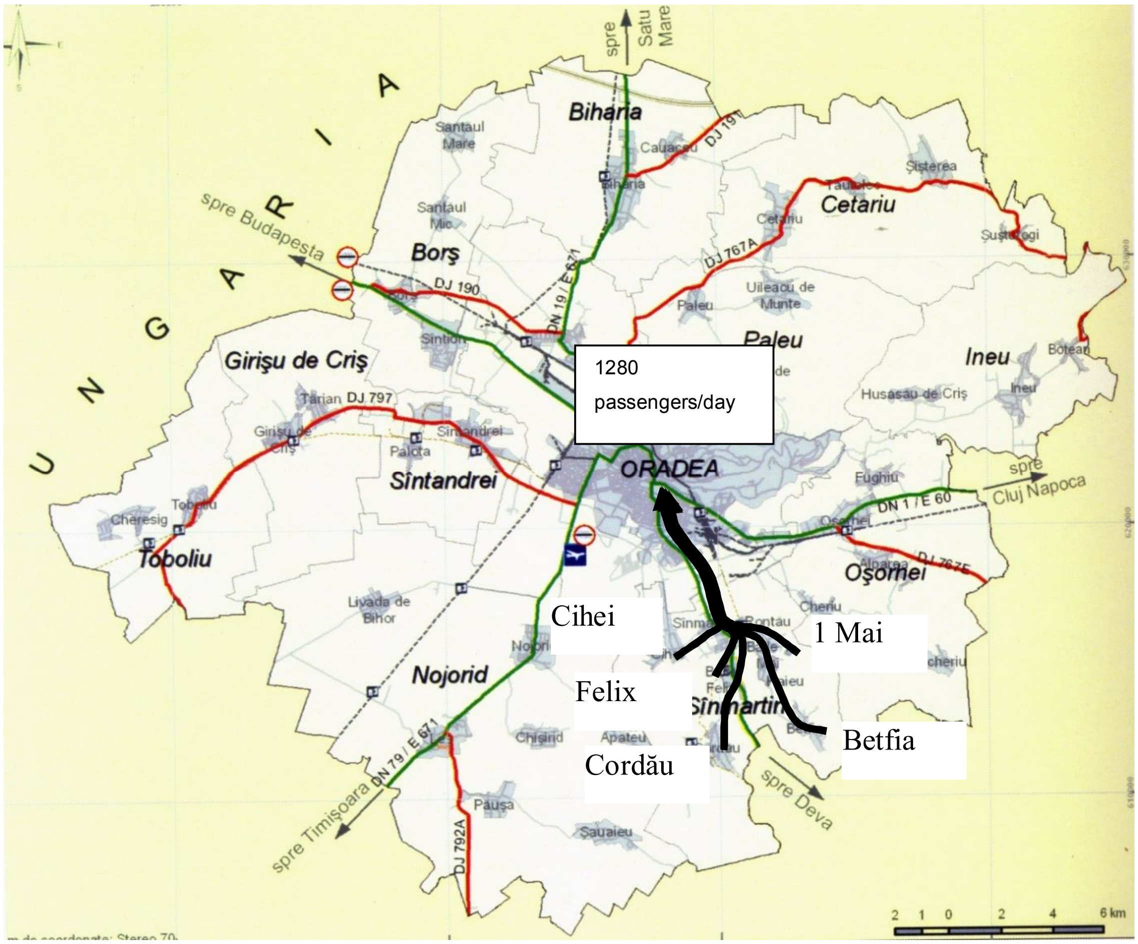

Fig. II.53

The peak hours for the two resorts Baile Felix and Baile 1 Mai:

- 6.00 – 8.00 in the morning (conventional by 100%)
- 14.00 – 17.00 in the afternoon (in comparison by more than 120%)

The peak hours for the three villages Betfia, Cihei and Cordau:

- 5.00 – 8.30 in the morning (conventional by 100%)
- 13.00 – 17.00 in the afternoon (in comparison with lower than 25%)

The passengers transport relation Oradea – Santandrei – Girisu de Criș – Toboliu

Thare are to retain:

The beginning hour of the program is:

- from Oradea 4.40
- from Santandrei 5.20

The final hour of the program is:

- in Oradea 15.20
- in Santandrei 15.40

The beginning hour of the program is:

- from Oradea 5.30
- from Palota 5.00

The final hour of the program is:

- in Oradea 18.30
- in Palota 18.00

The beginning hour of the program is:

- from Oradea 5.25
- from Giris 4.45

The final hour of the program is:

- in Oradea 22.30
- in Giris 21.00

The beginning hour of the program is:

- from Oradea 5.30
- from Cheresig 4.45

The final hour of the program is:

- in Oradea 22.40
- in Cheresig 17.30

The passengers traffic flow Santandrei – Girisu de Criș – Toboliu

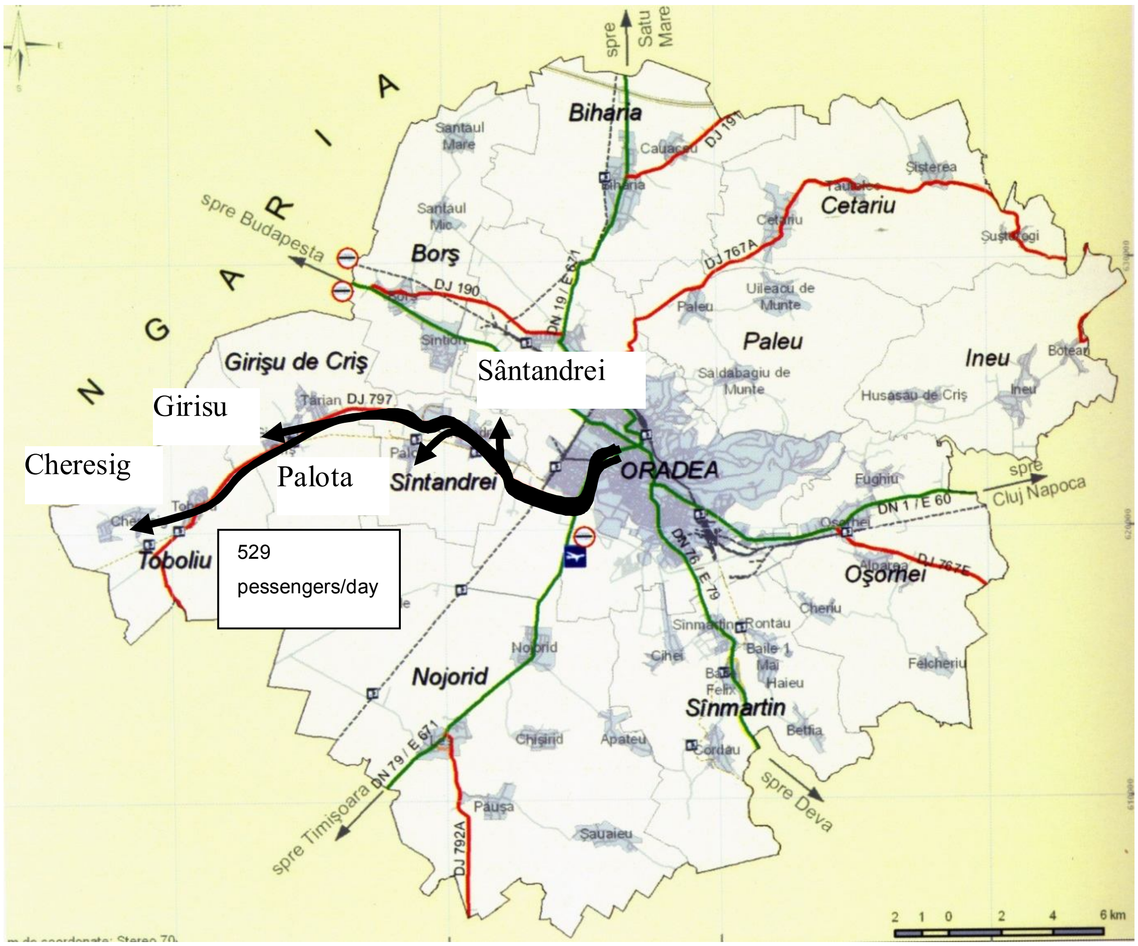

Fig. II.54

The peak hours are:

- 7.00 – 8.00 in the morning (conventional by 100%)
- 13.00 – 17.00 in the afternoon (in comparison with more than 250%)

Thae passengers traffic flow to Oradea

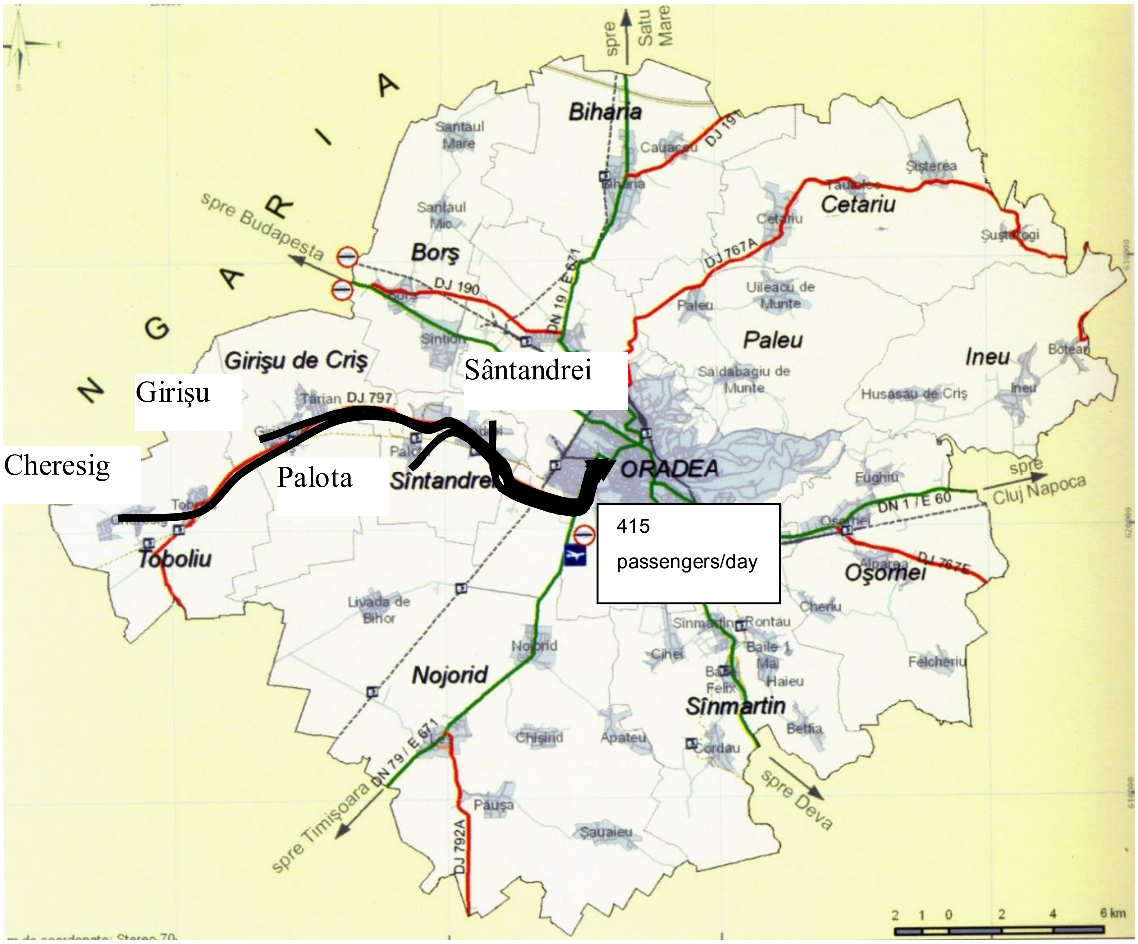

Fig. II.55

The peak hours are:

- 6.00 – 8.00 in the morning (conventional by 100%)
- 14.00 – 16.00 in the afternoon (in comparison of approx. 33%)

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The following table shows the situation of trips shift between city and OMA – in number of daily trips in a workingday:

Tab. II.14 – Trips shift between city and OMA

Relation	From Oradea to OMA villages	From OMA villages to Oradea	Total	Observations
Bors	**345**	**315**	**660**	
Biharia	**58**	**123**	**181**	There are no courses. The only relation for each the „outputs" are lower than „inputs".
Paleu – Cetariu	**115**	**75**	**190**	
Osorhei – Ineu	**708**	**665**	**1373**	
Sanmartin	**1487**	**1280**	**2767**	
Nojorid	**383**	**338**	**721**	
Santandrei – Girisu – Toboliu	**529**	**415**	**944**	
Total	**3625**	**3211**	**6836**	

It has been found:

In all cases, except the relation to Biharia, the number of trips is higher in terms of outputs than those of inputs in the city; the explanation is found in travel behavior: in the city there are assured in the beginning points of the trips a good regularity – the citizen knows that at a certain hour a vehicle will arrive – while at the other side of the route and especially along the route – situated in one the villages – up to the city, the regularity issue has a random connotation rather than exact.

This is the aspect that once solved, gives a solution to the issue of commuters: it is necessary that allocation of the transport courses which serve or will serve the relations IN THE GEOGRAPHICAL AREA OF THE ORADEA CITY to be done only for **those urban/peri-urban transport operators which fulfill ADDITIONAL conditions of quality of transport**. Corroborating this measure with the posibilities to undertake the flow of commuters by urban transport, this shoul lead to mobility envisaged by SUMP.

OBJECTIVES TO EXCLUDE:

OBJECTIVES WHICH REQUIRE TO DECREASE THE SCALE/SIZE:

OBJECTIVES FOR EACH THE SCALE/SIZE HAS TO BE MAINTAINED:

OBJECTIVES WHICH REQUIRE TO INCREASE THE SCALE/SIZE:

- high qualitative demands for public transport operators that participate to auctions for peri-urban routes;

OBJECTIVE TO INTRODUCE:

- prepare a program of transport service for peri-urban area (particularly to Băile Felix and Băile 1 Mai resorts but also to Borş – link with European Western);
- the local authority should take into account the legal arrangements to undertake the activity outside the city's boundaries;
- to analyze the cases in which it is possible to introduce special lines for penetration-distribution flows big enough (for example the route to Baile Felix and Baile 1 Mai);
- to analyze the possibilities analiza posibilitatilor de uniformizare a platii printr-un singur abonament a deplasarilor urbane in combinatie cu deplasarile periurbane;
- analyze the possibilities to standardize the payment into a single pass for urban trips in combination with peri-urban trips;
- actions and rules against „piracy" on the urban trips market;
- should be introduce a tax / fee – contribution of the non-local transport operators in order to cover the costs of maintenance the boarding-unboarding stations used by them;
- remove the taxi stations near to boarding-unboarding stations of SC OTL SA;

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XII. provide conditions for a superior intermodal transport services

Some groups of experts in the field recognize that the development of separate and even separatist between mode of transport is one of the causes of congestion in cities. Modal shift of people often leads either to a loss of comfort and / or an increase in travel time or involve higher costs. Intermodality is defined as the material and procedures that ensure optimum trajectories from origin to destination that a passenger travels across the combined networks involving at least two different means of transport except walking.

The main objective of intermodality is to give travelers the opportunity to go efficiently and comfortably from "door to door". Intermodality can contribute to the development of integrated and efficient transport system, allowing a rebalancing between the various modes of transport and to offer passengers more choices. The nature of connections during a movement, until the last km of urban area requires cooperation between decision makers in ensuring of a continuous operations for transport.

Interconnection is the result of clear connections between different modes of local transport networks (for the user), both within the city and between the city networks and the rest of the networks.

Interoperability is the ability of transport, geographical limited to provide efficient services between different networks (services to overcome the material, technical or organizational barriers).

Door to door travels request primarily increased demands between transport system and an operational integration. If these requirements can be met, intermodality offers the following benefits:

- Increased opportunities to rebalance transport modes by encouraging strong links, eg to suburban and interurban transport system (but by extension with rail or air, for example). It can be thus obtained a reduction of negative environmental and social externalities by

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efficient economical means (a balanced transport system, but also integrated physical and operational, which offers to passengers a wider opportunity to choose certain means of transport, depending on their strengths to compensate the weaknesses).

- More trips will lead to effective individualized trips and to the the system effciency as a whole.
- Finally, a well organized transport system that contributes to achieving the EU argets, namely competitiveness, labor distribution, local sustainable development and territorial cohesion.

Current status of intermodal passenger transport in Oradea shows that there are ways to achieve all these benefits, but only in the presence of an analysis of the costs and benefits. Among the most important issues in this respect is that of combinations and means which have to be promoted as a priority when there are considered the real transport costs, including external costs (environmental costs, costs for urban split, costs of accident, costs of congestion, ecological separation costs, etc.) and, on some level, the assessment of actual costs and benefits of certain intermodal investments.

The required facilities at intermodal nodes vary depending on the combination of transport modes. In order to improve interoperability, intermodal transport nodes facilities are required to provide travel convenience, safety, comfort and accessibility for all users including the elderly, children, people with disabilities, people with heavy luggage, tourists and foreigners.

The location and number of interchange should be decided based on local or urban factors including transport characteristics, network transport and travel patterns. The size and the location of intermodal nodes in an integrated network of transport is particularly important everywhere where attracting system of passengers' flows connects to a central transportation system. In this case, the location should be chosen so as to attract passengers' flows to intermodal node to operate on shorter routes and within a short time travel.

Functional requirements of facilities of intermodal transportation node

Easy transfer between modes of public transport

Interchange must be carefully designed to keep the minimum distance of transfer and fast movement of passengers simply so as to avoid to complicate the transfer trips traveling between different transport services. It is also very important that the transfers to be made at the same level (preferably on the same platform) to avoid bad weather and make the trip as little problematic. At light rail terminals in Hanover buses and light rail stop to one side and another each of them. This means that the points of arrival of a transport mode connect the starting points of the other, in both directions. In these cases, the central computer also controls the arrival of both modes. To make his people move more easily in both horizontal and vertical levels in an intermodal hub that has wider space and more levels is very important to be provided with elevators, escalators and moving band (Air Terminal Osaka Japan). Intermodal hubs in Australia Perth Warwick intermodal node, Node intermodal Dandenong Melbourne or Brisbane Transit Centre) were done a design without obstacle to facilitate wheelchair access for people with disabilities by providing ramps and minimizing differences level. It is also very important to consider groups of persons whose mobility is reduced.

Car parking facilities

To make an easy transfer between private car and public transport, it is desirable to develop a possibility of parking within corresponding walking distance to public transport. Parking facilities should be provided to less than 100 m of stopping points. It is also very important to maintain a reasonable level of parking charges to increase the attractiveness of public transport. Adopting a parking system where users are not charged as long as they are users of public transport (Intermodal node Dandenong Melbourne) can be useful.

Bicycle parking facilities

The bike has been recognized as an important transportation since it is "friendly" to the environment. To encourage this mode of transport is required to reserve a parking space for bicycles in the points nearest public transport stop.

Safety and Security

Security measures are very important when create a safe and secure environment for all users of intermodal nodes, especially women. Safety and security at night and off-peak hours should be considered in the design process so that both the stopping and connecting passages to ensure proper visibility and be lit properly (Caboottine railway station in Brisbane). Surveillance cameras

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can be installed in some points with low visibility to ensure user safety at night or off-peak hours (Parc – O - Bus Rivermead in Hull - Canada). And furthermore, traffic management should ensure that all equipment remains in a constant order, clean and kept in "friendly" conditions for travelers. Emergency evacuation and rescue activities which derive in case of accidents or other accidents must be considered when designing inter-modal nodes (Diamond Underground Shopping Mall in Osaka railway station).

Currently, in the Oradea there is a single bus station (Razboieni Bus Station) in the property of a private carrier. County transportation lines uses a series of stations of the local public transport operator and as the ends of lines are the following stations (SC OTL SA): Borsului, Decebal, Central Station, Cluj (Traffic Police) and Nufarul. These are not designed according to the requirements for a bus, resulting in many problems of safety and comfort, and not having the necessary facilities and creating traffic problems.

Proposed interchange:
- central railway station: upgrade central station so that the transition from rail to road - particularly transport system that takes the trips to Baile Felix and Baile 1 Mai - will be an action of will form an **intermodal hub of major importance**;
- Nufarul point of boarding-unboarding - for interurban transport - can become through an adequate investment an effective interchange for passenger transport system between the city and part of the villages belonging to OMA;
- Oradea Airport: can benefit from direct connection to the city center by tram line extension.

The essential product of the intermodality consists in combining various types of transport during a long trip, which is in a bond that strive for perfection. In order to achieve such an ideal product, it is necessary to integrate:

- the networks through interchange points;
- technological process through cooperation and exchange information;
- ticketing and pricing systems,

which are the passengers’ requirements.

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Transfers between the means of transport is done at interchange points, as entities of convergence between nodes, in the framework of integrated transport networks.

An interchange is a location, but induces an action of its two main functions of the access and transfer. Regarding interchange points the passengers' necessities were grouped into four major categories:

- Logical and operational (the integration/the correlation of transport schedules, the average waiting time)[39];
- Physical design (accessibility and pedestrian flow, material obstacles between means, access to recreational activities, lighting, easy transfer, cleanliness, access to information systems and the ticketing system);
- Spatial and local planninf (location, the planning of surrounding area, accessibility).

An intermodal system must optimize the use of various means of transport so that it can compete with taxi service, but also with the private car, in terms of comfort, speed and flexibility. This optimization should not be made in isolation but considering mobility as a whole, by reducing any perception of passengers trying to intrerrupt his trip. A good example of interoperability can be given at the regional level, such as the city of Karlsruhe in Germany, where urban tram can run on the same railway infrastructure is and railroad train services, linking the city center to the outer regions. In this case, the compatibility between heavy and light rail allow direct trips from neighboring areas to the city center without having to change the means of transport in the main train station, which is outside the city center.

Not applicable for Romania or Oradea, but the idea of traveling by tram or trolleybus to Baile Felix and Baile 1 Mai is not ignored.

Regarding the design and function of the interchange, numerous positive and negative examples can be given, in cities in Europe. In Madrid, Spain, was created in 2000 a huge station (Avenida

[39] It to note that in preparing of SC OTL SA transport schedules thare are not considered any correlation with passengers trains – central station.

de America) interchange between bus and subway, reducing the transfer duration. Volume travelers crossing this station increased to 30% in the first year after reopening the station. Another example is the UK Stratford. It is a case of successful cooperation between carriers, private sector and other partners to integrate public transport with urban design and economic regeneration strategies. It is a new bus terminal which was a first element of the interchange that now includes national network stations and the underground railway, as landmark for the East London and a catalyst for restructuring the city center[40].

In terms of implementation intermodality, the most important is to establish a clear perspective of the user to avoid the risk of misperception and/or misunderstandings.

The logic of the (public) operator is based on its own logistic organization (lines, graphics circulation, vehicles rotation and drivers), while logic is based on the needs of their users to find the most pleasant way to travel between points origin and destination.

The correlated understanding of these two logics is that a total deregulation and market competition are valid only for long distance transport, while public transport requires coordinated planning and control.

Both types of transport are found in interchange points, reason for which attention should be paid to passengers real-time information systems (especially in the points that are not designed element by element, but in an integrated manner), because it has been some conflict in terms of necessary cooperation between transport and competition between operators to attract passengers. Operators want to differentiate between them to provide individualized services recognized. They appear to have no interest to work closely with rival companies or to share information. At the executive level, it is vital a cooperative approach and a rational process of guidance.

Inappropriate feelings of autonomy of key-actors are due to malfunctions in the planning process. This becomes a major problem, because there are many players in this field and their own

[40] Still therea are few information about organization an management of these points or of the whole structure.

interests. It has to be established partnership projects and the multiple competent coordinator is a mandatory function. But above all, access to information, promote the information in real time about the trip, rich in content with a simple and transparent presentation are not required but are essential for planning a efficient trips and negotiation of transfers, especially in case of service or traffic interruptions. Some fair claims information of the intermodal passengers that can be supported by telematics solutions are the following:

- Information on traffic schedules, prices, rules;
- Understanding the easy messages before, during and after interchange points attract attention of passengers;
- (Sometimes) assistance in automatic planning of a multimodal trip;
- Availability of information along the trip, the real-time and instant information about delays, even when the user is in the transport means which precede affected mean of transport.

In order to talk of an efficient "door to door" transport system, these absolutely should include all services of means and networks at various hierarchical levels. Beyond the core of transport services, there are some basic elements of the transport links.

Decision of an intermodal trip start with information both before and during travel. Integrated ticketing and tariff systems in the context of ticket payment, can contribute to the quality of such trips. Integrated systems of this type are of great importance to consider (by customers) that use of an intermodal passenger transport has become more attractive.

Technical and organizational aspects of these areas are in a considerable interdependence and will be approached together. It should be emphasized that integrated pricing is an essential precondition for the introduction of improvements of the intermodal chain trips. A simple ticketing payment in advance, using as few interfaces as possible, including customer-oriented services, could contribute significantly to improve intermodal passenger transport.

OBJECTIVES TO EXCLUDE:

OBJECTIVES WHICH REQUIRE TO DECREASE THE SCALE/SIZE:

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OBJECTIVES FOR EACH THE SCALE/SIZE HAS TO BE MAINTAINED:

OBJECTIVES WHICH REQUIRE TO INCREASE THE SCALE/SIZE:

- the central station modernization so as the transition from rail to road to constitute an action of forming a **intermodal hub** of maximum importance; same for Nufarul node;

OBJECTIVES TO INTRODUCE:

- reviwe the project wich are related to development of infrastructure so as the network (of tram or trolley) to include also de airport location;
- organize the transport schedule support de urban transport operator in accordance with the schedule of transport by rail and by air.

5.2 SMART targets

(specific, measurable, applicable, realistic, time-bound)

The objectives are concrete forms of commitment in a SUMP, but **without specify** the desired level of change within a given timeframe. Targets are needed to assess whether a measure – WHICH WILL BE ADOPTED[41] – really achieves the desired outcomes. Detailing:

- Specific = which is customizable for Oradea and consistent with infrastructural characteristics and with institutional organization and mostly with population's feed-back to a certain change in life style. Targets must be accurately described using qualitative and/or qualitative terms, which are understood by all stakeholders.

- Measurable = to which can be determined or assess the value – of whole or one relevant indicators, in relation to the pursued interest. Generally, all imaginable rational parameters related to mobility phenomenon can be measured; however, in practice:

  - ✓ some parameters are not included in usual list of official statistics; for example, tons*km done within the city.

  - ✓ other parameters do not have unit of measure; for example the level of smell for emissions of internal combustion engine is not measurable.

  (it is to underline that **resources are, also, able to measure** the presumed qualitative/quantitative changes that occur).
- Applicable = that can be implemented (with real opportunities to be achieved); for something to be applicable in the space of rationality it has:

[41] The sequence is: objectives – overcome stage, targets – stage in progress, measures – forward stage.

- ✓ to be necessary
- ✓ to exist **the procedure, means, framework and opportunity** (all these can be achieved after periods of long and intense efforts): implementation involves technical, operational and financial abilities, especially AGREEMENTS BETWEEN STAKEHOLDERS, RESPECTIVELY COMMITMENTS AND RESPONSABILITIES.

- Realistic = that is based on complete reflection of reality by objective essential information.
- Time-bound = that indicates time under two aspects: time of initiation or time of action progress (which can be unlimited); in other words, the key dates for achieve objectives are exactly specified.

The targets are essential for organize the SUMP monitoring and assessment and can not be separated from the **selection of indicators** by which monitoring and assessment will be done. Moreover, targets and associated indicators establishing assures transparency and clarity on what it is intended to achieved, in terms of city's mobility change.

Purposes of this activity is:

- ➢ Define a set of intermediate and final results in order to monitor progress in achieving goals.
- ➢ Detail a methodology that allows the monitoring of progress in achieving objectives.
- ➢ To set key references in order to assess the efficiency and effectiveness of measures.

Next theoretical example taken from SUMP guidelines will explain the concept of "target":
theme: traffic congestion.
objective: reducing the traffic flow in a section of major city's route with highest level of traffic flow at peak hours.
target: growth rate of traffic flow passing through the section between 6:00 am and 9:00 am does not have to exceed a limit value of 5% (at the end of every 2 years period from implementing the measure to reduce congestion)[42].

[42] It is to note that "measure" was not explicitly mentioned because it is not necessary for the notions as theme, objective, target. But this aspect highlights that *theme, objective, target, measure* sequence will not run one single time because it is possible, but less probable, **from the start,** that targets would have to be taken into account all parameters, all limitations, all successful possibilities etc, which could characterize a given situation.

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THE ABOVE IDEA UNDERLINES THE FACT THAT IT IS UNREALISTIC TO THINK THAT THE APPLICATION OF SOME DEMOCRATIC MEASURES – OF ANY NATURE – WOULD RESULT IN LOWER VEHICLE FLOW: THE SLOWDOWN IN THE GROWTH RATE OF VEHICLE FLOW IS A SUFFICIENT RESULT SO AS THE APPLICABILITY OF MEASURES TO BE A SUCCESS.

The main task of this activity is to “force” the formal adoption of the objectives, as part of action plan and SUMP budget plan.

In order to establish the realistic targets, there are two main options:

- Modelling – ut this is expensive and consumes time.
- Taking into consideration what others made, as the homologous packages of measures could be similar to those considered fro Oradea.

Concerning the number of targets, “orientation plan” for local transport in United Kingdom (second edition) suggests that:

- to include a large number of targets for final or intermediary objectives is likely to be counter-productive;
- optimal numer of indicators in an efficient set is seems to be between twenty and fourty, mainly determined by the size and plan characteristics (this is a general indication in UK).

But many experts involved in SUMP projects – on the continent – consider that working with fewer targets could prove more effective in certain contexts, particularly for “newcomer” cities who do not have extensive resources or experience determine development of SUMP – **attitude which will be adopted by INCERTRANS in resolving ongoing contract.**

Below there are inserted 25 target indicators in SUMP implementation:

• total number of public transport trips;
• accessibility of public transport vehicles;
• bus/tram/trolley routes (number, length, density, coverage);
• electricity consumption related to energy consumption from fossil fuels - in public transport of passengers;
• length of dedicated lanes for public transport from all the network of streets ;

• the ratio of the total population and public transport fleet;
• commercial speed achieved by public transport at peak hours;
• end time of public transport program;
• cost per km of travel in public transport;
• number of employees engaged in transportation company;
• the degree of motorization in the city;
• number of parking spaces (excluding residencial spaces);
• bicycle tracks network (length, density, percentage of total road network);
• the number of bicycle rental points;
• km of roads built or rehabilitated;
• square kilometers of extension of the city limits;
• development of green areas versus built areas (sq/m);
• hourly traffic on the most crowded traffic artery of the city;
• noise on the most crowded traffic artery;
• the pollutants and dust content on the most crowded traffic artery;
• the ratio between the average wage and the price of the trip;
• the cost of a parking hour relative to the cost of a trip of 5 km by public transport;
• the time required to travel 5 km in the means of public transport compared to the average of the same distance traveled by car;
• the level of delinquency in the city;
• freight traffic in the city (tonnes*km/day) .

Regarding the change rate of parameter values which indicates the closeness to the TARGET or contrary, the remoteness to it, INCERTRANS considers that, although it is not a general rule on development model, however there are circumstances which lead to “logistic function of development”.

In order to explain the reason for the use of logistic function of development the following specifications are required. The transport carries out its production process using a specific type of opportunity: the need to shift people across the urban areas. Both the community and transport carriers pass through stages of development characterized by periods of improvement followed by stagnation or even regression; the inherent periodicity of any human activity is manifested on economic development of companies which includes transport. Serving the public is done through a system for that the most part of the demand and supply has random events, that means is a subject that is changing continously.

Optimal structure of the **mix of measures** mobility benefit could be determined if there is a criterion that allows analyzing and comparison of unused opportunities when demand decreases, respectively losses and delays when demand increases. On the one hand, the structure of the **mix of measures** depends on public transport service opportunities; on the other hand the efficiency achieved on the base of a certain level of demand is different from the efficiency achieved in the case of other level od demand (most likely, use of the possible values up to limit of opportunities, involves high levels of efficiency, **but not necessarily the highest).** Practically, the clarification of some aspects related to demand is linked by the explanation of EXPECTED LEVEL OF THE RESPONSE TO INTERVENTION[43].

The optimal level of intervention can be defined as the effort that a technical-economic and administrative system can achieve, in the conditions of resources efficient usage on long terms, taking into account a certain type of traffic structure and certain **qualitative** indicators of activity – primarily the transport and **which has an answer depending on level of introduced resources.** Valoarea diferentei dintre rezultatele de ”maxim” si cea reprezentand nivelul optim de interventie, poarta numele de rezerva economica; atacarea acestei rezerve ofera posibilitatea realizarii unui nivel mai ridicat al indicatorilor **cantitativi**, dar in conditiile unor randamente inrautatite. Se pune astfel problema determinarii corelatiei optime dintre eforturile necesare asigurarii unei anumite oferte si pierderile legate de mentinerea exploatarii la un nivel inferior capacitatii maxime de servire.

[43] The idea is: today is being introduced a new bus line; no one can pretend that starting tomorrow to appear an additional number of passengers equal with transport capacity ensured by new bus line; obviously there is a time of reaction, after this will be registred increases of passengers’ number IF THE LINE WAS INTRODUCED SO AS TO MEET A REAL DEMAND (contrary the new bus line will not bring in system new additional trips – that means there is no reaction to intervention).

In a descriptive way the situation is: at the beginning of the intervention, the amount of material resources, human factor quality, level of organization, the level of understanding the community's needs etc. require a certain effort, most likely parameter/parameters value/values being to a lower level and the any king costs are larger. In time, parallel with intervention maturation (means, methods, technological capabilities, financial involvement) the mix of measures becomes more substantial and appropriate to reality (as penetrating strength not by volume) and beneficial consequences on transport occur. However there is a time when a certain social-economic stability leads to a balance between demand and offer that causes a slowdown of the mobility improvement or even the stabilization (to a upper level than before the intervention, but stabilization), according to a level of conjuncture – case in which the process of refining of initial SUMP measures should be resumed.

Mathematically, the situation can be represented: note with y the level of mobility – characterized from a certain point of view; the growth speed of this (the limit value) $\frac{\mathrm{dy}}{\mathrm{dt}}$ is proportional, on one hand with the value of y which varies along t time, and on the other hand, with the distance of y level in relation with a α level of saturation namely (α - y) factor.

Y factor which grows in the same time with *t* time is called tha launching factor, and (α - y) factor which decrease along time is called the break factor. Involving in calculations a ψ necessary proportionality factor, the mathematical model is done by the relation:

$$\frac{dy}{dt} = \psi y(\alpha - y)$$

Which is a differential equation with separate variables (y, t).

The solving of that follows the next stages:

$$\frac{dy}{y(\alpha - y)} = \psi dt$$

$$\frac{1}{\alpha} \cdot \left(\frac{1}{y} + \frac{1}{\alpha - y} \right) dy = \psi dt$$

$$\ln\frac{y}{\alpha - y} = \alpha\psi(t - t_0)$$

$$\frac{y}{\alpha - y} = e^{\alpha\psi(t - t_0)}$$

$$y = \frac{\alpha}{1 + e^{-\alpha\psi(t - t_0)}}$$

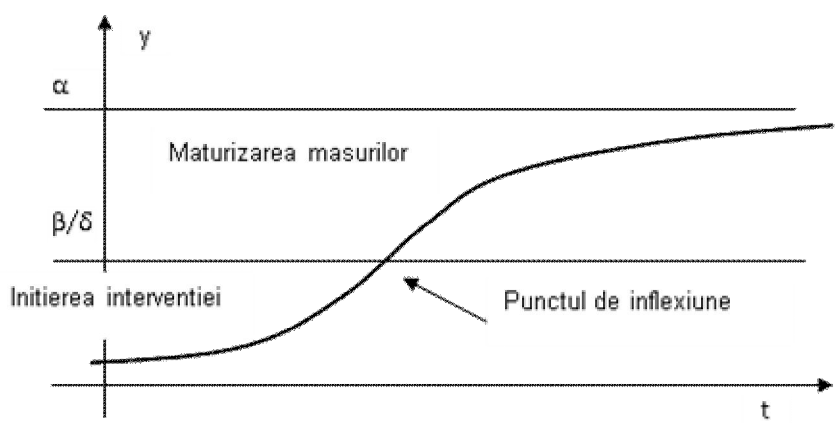
and the general solution:

$$y = \frac{\alpha}{1 + e^{\beta - \delta \cdot t}}$$

called the logistic **function of development**

where $\beta = \alpha\psi t_0$ and $\delta = \alpha\psi$ (note that β and δ parameters organically depends by saturation level α and more $\beta = \delta t_0$).

This aspect revealed by logictic function of development is showed below:



**Maturizarea măsurilor = maturation of measures; Inițierea intervenției = initiation of intervention; Punctul de inflexiune = inflection point.*

Fig. II.56 - Logistic function of development image

Algebraically, the selection of α, β, δ parameters is quite difficult. For a specific case, for fast calculations it can be obtained the following method.

For example, there is a succession of inputs (y = fct.(t)), where y is the volume of activity (in daily transported passengers) in each semester of the next milestone.

Tab. II.15 – Performance data of a SUMP implementation

Variabila independenta	t	0	1	2	3	4	5	6	7	8	9	10	11
Variabila dependenta	y	10	12	18	22	32	57	67	85	92	97	100	…
Variabila auxiliara	H	- 1	0	1	2	3	4	5	6	7	8	9	10

Variabila independenta – independent variable
Variabila dependent – dependent variable
Variabila auxiliara – auxiliary varaiable

Being necessary three parameters it should be used three representative points to ensure, on the one hand, a larger use of the information contained in the input data and on the other hand, to cover all of the graphical representation of the variable. The two conditions can be met if we choose three sets of three points placed at the beginning of the period of 11 years, its middle and its end. so:

$$y_1 = \sqrt[3]{10 \cdot 12 \cdot 18} = 12{,}98$$

$$y_2 = \sqrt[3]{32 \cdot 57 \cdot 67} = 49{,}43$$

$$y_3 = \sqrt[3]{92 \cdot 97 \cdot 100} = 95{,}83$$

The working way requires a translation of abscissa, the y_1 value being calculated 12,98 12 of empiric data series, setting a new origin of time thorugh relation:

H = t – 1

(in addition, a possible start value y = 0 is incompatible with advanced mathematical relations, case in which is repeated the mathematical artifice of translation of the time axis so that the auxiliary value H = 0 to correspond to a start non-zero value).

The chosen points being placed at regular distances from each other (4 to 4) there are formed series of periodical values:

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- for initial point: $H_{initial} = 0$
- for intermediary point: $H_{intermediar} = 4$
- for final point: $H_{final} = 8$

which are introduced in equivalent of the logistic function:

$$\beta - \delta \cdot H = \ln \frac{\alpha - y}{y}$$

And iti is formed a equation systems for each value from those selected:

$$\begin{cases} \beta = \ln \dfrac{\alpha - y_1}{y_1} \\ \beta - 4\delta = \ln \dfrac{\alpha - y_2}{y_2} \\ \beta - 8\delta = \ln \dfrac{\alpha - y_3}{y_3} \end{cases}$$

Eliminating the δ unknown variable from the last two equation

$$\delta = 2\ln \frac{\alpha - y_2}{y_2} - \ln \frac{\alpha - y_3}{y_3}$$

Eliminationg from this last equation and from the first equation of the system the β unknown variable result:

$$\ln\left[\left(\frac{\alpha - y_2}{y_2}\right)^2 \cdot \frac{y_3}{\alpha - y_3}\right] = \ln \frac{\alpha - y_1}{y_1}$$

means:

$$\alpha = \frac{y_2^2(y_1 + y_3) - 2y_1 y_2 y_3}{y_2^2 - y_1 y_3}$$

The β parameter is obtained by replacing the α value in the first equation, and δ parameter by replacing α and β values in th second equation of the system. For the case of the example:

$$\alpha = 118{,}82$$

$$\beta = 2.10$$

$$\delta = 0{,}44$$

So, the searched relation is:

$$y = \frac{118{,}82}{1 + e^{2{,}10 - 0{,}44H}}$$

Which finally conduct to formula:

$$y = \frac{118}{1 + e^{2{,}50 - 0{,}45t}}$$

For example, the most likely value in the first phase t-11 (unknown in tab. II.15) is 103.

Basically, through a simple excel functions can be determined the parameters used: in fig. II.57 is shown as function based on real data, in Fig. II.58 is presented theoretical same functions.

In case in which the target parameter is **usefull for mobility** thorugh the decrease of the values, the functions to be used is:

$$y = 118 - \frac{118}{1 + e^{2{,}50 - 0{,}45t}}$$

The image being showed below in fig. II.59

1	2	3	4	5	6	7	8	9	10	11
10	12	18	22	32	57	67	85	92	97	100

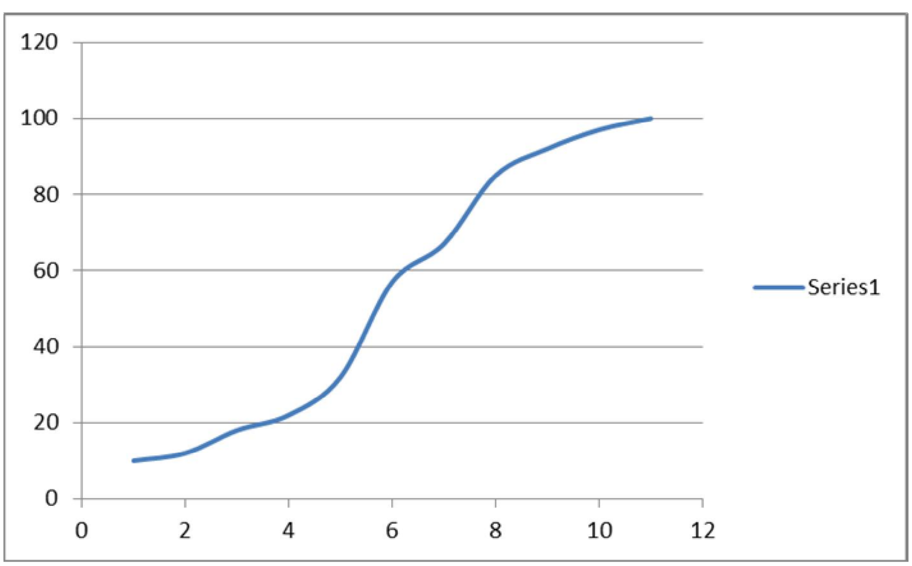

Fig. II.57 – The succession of real data referring to a increase of a parameter

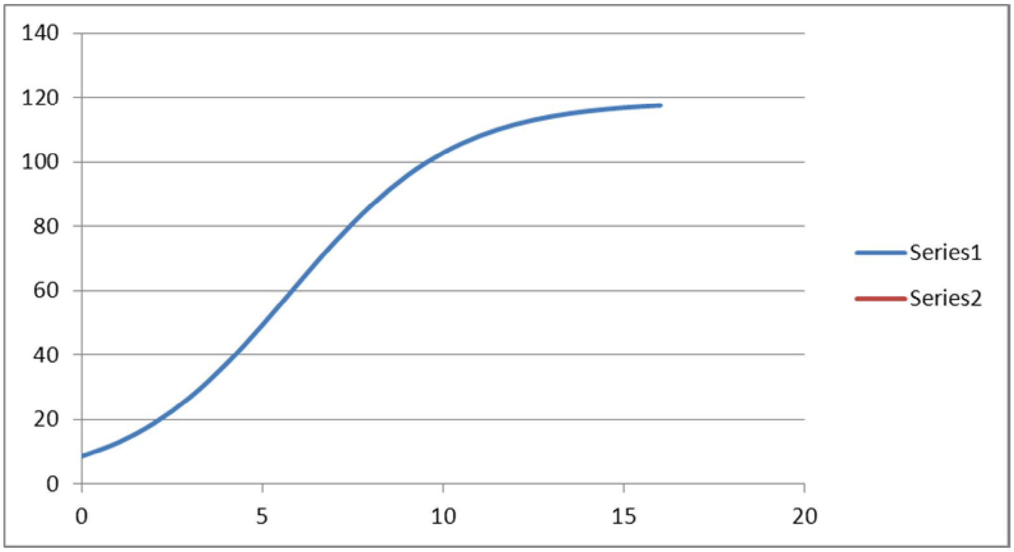

Fig. II.58 – The succession of values in accordance with logisctic function of development – in the case in which the increase is usefull for mobility

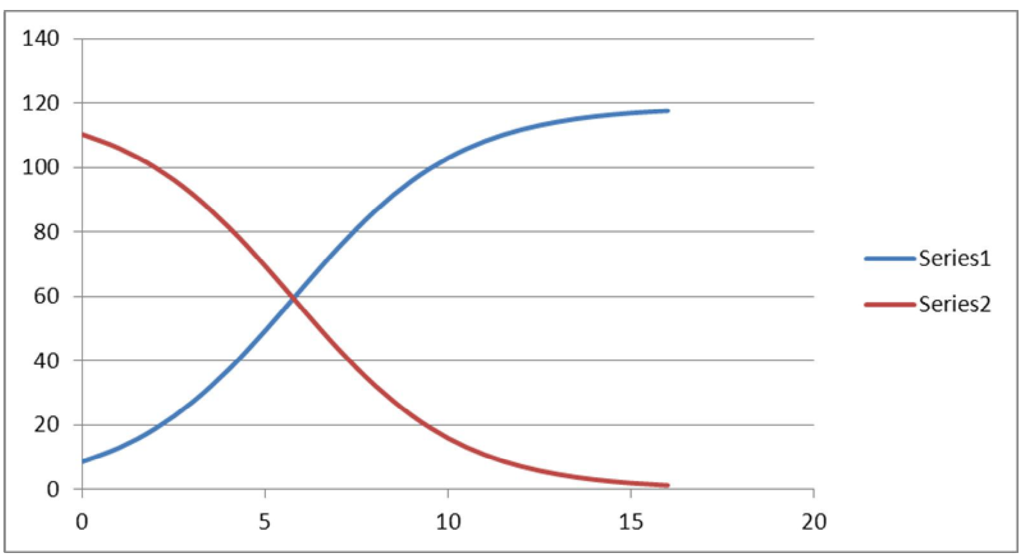

Fig. II.59 – The succession of the values in accordance with logistic function of development – in the case in which the decrease is usefull for mobility (red line)

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In the analysis that follows logistic growth function elements will be determined for each case by using the above technique.

Taking into consideration:

- conclusions reached when it was made the list of target synthesis indicators and which can justify the efforts and mandatory spending for SUMP implementation in Oradea reality,

and taking into account:

- that in many cities the objectives for urban transport and mobility **reflect the thinking more than desire,**
- although it seems "it is good to be ambitious", it should honestly assess what can be achieved with the allocated resources and expertise[44],
- considering that the chosen target should reflect the issues that are most important for Oradea and in the same time, it shpuld allow to compare the progress in comparison with other cities of the country and aborad,
- that SUMP refers not only to transport policies but especially to agenda and sectoral measures which affect the future mobility in a city, like plan of territorial planning, economic development strategies or tourism concepts,
- that SUTP not means only to accomplish a "master plan" for transport: SUMP includes also the spirit which have to be included in all plans and programs that have to be carried out by local authorities,
- also, SUMP is not ended with the adoption of plan which contains innovations in transport because in large sense, SUTP represents the direction in which the current practices of planning should be continuously focus to improve the development of a sustainable urban transport,
- **FINALLY:**
    - ✓ **TAKING AS A TERM OF REFERENCE THE TIME OVER 6 YEARS SINCE THE PRESENT MOMENT (2 YEARS OF LOCAL CURRENT LEGISLATURE AND ANOTHER CYCLE OF 4 YEARS),**

[44] In ambele centre de "putere": si la INCERTRANS si la SC OTL SA (sau la oricare din institutiile municipale).

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- ✓ **BUT FRAGMETING THAT 6 YEARS INTO PERIODS OF 6 MONTHS – TO ALLOW TIME FOR MEASURES MATURATION AND TO SEE THE SYSTEM REACTION TO THE TAKEN MEASURES**
- ✓ **INCERTRANS considered that CALCULATED values of increases or decreases should be INDICATED by absolute or percentage change values, valid for each period of 6 months,**

In the following there are the SMART **TARGETS** determined by INCERTRANS:

TOTAL NUMBER OF TRIPS BY PUBLIC TRANSPORT

In development of 3.2 = defining and selecting of relevant indicators have been calculated the limits between which - at this moment - it can be considered that there is a potential (75,000) for the variation of the number of daily trips in Oradea between:

- minimum 219.000 trips
- maximum 294.000 trips

stating that the counting made (spring of 2013) on public transport revealed 173,000 trips.

It can be appreciated that an increase of 75,000 passengers over the start value of 173,000, namely a goal of 248,000 daily trips in the public transport system at the end of the 12 time periods = 6 years, is acceptable. Calcul functiei logistice de dezvoltare conduce la:

$$y = \frac{75000}{1 + e^{4,30 - 0,72t}}$$

Which, by detailing offers the absolute growth by the below numbers, respectively the growth percentage in a 6 months period[45]:

0	1	2	3	4	5	6	7	8	9	10	11	12
1004	2034	4063	7895	14600	24886	37875	50775	60865	67383	71088	73044	74035

[45] In the first periods of 6 months the increases are by 1000, 2000, 4000 trips, while in the middle of 12 periods of 6 months the increases are 10000-13000 trips.

0,506	0,499	0,485	0,459	0,413	0,343	0,254	0,166	0,097	0,052	0,027	0,013

The image of changes is showed below:

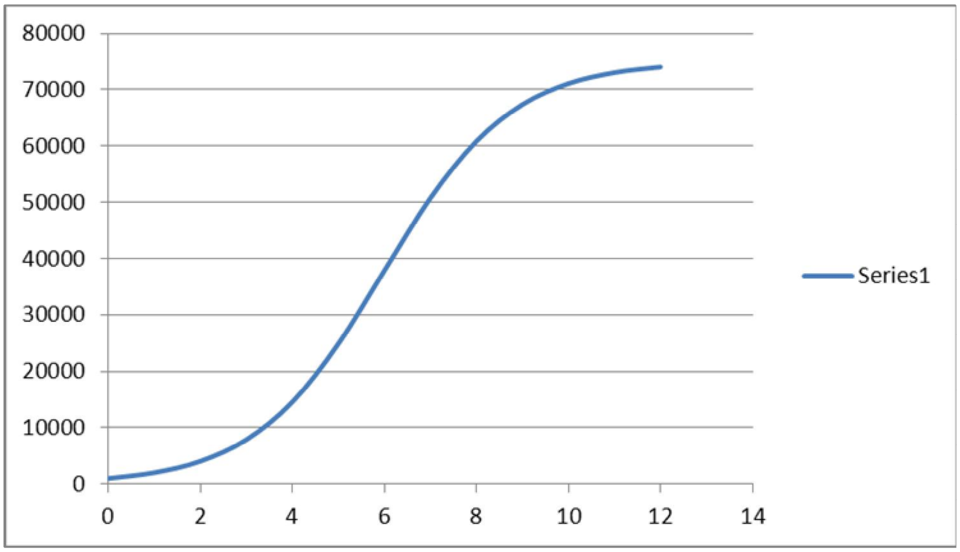

Fig. II.60 – The possible way of system reaction after the implementation of measure to increase the number of trips in public transport

From the mathematical model of logistic growth function shows that the inflection point - the point where the rate of change of the indicator is high - appears on the time axis after 5-6 periods of six months, in other words the first notable successes must be able to be counted after about a year ... a year and a half since the effective implementation of the measures that should lead to improved mobility.

ACCESSIBILITY IN PUBLIC TRANSPORT VEHICLES

Urbanistic General Plan 2013: “in terms of space, it is to achieved a balance between the number of dwellings and number of existing and created jobs, in order to avoid traffic pollution and also the REDUCING UNDER ½ HOUR OF THE TIME REQUIRED BY TRIP FROM RESIDENCE TO JOB, promoting the use of (1) tram, (2) bicycle, or (3) walking”

In these conditions, the accessibility will have to commensurate in which extent was fulfilled to what extent this decision was wrought of Oradea City Hall. The problem will be solved indirectly by addressing the difficulties of access to the system, the idea is:

- there are small chances that the speed of public transport vehicles to increase at values which to enable to travl "the average length of the trip" – which currently is about 3…3,5 km – in periods of time very different of those current;
- neither the waiting times in boarding-unboarding stations can not be major modified (no more than 10 minutes, of which there is a reduction of 2-3 minutes, can not substantially modify the total time of trip from home to work);
- what is to improve is fo und in the **time made from the origin of trip up to irigin of travel** – in other words it should be modified the distance form any point of the city up to boarding-unboarding station.

Practically:

- in the contain of first phase, activity 3.2.3 – 3.1 = "Prepare an analysis of problems and opportunities" it was inserted an EXCEL program which enable to determine the distances from any point of the city up to the closer station of passengers public transport (at this moment there even distances of 4 km between border neighborhoods and one the station of SC OTL SA – tab. II.16).

Tab. II.16 – Locations inappropriately served by public transport

Nr. Crt.	Latitude	Longitude	Distanta (m)	Statia	Traseu
1	47.111397	21.852460	4309	Gara Episcopia	11
2	47.025249	21.910116	3452	Carrefour ERA	19, 23
3	47.084347	21.951416	3227	Bihorului	18
4	47.072498	21.993952	3006	Podgoria Nr. 19	15
5	47.106131	21.928500	2984	Ion Bogdan	18
6	47.012325	21.958704	2922	Nufarul	20
7	47.089778	21.946216	2747	Bihorului Nr. 68	18
8	47.014420	21.957059	2562	Nufarul	20
9	47.098880	21.860454	2473	Gara Episcopia	11
10	47.098824	21.934197	2299	Bihorului Nr. 68	18
11	47.026799	21.921589	2295	Grigorescu	20
12	47.029724	21.971818	1994	Str. Bumbacului	12
13	47.022057	21.924179	1963	Grigorescu	20
14	47.032699	21.916928	1813	Cartier Europa	26
15	47.027438	21.968214	1780	Str. Bumbacului	12
16	47.027382	21.984743	1709	Metro	16
17	47.058842	21.960511	1334	Str. Facliei Nr. 17	15
18	47.030490	21.994316	1141	Metro	16
19	47.057979	21.981151	1107	Str. Facliei Nr. 46	15
20	47.050176	21.887445	905	Densusianu	10
21	47.049431	21.972753	697	Str. Facliei Nr. 45	15

Nrt. Crt. – Crt. No., Distanta – distance, Statia – Station, Traseu - Route

- as SUMP will be implemented, the separate moments of those above mentioned 6 months, it is possible to refresh the EXCEL program and to see the recorded progresses.

From the mathematical point of view, the identification of “rythm” of the progress can be done also by a logistic function of development, starting from the assumption that at the end of the 6 months the target of PUG will be accomplished. In this sense, the input of mathematical model (start = hours – of 4 km travel by walking, plus a little more than half an hour by public transport, towards 0,5 houyrs – in accordance with PUG target) conduct through calculations to logistic function of development below mentioned:

$$y = 1{,}5 - \frac{1}{1 + e^{2{,}94 - 0{,}49t}}$$

which detailed, offers through the below numbers the abosolute decrease – in hours – from care hours = 86 minutes after the first 6 months, up to 0,55 hours = 33 minutes at the end of 6 years:

0	1	2	3	4	5	6	7	8	9	10	11	12
1,44	1,42	1,37	1,31	1,22	1,12	1	0,87	0,77	0,68	0,62	0,57	0,55

the image of modifications being showed in the next figurew:

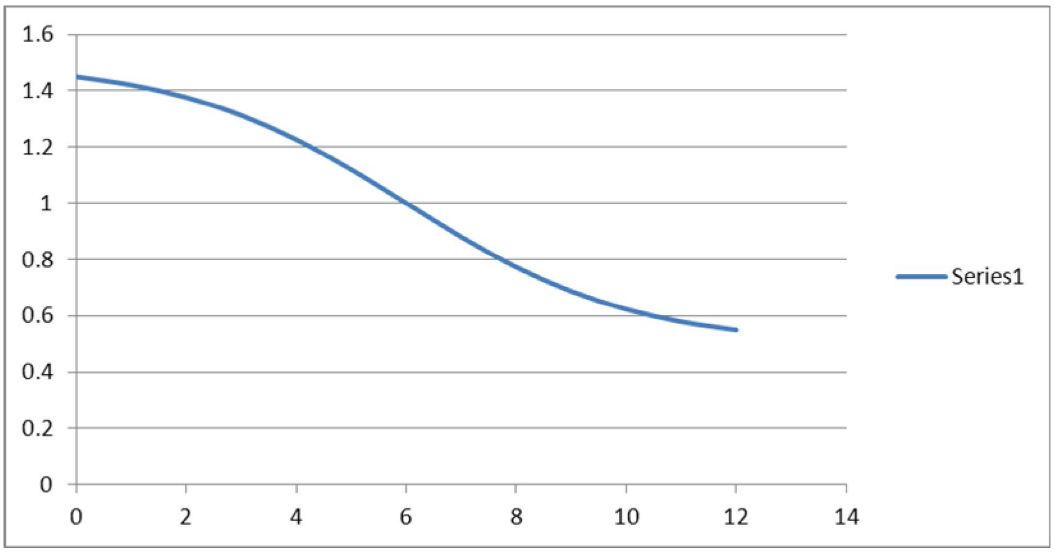

Fig. II.61 - Expected pattern of decreasing the access time of the transport system by implementing the measures for reducing the time required to travel from home to work

Although taking into account the values – of only few minutes for a interval of 6 months – it is to adopt the following behavior: only after 2 years since the starting of implementation of measures to improve the mobility it will be proceeded a check; thus:

- after the first 2 years, the decrease of the time should be by approximatively dupa primii 2 15 minutes;
- in the next 2 years the progress should to reduce the time to a station by 30 minutes;
- in the next 2 years it remains to reduce with 15 minutes more.

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BUS/TRAM/TROLLEYBUS ROUTES (NUMBER, LENGTH, DENSITY, COVERAGE)

Synthetically, all these parameters can be characterized by **isochronous.** The figures below show the areas occupied by isochronous made on the current passengers urban transport network for points of interests as “City Hall”, Central Station, and Nufarul Station, **for the time of 30 minutes necessary to reach these destinations.**

On the one hand, using the mathematical relations in 1st phase, activity 3.1 = Preparing an analysis of problems and opportunities and using AutoCAD software for the calculation of area covered by this isochronous, it was determined that only 3,450 hectares of the 11,550 hectares of the city can consider public transport under cover of SC OTL SA (less than 30% of the city).

On the other hand, a target of 100% coverage by 30 minutes isochrones is not possible - taking into account the configuration of the city - but attaining the value placed to 50% of city’s area - 5,775 ha under isochronous - although ambitious, it may be feasible - at the end of 6 years of supervision.

Fig. II.62 – The isochronous structure of 30 minutes having as point of polarization Central Station

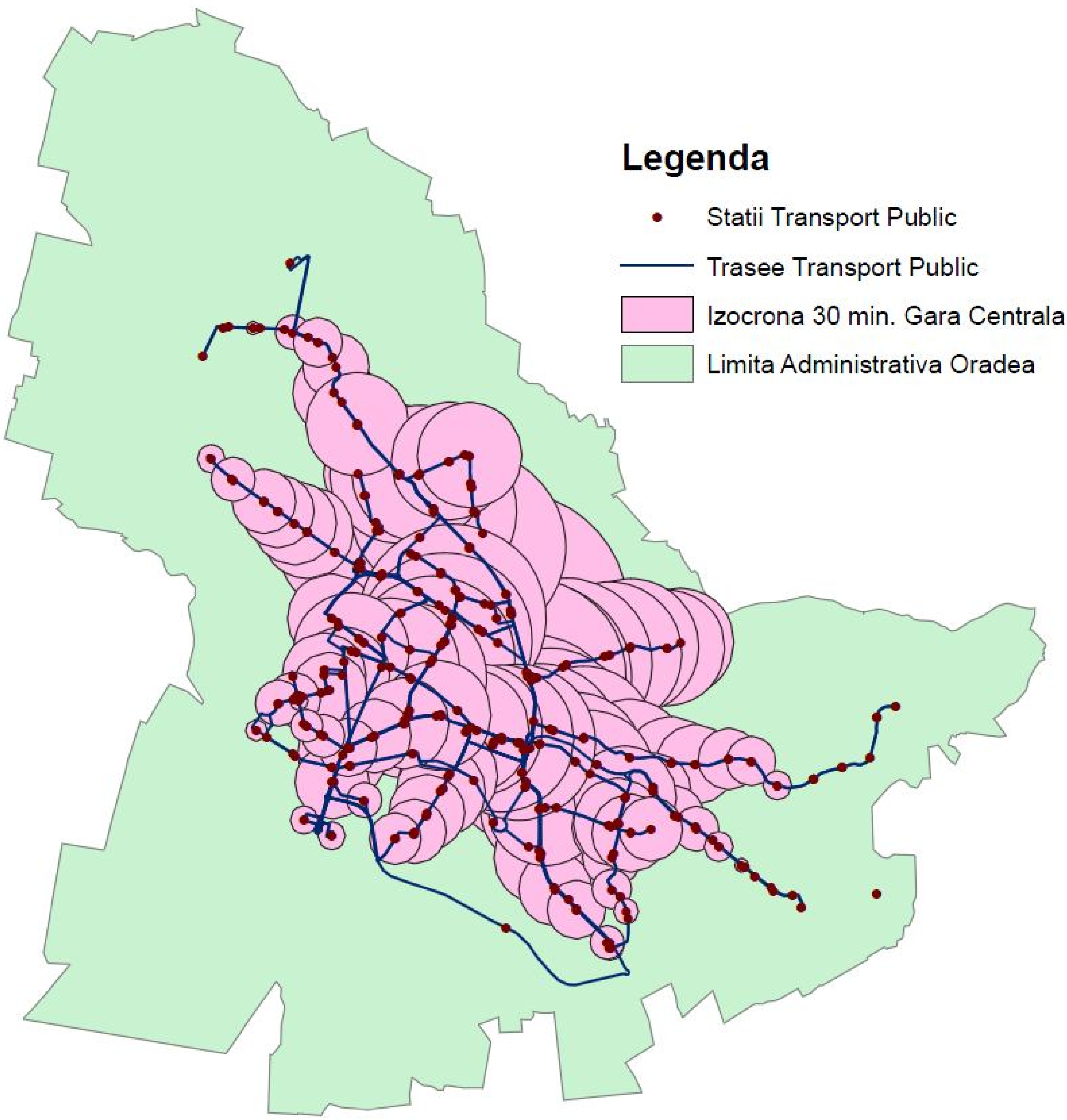

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Fig. II.63 – The area covered by the isochronous of 30 minutes having as point of polarization Central Station

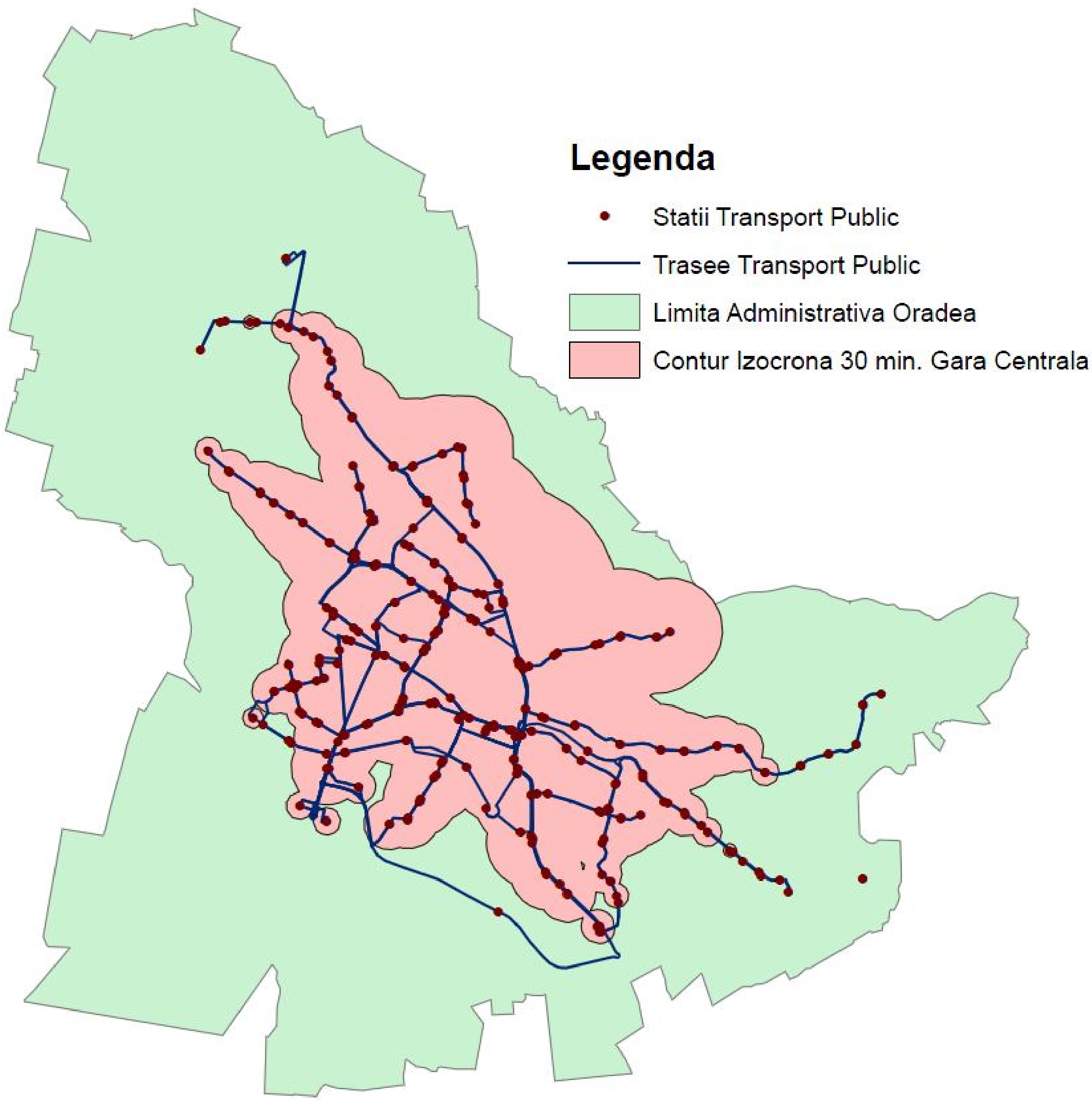

Fig. II.64 - The isochronous structure of 30 minutes having as point of polarization Nufarul

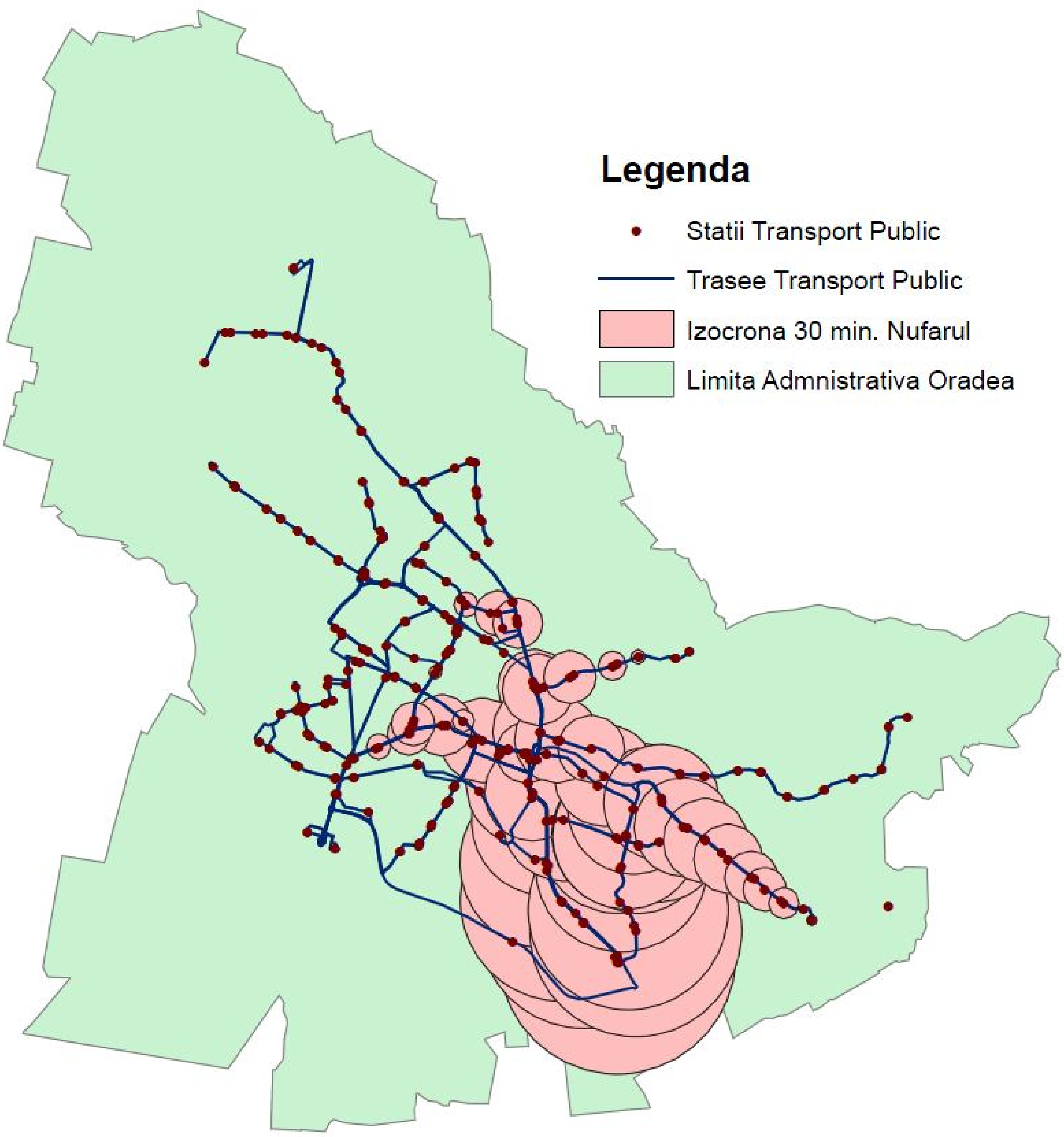

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Fig. II.65 - The area covered by the isochronous of 30 minutes having as point of polarization Nufarul

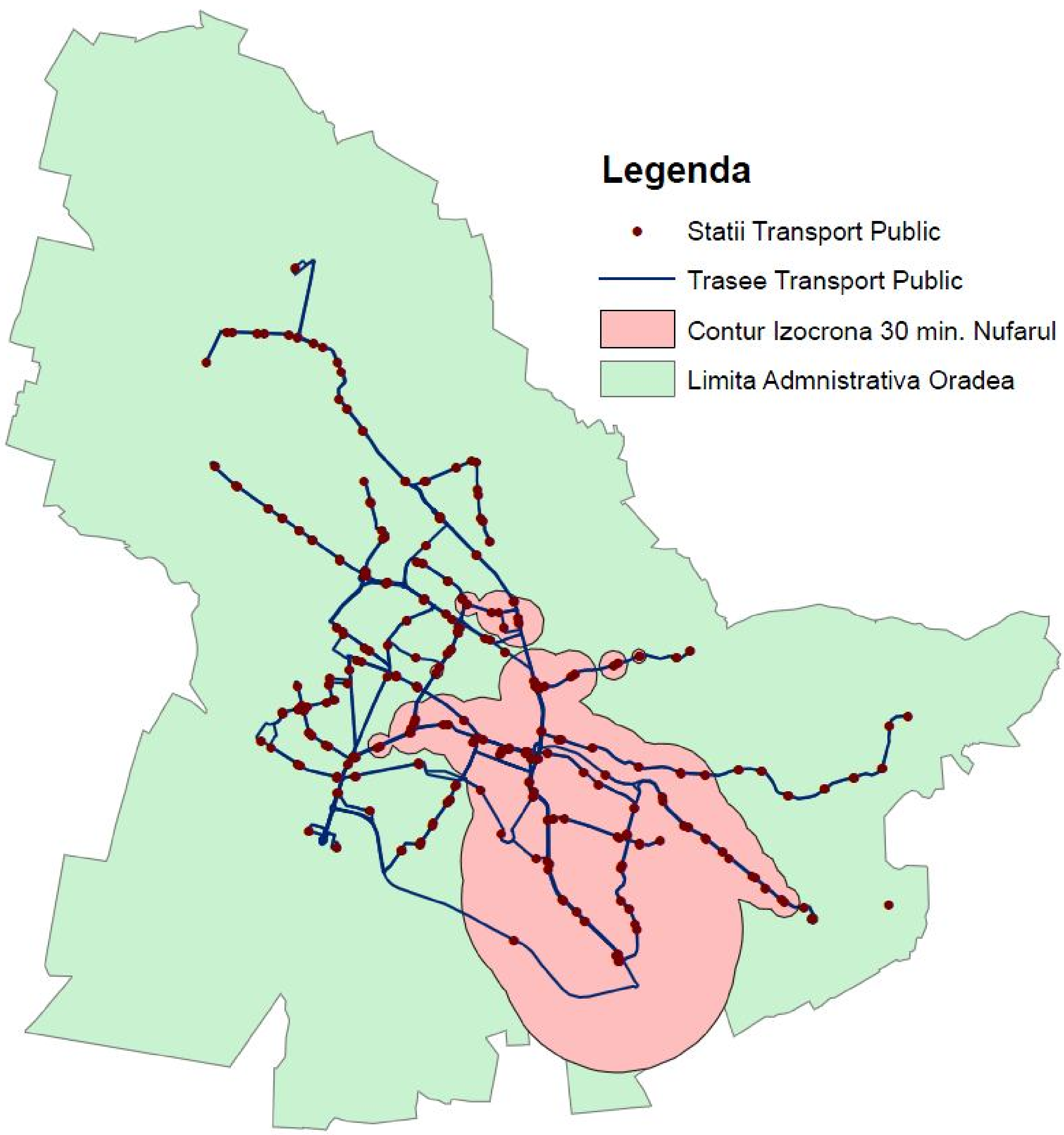

Fig.II.66 - The isochronous structure of 30 minutes having as point of polarization the City Hall

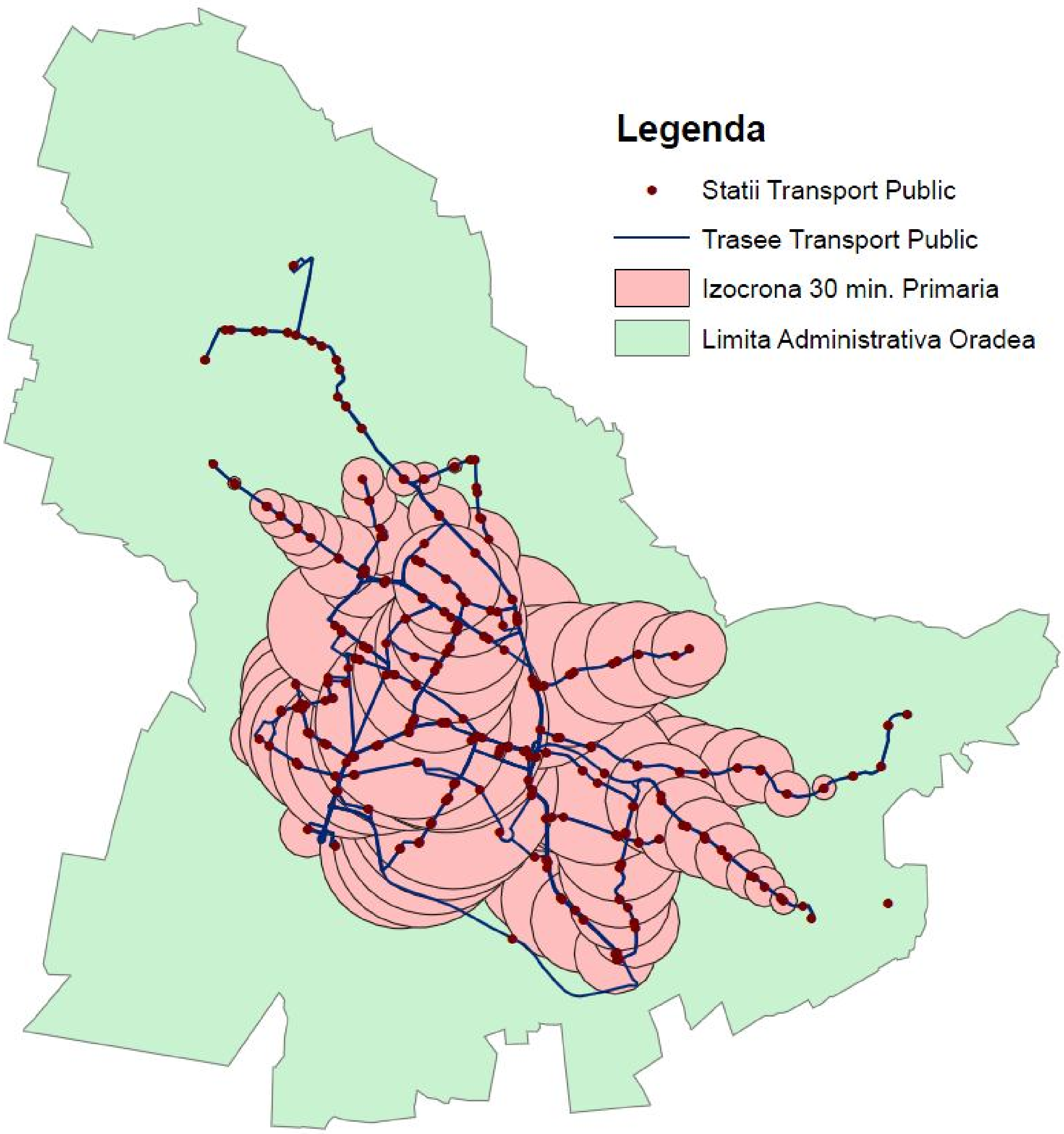

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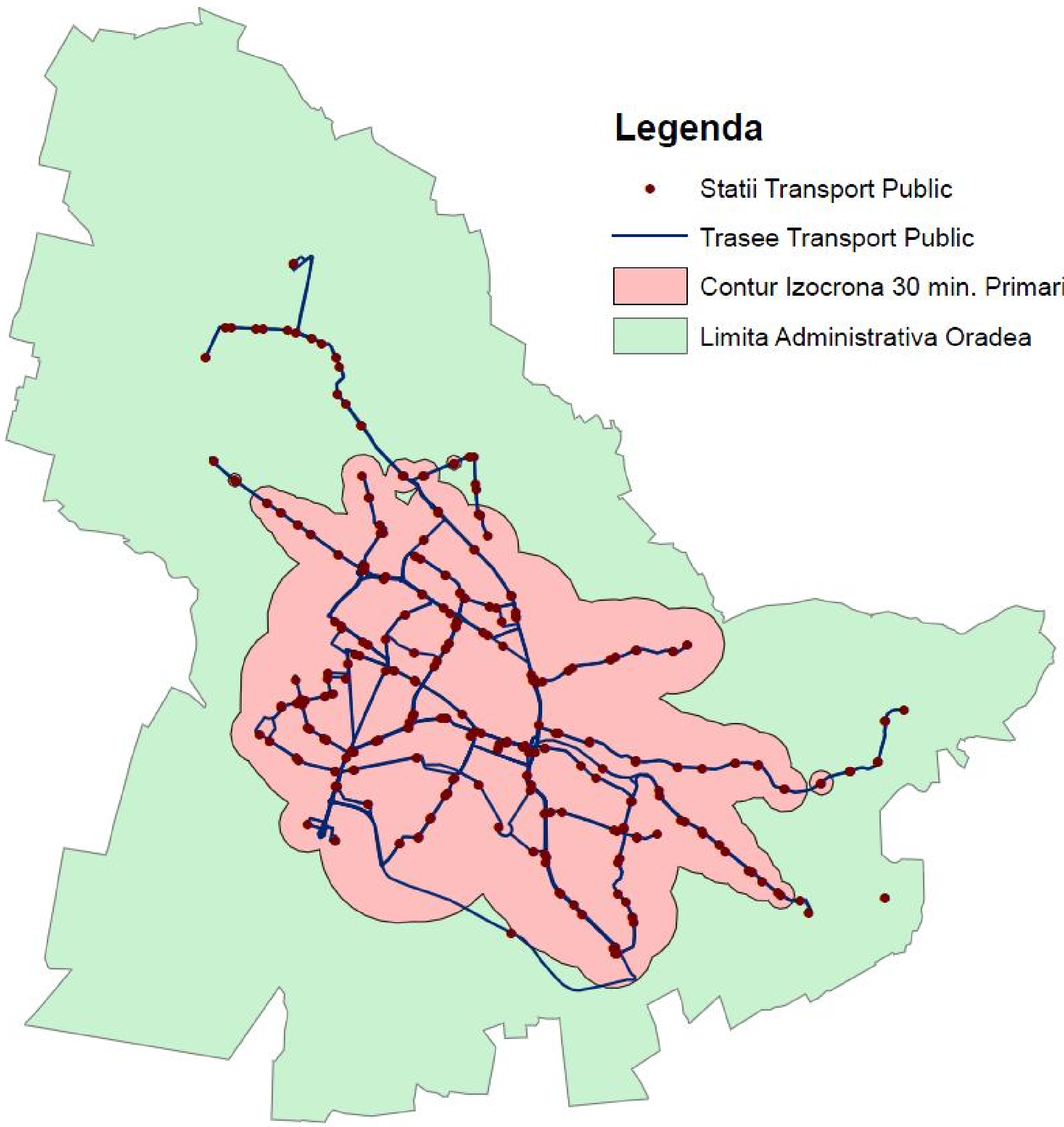
Fig. II.67 - The area covered by the isochronous of 30 minutes having as point of polarization the City Hall



The calculation of logistic function conducts to:

$$y = \frac{2325}{1+e^{3,10-0,51t}}$$

which detailed offers through the above numbers the absolute increase, respectively the increasing percentages in 6 months:

0	1	2	3	4	5	6	7	8	9	10	11	12
100	162	258	400	598	851	1139	1431	1691	1897	2048	2150	2217

the image of modifications is showed in the below figure:

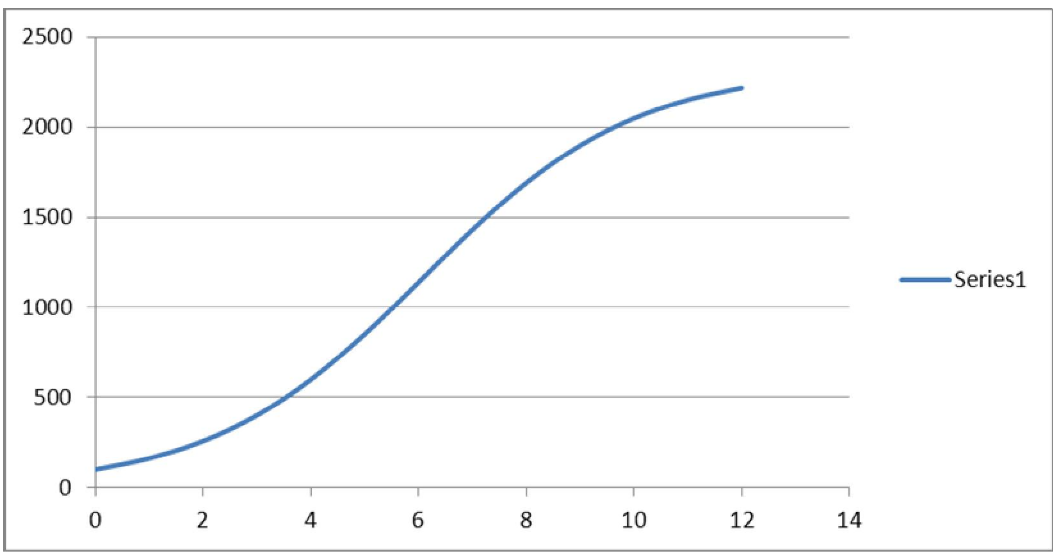


Fig. II.68 – The probable way to increase the area under the reactive isochronous of the system after the implementation of measures to increase the number of trips by public transport

ELECTRIC ENERGY CONSUMPTION IN RELATION TO CONSUMPTION OF ENERGY FROM FOSSIL FUELS – IN PUBLIC URBAN TRANSPORT

For 2012 this ratio is obtained by dividing the 8,670,140 kWh to 1,118,884 liters of fuel, resulting 7.7489.

The target for this indicator can not be apriori determined, depending by unexpected factors – it is well known the way (full of appeals court interventions) of going of a public auction for transport means. In these conditions, the single way to observe the progress is by **persevering** improvement at each period of 6 months with a decent percentage[46] of at least 2-3 %. For example, after 6 months, electricity consumption increased by 2% simultaneously with decrease of fuel consumption by 1% brings the pointer to the value of 7.9837 with improvement of more than 3% towards achieving the target (the table is around of 10.3318)[47].

LENGTH OF LANES DEDICATED TO PUBLIC TRANSPORT IN THE TOTAL OF MAIN NETWORK OF STREETS

The proposal for this indicator is linked to the bus fleet holds by SC OTL it at every moment of analysis (from 6 to 6 months). Concretely:

- in 2013 bus fleet is of 48 pieces/vehicles, number of km of public transport lanes is zero and bus network length is 68.25 km;
- this information leads to the value of 68.25 / 48 = 1.42 km per bus;
- on the date on which the fleet will grow through new acquisitions should be self-imposed by municipality's ambition to provide the first dedicated lane in length of 1.42 x number of purchased buses[2] namely **on those streets where the commercial speed of public transport is the lowest;**
- in addition: no matter how many buses are taken out of fleet owned by urban transport operator, the value of cumulative length of dedicated lanes should not decrease.

THE RATION BETWEEN TOTAL POPULATION AND PUBLIC TRANSPORT FLEET

For this indicator the target would be at least at the level of the 6th lowest ratio recorded in the country[48].

[46] The target is: at the end of 6 years of SUMP, the respective ration to be modified by 30%.
[47] This target do no literally follow the title (energy consumption/energy consumption) an there is the possibility to transform in liters of fuel in kwh, but the calculations would be artificially complicated.
[48] Situatia generala a sustenabilitatii sistemului de transport public urban din Oradea a plasat municipiul pe locul 7 intre orasele tarii.

COMMERCIAL SPEED ACHIEVED BY PUBLIC TRANSPORT

Commercial speed currently achieved by the local public transport operator varies between 14.18 km / h - the tram line 3 and 27.00 km / h - the bus line 20. At peak hours (in the morning) the real speed of transport increase with at least 7%, means that **the passengers displacement is done to speed lower than the bicycle spedd.** Tha base values, in statistic, of the speed of public transport vehicles of SC OTL SA:

- the average just a lower than 18 km/h
- the deviation just a little bit more than 3,35 km/h

By accepting that the distribution of "random variable the commercial speed" respects a law of Gauss distribution, result that the absolute limits in the range:

- minimum = the average speed – 3*deviation = 7,95
- maximum = the average speed + 3*deviation = 28,05

In this context, **if it is accepted that the hope of commercial speed improving is based on evolution and not revolution**, it can be established a difference - for speeds to achieved after the application of mobility measures - that lasts from 14.18 - value which is a certainty to 28.05 - maximum statistical value (if it is accepted that values which are subject to a Gaussian distribution laws) which presents only 5 percent above what is possible for the current circumstances, in other words: 21.12 km / h **average speed suitable as a target**.

Practically it is poposed as target for "commercial speed" indicator the increase in 6 years of speed of travel – for each of Oradea lines – with differences between the above mentioned average speeds, namely with 3 km/h (the value is achievable and the required level is too low in order to be necessary a mathematic of increases on control intervals – from 6 to 6 months).

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PUBLIC TRANSPORT PROGRAM END TIME

In European cities end time for public transport program is around 00:00 am. For Oradea end time for public transport program is around 10:00-11:00 pm. Up to 00:00 am there is an average of 2 hours to be covered. Consequently, in each of the 6 years the target is to “delay” cease service with 20 minutes FOR MOST VEHICLES, for each year of operation[49].

It is to note that this aspect shouldn’t be considered automatical: if SC OTL SA will find that is useless to extent the activity of vehicles on line, SC OTL SA will no take that measure, but **the fact will be able to prove the failure of the measures to improve the mobility:** the following is abvious: it has to be analyzed the general causes of the impossibility to extent (in conditions of rationality) and to be implemented additional measures in the respect of this project[50].

COST PER KM IN PUBLIC TRANSPORT

Currently the cost per km of travel in Oradea is 6.26 lei / km. This cost is determined by the annual operating costs related to the number of km traveled by public transport during the year. The costs reported by SC OTL SA for 2012 were:

- for buses = 14,061,498 lei
- for trams = 15,416,023 lei
- Total = 29,477,521 lei

And the mileage:

- buses = 2,484,000 km
- trams = 2,219,000 km
- Total = 4,703,000 km

On types of service the situation is:

- buses = 5.66 lei/km.
- trams = 6.94 lei/km.

being a scale of values which separate the maximum, the minimum and the average

[49] To see also the target regarding to delinquency.
[50] Obviously there are also exceptions: SUMP may be perfect, but the city can get in financial collapse.

approximativelly with the same range:

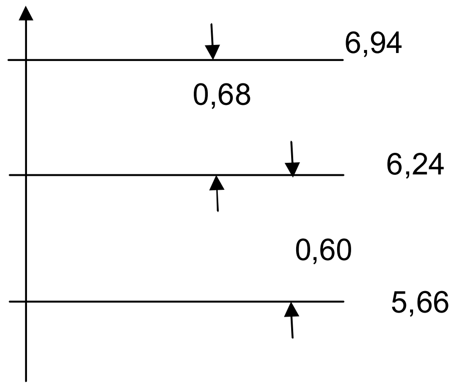

Fig. II.69

The proposal for the discussed target is the following: the values to “go” obviously on the scale of values, in this way:

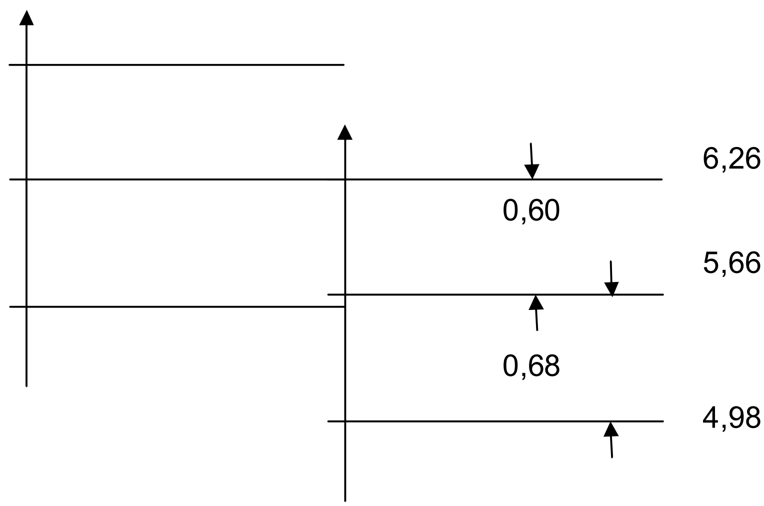

Fig. II.70

Practically it is proposed as target for the "cost per km" indicator the decrease within six years by 0.60 lei / km (the required level is too low to be necessary mathematical growth on control intervals - from 6 to 6 months).

NUMBER OF EMPLOYEES IN THE PUBLIC TRANSPORT COMPANY

The target for the number of employees is: percentage increases to be lower than quantitative increases of operator’s own transport system; for example, if there are recorded 10% increases in number of trips, while there was a 8% increase of fleet, then for the number of employees it may be allowed a increase of maximum 8% (note: it is allowed the increase of number of employees only if there are increases for both indicators).

THE LEVEL OF MOTORIZATION IN THE CITY

Can not be accepted any increase of vehicles numbers to 1000 inhabitants in the city.

It can not be accepted any increase of car numbers to 1000 inhabitants. Actions like “Rabla” Program, aggressive taxation of old car, support green cars/hybrids owners by benefits should allow to maintain at a “frozen” level the current level of motorization

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Of course, it can be imagined situations in which the increase seems to be justified, but the truth is this kind of "the life' improvement" shows that the measures on sustainable development were unefficient[51].

PARKING SPOTS (EXCLUDING RESIDENCIAL PARKINGS)

For "parking spaces" indicators it is appropriate to introduce a degree of "parking": the number of parking spaces to 1,000 inhabitants[52]. It can not be accepted any increase in the number of parking spaces with economic-social-cultural destination for 1,000 inhabitants; but unlike the previous target, no parking spaces will be removed, unless there is verified information that their use is not confirmed by fees.

BIKE TRACKS NETWORK (LENGTH, DENSITY, PERCENTAGE OF TOTAL STREET NETWORK)

Currently in Oradea there are less than 18 km of byke tracks. Byke tracks network is 3.6% of total street major network. There are projects to build 42 km of byke tracks – in different stages of execution. There were submitted proposals for another 29 km. In these conditions it can be established as a target for this indicator the COMPLIANCE to commitments already made.

NUMBER OF BICYCLE RENTAL POINTS

At the time of 2013 it can be noted – by a random and restricted selection – the following development of this service:

Berlin – 130 renting points

Amsterdam – 33 renting points

Wienn – 13 renting points

Florence – 4 renting points

[51] Usually, the persons who want to demonstrate that is normal to increase the level of motorization in a city, still accept that number of children to limit at 1-2.

[52] In 2013 there are 700 parking spots for 204000 inhabitants, meaning 34,3 parking spots to 1000 inhabitants.

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Bucharest – 3 renting points

Timişoara – 2 renting points

Iaşi, Constanța, Sibiu – 1 renting point

Taking into consideration strangeness of this initiative, **the porposed target** is to create conditions for a bicycle rental point for every year of SUMP monitoring. The proposed target is to create conditions for development of a bicycle rental point for every year of SUMP monitoring. Thus for 2014 can be recommended – as a first renting point – the campus[53] (which have the requested conditions for a "market" of this service).

KM OF BUILT OR REHABILITED STREETS

The target for this indicator is the number of rehabilitation projects, projects carried out successfully for the neighborhoods lacked by penetrability and permissiveness, under the obligation that at the end of 6 years of SUMP monitoring the level reached by these to be at least one step higher than for the present.

INCERTRANS considers that this option could be part of a "as until now" scenario – which will be in disagreement with scearios 2 and 4 whicg have been accepted as defining for SUMP development.

In these circumstances, the recommendation is to correlate this target with penetration and accessibility indicators of the neighborhoods:

- the penetration indicator is calculated as a ration of the number of accesses in a neighborhood and the neighborhood area.
- The accessibility indicator is calculated as a ration between the number of km of main network on the neighborhood territory and the number of inhabitants of this neighborhood.

For both indicators there are desirable high values:

[53] INCERTRANS considers that the local municipality shoul take into account setting up a structure with this main activity, and the fleet of bicycles administration – purchased even by Oradea City Hall – should be entrusted to a student associations.

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- the high penetration indicator shows that the traffic is distributed on several direction, the dissipation of vehicles flow contributing to traffic congestion;
- the high accessibility indicates that a neighborhood provides multiple option to travel for the inhabitants and for drivers offers o lower density of vehicles in the traffic; note that the accessibility of the neighborhood[54] is “felt” in a almost involuntary way by drivers – who chose their route depending on free mobility which they find on each section of the travel.

The below figures indicate the penetration factor and accessibility indicator for Oradea’s neighborhoods:

[54] With implications also on traffic safety.

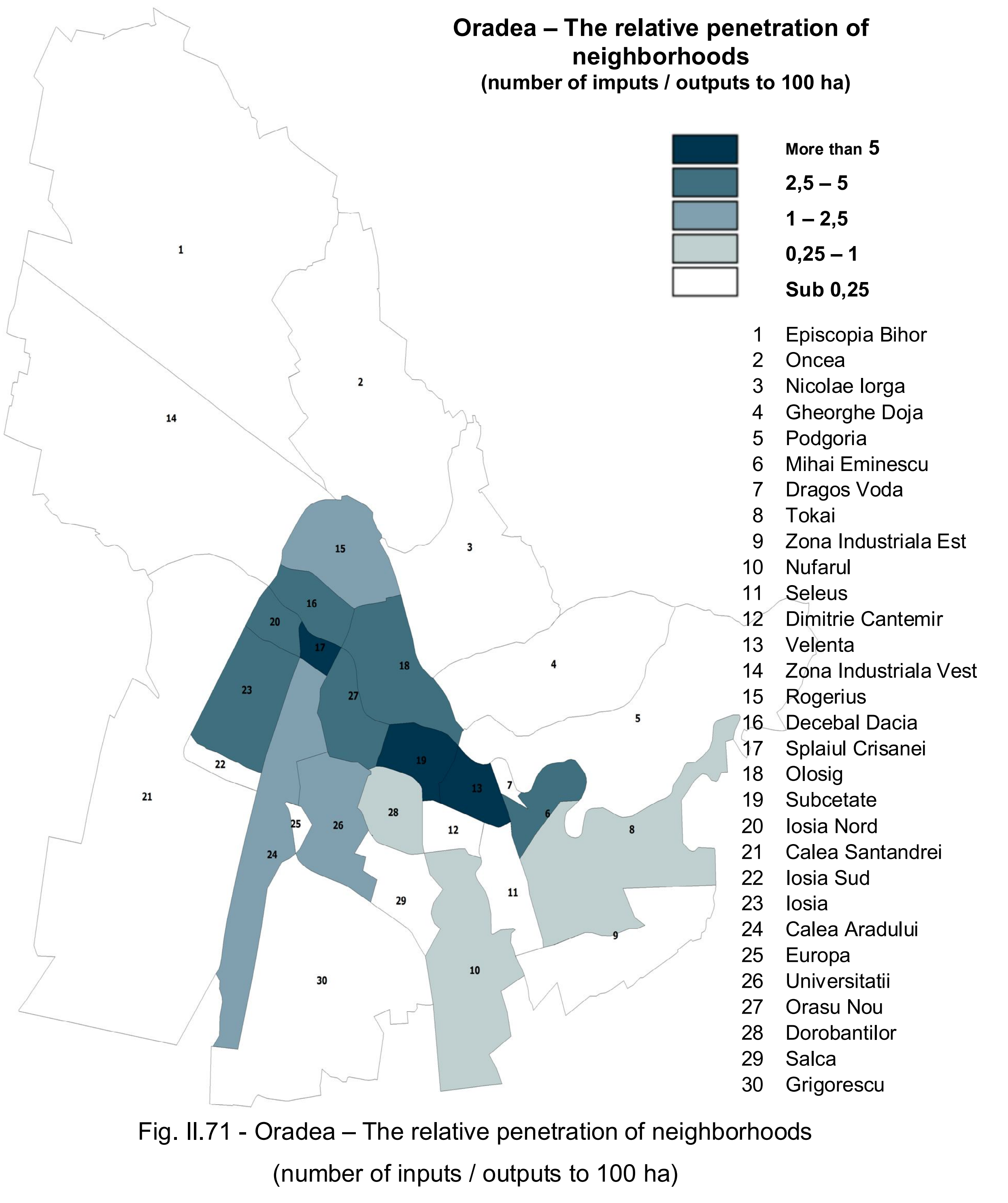

Fig. II.71 - Oradea – The relative penetration of neighborhoods (number of inputs / outputs to 100 ha)

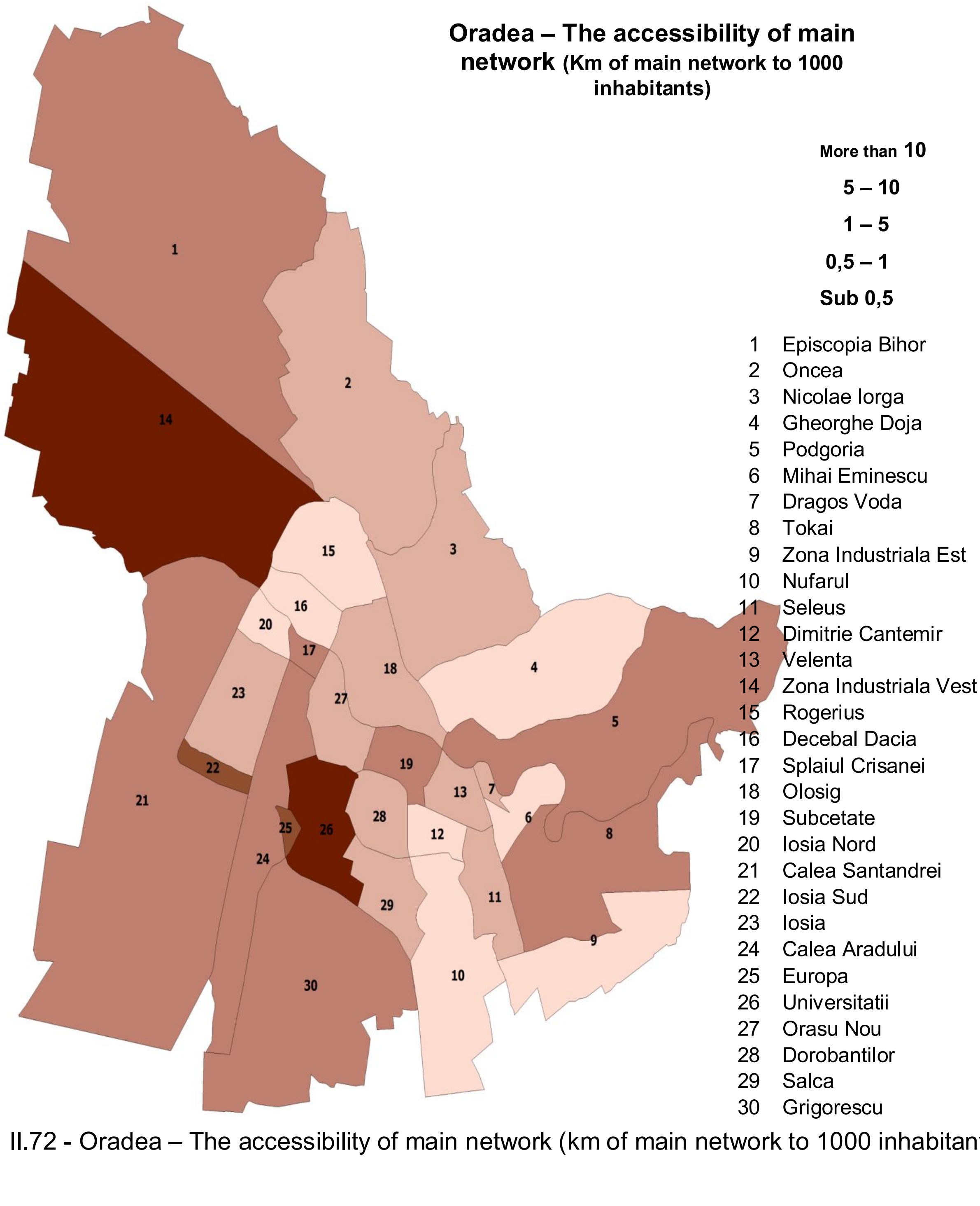

Fig. II.72 - Oradea – The accessibility of main network (km of main network to 1000 inhabitants)

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Observations:

• The penetrability is the characteristic of a neighborhood through are evaluated the points of inputes-outputs of which benefits the area which surround the neighborhood (it can be considered two types of penetrability: absolute = a numbr of inputs-outputs and relative = the number of inputs and outputs reported to neighborhood area);

• The accessibility approach the inside of the area which surround the neighborhood: the number of km of traffic network for 1000 inhabitants: the higher value of accessibility the more and different conditions for motorized trips the neighborhood offers.

The question in front of decision makers of the city is to correlate the construction and repair of streets with concrete needs of neighborhoods, graphic-analytical representations of figures above highlight:

From the penetrability perspective:

• the neighborhoods 11,12 si 29 = Seleus, D. Cantemir and Salca are different of the entire central assembly of the city; **conclusion**: at least in the first two years of SUMP monitoring it should be concentrated the efforts to improve the penetrability in these neighborhoods.

• in the next 4 years the efforts should focused to border neighborhoods – almost lack of connection possibilities with the city's center and worse, the border neighborhoods are lack of connection possibilities between them (the result: almost every trips or travel affects – by almost unique ways – the city's arteries, having as result the CONGESTION).

From the accessibility perspective:

• it can be seen that the main poles of population's concentration from N-V and S-E have the lowest accessibilities: so, in neighborhoods 15, 16, 20, 10 si 12 = Rogerius, Decebal-Dacia, Iosia-nord, Nufarul and D. Cantemir should be intensified the efforts for repairs and even for new streets – in the idea of ensuring easy traffic possibilities in their area (new streets mean the improvement of some streets in order to be categorized in superior classes);

• because of the overlaps between the revealed necessities by penetrability and accessibility, it cacan be planned the works in South – for the first two years, respectively in North for the next four years, IN THE RHYTHM REVEALED BY FINANCIAL RESOURCES OF THE CITY.

Summarizing: **the target for this indicator is given by the number of rehabilitation projects, ACCOMPLISHED PROJECTS,** under the obligation that at the end of 6 yars of SUMP monitoring the level reached by these neighborhoods to be at least one step higher than currently.

SQUARE KILOMETERS OF CITY LIMITS EXPANSION

The discipline in managing the urban space forces to cease any expansion of city’s official area.

In the event of simultaneous growth in the number of inhabitants and the number of jobs it is recommended to adopt the following behavior: it is acted - only once every two years - in the sense of introducing new city boundaries between areas with a equal value to that of the smaller of the two increases, for example if there was a 10% increase in population and an increase in the number of jobs by 5%, then the growth of city’s area can be located in the city around 5% (solitary increases, only jobs or only population should not lead to increased city area).

BUILT-UP AREAS VS GREEN AREAS (Square Meters / Square Meters)

Any approval of a new construction – building, deposit, utility (food market, electric power station, fuel station etc.) should be given only if it will exist the guarantee of expansion the city green area with the same built area (square meters). This guarantee should be given directly by the owner, builder, designer or indirectly by the local authorities.

HOURLY TRAFFIC ON THE CITY’S TRAFFIC ARTERY WITH THE HIGHEST LEVEL OF TRAFFIC FLOWS

Growth rate of vehicles flow passing through Piața Independenței between 6:00 am and 9.00 am does not have to exceed a limit of 5% (at the end of each period of 2 years since the moment of implementing the measures of reduction the congestion[55].

NOISE LEVEL ON THE CITY'S TRAFFIC ARTERY WITH THE HIGHEST LEVEL OF TRAFFIC FLOWS

Target to be established is: level of noise pollution on these arteries should fall, at the end of the 6 years, within following limits (according to Government Emergency Ordinance no. 152/2005 concerning prevention and integrated control of pollution, approved with amendments by law nr. 84/2006):

- for indicator Lden = 65 dB;
- for indicator Ln = 50 dB.

LEVEL OF EMISSIONS AND DUST ON THE CITY'S TRAFFIC ARTERY WITH THE HIGHEST LEVEL OF TRAFFIC FLOWS

According to the report on air quality in the Bihor county, there were no exceedances of SO_2, NOx, O_3 (ozone), CO, C6H6 (benzene), Pb in Oradea city. There were exceedances of dust emissions (PM10). The target that should be established is to reduce dust emissions (PM10) up to the level (law 104/2011):

- **50 µg/m^3** – daily limit value for the protection of human health;
- **40 µg/m^3** – annual limit value for the protection of human health.

[55] It will be unconceivable that once accepted the target, at the time of appearance of a new artery with high traffic flow, to continue to analyze traffic increase only in Piața Independenței.

THE RATION BETWEEN THE AVERAGE WAGE AND TICKET COST

The proposal – **given that at the 2013 moment in Oradea is selled the most expensive ticket for a trip from all over the country –** is to annualy reduce the cost of the ticket according to value of inflation during the 6 years of SUMP[56] monitoring.

THE PRICE OF AN HOUR PARKING RELATED TO THE PRICE OF A TRIP BY PUBLIC TRANSPORT

In 2013 the price of one hour parking is of 2 lei.

After a survey made in February 2013, the average trip length was estimated to be 3.5 km; in 5 km it should be included the price for two trips – if there are paid separately the two purchased tickets, respectively one single trip – if the pass/supscription is paid. As a result: the cost of a trip on 5 km distance can be consider as a maximum 6 lei or minimum 1 leu, namely an average of 2.7 lei[57].

I can be seen that **the ration between the two costs (about 0.75) is unfavorable for sustainable development** whereas, in a superficial approach of the situation, travel by car in the city's center seems to be at parity – in financial terms – with round trip by public transport. In the same vein: even one, the ration is still unfavorable to sustainable development, because, from the psychological point of view "the driver" will count the convenience of his journey as a top benefit of reducing the fuel costs:

- conclusion: reversal of the ration – from 2/2.67 = 0.75 – to 1.34 could represent a target for SUMP.

- consequence: whereas for the 6 years of SUMP monitoring it was proposed (above indicator) a target for the price of a trip, 2 lei value, that means in 6 years the STANDARD hour for the parking should vary between:

---

56 The situation after 6 years in which the inflation would be at an average of 5%, would bring the price of the ticket from 2 to 3 lei, what is acceptable – in the context of other price for tickets recorded in country.

57 The average was calculated alo considering the proportions of selling the tickets, the passes/subscriptions.

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3 lei * 1.34 = 4 lei and

2 lei * 1.34 = 2,70 lei

simultaneously with the introduction of progressive taxation.

Practically, it should start immediately[58] that parking hour to be charged with 4 lei and after that, annually – along with the decrease of ticket – the cost of the first hour of parking to decrease simultaneously with the decrease of the ticket, but the cost for the next few hours to remain 4 lei etc. (so, after 6 years the cost of the ticket will reach at 2 lei, the first hour of parking toll will reach to 2.70 lei, but with passing hours the parking taxes will increase up to the 4 lei above mentioned).

THE NECESSARY TIME FOR TRAVEL 5 KM BY PUBLIC TRANSPORT VEHICLES REPORTED TO NECESSARY AVERAGE TIME TO TRAVEL THE SAME DISTANCE BY CAR

In a SUMP, the target for this indicator should be "one" – calculated on multiplication of two complementary values:

- the time required to travel 5 km in public transport vehicles – on those routes on which there are NO dedicated tracks – related to average time to travel same distance, on the same routes by car, **could offer a supraunitary level;**

- the time required to travel 5 km by public transport – on those routes on which are / will be dedicated lanes – related to average time to travel same distance by car **should offer a subunitary value;**

the conditions under which public transport is performed = favoring, respectively the conditions under which the rest of the traffic is performed = regulated reduction of the speed, ensuring the balance of the result of multiplication of the two ratios (for example: 17/13 on routes on which there are no dedicated tracks for public transport, respectively 14/18 on the routes on which there are dedicated tracks)[59].

[58] According with the recent increase of the ticket cost.

[59] The values mentioned in the exemple take into account the average speed achieved so far = 18 km/h and the estimated speeds for the future = 21 km/h according to the proposed target for increasing commercial speeds.

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LEVEL OF DELINQUENCY IN THE CITY

The above established target regarding the end time of daily public transport service is relatively connected to the issues of delinquency:

- those 20 minutes of work schedule represents – in relation with the 16 hours of public transport activity – approx. 2%

- therefore it is proposed as a target the decrease of delinquency level by 2 percent for every year of 6 monitored by SUMP.

FREIGHT TRAFFIC IN THE CITY'S AREA (TONS*KM/DAY)

Subscribed to this project the target is simple to be established:

- if it is necessary to organize freight only between 18.00 and 6.00 there is no value to monitor.

- if it will be required to organize freight traffic based on city-vignette then the freight traffic will be adjusted on the base of city-vignette price which will be modified every year and at the end of the 6 years the number of tones*km/day will reach half the value of 2014 – **the first year when city-vignette will be applied and statistics will be carried out in the specific field.**

For the members of working groups (recommendation of SUMP Guidelines):

- the realistic and working position (**at this moment of target definition**) is recommended on the base og European cities that have passed of the first SUMP;
- although it is good to be ambitious, also it is good to be onestly evaluated what can be accomplished with allocated resources and experience[60];
- it is not to forget that almost every target involves financial resources for the MEASURES which will follow, resources which can can be or not available.

[60] This fact will be seen in the selected measures – the activities following the current activity.

Cap. 6 – Develop effective packages of measures

6.1 Identify the most effective measures

6.1.1 The reviewed framework of resources

Developing a Sustainable Urban Mobility Plan can help planners to access some funding sources that are available for innovative integrated solutions or approaches of planning. In some cases, the existence (or works for adoption) of a Sustainable Urban Mobility Plan can improve a city's competitiveness when applying for funding.

It takes several substantial funding to intervene in infrastructure and interchanges and using networks, fleet renewal and maintenance and communication campaigns and public awareness. In most part, the responsibility for this investment belongs to the local authorities involved.

According to a recent survey, over 40% of urban fleet of trams and light rail in the EU 15 and 67% of the fleet in the new Member States are over 20 years old and should be replaced before 2020.

Successful financing of urban transport projects require a combination of budgetary, regulatory and financial matters, including specific local taxes. It has to be adopted a long-term perspective.

FINANCING INSTRUMENT FOR CITIES

To achieve the goals of improving mobility, including by finding funding sources, must contribute all stakeholders at local, regional, national and EU levels. Users should also contribute and pay a fair price for transport services. Notice that they are willing to pay for quality services.

Private financing, usually in the form of public-private partnerships can make a contribution, but requires stable legal frameworks. Parking charges and urban road user charging could also help finance urban transport, in particular by earmarking the revenues raised for the financing of urban transport.

The congestion charging in London (see cap.4.1 where this detailed) proved to be a useful lesson for improving bus services.

Stakeholders proposed that the EU to consider expanding the scope of the "Eurovignette directive" by introducing an urban dimension, so road tax to apply to all types of vehicles and infrastructure.

According to stakeholders, market-based mechanisms, such as the possible use of EU Emissions Trading Scheme (ETS) - by granting emission rights or credits equivalent to authorities that invest in a new and cleaner infrastructure - could be analyzed in depth. However, it has to be avoided negative consequences on the operation of efficient and environmentally.

In its policy on State aid, the Commission undertakes to consider the environmental benefits of investment in clean transport to move to less polluting vehicles. By way of example, the draft guidelines for environmental permits exceptions in aid for the purchase of new vehicles to accelerate the adoption of Community standards before they become mandatory. Moreover, the Commission's proposal to adopt a new Block Exemption Regulation explicitly designates as eligible asset investments in transport and transport equipment, except for the carriage of goods by road and air transport. Finally, the Commission is currently considering the issuing of guidelines on State aid for railway sector to improve transparency and legal certainty in an economic activity that was open to competition and essential for ensuring of sustainable mobility in Europe.

One of the problems considered is the need to quickly replace aging vehicles in order to provide reliability, safety and operability.

In certain geographic areas of Europe, this need is particularly acute, and regional aid proved to be an appropriate tool to address this problem.

European financial support

At EU level there are several available sources of funding, for example, the Structural Funds, Cohesion Fund and loans from the European Investment Bank. As in the past, the policy of the EU will remain an important source of funds in the eligible regions in the next period. In the period 2000-2006, funding for transport projects from the European Regional Development Fund (ERDF) was worth almost 35 billion euros, of which an amount of less than € 2 billion has been earmarked for urban transport. According to the programming documents, ERDF and Cohesion Fund contributed with nearly 8 billion for urban transport in the period 2007-2013. Another € 9.5 billion has been set aside for integrated projects for urban and rural regeneration, which may include investments related to transport. Cohesion instruments in the current period 2007-2013 provide a wider and more solid base foe co-financing of urban transport and public transport across Europe. The ERDF and Cohesion Fund make explicit reference to clean urban transport and public transport, but for the first time, also to integrated strategies for clean transport. Authorities, especially in the new Member States should take advantage of these opportunities to modernize urban transport systems.

Most national strategic reference frameworks submitted by Member States include the area of sustainable urban transport action. EU co-financing from instruments of cohesion is possible for infrastructure investment (eg railways and terminals) and vehicles such as clean buses, trolleybuses, trams, metro and suburban rail. The same things apply measures such as reconditioning and upgrading other components that form part of an integrated transport system and user (ITS, traveler information, integrated ticketing, traffic management, etc.). ERDF may finance facilities related to sustainable urban transport in terms of the environment and provide support for certain target groups of the population (the elderly, people with disabilities) that they can have access to regular public transport. The Fund finances increasingly more projects related to intelligent transport systems.

On average, the European Investment Bank lends annually 2.5 billion for transportation projects gold. Projects include construction, expansion or rehabilitation of transport infrastructure or purchase of vehicles in major urban areas or mid-sized cities in Europe. More than loan actions operations that the bank performs routinely, EIB has joined forces with the European Commission and the European Bank for Reconstruction and Development to develop new financial instruments or initiatives.

The Seventh Framework Programme for Research and Technological Development (FP7) promotes research, technological development and demonstration for urban mobility, energy aspects of transport, clean urban transport and sustainable mobility for all citizens. FP7 includes at the theme "transport" an activity area on "Ensuring sustainable urban mobility". This activity includes technical research, demonstration and policy support in the area of new transport and mobility concepts, innovative systems to manage the transport demand, public transport quality and innovative strategies for clean urban transport. Other actions will focus on the development of transport and mobility concepts very innovative, clean and smart, including their implementation. FP7, under the theme "Information and Communication Technology" funds activities related to mobility and services. Research issue in the field of road and the related infrastructure and that related to smart and clean vehicles are addressed independently of the geographical context, but the results can be applied effectively in the urban area.

CIVITAS is a program of the Research and Demonstration Commission in the field of clean urban transport. The CIVITAS Initiative helps cities to test and demonstrations of integrated packages of measures, both political and technological, which aims to make urban transport more sustainable, cleaner and more energy efficient.

CIVITAS has so far financed actions in over 36 cities with a Community contribution of 100 billion euros. CIVITAS Plus initiative has already been launched in the context of FP7.

Stakeholders emphasized the importance of continuing the CIVITAS initiative. CIVITAS "approach" could pave the way for a program dedicated EU support for financing clean urban transport activities outside the research framework. This program could concentrate on actions on a larger scale, focusing on the integration of innovative actions in cities and their periphery. Ideas for such a program could be considered as soon as it is adopted action plan on urban mobility.

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The "Intelligent Energy - Europe" (IEE) Program funded through the "Competitiveness and Innovation" (CIP) includes ALTENER and STEER sub-programs, which support initiatives related, for example, with renewable energy sources, promotion of alternative fuels and promoting efficiency energy in transport.

National financial sustainability

Adoption of a new national legislation which to allow the purchase of additional non-euro vehicles, respectively reduced rates for carriers that purchase public transport vehicles with low pollution.

Local financial support

The introduction of charges for the use of road infrastructure in areas where traffic congestion is occurring today, is a measure that has proven effective in many cities. The same idea can establish a protected perimeter downtown where motor vehicles to cross only by payment of a fee.

Management of parking (cost, number, range, collecting) in order to reduce the availability of parking and thus to reduce the number of people who choose to travel to destination by car.

Changes in taxes in order to make employers provide benefits in terms of travel costs. For example, turning a parking offered by the company in a space for which the user pays a tax rate would reduce the attractiveness of it and could not convince the employee to drive to work.

6.1.2 Optiuni cu posibile masuri definite și sintetizate

According to DEX (Explanatory Dictionary of the Romanian Language) the measures are procedures used to achieved a certain objective. Criticism:

- procedures itself can be used only if there are resources for implementation („can we defeat the mentalities inconsistent with the principles of sustainable development? – yes, but only if we have sufficient resources"; otherwise the measures are to be taken only at descriptive level and although they may be used to achieve the objective, they are not enough).

- as used in this context, the measures are ways by which IT WOULD BE POSSIBLE to reach the materialization of the objective FROM A CERTAIN PERSPECTIVE. Therefore, measures are closely related to agreed indicators, which were specified through SMART targets: **when one target is achieved it can be only said that the analyzed objective was achieved?** NO! It can be only said that developed measures reached the pre-set level for indicators characterizing the expected stage of achieving the objective, objective that remains in the sphere of concern later

Concretely, the feasible measures for Oradea have been already envisaged in Chapter 5.1; also the indicators considered appropriate in the Chapter 3.1, also the targets considered sufficient to achieve an adequate level of mobility – in Chapter 5.2. The main problem is to create a synthesis which to bring the whole „measures-indicators-targets" to a level of aggregation **so that to allow the measures to manage geographic, demographic, social and economic framework – analyzable through indicators, at the level of targets (once again, if if there are resources).**

The procedure used is as follows:

- Compile an incidence matrix with 25 rows – corresponding to the number of indicators – and 95 columns – corresponding to the number of objectives – see Annex 23.
- It is filled the contain of the 25*95 locations of matrix with binary values Δ_{ij} defined as:
  - ✓ Δ_{ij} = 1 if **the objective** has a major incidence (and preferably direct) on
  - ✓ the **target**
  - ✓ Δ_{ij} = 0 otherwise:
- There are carried the totals on columns: the resulted values indicates the **influence area of measure =** the rank of a certain objective in 25 possibilities:
  - ✓ greater the value derived on a particular column, the more the objective influences the level reached by these indicators (finally, even more the objective contributes to multiple targets); in other words: the effort in implementing of measures which materialize the objective has influence on several indicators.
  - ✓ the reverse situation indicates that the effort in measures implementing which can be porposed, will have a punctual impact.

- There are carried the totals on rows: the resulted values indicate the possible – not yet probable – **synergies** contained by the measures involved by several objectived focused on the same indicator:
  - ✓ greater the value resulted on a certain row, the more indicator can be influenced by more ways (and some of the combinations of materialized objectives by measures, can benefit of the quality to be in synergy with each other).
  - ✓ the reverse situation indicates how difficult will be to influence the indicator: in this case the problem han no more in its center the synergy but the way – maybe the unique one – to achieve the target.

In this latest finding it is found the key of measures materialization:

- it is choosed the lowest value on the column (for example: the level of delinquency in the city);
- there are identified the objectives which can influence the indicator (for example: the only two objectives are „combined projects to assure the utilities for each neighborhood" with a total of 5 on its column, respectively „create the framework for tele-activities and teleworking" with a total of 3 on its column);
- it is decided in favor of the objective for which it is estimated that simultaneously it is perfect feasible and can greatly change - in the desired direction – the nearness of the indicators to pre-set target (for example: it is decided to initiate projects which to ensure utilities in each neighborhood – supply, kindergarten, clinic, efficient street lighting system etc.);
- subsequently, in the location placed at the intersection of analyzed row and its corresponding column, it is customized the measure – the objective is directed to the benefit of the indicator (for example: the end time for utilities is „pushed" to late hours so that the presence on the street of several persons to discourage the potential aggressors).

It is to highlight that the entire procedure is resumed after the removal of analyzed row and the corresponding column of the objective, from the incidence matrix (with the corresponding change of the values on rows and columns. Because there are more columns then rows, the procedure

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continues up to elaboration of the first 25 measures, so that each indicator to have assigned at least a measure. Then the matrix is restructured – without 25 of initial objectives – and continue the determination of measures – IN NUMBER ESTABLISHED BY A LOCAL AUTHORITY OR DEPENDING ON IDENTIFIED RESOURCES – **starting with the objective with highest value on its column,** the measures losing their feature of particularity, become even more general, higher their registry.

INCERTRANS ceased the procedure after the extraction of the 75 measures – of greatest impact on Oradea mobility.

The combined matrix „objectives-targets" (annex 25) led to achieving the **support measures –** 25 in number = one for each target – and subsequently to **strenghtening measures –** restrict the volume to 25 measures (from a total of 95); and finally as **reinforcement measures** there were selected[61] also 25, so that it can be made a subsequent selection at least from the financial possibility to implement.

A. Support measures

I. reduce the congestion (including by general traffic reducing)

- 3 = to activate and stimulate the activity of department working with citizen's associations (regular meetings organization);
- 9 = regulate and promote car-sharing and car-pooling (including tax incentives for rental companies which declares as an activity object these activities);
- 11 = it would be recommendable that local authority to develop a regulation that not only to allow the public presence but to ensure the public presence in the decisions regarding the community;

[61] The selection was made based on „influence area of measures" = given by the ranking obtained on the base of multiple intervention criterion on targets (the sum on vertical); for example, one of the measures has a influence on 20 targets, another measure only on 10 targets: therefore, it will be preferred the first measure, with numerous possibilities to bring simultaneously enhacements in several fields. Regarding the sum on horizontal = „the level of synergy" given by the numer of objectives that influence one target, the values will be used for compiling the packages of efficient measures.

- 14 = improving some streets (planning and funding) and changing their classes into upper classes – possibly with one-way traffic – in order to increase the traffic capacity;
- 16 = taxation of cars passing through a „protected ring" in the city's center;
- 20 = the development of a center equipped with a management traffic system in the city;

II. remove the freight traffic in the city simultaneously with the renewal of public transport fleet

- 2 = to analyze the possibility of implementing of a system type „city-vignette" in a central area of the city;
- 3 = establish a working group formed by municipal institutions and freight transport operator in order to organize on days and neighborhoods the freight transport activity in the city area;

III. reduce the need to travel

- 5 = it is recommendable to modify the opening & closing times of big stores;

IV. develop sustainable modes of transport (less polluting)

- 1 = purchase a medium capacity vehicle – an electrical vehicle – initiating an ecumenical route inside the city;

VI. discipline the planning of buildings area (and for utilities)

- 1 = definitively settle (long term – 20-30 years) the Oradea ring road;
- 4 = the necessity to create a unit – construction – infrastructure for motorized and non-motorized access and green area (for every new building/construction);

VII. innovation of parking management

- 4 = regulate the „park and ride" transport system;

IX. improve the city's streets infrastructure

- 1 = completion of a network of bicycle routes;
- 3 = the development of several projects that aim to enhance the capacity of main network of streets – starting with streets that now have the lowest capacity to take vehicles flows;

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X. develop the public transport system

- 6 = it is necessary to ensure the second access to trams depot; in the same vein: it is to consider a “shed” for trams in order to reduce the travel distances for the withdrawn trams at the end of the peak hours;
- 7 = it can be obtained a higher elasticity in public transport operation if it will be done the third “triangle” which to serve Line 2;
- 8 = from the point of view of efficiency, the main route which can be served by a tram line is between the point of intersection of tram line 2 with central ring and the second access of depot;
- 10 = local authority has the obligation to tax at the lowest level the SC OTL SA vehicles;
- 12 = general interests of the citizens – not those specific to a part of the citizens – request to reassess the gratuity award system for retirees (the gratuity may be a right but using this for the time during students are traveling by public transport can not be tolerated);
- 14 = SC OTL SA has to make a project proposal for the first lanes dedicated to public transport;
- 15 = it is recommended to initiate a project for modern boarding-unboarding stations (to standardize – to customize these contact points between the public transport operator and the public);
- 17 = it is necessary a new public transport regulations (which to envisage also rewarding the loyal passengers);

XI. the operational expanding of local transport market (plan for commuters)

- 7 = ACTIONS AND RULES AGAINST „PIRACY” (unauthorized urban public transport by private cars) ON URBAN TRANSPORT MARKET;
- 8 = should be introduce a tax / fee – contribution of the non-local transport operators in order to cover the costs of maintenance the boarding-unboarding stations used by them;

B. Strenghtening measures

I. reduce the congestion (including by general traffic reducing)

- 4 = innovations in administration system that reduce the number of travels for citizens to administrative institutions;
- 7 = set up bicycle parkings;
- 8 = promotional campaigns for bikes using;
- 10 = SC OTL SA has to initiate cooperation actions with public transport passengers and regular meetings with amateurs drivres;
- 13 = maps for spreading of main utilities in the city (the next implants will be done only based on the equal spread in territory principle);
- 18 = parking spaces on public domain and which are „given" to some economic agents (in order to be used by their employees): **with payment** done to economic agent

III. reduce the need to travel

- 1 = the reducing of private car use[62];
- 2 = public transport development[63];
- 8 = creating the framework for tele-activities and teleworking development, including finding ways to reduce taxation for companies who practice tele-activities and teleworking.

V. reduce the carbon emissions (including by traffic management)

- 1 = new pedestrian areas;
- 3 = street infrastructure rehabilitation;
- 5 = public transport fleet renewal;
- 8 = purchase non-euro vehicles – extra charged;

[62] The idea is: the owners should accept that the travel only with the driver in a car is damaging and contrary to the interests of a crowded city (at this moment the average number for car's occupants is 1,3).

[63] The action which is the target of this measure refers to annualy introduction in the local authority budget of a constant increasingly percentage for the amounts allocated to general transport (but not for SC OTL SA employees wages, but for the modernization of the service).

VI. discipline the planning of buildings area

- 3 = correlated projects to ensure the utilities in every neighborhood;
- 6 = systems of incentives for placing the new schools, healthcare centers, commercial centers etc. within residential neighborhoods or close to them.

VII. innovation of parking management

- 1 = local authority should provide new regulations on parkings which to reduce the possibilities to park on the streets;
- 2 = restructuring of parkng system (by introducing a progressive payment type, distinctiv on peak hours and off peak hours and even on target groups – for example for the small capacity vehicles the tax could be more reduced);

VIII. improve the road safety

- 1 = Oradea municipality administration has to make a plan for design, redesign and improve the general infrastructure and trams infrastructure;

IX. improve the city's streets infrastructure

- 2 = promote a program of re-construction the elements of streets infrastructure (streets widening, modification of curves radius, modification of intersections geometry in order to increase the public transport service operation;

X. develop the public transport system

- 3 = Oradea Municipality Administration has the obligation to recalculate periodically the compensation of public urban transport - SC OTL SA;
- 18 = it has to be introduced and then generalized express transport system (or maxi-taxi), in the same time with normal routes;
- 19 = it is necessary to redesign the bus routes so as to be excluded the parallelism of the two modes of transport;
- 21 = take into consideration the possibility to implement the transport system by trolley;
- 22 = it is necessary that some of the trams lines to be transform in light rail lines;

XI. the operational expanding of local transport market (plan for commuters)

- 2 = prepare a program of transport service for peri-urban area (particularly to Băile Felix and Băile 1 Mai resorts but also to Borş – link with European Western);

C. Reinforcement measures

I. reduce the congestion (including by general traffic reducing)

- 1 = electronically payment systems;
- 2 = systematically educational measures in schools – in the idea of a sustainable development culture;
- 5 = periodical analysis of the section of streets on which have to be increased the speed, or on which have to be reduced (effectiv reduced by traffic calming means);
- 15 = installing on ground passages or building underground passages for pedestrians on the streets with high flows of traffic – instead of crosswalks – where signaling / traffic lights programs is insufficient for combined flows vehicle-pedestrians;
- 17 = modification in starting hours of the economic agents activity situated on the same street or in the same point – marginal – of destination;
- 19 = tickets to concerts, sport events etc. should include the price of two trips by public transport - to be given the right to travel;
- 21 = introduce a „no car day" (monthly);

III. reduce the need to travel

- 7 = an echeloned schedule for starting working hours in case of the companies;

IV. develop sustainable modes of transport (less polluting)

- 3 = local authority straight actions to remove any obstacles on the sidewalks or on the rest of paths needed for pedestrians mobility;

V. reduce the carbon emissions (including by traffic management)

- 2 = rehabilitation of tram railways (in the same time with grassing of the embankment);
- 7 = carrying out punitive actions against polluters;

VII. innovation of parking management

- 3 = allocation – in case of institutions subordinate to local authority – of the parking spaces for their employees on the principle of the distance from employee's residence;

VIII. improve the road safety

- 3 = periodical analysis of „becoming black spots" from the SC OTL SA perspective;

X. develop the public transport system

- 1 = removal of the tramway section from Iosia Sud Neighborhood - which, given the neighborhood's specific , does not justify the public transport by tram;
- 4 = SC OTL SA has to expedite the conformation of fleet to sustainable development requirements (project for general fleet renewal but especially for buses EURO 3 and 4);
- 5 = it has to enhance the efforts for increase transports regularity and even the public transport vehicles punctuality – according to schedules;
- 9 = SC OTL SA has to redo the schedule for public vehicles so as the intervals at peak hour to reach 7-8 minutes between the vehicles of the same line/route;
- 11 = SC OTL SA has to take into account the purchase of mobile means with high access possibilities (by different capacities, with low floors etc.);
- 20 = it is necessary to reconsider the set of public transport stations for boarding and unboarding;
- 23 = in order to make profitable the SC OTL SA activity, it should be defined the threshold between social transport and solitary transport;

XI. the operational expanding of local transport market (plan for commuters)

- 5 = analyze the possibilities to standardize the payment into a single pass for urban trips in combination with peri-urban trips;
- 6 = it should be necessary to be rethought the granting systems of transport licences for peri-urban area and even county area – in order to have the

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obligation to use as arrival and departure in/from oradea only the bus - stations – to strictly forbid the public transport;

- 9 = remove the taxi stations near to boarding-unboarding stations of SC OTL SA;

XII. ensure the conditions for a superior intermodality of transport services through which is made public transport service (respectively the correlation with metropolitan transport, possibly the county transport)

- 1 = Central Railway Station modernization so as the transition from railways system to roads system to represent an action of establishing a intermodal hub of maximum importance; same for Nufărul node;
- 3 = revise the projects which regard infrastructure development so as the network (trams or trolleys) to include also the airport area.

On the synthesys of various above information result the following tabel:

Tab. II.17

	Measures to the level of local authority			Measures to the level of SC OTL SA		
	Support measures	Strenghtening measures	Reinforcement measures	Support measures	Strenghtening measures	Reinforcement measures
	alfa measures	beta measures	gama measures	alfa measures	beta measures	gama measures
Measures that bring money	I-16, II-2, X-12, XI-7, XI-8	I-18, III-1, V-8, VII-2	I-12, V-7, XI-9	-	X-18, X-19, XI-2	I-21, X-23
Measures without money	I-3, I-9, I-11, II-3, III-5, VI-1, VI-4, X-10	I-4, I-8, I-13, III-8, VII-1	I-2, I-17, I-19, III-7, IV-3, VII-3, XI-5, XI-6	X-14, X-17	I-10	I-5, X-5, X-9, X-20, XII-3
Measures that require money - financial effort being moderated	**-**	**I-7, III-2, V-1, VI-3, VI-6**	**I-1, I-15, VIII-3, XII-1**	**IV-1**	**-**	**V-2, X-11**
Measures that require money - financial effort is considerable	**I-14, I-20, VII-4, IX-1, IX-3, X-8, X-15**	**V-3, IX-2, X-3, X-21, X-22**	**X-1**	**X-6, X-7**	**V-5, VIII-1**	**-**

From the technical point of view it is necessary to explain – separately – support measures, strenghtening measures, reinforcement measures: the strategy used by cities which are on second or third edition of SUMP included a mix of measures, different from case to case, but in all the cases practical actions were initiated with the most „profitable” – that could create at least a revolving fund for actions that consume money. Next there are presented the measures that can determine this revolving fund, followed by neutral actions in this respect[64]. **Generally, the actions that customize the way to SUMP refers to:**

- In terms of form, at each above measures – according to the category (support, strenghtening, reinforcement)
- In terms of their substance being customized below:

[64] Another point of view is the one of the time the measures reach their maturity and can be seen changes i the level of observed indicators.

A) support measures

(the measures that can not be applied unless the financial source is identified)

I-20 = THE DEVELOPMENT OF A CENTER EQUIPPED WITH A MANAGEMENT TRAFFIC SYSTEM IN THE CITY = without additional parameters of identification.

IX-3 = THE DEVELOPMENT OF SEVERAL PROJECTS THAT AIM TO ENHANCE THE CAPACITY OF MAIN NETWORK OF STREETS – STARTING WITH STREETS THAT NOW HAVE THE LOWEST CAPACITY TO TAKE VEHICLES FLOWS = in first stage can be included:

- the construction of Oradea ring road that also links OMA (Oradea Metropolitan Area) villages
- Roman Ciorogariu
- Traian Moşoiu
- Ady Endre
- Eroul Necunoscut
- Tudor Vladimirescu
- Oneştilor
- removing the pedestrian crossing on D. Cantemir Street (in front of Episcopal Cathedral)
- passages building at the intersection Ogorului Street and DN 76, DN 79, DJ 797, DC 62, DC 66 and also over the railways.

I-14 = IMPROVING SOME STREETS (PLANNING AND FUNDING) AND CHANGING THEIR CLASSES INTO UPPER CLASSES – POSSIBLY WITH ONE-WAY TRAFFIC – IN ORDER TO INCREASE THE TRAFFIC CAPACITY = in first stage it can be included the following streets:

- **one-way streets:**
  - Călăraşilor with Tudor Vladimirescu
- **upgrade**
  - Matei Corvin (in Episcopia Bihor area);
  - Uzinelor;
  - Ecaterina Teodoroiu;

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- Depoului;
- Constanței, etc.

X-6 = IT IS NECESSARY TO ENSURE THE SECOND ACCESS TO TRAM DEPOT; IN THE SAME VEIN: IT IS TO CONSIDER A „SHED” FOR TRAMS IN ORDER TO REDUCE THE TRAVEL DISTANCES FOR THE WITHDRAWN TRAMS AT THE END OF PEAK HOURS = no additional parameters identification.

X-7 = IT CAN GET A HIGH ELASTICITY IN PUBLIC TRANSPORT OPERATION IF IS MADE THE THIRD „TRIANGLE” TO SERVE LINE 2 = no additional parameters of identification

X-8 = FROM THE POINT OF VIEW OF EFFICIENCY, THE MAIN ROUTE WHICH CAN BE SERVED BY A TRAM LINE IS BETWEEN THE POINT OF INTERSECTION OF TRAM LINE 2 WITH CENTRAL RING AND THE SECOND ACCESS OF DEPOT (POSSIBLY TWO MORE OTHER ROUTES) = as:

- Emanuel – Decebal – Stadium – Universitatii – Cemetery – Ceyrat – Atelierelor – Depot
- Aradului (in 3 stages: up to Ogorului Street, up to commercial area, up to airport)
- Sinteza – Eurobusiness.

X-15 = IT IS RECOMMENDED TO INITIATE A PROJECT FOR MODERN BOARDING-UNBOARDING STATIONS (TO STANDARDIZE – TO CUSTOMIZE THESE CONTACT POINTS BETWEEN THE PUBLIC TRANSPORT OPERATOR AND THE PUBLIC) = no additional parameters identification

VII-4 = REGULATE THE „PARK AND RIDE” TRANSPORT SYSTEM = it can be implemented only following a **study** which will establish the protected area (at the limits of this area it will be done the interchange between private car and public transport means)[65].

IX-1 = COMPLETION OF A NETWORK OF BICYCLE ROUTES WHICH WILL INCLUDE Oradea Metropolitan Area = it can be done only following an **analysis** in order to determine the connected graph which will bring together the available routes with under construction routes and with projected routes.

[65] Incertrans opinion is that the protected area should coincide with “central ring” proposed in Urbanistic General Plan (but also can be another configurations).

IV-1 = PURCHASE A MEDIUM CAPACITY VEHICLE – AN ELECTRICAL VEHICLE – INITIATING AN ECUMENICAL ROUTE INSIDE THE CITY = it is implemented only after fixing of a number of historical monuments of great interest for the tourists. One proposal should include:

(Walking)

- ✓ Moon Church + Synagogue + Theatre + City Hall + Greek Catholic Palace

(By bus)

- ✓ Partium University
- ✓ Children's town
- ✓ Central Station
- ✓ Roman Catholic Diocese
- ✓ Crişul Store
- ✓ Orthodox Monastery

(Walking)

- ✓ Citadel + st December Park

(Bz bus)

- ✓ Lotus center
- ✓ SC OTL SA Depot
- ✓ Oradea University
- ✓ Military Museum
- ✓ Zoo
- ✓ The Malls (end of Calea Aradului)
- ✓ Airport
- ✓ Moon Church

So that touristic circuit is like the one shown below:

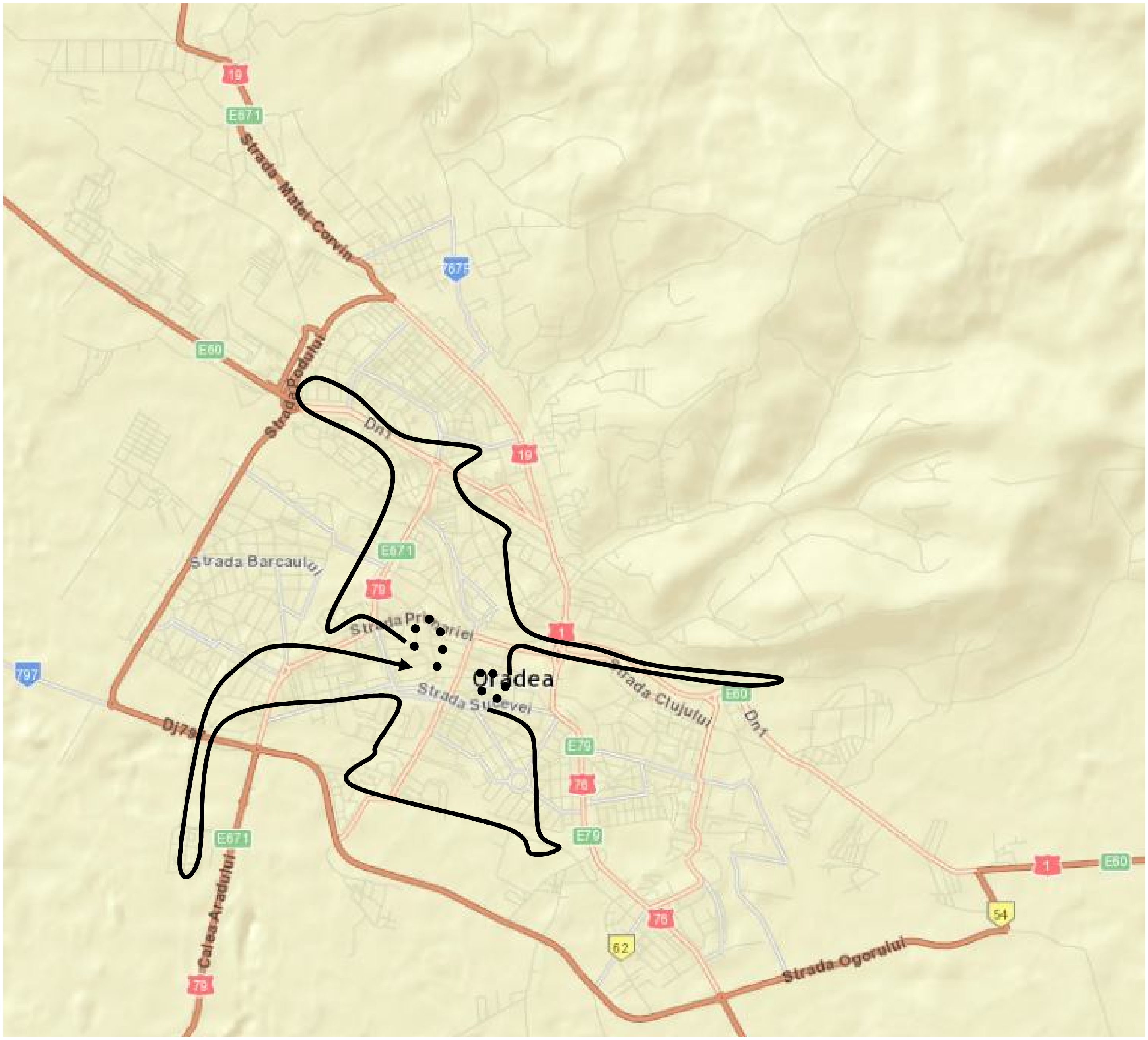

Fig. II.73 - The proposed touristic route

(measures that can create funds for mobility)

I-16 = TAXATION OF CARS PASSING THROUGH A „PROTECTED RING” IN THE CITY'S CENTER = no additional parameters of identification

II-2 = TO ANALYZE THE POSSIBILITY OF IMPLEMENTING OF A SYSTEM TYPE „CITY-VIGNETTE” IN A CENTRAL AREA OF THE CITY - FOR FREIGHT FREIGHT TRANSPORT VEHICLES = no additional parameters of identification

X-12 = GENERAL INTERESTS OF THE CITIZENS – NOT THOSE SPECIFIC TO A PART OF THE CITIZENS – REQUEST TO REASSESS THE GRATUITY AWARD SYSTEM FOR RETIREES = no additional parameters of identification

XI-7 = ACTIONS AND RULES AGAINST „PIRACY” (unauthorized urban public transport by private cars) ON URBAN TRANSPORT MARKET = no additional parameters of identification

XI-8 = SHOULD BE INTRODUCE A TAX / FEE – CONTRIBUTION OF THE NON-LOCAL TRANSPORT OPERATORS IN ORDER TO COVER THE COSTS OF MAINTENANCE THE BOARDING-UNBOARDING STATIONS USED BY THEM = no additional parameters of identification

(measures that can be considered neutral regarding financial effort)

X-10 = LOCAL AUTHORITY HAS THE OBLIGATION TO TAX AT THE LOWEST LEVEL THE SC OTL SA VEHICLES = no additional parameters of identification

X-14 = SC OTL SA HAS TO MAKE A PROJECT PROPOSAL FOR THE FIRST LANES DEDICATED TO PUBLIC TRANSPORT = on Republicii Boulevard it can be immediately implemented the steel-tracked fixed guideways for tram lanes which will have major repercurssion on communication speed of 1 and 3 tram lines.

X-17 = IT IS NECESSARY A NEW PRICING POLICY (WHICH TO ENVISAGE ALSO REWARDING THE LOYAL PASSENGERS) = no additional parameters of identification

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VI-1 = DEFINITIVELY SETTLE (long term – 20-30 years) THE ORADEA RING ROAD = no additional parameters of identification

VI-4 = the necessity to create a UNIT – CONSTRUCTION – INFRASTRUCTURE FOR MOTORIZED AND NON-MOTORIZED ACCESS AND GREEN AREA (FOR EVERY NEW BUILDING/CONSTRUCTION) = no additional parameters of identification

I-11 = IT WOULD BE RECOMMENDABLE THAT LOCAL AUTHORITY TO DEVELOP A REGULATION THAT NOT ONLY TO ALLOW THE PUBLIC PRESENCE BUT TO ENSURE THE PUBLIC PRESENCE IN THE DECISIONS REGARDING THE COMMUNITY = no additional parameters of identification

I-3 = to activate and stimulate the activity of department working with citizen’s associations (regular meetings organization) = no additional parameters of identification

I-9 = REGULATE AND PROMOTE CAR-SHARING AND CAR-POOLING (INCLUDING TAX INCENTIVES FOR RENTAL COMPANIES WHICH DECLARES AS AN ACTIVITY OBJECT THESE ACTIVITIES) = no additional parameters of identification

II-3 = REGULATE THE CITY TRANZIT – AFTER COMPLETION OF INFRASTRUCTURE WORKS FOR ORADEA RING ROAD AND THE ROAD WHICH WILL ENSURE THE LINK BETWEEN THE VILLAGES WITHOUT CROSS THE CITY = a study is required which mathematically provide the national routes which, on the one hand, intersect less other flows vehicles, on the other hand to protect the urban network of streets.

III-5 = it is recommendable to modify the opening & closing times of big stores = it can be implemented the following tactic:

- ✓ In working days the opening hour of the stores along the urban public transport lines should be at least 10.00
- ✓ The times „lost” by merchants in working days are recovered through extended programs – even all the night – Saturday and Sunday.

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Extracting only measures that require considerable financial effort, it is found:

ONE – the traffic congestion can not be reduced unless:

I-20 = the development of a center equipped with a management traffic system in the city;

IX-3 = the development of several projects that aim to enhance the capacity of main network of streets – starting with streets that now have the lowest capacity to take vehicles flows.

I-14 = improving some streets (planning and funding) and changing their classes into upper classes – possibly with one-way traffic – in order to increase the traffic capacity;

TWO – it can be obtained superior conditions of public transport service unless:

X-6 = it can be obtained a higher elasticity in public transport operation if it will be done the third “triangle” which to serve Line 2;

X-7 = it is necessary to ensure the second access to trams depot; in the same vein: it is to consider a “shed” for trams in order to reduce the travel distances for the withdrawn trams at the end of the peak hours;

X-8 = from the point of view of efficiency, the main route which can be served by a tram line is between the point of intersection of tram line 2 with central ring and the second access of depot;

X-15 = it is recommended to initiate a project for modern boarding-unboarding stations (to standardize – to customize these contact points between the public transport operator and the public);

THREE – it can not be obtained the compliance with sustainable development principles unless:

VII-4 = regulate the „park and ride” transport system.

FOUR – it can not be obtained the development of alternative motorized transport system development (including the decrease of pollution’s level):

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IX-1 = completion of a network of bicycle routes;

FIVE – it can not be revitalize the urban tourism without efforts to mobility:

IV-1 = purchase a medium capacity vehicle – an electrical vehicle – initiating an ecumenical route inside the city.

As a whole, the 25 above particularized measures influence at least one indicator and CONTRIBUTE IN CHANGING OF SOME ATTRIBUTES OF THE MOBILITY. THEY ULTIMATELY INFLUENCE THE SPEED AND LEVEL OF THE INDICATOR TO THE TARGET VALUE. The renouncement at one of the measures can be done in the following conditions:

- If in the set of strengthening or reinforcement measures (or even in the 20 unselected measures, possibly another measure non envisaged in the work) there is one that has a certain influence on the indicators for which was intended, then the above unaccepted measure (the one to renounce to) can be replaced with another.
- In case of negative response it is necessary to investigate in the set of support measures if is one thaT has a certain influence on the indicator for which was intended, then it can give up to unaccepted measure without replacement.
- If unaccepted measure is the only one that influences the indicator for which is intended, it is not possibly to disclaim the measure unless disclaim also the indicator attached to it.

B. Strengthening measures

(measures that can not be applied unless financial source is identified)

III-2 = THE DEVELOPMENT OF PUBLIC TRANSPORT = no additional parameters of identification

V-5 = RENEW THE PUBLIC TRANSPORT FLEET = no additional parameters of identification

V-3 = STREET INFRASTRUCTURE REHABILITATION = no additional parameters of identification[66] (for example: asphalting the streets with cracks)

VIII-1 = SC OTL SA HAS TO MAKE A PLAN FOR DESIGN, REDESIGN AND IMPROVE THE INFRASTRUCTURE OF TRAMS = no additional parameters of identification[67] (for example: to extent Căii Ferate Streets up to Ogorului Street – measured also proposed in Urbanistic General Plan)

IX-2 = PROMOTE A PROGRAM OF RE-CONSTRUCTION THE ELEMENTS OF STREETS INFRASTRUCTURE (STREETS WIDENING, MODIFICATION OF CURVES RADIUS, MODIFICATION OF INTERSECTIONS GEOMETRY IN ORDER TO INCREASE THE PUBLIC TRANSPORT SERVICE OPERATION ETC.) = no additional parameters of identification[68] (for example: underground passagee – measure proposed also in PUG)

X-22 = THE ANALYSES COULD REVEAL WHICH ONE OF THE TRAMS LINES TO BE TRANSFORM IN LIGHT RAIL LINES = the tram line between Nufărul and Piața Independenței or even up to Central Station could be easily to transform – this transformation could bring improvements on multiple plans.

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[66] Rehabilitation means to restore the initial parameters.
[67] Actions have to take into account the modification of the initial parameters.
[68] The improvements focus not only on infrastructure but also adjacent buildings.

- ✓ X-21 = CONSIDER THE IMPLEMENTING OF TRANSPORT SYSTEM BY TROLLEYBUSES = for the first trolleybus line we can advance the idea of takeover the surplus of trips estimated by some prognosis models through implementing of a structure indicated in the below figure (concretely, the measure envisages to achieve 2 additional branches on city's general network, starting from the central ring):
- ✓ one extension on Muntele Găina/Războieni Streets which aims to connect Velența neighborhood to center and an intermodal connection at Gara de Est.
- ✓ One extension on H. Ibsen Street from Densuşianu, Vlădeasa, Sucevei-Basarab, A. Iancu, … Streets which aims to connect the south-west area – served – by historical center through direct route – in opposition with the current line 10 which makes a unproductive detour moving away from the center and then return – figure below – fig. II.74)

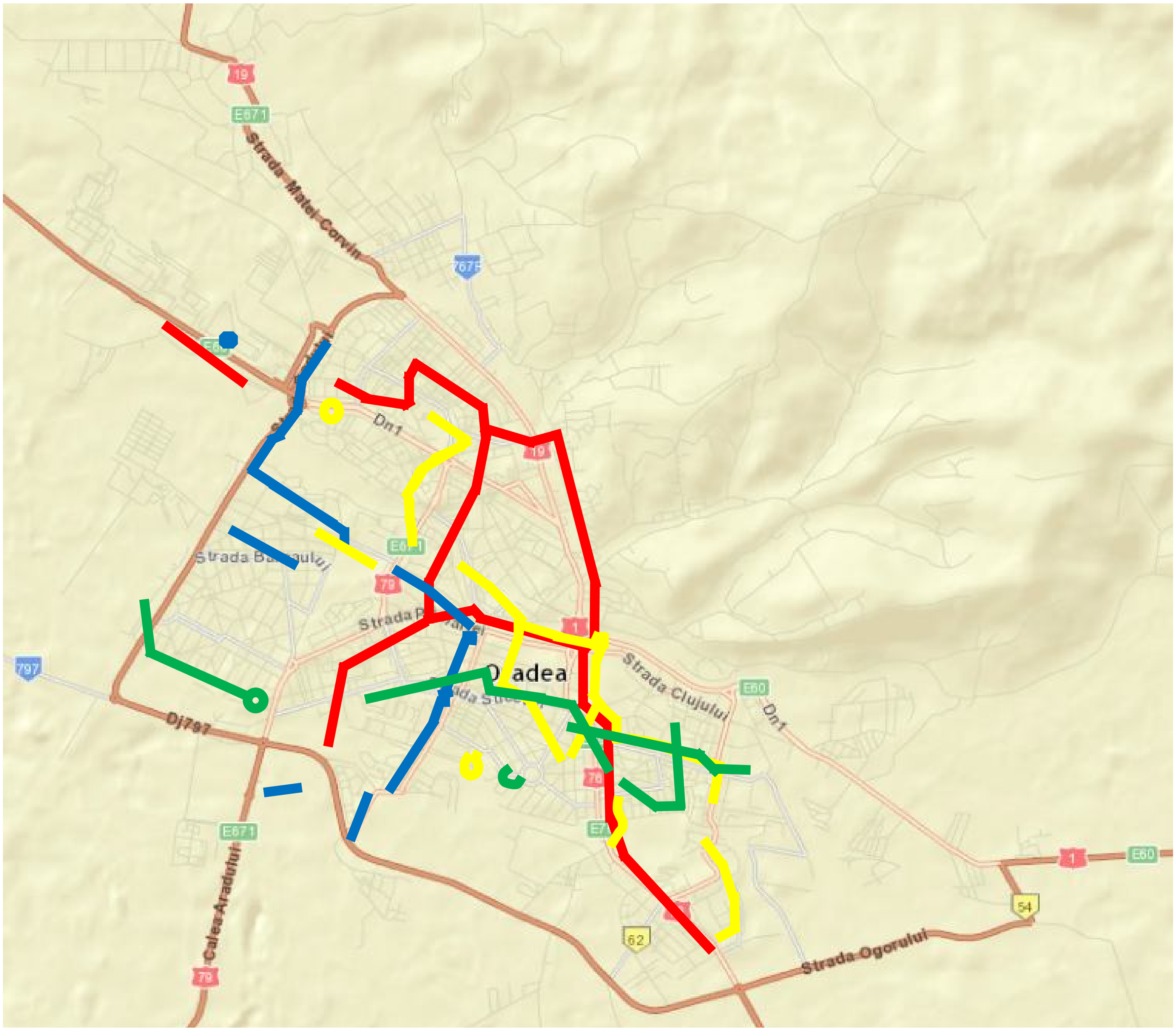

Fig. II.74 The green line is a possible trolley route (the main bus lines are in yellow and blue, the tram lines with red; additional some of the current transport lines – fully proved unprofitable are removed)

I-7 = SET UP BICYCLE PARKINGS = currently the bicycle routes are not connected, but when the projects already prepared will be implemented there will be conditions for parkings in all the nodes in which the current routes will meet.

V-1 = NEW PEDESTRIAN AREAS = there are relevant proposals in PUG (Urbanistic General Plan) (for example: changing in pedestrian area the section of Republicii Blvd. between Dunărea and Gheorghe Magheru Blvd., changing in pedestrian area the Piața Unirii, str. Vasile Alecsandri and the entire adjacent area of Crişul Repede)

VI-3 = PROJECTS TO ENSURE THE UTILITIES IN EVERY NEIGHBORHOOD = the goal of such measure is not identify with the fields in which “the utilities” are considered from PUG perspective (88.86% of the population has access to water, ie 92.88% of the population has access to sanitation, 70% receive heat); **the mobility issues include other fields**, including food markets, healthcare centers etc.; following the distribution of the utilities on city’s map it can be determined where should be placed such points of interest for the population – rational placing is beneficial for mobility.

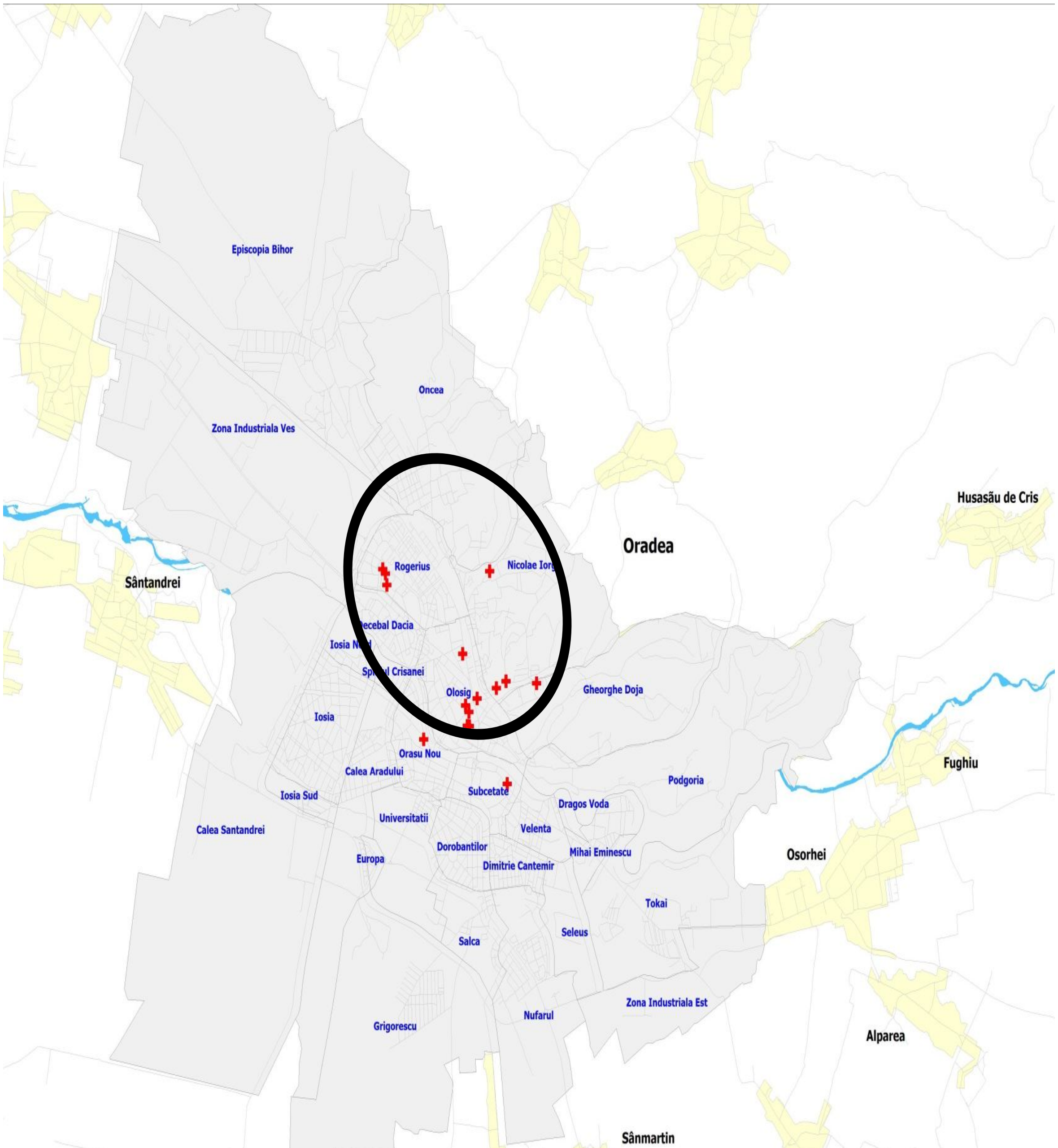

Fig. II.75 - Grouped location of healthcare centers

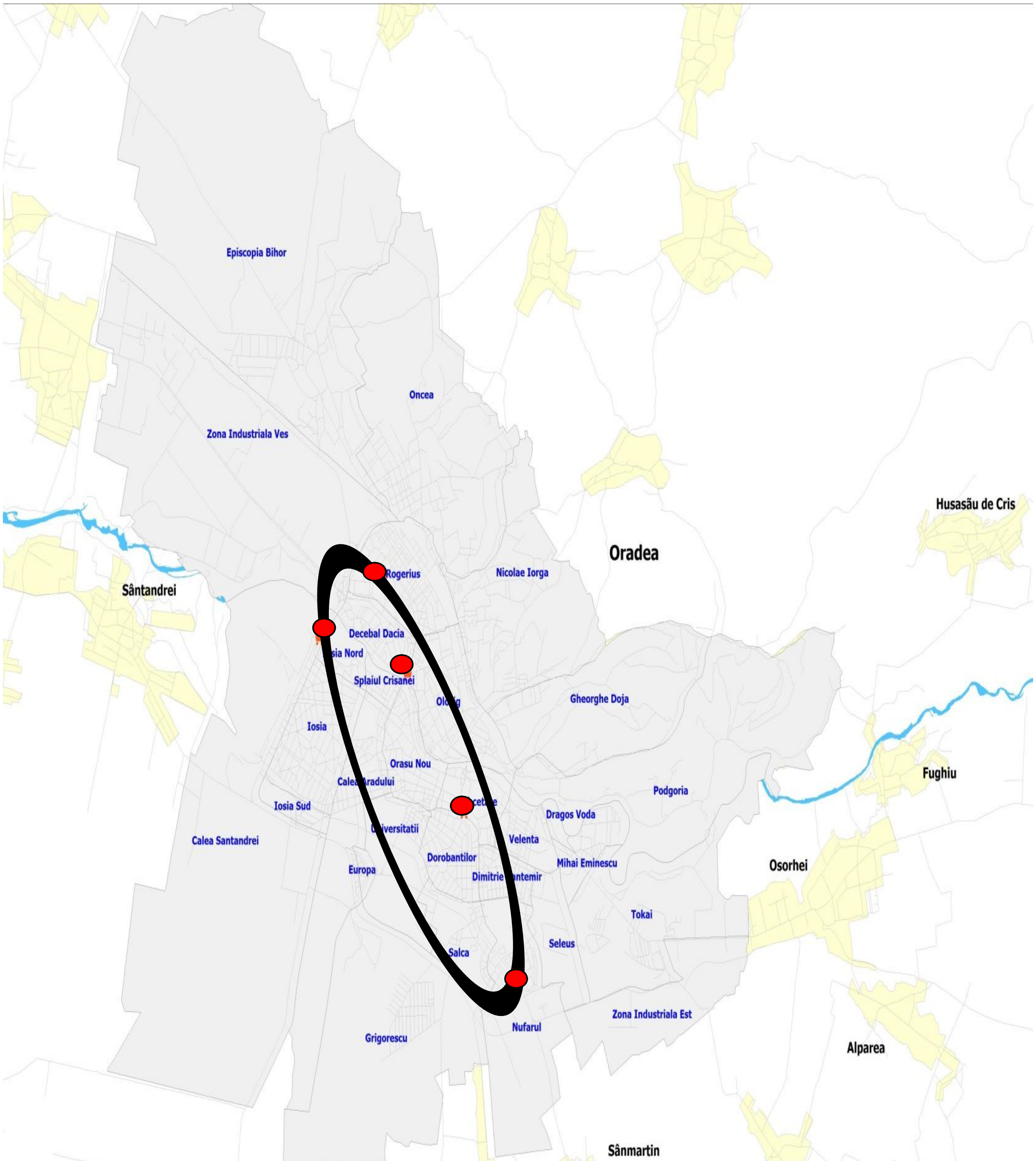

Fig. II.76 - „Unidirectional” location of markets

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VI-6 = SYSTEMS OF INCENTIVES FOR PLACING THE NEW SCHOOLS, HEALTHCARE CENTERS, COMMERCIAL CENTERS ETC. WITHIN RESIDENTIAL NEIGHBORHOODS OR CLOSE TO THEM = it is necessary to make detailed maps of each neighborhood, aiming earnestly that density of the utilities (which lead – if their localization is irregular – to unnecessary additional trips) to be uniform on entire city's area.

I-4 = INFORMATION CAMPAIGNS ON INNOVATIONS IN ADMINISTRATION SYSTEM THAT REDUCE THE NUMBER OF TRAVELS FOR CITIZENS TO ADMINISTRATIVE INSTITUTIONS = electronic signature as a form of symbolic representation of the citizen without requiring physical presence.

X X-3 = LOCAL AUTHORITY HAS THE OBLIGATION TO RECALCULATE PERIODICALLY THE COMPENSATION OF SC OTL SA = no additional parameters of identification

(measure that can create funds for the mobility)

III-1 = REDUCING THE USE OF PRIVATE CARS (THROUGH PRICING POLICIES AND AWARENESS) = it can be included measures that not directly forbid the private car use but leads to a „more expensive" private trip; for example, parkings pass purchased by cars owners - with more than a week validity – become operational only 4 days of the 5 workdays of a certain week of the month, week called „mobility week".

VII-2 = RESTRUCTURING OF PARKING SYSTEM (BY INTRODUCING A PROGRESSIVE PAYMENT TYPE, DISTINCTIV ON PEAK HOURS AND OFF PEAK HOURS AND EVEN ON TARGET GROUPS – FOR EXAMPLE FOR THE SMALL CAPACITY VEHICLES THE TAX COULD BE MORE REDUCED) = no additional parameters of identification[69]

[69] To review the target regarding the cost of one hour parking related to the cost of a trip by public transport..

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I-18 = PARKING SPACES ON PUBLIC DOMAIN AND THOSE OF ECONOMIC AGENTS (USED BY THEIR EMPLOYEES): ECONOMIC AGENT **PAY** A TAX TO LOCAL AUTHORITY = it is a matter of local taxation; the companies dave to declare annually the number of parking spaces they administer, according to which a tax is calculated by the local authority (the company can eventually recover the money from the employees who benefit of parking spaces in front of the unit).

V-8 = PURCHASE NON-EURO VEHICLES – EXTRA CHARGED = no additional parameters of identification

X-18 = IT HAS TO BE INTRODUCED AND THEN GENERALIZED EXPRESS TRANSPORT SYSTEM (OR MAXI-TAXI), IN THE SAME TIME WITH NORMAL ROUTES = 14, 12 and maybe 17 routes are suitable – due to large enough traffic – for double line organization (a speed route with vehicles which stop in 2-3 intermediary stations besides ends of the route and a normal route with vehicles stop in all stations)

X-19 = IT IS NECESSARY TO REDESIGN THE BUS ROUTES SO AS TO BE EXCLUDED THE PARALLELISM OF THE TWO MODES OF TRANSPORT = it has to be bone a detailed study that starts from the assumption that electric transport system must be powered by the transport system which consumes fossil fuel; in fact, new bus routes do not have to double the tram routes.

XI-2 = IN COLLABORATION WITH OMA (Oradea Metropolitan Area) IT IS RECOMMENDED TO PREPARE A PROGRAM OF TRANSPORT SERVICE FOR PERI-URBAN AREA (PARTICULARLY TO BĂILE FELIX AND BĂILE 1 MAI RESORTS BUT ALSO TO BORŞ – LINK WITH EUROPEAN WESTERN) = it is necessary to corroborate the findings and conclusions of this project with findings and conclusions of the project made also in 2013 for OMA in order to find feasible formula of collaboration for mobility improvement for the entire established area as being determinant for Oradea population.

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(measures that can be considered neutral in terms of financial effort)

VII-1 = LOCAL AUTHORITY SHOULD PROVIDE NEW REGULATIONS ON PARKINGS WHICH TO REDUCE THE POSSIBILITIES TO PARK ON THE STREETS = it is necessary to identify which street are at their capacity limit and subsequently to forbid parking (the measure must be accompanied by police controls and **controls of companies which lift illegally parked vehicles**)

I-13 = MAPS FOR SPREADING OF MAIN UTILITIES IN THE CITY (THE NEXT IMPLANTS WILL BE DONE ONLY BASED ON THE EQUAL SPREAD IN TERRITORY PRINCIPLE) = it is necessary that PUG to be completed with provisions of this kind.

III-8 = CREATING THE FRAMEWORK FOR TELE-ACTIVITIES AND TELEWORK DEVELOPMENT, INCLUDING FINDING WAYS TO REDUCE TAXATION FOR COMPANIES WHO PRACTICE TELE-ACTIVITIES AND TELEWORK = In recent years new informational and communicational technologies have been rapidly developed so that, in the center of recent scientifical, political and political debates was Informational Society development who generates new opportunities for work and essential changes in nature of labour and ways of working, comparable to those occured in industrial revolution. **Telework** refers to an activity in which employees can choose the location where to work and the working hours. **Telework** is by definition, **the activity in which computers and telecommunication are used to change the accepted geography of work:** telework is the activity in which information and communication technology is used to work at the distance from the place where work result is needed, or the place where normally activity would be performed. **The fields** in which – for the moment – it has already been created niches for TELECOMMUTATORS = companies that could delegate activities outside of their official centre/headquarters are companies in domains like commerce, marketing, education, software.

I-10 = SC OTL SA HAS TO INITIATE COOPERATION ACTIONS WITH PUBLIC TRANSPORT PASSENGERS AND REGULAR MEETINGS = SC OTL SA has to initiate a program of meetings with public transport passengers and with amateur drivers and to present them the current problems of a public transport operator (for exampe, an amateur driver should be let to drive in SC OTL SA polygon to see what means driving a 15 m lenght and 3 m width vehicle; a person without driving license should be put on the driver's seat while the vehicle is stopped, in order to see how much can be seen from the driver's seat in the minute in which the vehicle is in station with open doors, etc.)

I-8 = CREATING THE COMMERCIAL AND TECHNICAL FRAMEWORK FOR BICYCLE CARRYING IN VEHICLES OWNED BY PUBLIC TRANSPORT OPERATOR = no additional parameters of identification

C. Reinforcement measures

(measures can not be applies unless the financial source is identified)

X-11 = SC OTL SA HAS TO TAKE INTO ACCOUNT THE PURCHASE OF MOBILE MEANS WITH HIGH ACCESS POSSIBILITIES (BY DIFFERENT CAPACITIES, WITH LOW FLOORS ETC.) = without additional parameters of identification (percentage of such vehicles has to be in accordance with the percentage of disabled people in the city).

V-2 = REHABILITATION OF TRAM RAILWAYS (IN THE SAME TIME WITH GRASSING OF THE EMBANKMENT) = no additional parameters of identification (only examples: Independenței Street, 1st December Square, Coposu Area, Emanuel intersection).

-15 = INSTALLING ON GROUND PASSAGES OR BUILDING UNDERGROUND PASSAGES FOR PEDESTRIANS ON THE STREETS WITH HIGH FLOWS OF TRAFFIC – INSTEAD OF CROSSWALKS – WHERE SIGNALING / TRAFFIC LIGHTS PROGRAMS IS INSUFFICIENT FOR COMBINED FLOWS VEHICLE-PEDESTRIANS = this measure was already envisaged; specifically insist on possibility to to remove one of the 4 crosswalks is usually marked at the entry in a common intersection – see the figure below:

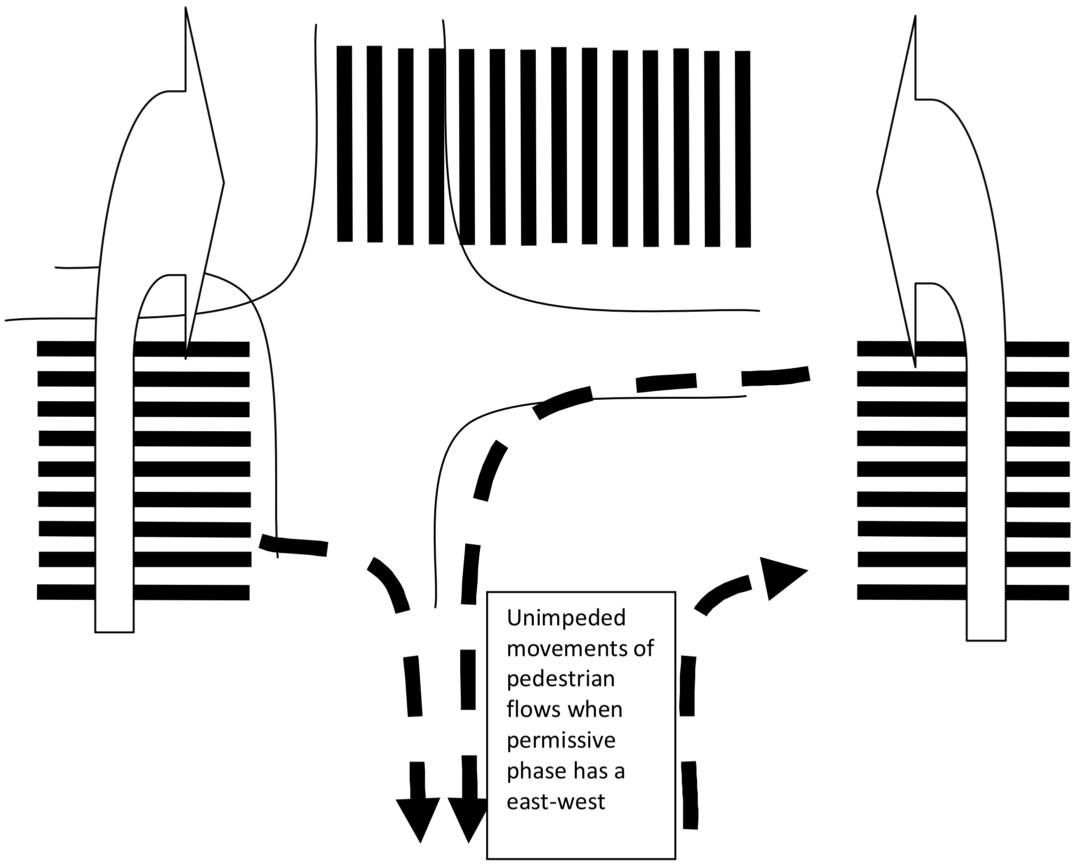

Fig. II.77 – The way to obtain – besides the movements represented in the figure – and additional space for the flows of vehicles on South-North axis (also decrease the waiting time for the vehicles of some flows of traffic)

XII-1 = CENTRAL RAILWAY STATION MODERNIZATION SO AS THE TRANSITION FROM RAILWAYS SYSTEM TO ROADS SYSTEM TO REPRESENT AN ACTION OF ESTABLISHING A INTERMODAL HUB OF MAXIMUM IMPORTANCE; SAME FOR NUFĂRUL NODE = no additional parameters of identification.

VIII-3 = PERIODICAL ANALYSIS OF „BECOMING BLACK SPOTS” FROM THE SC OTL SA PERSPECTIVE = no additional parameters of identification.

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I-1 = ELECTRONICALLY PAYMENT SYSTEMS = the reference does not regard the procedure itself, which, according to Law 291/2002 should have been implemented in all cities, but to widespread promotion a this type of payment (which leads to a decrease of trips on public roads).

(measures that can create funds for mobility)

XI-9 = REMOVE THE TAXI STATIONS NEAR TO BOARDING-UNBOARDING STATIONS OF SC OTL SA = no additional parameters of identification (for example, even at 50 m close to City Hall, it can be observed a such overlap of interests: between the two stops of trams there is a taxi station).

X-1 = PREPARE A PROFITABILITY PLAN FOR THE TRAMS RAILWAYS SECTION FROM IOŞIA SUD NEIGHBORHOOD – WHICH DUE TO NEIGHBORHOOD'S SPECIFIC NOT JUSTIFY THE TRAMS TRANSPORT OPERATION – POSSIBLY, THROUGH THE END OF ROUTE REALLOCATION BEYOND THE FENCE WHICH DELIMIT NORTH-SOUTH ARTERY, IN PARALLEL WITH RAIL = no additional parameters of identification;

X-23 = IN ORDER TO MAKE PROFITABLE THE SC OTL SA ACTIVITY, IT SHOULD BE DEFINED THE THRESHOLD BETWEEN SOCIAL TRANSPORT AND SOLITARY TRANSPORT = no additional parameters of identification[70]

V-7 = CARRYING OUT PUNITIVE ACTIONS AGAINST POLLUTERS = the measure is especially important as the respective target is specified only by the values provided by law – regarding level of pollution on public roads.

I-21 = INTRODUCE A „NO CAR DAY" (MONTHLY) = no additional parameters of identification[71]

[70] To review the chapter regarding OBJECTIVES, which refers to profitability limits of transport urban routes.
[71] This measure can be a proof of Oradea municipality administration involvement in mobility improvement

(measures that can be considered neutral in terms of financial effort)

IV-3 = LOCAL AUTHORITY STRAIGHT ACTIONS TO REMOVE ANY OBSTACLES ON THE SIDEWALKS OR ON THE REST OF PATHS NEEDED FOR PEDESTRIANS MOBILITY = the measure aim in particular the people with disabilities / the disabled (an example for this is the construction of boarding-unboarding station on D. Cantemir – Piața Mare, the way to Nufărul).

XI-6 = IT SHOULD BE NECESSARY TO BE RETHOUGHT THE GRANTING SYSTEMS OF TRANSPORT LICENCES FOR PERI-URBAN AREA AND EVEN COUNTY AREA – IN ORDER TO HAVE THE OBLIGATION TO USE AS ARRIVAL AND DEPARTURE IN/FROM ORADEA ONLY THE BUS - STATIONS – TO STRICTLY FORBID THE PUBLIC TRANSPORT OF PASSENGERS WITHIN THE CITY = at the present date, SC OTL SA has accepted – perhaps forced by circumstances – to allow stops for boardings and unboardings in other locations than **official depot** on Războieni Street, the only place that should be the terminus point for extra/urban routes.

VII-3 = ALLOCATION – IN CASE OF INSTITUTIONS SUBORDINATE TO LOCAL AUTHORITY – OF THE PARKING SPACES FOR THEIR EMPLOYEES ON THE PRINCIPLE OF THE DISTANCE FROM EMPLOYEE’S RESIDENCE = no additional parameters of identification.

I-17 = MODIFICATION IN STARTING HOURS OF THE ECONOMIC AGENTS ACTIVITY SITUATED ON THE SAME STREET OR IN THE SAME POINT – MARGINAL – OF DESTINATION = is a measure linked with economic progress recorded by industrial areas form North-Est and South-East.

III-7 = IT IS RECOMMENDED AN ECHELONED SCHEDULE FOR STARTING WORKING HOURS IN CASE OF THE COMPANIES = it is a measure to be taken for economical or industrial companies situated near to city’s center (**City Hall, Prefecture, County Council but also some other municipal or county authorities start their working day at the same hour – although they are situated about 7 minutes distance one from onther, or about 2 up to 7 minutes of Partium University**).

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I-2 = SYSTEMATICALLY EDUCATIONAL MEASURES IN SCHOOLS – IN THE IDEA OF A SUSTAINABLE DEVELOPMENT CULTURE = no additional parameters of identification

-19 = TICKETS TO CONCERT AND SPORTS EVENTS WHICH HAVE TO INCLUDE THE PRICE OF 2 TICKETS FOR TRAVEL BY PUBLIC TRANSPORT – TO OFFER THE RIGHT TO TRAVEL = no additional parameters of identification[72]

X-9 = SC OTL SA TREBUIE SA REFACA GRAFICELE DE CIRCULATIE ASTFEL INCAT INTERVALELE LA VARF DE TRAFIC SA AJUNGA LA 7-8 MINUTE INTRE VEHICULELE ACELEASI LINII = fara parametri suplimentari de identificare[73]

X-5 = IT HAS TO ENHANCE THE EFFORTS FOR INCREASE TRANSPORTS REGULARITY AND EVEN THE PUBLIC TRANSPORT VEHICLES PUNCTUALITY – ACCORDING TO SCHEDULES = no additional parameters of identification (theoretically there are many actions that ca be take into account when the punctuality is analyzed; but most of them refers to compliance with the schedule, fact that depends by human factor = driver and random phenomena in traffic). Without reducing their importance, practically the public transport operator can only establish the time of the trips by public transport so as time RESERVES introduced in travel time to cover the most of objective deviations – „due" to driver and general traffic – and that could take the vehicles displacement out of the schedule. In order to rationally establish the time for the trip by public transport, there are mathemaical methods based on probability theory.

X-20 = RECONSIDER THE SET OF PUBLIC TRANSPORT STATIONS FOR BOARDING AND UNBOARDING = no additional parameters of identification

XI-5 = ANALYZE THE POSSIBILITIES TO STANDARDIZE THE PAYMENT INTO A SINGLE PASS FOR URBAN TRIPS IN COMBINATION WITH PERI-URBAN TRIPS = no additional parameters of identification

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[72] The management of „Regina Maria" Theatre has already shown the interest for this type of ticket-pass. .

[73] Trebuie eliminat dublul standard sub care se prezinta "tabloul" circulatiei, utilizat de cele doua exploatari – electric si auto – ale SC OTL SA.

XII-3 = ORGANIZE THE PUBLIC TRANSPORT PROGRAM PERFORMED BY PUBLIC TRANSPORT OPERATOR IN ACCORDANCE WITH THE RAIL AND AIR TRANSPORT PROGRAM = no additional parameters of identification.

6.2 Best practice

6.2.1 Best practice case cities

With growing number of private trips in urban areas which lead to great negative impact on environment and ever growing external costs in urban transport, both resulting bad and ineffective interconnections for transportation networks. Cities and regions that serve as important nodes of European transportation network are also dealing with low and poor accessibility and decreasing interest in using urban public transportation modes as an alternative to more comfortable private car trips. Therefore cities and regions covered in this report had been chosen as an example of how to attack and face with problems like increasing comfortable personal mobility needs, escalating congestions and intensified suburbanisation.
As public transport is often perceived from users point of view as very unsafe, uncomfortable, imprecise and rigid, the core output of ATTAC is a collection of good tools and strategies for reduction of car use and shift to sustainable public transportation modes. To achieve this objective three Task Forces were formed, each covering their own thematic filed.

To encourage people to walk, cycle and use public transport in order to reduce motor traffic and its adverse effects, several cities implemented mobility management measures.

Examples of measures implemented in European cities (as they were presented by ATTAC Programm) are ilustrated below:

Flexible public transport solutions

Bridging the mobility gaps by promoting flexible and new transport solutions is an objective that the Agency for Mobility and Local Public Transport in Modena (aMo) as coordinating partner of TF1 with long going experience in mobility management and logistics will tackle. Bridging the mobility gaps by promoting flexible transport solutions is covered with detailed review of:

- **Alternative organisation of FTS** (integration with taxi service – Achterhoek, mixture of DRT and fix PT – Genoa, support to fix PT – Modena, replacement fix with DRT – Fano, activity base DRT for healthcare and disabled – Bologna and Brno)

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- **Technological and financial upgrade** (dynamic route planning based on customer requested – Florence, DRT for minimal costs – Purbach, integration PT, bike and car sharing – Bremen)
- **Transferability and sustainability** (Genoa transferability – Krakow, feasibility study on DRT – Livorno).

Integrated ticketing and smart card systems

Thematic field covers the promotion of innovative and integrated ticketing system and the use of smart card service in urban public transport based on experiences in different EU cities and regions:

- **Technical and financial upgrade (**online smart card – Verona, integration of e- and magnetic ticketing process - Vicenza, e-ticketing for bike, bus, taxi and ferry- La Rochelle, e ticketing for PT, parking and bike sharing - Cuneo, e-ticketing for P&R and PT**.**
- **Methodological steps** for implementing integrated e-ticketing – Timisoara

Passenger information systems

Improving the way of providing public transport information to the PT users is coordinated by Faculty of Civil Engineering in Maribor where main knowledge is based on capitalisation of successful implementation of real-time passenger information system in other EU cities and regions:

- **Management and marketing upgrade** (rising the image of PT – Malmö, RTPI and accuracy control – Ljubljana, RTPI and occupation level – Donostia – San Sebastian, integrated mobility centre - Brno)
- **Technical and financial upgrade (**RTPI with traffic priority – Almelo, RTPI for multi-operators – Barcelona, P&R and RTPI – Cornwall, full scale RTPI international tendering - Toledo, RTPI and customer willingness to pay – Thessaloniki)
- **Transferability and sustainability** (ITS for PI part of BHSL – Jönköping, Guidelines on mobile RTPI **–** Trondheim, Cross border door to door planner – Graz – Maribor)

Tab. II.18: Identified Projects/Case cities

Project/study	Content/City	Description and additional information
CIVITAS	VIVALDI – Bremen (GER)	New concept of mobil.punkt stations in the city serving as interchanges between car sharing, public transport and cycling.
	MIRACLES – Barcelona (SPA)	Development and Installation of Multi-Operator Automatic Vehicle Monitoring and Real-Time Passenger Information System
	SUCCESS – La Rochelle (FRA)	Launching new single smart card service for multimodal public transport use with online rechargeable ticketing system.
	ELAN - Brno (CZR)	Five special minibuses were delivered to improve bus service for disabled on special lines and on common lines in non pick hour.
	Ljubljana (SLO)	New Integrated Mobility Centre (IMC) for providing info about cycling, parking, public transport, new car sharing system and ticket vending machines.
		New Real Time Passenger Information System integrated with the existing public transport management system of the PT operator.
NICHES+	Trondheim (NOR)	Implementation of Mobile Travel Information Services for the Public (MTIS)
DRIN BUS	Genova (ITA)	Flexible bus service (DRT) for connecting low-density areas.
ProntoBus	Modena (ITA)	Flexible service connecting growth residential localities to centre.
Personal Bus	Florence (ITA)	Flexible bus service (DRT) for connecting low-density areas.
MOVER	Verona (ITA)	Introduction of electronic smart card ticketing service.
FTV tick.	Vicenza (ITA)	Integration of electronic and magnetic ticketing processes, info-mobility and service certification.
BIP	Cuneo (ITA)	Improving accessibility and quality with

		construction of electronic fare collection system.
SIEIC	Timisoara (ROM)	New ticketing system based on contact less cards and the centralized management system of the vehicles.
SABIMOS	Almelo/Enschede (Olanda)	AVL tracking system with traffic intersection priority system and providing Real Information and Time Passenger Information.

Modena (Prontobus) – Italy

City of Modena with over 183000 inhabitants is the largest city in the Province of Modena and lies in the centre of Po valley and is also a part of administrative region of northern Italy called Emilia-Romagna region which is one of the richest and most developed regions in Italy. Covering area of around 183 km² the city has a variety of urban public transport services that include bus, trolleybus.

The services Prontobus has been activated by the Agency of Mobility of Modena and in concert with the municipalities involved since 2003 has enabled on-call services in different areas of the province of Modena, in particular in the municipalities of Pavullo, Carpi, Modena, Mirandola, Maranello, Serramazzoni, Castelfranco and Fiorano.

Services have been activated on the basis of the following assumptions:

- Replace normal PTS in areas or hours with low demand;
- Integrate traditional public transport services, or in smaller towns with low population density, dispersal population (mountain areas, rural locations) or areas not served by fractional TPL services;
- It is something between the traditional service and a door to door service, without overlapping to the first one.

Prontobus offers an high quality public transport service, closer to the need of users, thanks to the customization, the duration and the comfort of the trip that must not be greater than 30 minutes and is performed with small and ecological buses, equipped with devices for transporting disabled people.

The service network consists of a series of collecting points coincident with bus stops already existing, or bus stop for school-buses if new points for Prontobus are required, they should be allowed after inspection, by authorities.

The travel reservation is made through a call centre from 8 to 17.45 to a number with a fixed cost for the user (about € 0,20 per call), even up to 30 minutes before the departure. The way to book Prontobus is quick and easy; Prontobus bus stops, are marked with special signs with the logo of the service and an identification number, that has to be reported at the booking. From the list of collection points the user chooses the one from which wants to start the trip and the one to which he wants to go. The departure and the arrival time are evaluated with the operator depending from the other bookings. Reservations for the same day, for other days or a week later are allowed, with a maximum advance booking of seven consecutive days even for more than one person.

The fares are the same as for other public transport services of Modena province (€ 1,20 for one way trips; monthly and annual cards are allowed). The one way ticket can be purchased on board too. The public transport company has a call centre and a software to manage reservation (similar to ATAF's software).

Prontobus services costs are included in the Service contract that aMo has with ATCM (the Public Transport company) and they are considered from a contractual point of view, as local public transport services. Services are paid based on mileage and available hours of service, in particular € 0.60 per km - € 26 per hour.
50% of the costs are covered from aMo and the remaining 50% are covered from the municipalities that requested the service; The cost per km of flexible service is higher than the traditional service, but the total cost of a flexible service is lower of the cost on a traditional service with the same coverage of area and time.

The main aim of Prontobus is to support to the line buses linking different areas with a low populated areas, and then at a low transport demand, with the main cities and the regular line stops. Without this service that routes are not covered because the traditional service would be too expensive and economically unsustainable.

Bremen (CiViTAS VIVALDI) – Germany

Bremen consists of the City of Bremen and the City of Bremerhaven. As the tenth biggest city in Germany and with the population of around 550.000 inhabitants the city of Bremen has a versatile urban public transport network. The public transport in Bremen is operated by the Bremer Straßenbahn AG (BSAG) which key priority is to expand the entire transport system with new direct connections from city districts into the city centre and consistent customer oriented planning. With a fleet of several hundred vehicles that operate in the city of Bremen alone and is constantly supplemented and modernized with new comfortable low-floor vehicles the BSAG achieved with their aggressive marketing strategies, a new sale system and a quality-focussed human resource planning the growth of public transport users. Their fleet of 210 modern buses and 121 trams operating on 45 bus routes and 8 tram routes cover the entire city area of around 350 km² and provide comfortable, safe and punctual transport for nearly 270000 passengers on daily bases.

Intensive and increasing parking problems in the inner-city areas and the steady growth in car-ownership is a well-known obstacle for achieving sustainable urban development. To reach sustainable mobility some measures had to be implemented to stop and prevent the consumption of public space and the space required by the car and related infrastructure. Therefore to improve the quality of urban life and to regain the street space back two “Mobil.punkt” stations were built in the city centre. These first two special integrated intermodal car-shearing stations represent a alternative and efficient approach to compete with the private owned car in terms of convenience and cost-structure and can help to improve the quality of life in the cities.

When introducing this new car-sharing service the city authorities and public transport operator have led down some basic guidelines and terms that this new service must fulfil to reach the desired effect as good alternative for reducing the number of private cars in city centres. This new car-sharing must be:

- *Affordable* - Reasonable rates for system users and suitable for short trips in inner- city and its periphery.
- *Convenient* - Vehicles that are easy to check in and check out and are available at any time throughout the year.
- *Reliable* - Vehicles that are technically flawless and regularly serviced and with good dependable booking and access system.
- *Accessible* - Good connectivity with other PT modes and ITS systems and cycling.

Since its introduction in year 2003 the "Mobil.punkt" on-street car-sharing system expanded and has now over 40 service stations in the city of Bremen alone and over 130 cars for more than 6200 clients. The pay-as-you-drive principle and related reduction of car-borne mileage (shift to public transport, rail, cycling and intermodal chains) and the availability of a variety of low-emission cars lead to a reduction of emission and noise. With the help of Car-Sharing more than 1.500 private cars are replaced in Bremen.

The modal split of the public transport and private trips in the city of Bremen is in favour of PT modes and cycling. With 20% of trips made by walking and 25% of trips made with bicycle this modal split in Bremen is a good example and a foundation for future sustainable mobility. With added 14% of trips made with different public transport modes (bus, trams, railway) to walking and cycling we can conclude that transport related problems (noise, emissions, road accidents) are decreasing. Still around 39% of trips are made with private cars and represent a convenient solution for making more frequent and diverse trips to many of which the public transport just cannot compete. Different transportation means and vehicles that are used to make trips represent a modal split of around 3%.

The project is financially supported by the European Commission. BREPARK, a company for parking management, was authorised to construct and run this mobility stations. BREPARK received the right for separate use of public areas per contract for an undefined period of time. The company rents the parking spaces to the Car-Sharing operator and finances the running costs with the rental income.

The technology framework of the project was chosen to be effective to end-users and all customers, to be optimal as cost and easy to maintain.

The main factor for decision where the measures should be installed was the opportunity for simple, easy and accessible customer-operated travelling system .The ITIC was established in a city centre multi-story car park and the main factor for that was the fact that a Car-Sharing station was situated in the same building. The implementation of the two "Mobil.punkt" stations was in the centre of Bremen where space is usually very limited. The E-tickets terminals were installed in each bus or tram (1 or 2 terminals in the buses and 3 terminals in the trams).

The key factor for choosing the procedure of the implementation of the Mobil.punkt project was its efficiency - for the urban development, for the urban environment and the customers using the service.

The existing electronic infrastructure in the Public transport was included in the implemented measures in "Mobil.punkt" project. The Integration allows easy access for customers to all kind of transport. The cost of 1 Mobil.Punkt - Station is 15.000 Euros.

The implementation of the measures is consistent with quality indicators.The Senate Department of Environment, Construction, Transport and European Affaris in Bremen was the main initiator of the project "Mobil.punkt" which is a part of the Civitas Vivaldi initiative for "Cleaner and better transport in cities". The results of the pilot project had a great success. From a management/financial point of view there were no discrepancies between the planned and realized objectives, from an environmental point of view were lower CO_2 emissions and reduced noise level. The latest model of Cambio car emit 98g/km CO_2 in comparison to German private cars that emit 129g/km CO_2. A Swiss research shows that a single car-Sharing user saves about 290 kg CO_2 annually. The number of travellers using public transport or bicycle increased.

Genova (DRIN BUS) – Italy

Drinbus is the result of a CIVITAS Caravel Project. It is a “many to many” service, with trips and timetables fully flexible within fixed stop points in the defined areas during the operating hours. It is used on the hilly areas of Genoa (Italy), characterized by low demand, low housing density, absent or inadequate public transport services and strong demand for public transport. The service is characterised by:

- Flexibility: booking by phone via call centre, without any territorial installation;
- Advanced technologies: GPS-GIS integration for fleet monitoring and GSM for communications between dispatch centre and vehicles;
- GPS-GIS integrated bus-monitoring software allows a central call centre to manage the bus fleet dynamically according to demand;
- Vehicle typology definition: reduced dimensions, ecologic traction (methane), air conditioned and wide internal room, equipped with 8 to 13 seats;
- A coordinated brand image: name, logo, slogan and free telephone number are shown in every service's element (bus, stops, brochures, tickets, website).

The service is available from Monday to Saturday, from 6.00 am to 8.00 p.m. The booking can be made 30 minutes before departure, however users "on the road" without previous booking will also be accepted, in accordance with the scheduled service.

The PT services are managed by AMT - Azienda Mobilità e Trasporti di Genova S.p.A. which manages also the flexible services.

The Agency is a unique coordination centre able to design, develop and manage integrated flexible services and systems, using several different transport operators.

With particular reference to the Flexible services there are 5 employees for the design, implementation and management phase plus 4 in the dispatch centre.

Genoa's public transport company AMT operates the Drin Bus service with a fleet of Mercedes Sprinter minibuses, which seat 8-13 passengers and run on low-emissions methane. GPS-GIS integration allows the call centres to monitor buses on the road and helps bus drivers keep track of their scheduled routes. The call centres are connected with the buses through GSM digital telecommunication technology.
Bus stops are an average of 200m apart. The call to make a reservation is free, and Drin Bus

honours Genoa public transportation passes, with a minimal supplemental charge. Drin Bus service is available Monday through Saturday from 6 AM to 8 PM. Customers requesting the service in advance may choose their time of departure and arrival.

The CIVITAS Caravel Project (2005-2009) is currently working on software upgrades for the Drin Bus system, which will add new booking capabilities and include an interactive voice recognition system.

As the Flexible transport services are extra-ordinary measures they are not included in the general framework of the collective passengers transport services.

About 2900 users are registered for the service. The number of passengers has yearly increased by 9-10% with a saving of 34.500 EUR each year, due to the decreased environmental pollution combined with the modal shift obtained.

The public transport operator AMT launched two demand-responsive services in 2002 and a third in 2004 (DRINBUS) with the support of the EU LIFE Programme. The agency has been further developed under CIVITAS CARAVEL.

In November 2005, a new on-demand service was launched for people with reduced mobility, and further on-demand services were launched in 2007.

Users' main characteristics

Some figures: women (71%) aged from 25 to 60 years old (62%). The users are mainly employees (29%), housewives (22%) or retired people who go to the railway station or to the centre area served by the Drin Bus. The service is also used by students (15%) twice a day..

The users' perception of the service show positive results as the 91% of the Drin Bus users are satisfied with the service and consider it better than the previous traditional bus lines.

The weak points of the Drin Bus service have been, for the 78% of the users, the difficulty of reaching the call centre and only for the 6% of the users the lack of punctuality.

The strong points of the service are mainly the personalization of the journey (28%), the comfort and security provided by the modern vehicles with air-conditioning (21%) and the direct link with the centre of the area (21%).

The technology adopted allows to be incorporated into personal navigation software (such as Trekker and Navitime) that allows users to plan multimodal trips. Drin Bus can be used by navigation software in several ways like as GPS location information, Real-time traffic information monitoring, Navigational software for mobile phones.

For the back-end (Traffic Monitoring), buses are equipped with on-board GPS and communications technology, Drin Bus could potentially be used as a fleet of mobile traffic monitoring devices. Obviously, Drin Buses are limited in number and cannot provide full traffic coverage, but it may be possible to use Drin Bus monitoring technology in coordination with GPS/communications retrofits for fixed-route buses, taxis, and other municipal or commercial vehicles to form a network of mobile traffic monitors without needing to rely heavily on private mobile phones.

This system is integrated with the other Public services and the aim of the City of Genoa is to combine the traditional strong features of conventional public transportation (fixed routes and schedules) with on-demand services such as minibuses, collective taxis, car or bike sharing and car pooling.

New flexible service have been developed in the Liguria Region, involving 100,000 passengers per year are now carried by flexible services.

Liguera region:
Area
Total 5,422 km2 (2,093.4 sq mi)

Population (1 January 2011)
Total 1,617,000

Density 298.2/km2 (772.4/sq mi)

With these figures Drin Bus demonstrates that a service between traditional fixed bus routes and totally flexible taxi service is ideal to serve low-demand urban areas characterized by accessibility problems.

The main success is the reaction of the citizens who appreciate the better quality of this service. Drin Bus has reduced the use of the private car as well as providing an irreplaceable public transport service for some social classes (students, housewives, workers, elderly persons, etc.). Even when compared to traditional low demand fixed routes, the principal barrier to the introduction of the system were higher initial operating costs. It is remarkable that using demand services as a substitution for traditional fixed routes, the same operating costs will be accompanied with an increased number of passengers/revenues.

Florenta (PERSONALBUS) – Italy

PersonalBUS is the DRT system that has been developed and installed in Florence within the SAMPO and the SAMPLUS projects (European Commission, DGXIII Telematics Applications Programme).

The system has been developed by ATAF, the public transport company of the Florence metropolitan area for the service, by Softeco Sismat SpA (for the software system and the technologies) and the contribution of the IT and transport consultancy MemEx srl.

PersonalBUS solutions are used for the planning, dispatch and administration of flexible, collective Demand Responsive Transport (DRT) services in urban areas, peri-urban and extra-urban environments, large cities and small towns, rural zones and Mountain Community transport.

The main aim of the project was to develop and demonstrate demand-responsive public transport services in rural and urban areas and regions, and for the use of different passenger categories, such as elderly, disabled and other special groups as well as for the general public. An important

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objective was to reduce operating costs of public transport services by the implementation of more flexible schemes for service operations.

Before the introduction of the service, a complete Origin/Destination survey has been made in the whole area of Campi, in order to identify both the current and the potential users, together with other information on the mobility needs of different target categories.

In order to design an optimal PT network, together with users surveys, a complete recognition of the characteristics of the road network of Campi has been made, in order to identify the most proper typology of buses for every portion of the network itself.

A particular attention has been put on the service accessibility, both improving the conditions of streets and sidewalks in the bus stops zones, and operating low-floor vehicles that can fit also disabled users.

With reference to the legal issues, the service contract between the PT Company and the Public Administration has been defined on the basis of the number of kilometres run by the service that is in the same way as the traditional line service. The reference parameter for the preventive calculation of the amount of kilometres is the service of the previous year: this is not correct, and most of all represents a big limit in the developments of a DRT service inside one year, since the most relevant parameters to define a DRT service instead should the network extension (km and number of stops/meeting points) and the service hours.

Another important question to be solved has been the concession of the legal permission of operating a service not based on a fixed route, but on a set of possible routes, so that the new typology of permission has been given on the basis of the set of potential paths inside the ATAF network, according to the typology of buses and the related safety of circulation. On the basis of the experience acquired in the last years of DRT services, new standards are under study in order to solve the existing gaps.

The PersonalBUS service has been introduced in June 1997 with the SAMPO project, and since September 14th 1998, under SAMPLUS, it has been extended to the entire area of Campi, and now it has a total number of 175 meeting points: Campi has thus become the first town in Europe to be completely covered by a service on-demand.

Since year 2000, after the great success of the service in Campi, PersonalBUS has been extended also to some of the most relevant areas of the Florence metropolitan area (Scandicci - May 2000, Calenzano and Sesto Fiorentino - December 2000).

The telematics systems for operation of a DRT are based upon organisation of Travel Dispatch Centres (TDC). TDCs use booking and reservation systems which have the capacity to dynamically assign passengers to vehicles and optimise the routes and schedules. A variety of enabling technologies are used for implementation of a DRTS, including: booking and reservation systems, network design and optimisation, static and dynamic scheduling and assignment systems, dynamic systems for management and optimisation of DRT, vehicle location and monitoring hardware and software, invehicle terminals, meters and display systems.

PersonalBUS is the TDC software system developed by SOFTECO SISMAT for the Italian DRT application in Florence and Campi Bisenzio. PersonalBus supports TDC operators in several tasks, including customers order handling, journey booking, route and service planning, service reporting, service statistics. With PersonalBUS, routes and journeys are not pre-planned: they are dinamically defined upon customers demand, whose requests determine the order and timing of visit of stops by the scheduled bus and the itinerary of the journey.

Through a graphical user interface, TDC operators could handle all service operations, including:
● customer management (customer personal data handling),
● trip request information management, including origin and destination stops, desired departure and arrival times, number of seats requested
● service formation, including automated route planning and journey composition, manual journey editing and definition of special services
● service reporting (journey tables for bus drivers) and statistics

● service network editing and update

Furthermore, PersonalBUS also had a web-based remote information and booking component. Using internet access, DRT customers could get information about the planned service and send booking requests to the TDC. SAMPO results were further validated in the SAMPLUS project.

According to the passengers' opinion survey over seventy percent (74%) were satisfied or very satisfied with the new service provided, while the remaining respondents (26%) were dissatisfied or very dissatisfied.

Brno (CiViTAS ELAN) – Czech Republic

The city of Brno with 370,000 inhabitants is the second largest city in the Czech Republic and the largest in Moravia. It is the major urban centre of the Southern Moravian region which has 1,132, 563 inhabitants. Brno is the second largest city of the Czech Republic with area of 230.19 km².The population of the city is about 400,000.

Brno has a very well developed public transport system. The tram and trolleybus, an electric bus that draws electricity from overhead wires, are among the low-polluting means of transport . The trolleybus technology as recently rediscovered is energy efficient, soundless and produces no on-site emissions. Brno public transport company (DPMB) is the dominant public transport operator in the city of Brno and also in the Integrated Public Transport System of the South Moravian Region. It operates with 750 vehicles in the city of Brno and the surrounding area. From the total number of 750 vehicles 300 are trams, 300 buses and 150 trolleybuses Brno has the largest trolleybus network in Europe consisting of 143 vehicles that cover routes of 94 kilometres and transport 45 million passengers a year. To divert traffic from the city centre, a new international railway junction project and the development of the city ring road are underway. Brno has also created cycling and pedestrian zones in the centre.

The measure implemented was the installation of Integrated Mobility Centre, electronic information panels.

The decision for the implementation of the measure was mainly made by the Brno Municipality. The certain measure "Improving bus service for disabled" had a priority because of the enormous number of disabled people in Brno (more than 50 000) who were in a social isolation.

Certain needs of the disabled people were considered before the implementation of the measure. According to sociological researches and interviews the disabled people needed buses with enough space for more than one or two wheelchairs so that they can travel in groups, the buses had to be modern, safe and manoeuvrable.

The measure “Improving bus service for disabled” is realized by DPMB, a.s. (Brno Public Transport Company). From September 2009 to June 2010 five special minibuses were delivered and they operated on special lines for disabled and also on common lines where it is not economically beneficial to operate standard buses in the evening and during the weekend, when the special lines are out of service.

These lines operated in the whole city area and connected special facilities for disabled people with main public institutions and hospitals in the city of Brno. These lines were meeting at one interchange point at the city centre where three minibuses were waiting every two hours for transfer. Despite the fact that the route of the lines no. 81 and no. 82 were modified according to the needs of the disabled, these lines were used by all passengers. The implementation was a great success according to all interviewed passengers who were using the minibuses.

The results of the pilot projects were positive. Small changes on placement of bus stops and in timetable had to be done because disabled people had problems using them.

Main outcomes of the project were:

- Better mobility for people with disabilities;
- An improved public transport service in the city centre;
- Lower fuel consumption and less pollution of the bus fleet; and
- Lower operational costs for the part of the service covered by mini buses, which is projected to be €0.5/km.

For the evaluation of the measure it was planned to collect data about the number of passengers on lines no. 81 and no. 82 before the start of the measure and during the implementation of the measure. Because the lines are not only used by disabled people, data on number of wheelchair users and passengers was collected. Also, a comparison between the minibuses and standard buses is necessary. Therefore, technical data such as fuel consumption, emission and operational costs was collected, too.

During the project it was observed that the system fulfilled the expectations. No substantial problems or defaults were occurred during measure implementation.

DPMB compared the operational costs of the minibuses with the standard buses. It was evaluated that the operational cost of minibuses are much lower than for the standard buses. Mainly fuel consumption (and fuel costs) is more than twice lower and so it's for DPMB beneficial to operate minibuses on some routes. The number of people with disabilities using the public transport in Brno has increased.

La Rochelle (CiViTAS SUCCESS) – France

The Urban Community of La Rochelle has improved attractiveness of its PT network by launching a new service offer and pricing combined with a new unique identity called 'YELO'. With Yélo, the network offer and pricing system was upgraded, making ALL modes of transport easier and more practical to use with ONE single smart card: buses/coaches, bike sharing, park-and-rides, boats, electric car-sharing and train.

This best practice should be seen in the context of promoting various coordinated tools related to the mobility management. This includes various transversal concepts and measures such as the promotion of sustainable transport, behaviours change, etc. In this sense, it has to be emphasized that the implementation of the above mentioned measures in La Rochelle conurbation, were part of other important actions already undertaken since 2005 through SUCCESS project, such as clean vehicles (EEV buses, hybrid microbuses, experimentation on pure vegetable oils and used cooking oils), carpooling service, dedicated bus lanes, park-and-ride, improvement of car-sharing and city logistics, new cycle paths and which supposed the real involvement of political decision-makers.

La Rochelle political decision-makers have long provided a strong and continuous support to actions aiming at developing urban ecology, from the first town centre pedestrian in precinct (1973) to the first car-free day (1997), not forgetting the famous yellow bicycles (1976). Through CIVITAS-SUCCESS, political leadership has again proved to be valuable for accompanying technical implementation of the measures: by introducing the YELO concept and adopting a UNIQUE multimodal card for ALL the existing public transport modes, local decision makers made a strong appeal to convince the inhabitants to use alternative transport modes.

In order to increase user satisfaction with the integrated smart card in La Rochelle, a new service was offered in order to make the management of subscriptions more flexible by offering recharging.

The key objectives of the measure were therefore to:

- set up remote management of users' public transport season tickets via the Internet; and
- develop a new service available 24 hours a day, seven days a week

The Internet recharging service was made easily accessible on the website of the public transport operator.

The measure was divided into two main phases:

- equipping the bus depot and vehicles with a WIFI system; and
- setting up the reloading interface.

The service was launched in 2008 with a huge promotion campaign on board of buses and at bus stops and selling points.

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The first feedback on the e-recharging system for subscriptions was positive: users welcomed not having to go to the central bus station to renew their season tickets.
Prior to measure implementation, approximately 4,000 schoolchildren in the Urban Community of La Rochelle were using standard magnetic tickets or personalized cards. As a result of the measure, they were provided with personalized smart cards.

At the same time, it was decided to launch a transport pass combining unlimited public transport use with discounted prices for museums and the main attractions in the city.

As an popular tourist destination, La Rochelle welcomes thousands of visitors each year. The idea was to offer an appealing alternative to private car use by creating a pass combining public transport and a wide range of cultural and leisure activities.

The "Pass Rochelais" was based on:

- strong partnership between transport providers and the main tourist and cultural sites;
- attractive prices for all users;
- and the provision of information in multiple languages.

Smart cards were distributed to schoolchildren from September 2006. The Pass Rochelais was introduced for cultural sites in 2005. The pass was subsequently extended to leisure activities, new selling points and new target groups. Information about the pass was disseminated regularly, directed in particular at English-speaking visitors.

As a result of measure implementation:

- the one-ticket approach to public transport was promoted;
- satisfaction among new categories of users improved;
- the management of subscriptions was made more efficient for both transport operators and users;
- the number of passengers using public transport increased;
- the number of visitors to the main tourist sites increased;

- more than 11,500 Pass Rochelais were sold between 2005 and 2008; and
- 87 percent of Pass Rochelais users were very satisfied with the service and 12 percent quite satisfied (according to a survey carried out in summer 2008).

The CiViTAS SUCCESS demonstrated that, with an ambitious package of mobility and traffic management measures, significant results can be seen regarding sustainable transport and energy policy. The implementation and development of an e-ticketing system should be part of a larger planning process regarding the management of mobility.

With the ultimate goal of making public transport easier for travellers, the objective of this measure was to develop methods and a decision-making tool to help transport authorities to optimise the effectiveness and operational quality of their activities.

Integrated transport management systems comprise three aspects:

- exploiting data (data analysis, data mining);
- creating interfaces between the various software and databases used by stakeholders;
- developing decision aid systems.

A working group in SUCCESS was set up involving all actors and transport operators, as well as service users, in order to determine the various improvements needed to ensure better coordination and synchronization between multiple transport modes with multiple operators.

The first task comprised the definition of a strategic plan to define the global integration principles. This led to the elaboration of:

- standards for the procurement, development and implementation of software systems, with respect to technical characteristics as well as ergonomic or image aspects;
- a decision aid tool;
- and recommendations for the procurement of hardware and equipment.

The second task concerned the development of a prototype software system that would allow managers to simulate the consequences of their decisions on transport system evolution. This management tool would optimise global coordination within the Urban Community of La Rochelle. The decision aid tool for transport authorities helped them to provide efficient, high-quality and operational services by coordinating their activities.

Cuneo (BIP) – Italia

The main objective of Project BIP (Biglietto Integrato Piemonte, Piedmont Integrated Ticket) is promoting collective public transport system, by improving accessibility through a regional integrated ticket and fare integration.

The system has been fully operative since March, after assessment by Piedmont Region officials of full compliance with regional interoperability standards.

The unique characteristic of the system is that the 18 companies involved – though sharing a common control centre for all activities and processes regarding ticketing, monitoring and video-surveillance – maintain their total autonomy in management of their own data and confidential information (business and administrative organization), in order to ensure confidentiality of specifications and data. Thanks to this system, the citizens have access to real-time and detailed information on the service (travel indications, waiting time at the stops, etc.), while the responsible in the companies will have wide availability of data deriving from issued and used e-tickets. Such data will be useful for measuring a public transport service, more and more fulfilling real expectations by the users.

Besides the main objective, there are actions for promotion and information to users (actual real-time waiting time and distance covered), the increase of personal security both for operators and users through on-board surveillance systems, and the certification of the service delivered, in relation to quantity and quality.

The quantities involved in this realization are relevant: 420 urban and extra-urban buses, agencies belonging to 18 different companies, 315 retailers, 25 depots throughout the territory, 19 million km per year.

With the use of the BIP system, transport operators and the Province acquire fundamental data on Public Transport, such as frequency and occupancy of each journey, locations of residence of every user, boarding on and off for each bus stop, punctuality of the service performed. Users, instead, have availability of evolved tools for info-mobility, a multi-platform and multichannel platform (web, Smartphone, DTTV).

A lot was done to make the system usable by drivers/on-board crew and end users. Various information campaigns were broadcasted/published on media to involve users in accepting the system before its actual implementation. The system proposed foresees natural implementation with the Central Regional System (at regional level). As for now, no analyses have been made on a possible transferability at a European level.

Timisoara (SIEIC) – Romania

The main objective of SIEIC or Electronic wallet system is implementing a new flexible pricing policy and put it into practice with intension to improve the quality of PT service and to reduce fraud.

The city of Timișoara is the third most populous city in the country with a population of around 310.000 inhabitants and is considered as the main social, economic and cultural centre in the western part of the country.

Public transport in the city is operated by local transport authority Regia Autonoma de Transport Timisoara (RATT) and covers one of the largest public transport netwrok in nation. Timișoara's PT network currently consists of 8 tram lines, 7 trolley lines, 9 urban bus lines and 7 express bus lines. The entire PT network spreads out over an metropolitan area of around 1070 km² and with a total length of all PT lines over 600 km.

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In Timișoara, the public transport company RATT itself decides which is the best way of electronic ticketing implementation considering its own data regarding travellers, the experience of specialized companies in this domain. Implementing a flexible pricing policy and easy to put into practice, applying a tariff system closer to the actual performance for each passenger, implementation of technical means to reduce fraud, expanding the supply of services.

When introducing the new electronic ticketing system in city's public transport the main criteria was the lowest price with best performance and quality. For flawless implementation and for smooth transition to this new electronic wallet ticketing system the local public transport operator collected tenders from companies with experiences in this type of systems including the new hardware parts and software, to be able improve eventually upgrades.

When upgrading to this electronic wallet system as a paying method both travellers and local PT operator gained a more flexible and convenient way to make trips more user friendly for users of PT services and more controllable and transparent way for PT operator. Travellers with this system now have more payment options for their trips because the smart cards are more resistive and configurable or can be more personalized compared to old paper ticketing system. With this system PT operator reduced the costs with no need for hiring additional personnel and city hall also obtained a good image together with local PT company. When integrating this new electronic ticketing system a good sales network was established were wending machines and validators were positioned on strategic locations with easy accessible infrastructure and with high priority for visibility and safe issues.

For way of choosing location, it took into account the place of stations (priority central area and important PT nodes), the vehicles' status (year built and the usage). Installation of validators was made by status of door's vehicle (up side, down side). It took also into account the existing infrastructure (road network and PT network), best communication way (telecommunication operator), the city specific, inhabitants specific (local, metropolitan, temporally).

The new ticketing system can be considered, alongside the new management of the vehicles, like the third pillar of the development efforts done for a few years by the City Hall of Timişoara and RATT for improving the quality of the public transportation.

The first is done at the level of infrastructure, by rehabilitation of the tram lines. The second is at the level of the rolling material by renewing the busses and trolley busses fleet. The main reason for buying and implementing the new automatic ticketing system in Timişoara is for improving the management of the public transport company. This public system it is partially sustained by considerable efforts from the local budget. The investments and covering the difference from the real cost of the ride and the one socially accepted are sustained from community money. Under these circumstances, the efficiency of the activity becomes compulsory, and the good effects return to the society. The complete knowing of the exact transportation load, diminishing of theft, commercial procedures perfectly controlled and a more attractive varied payment offer, all these will consolidate the base of a more efficient resources management having the direct effect of improving the quality of the public transportation service.

This system also comes with some responsabilities for the client or public transport user. Befor implementation of new e-ticketing system, it was enought for the user to buy a season ticket and to carry it with him. Now with the new system the client must validate his card for each travel that he makes. Also, one shold pay attention not to lose the card, because when a new card is released the client will pay for the plastic material – the card and it’s personalization. Only when first emitted the cards and the personalizations are free of charge. If the buyer takes care of the card he/she cand have it for 5 years. Shoul it be stolen the client needs to declare it and can recover the money. Once declared stolen or lost the card is put on a black list and can’t be used in the system by the new owner.

Vicenza (FTV) – Italy

Newly developed and implemented electronic ticketing system by Ferrovie Tramvie Vicentine SpA company was chosen as a best practice because it stands-out as a integration of business Enterprise Resource Planning (ERP) in electronic and magnetic ticketing processes covering also info-mobility and service certification.

Ferrovie Tramvie Vicentine SpA (FTV) is a local public transport company that manages almost all the suburban public transport lines not only in the province of Vicenza but also together with providing urban services in nearby provinces of Bassano, Valdagno and Recoaro that are all a part of a greater Veneto region in north-eastern part of the country. The Vicenza province covers an area of around 2700 km² and has a population of around 875000 inhabitants whereby a city of Vicenza spreads over an area of approximately 80,5 km². In a one year period a local public transport operator FTV carries almost 11 million commuters in the regions that they operate. The fleet of bus based public transport is made up of 247 working buses and 13 replacement vehicles that make over 10 million kilometres on yearly basis.

The Veneto Regional Authorities promote operations aimed at co-ordinating transport and creating an integrated mobility and infrastructure system; it also promotes the use of integrated passenger tickets that can be used for multiple transport companies. The sales network of the ticketing system now comprises 20 agencies and over 120 authorised dealers in all four regions.

When deciding which measures should be implemented in the region or in the city and which measures have the priority it all comes down to Veneto Regional Authorities and full compliance with regional interoperability requirements.

The main end-user need that was taken into account when integrating new electronic ticketing system was that it has to be a easier and faster way to recharge credit on the cards using different channels.

The FTV Vicenza ensured the supply of ticket issuing and validation and control equipment, such as magnetic and contactless validators, handheld validation units for checking tickets on-board buses, and automatic ticket issuing machines for installation at bus stations. Validators were located near bus doors to facilitate access. Ergonomics studies were performed to optimize the most suitable location. Drivers' instruments were compatible with driving and

PART: Introduction to E-ticketing and smart card

68

overall view of the bus. As for the ticket offices and sale points a standard set of devices was provided and installed according to available spaces and to optimise customer/seller interface. When boarding the bus, passengers validate their cards and the maximum fare possible for a journey on that route is deducted. The card is then validated a second time upon leaving the bus and is re-credited in line with the exact fare for the journey made.

The ticketing system implemented by FTV Vicenza enables to collect data on passenger bus usage to optimise vehicle management, integrate its equipment with the different systems employed by other operators and suppliers, and also allow passengers to top up or renew their travel cards over the Internet or via the telephone. In addition, the new system is fully compliant with the requirements of the directive recently issued by the Veneto Regional Authority, which requires the implementation of a fully integrated, automated, regional ticketing system.

Verona (MOVER) – Italy

Verona is an Italian city with 263.964 inhabitants and it is one of the provincial capitals of the Veneto Region. Verona is a very important tourist destination, visited by more than 3 millions of tourists every year. It has an important motorway junction which forms the intersection between the A4 Milan-Venice Motorway and the A22 Brennero Motorway.

The public transport operator is the ATV company (Azienda Trasporti Verona) that was set up in 2007 from the merger of two companies, AMT and APT: the first one managed the urban service while the latter managed the suburban service. The aim of the merger has been that of provide citizens with a more rational and efficient transport system and to harmonize ticket prices.

ATV provides the urban transport service for the municipality of Verona and the other main cities of the province. In addition, it provides also the suburban transport service that connects Verona to other cities and towns, inside and outside the region. It is also very important the shuttle service that connects the railway station to the airport.

ATV Verona is an electronic ticketing project success story. A project created within a very short space of time (just 16 months from assignment of tender to the date on which the entire system was put into service at urban level) and with immediate positive results on the company financial situation after activation of MoVer on October 1st 2008. Particularly effective were both the efforts taken to communicate the importance of validation and “social control”, and intensification of on-board checks, including those by traffic wardens, which have almost halved the number of passengers without a ticket. Also positive was the fact that this strong growth trend in revenue has been confirmed by the figures for the first half of 2009. The system supplied includes software procedures and appliances installed both at the ATV company locations, where personalized smartcards can be issued, and at sales outlets, where the passenger can renew his or her subscription or top up his or her travel card. The customer can also renew his or her electronic subscription using the ATV web site. A flow of information is able to update all the on-board validation equipment fitted on the vehicles. The Company Control Centre, installed at the ATV headquarters, which is integrated with all the company procedures, allows more efficient and effective management of the enormous amount of information, so that managers have a better idea of the habits of users, from the areas with greatest traffic to statistics on passenger mobility and violations.

Figures for the ATV Mover project: over 35,000 contactless cards issued in 2008. Card recharge (also online), use of the card and its check are faster. The ATV card (among the first ones in Italy) is also an e-wallet allowing payment according to effective use of the service/system. The future Mover Card could be used also for other private and public services, thus becoming THE card for Verona's citizens.

The system will enable full fare integration between city and province just with a single ticket. New fare policies will be introduced in relation to effective use of the buses. ATV will be able to collect and manage a series of information useful for improvement of routes and fare policies by making them more suitable to users' needs.

Thanks to compulsory validation on board (also for registered users) there is a sort of "social check": it is simple to see who is travelling with a valid ticket/card or not. If the card is lost or stolen, the value is not lost since the system blocks the card and reintegrates the value.

The system itself provides a number of indicators and is able to collect information about the use of the new ticketing service and of the transport service (number of passengers, statistics on lines, routes, times etc).

Other pros are:

- Increase of sales thanks to greater user-friendliness
- Less fraud
- Higher traceability of passengers' movements, aimed at both better service planning and innovative and tailored commercial policies
- Faster boarding speed
- More checks of financial flows

Validators were located near bus doors to facilitate access. Ergonomics studies were performed to optimize the most suitable location. Drivers instruments were compatible with driving and overall view of the bus. As for the ticket offices and sale points a standard set of devices was provided and installed according to available spaces and to optimize customer/seller interface. Portable terminals were provided with hang on support. Data loggers (no interfaces) were installed in hidden places on board (easy access for maintenance).

The technology to be adopted for the system was selected according to the following terms:

- Analysis of company's specific objectives, in terms of traceability and monitoring of passengers' flow, flexibility of the system, possibility of managing innovative marketing policies, reduction of fraud, user-friendliness, other
- Analysis of technologies available on the market
- Company's own funds
- Limitations set by reference standards at regional/territorial level
- Necessity of technological interoperability with similar projects in the same fare territory

A strong marketing campaign on the new system was made to accelerate acceptance of the new ticketing using smart cards instead of paper tickets. No accessibility problems occurred and the use of smart cards instead of paper resulted easier to users (contactless instead of mechanical validation on board).

Almelo (SABIMOS) – netherlands

Almelo is a mid-sized city with 69,40 km² in the east of The Netherlands, near the German Border. The City has 70,000 inhabitants and is part of the Twente metropolitan area, in which about 300,000 people live (620000 whole Twente region).

In Amelo there are two PT operators. First one is the biggest Public transport service provider in Netherland named Connexxion mainly for city and another one is Syntus mainly for suburban. On-demand transportation system is for the elderly and handicapped people and also providing services for pupils of primary schools and for sick people that do not need an ambulance.

In the Netherlands the responsibility for regional and local public transport is decentralised to the twelve provinces and seven larger city regions. These are the so called 'Public Transport authorities'. The main responsibilities of the national authority are legislation and dividing the public transport subsidies for covering losses among the public transport authorities. The public transport authorities are responsible for regional and local public transport on a strategic level (planning, tendering etc.).

With implementing new public transport service with real time passenger information service the roles of central, regional and local governments in Netherland, transportation companies and other parties involved have been changed. These changes applied to planning, financing and contracting public transport services as well as public transport infrastructure. As a consequence, the parties involved did not only change their roles, but also their organizations. In addition, new parties came into the field.

Regio Twente is a public cooperation of 14 municipalities in the eastern part of the Province of Overijssel in the Netherlands and it is also the concession granting authority in the area of Twente, determines the fare prices and controls the quality of the exploitation of the services.

Regio Twente pays the concession holder a price to exploit the bus services in the region, which does not cover the costs of exploiting the services. To overcome the difference between the costs and the regional contribution, the concession holder gets the revenues from tickets people buy. A concession is the exclusive right of a transport company during a certain period in a given area to carry out public transport. For good performance, the transporters also earn a bonus, poor performances, they must pay a fine.

Using the Real Time Passenger Information system gives the public transport reliability. Providing information about departure and arrival time, bus routes and many others, on bus stops with electronic LED panel display results that the waiting time of passengers is now shorter.

Due to the introduction of dynamic information service earnings from passengers raised up by 4 percent. Some examples even speak of a passenger earnings up to 10 percent by introducing a dynamic travel passenger information system..

In 1999 the University of Twente executed a pilot project to establish a comparison between SABIMOS (Satellite based operation system) and VETAG (loop based traffic light priority system). The data that were collected for that test, were used in order to develop and test a travel time algorithm.

Through monitoring average delay of all the stops revealed, that bus arrives on 60 % of stops on time - up to 2,5 minutes late, while 30 % arrivals on the bus stops are up to 5 minutes late. Also higher delay is reported in peak hours.

The costs of managing bus-stop displays include:

- maintenance contract with supplier
- energy consumption
- data communication costs
- costs for repair, errors and damages (vandalism)
- software license for providing information on bus stop

The cost for the continuous operation varies greatly. They depend on the technology used and the types of displays. Annually they should be considered with an amount of about 5 to 10% of

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the purchased new price of the display. Experience shows that management tends more towards 5%. This of course depends on the quality delivered.

On national level TRANSUMO (TRANsition SUstainable MObility) is a Dutch platform for over 150 companies, governments and knowledge institutes that cooperate in the development of knowledge with regard to sustainable mobility. Transumo aims to contribute to a transition from the current inefficient mobility system towards a system that facilitates a stronger position in economic competition, as well as ample attention for people and environment.

Region Twente was by the end of last century exposed to road congestions and vicious circle of public transport (budget cuts, less buses, less passengers, less revenues). New characteristics of PT policy (Comprehensive, Innovative, Realistic, Cooperation) led to introduction of BSHL (Bus with high level of service) in Enschede, Almelo, Hangelo and Oldenzaal. Major success measures were bus priority lanes and integrated bus traffic light priority system with RTPI and integration of bus and rail. Results showed 30 % increasement of passengers on weekdays, 75 % increase of passengers on Saturdays, 45 % increase of cost coverage and 5 % decrease of ticket price.

Satellite Based Information Management Operating System was developed like a experiment in late ’90 in Almelo. In 2002 regional upgrading of the system started. In 2004 was the first implementation of regional RTI-system in the Netherlands.

Trondheim (NICHES+) – Norway

Trondheim is the fourth most populated city in Norway and is the administrative centre of Sør-Trøndelag county. The city of Trondheim has 165,000 inhabitants at a density of 458 people per km^2.

Trondheim currently experiences an adverse environmental impact from excess car use in the city centre: 44% of journeys in the CBD are made by private car. The re-introduction of road tolling was a strong recommendation of the Norwegian Department for Transport but has enabled

Trondheim's objectives to become self-financing through the hypothecation of revenues to finance improvements to Public Transport.

The city's Public Transport networks (train, bus and tram) are currently used by 40,000 people on a daily basis (23% of journeys in the CBD). The local bus company, AtB, operates 42 routes in the Trondheim area, and there is one tram line, with a 20 minute journey time from end to end that serves around 800,000 customers each year. The main objective is to increase the attractiveness of Public Transport by reducing travel times and improving the range and quality of services on offer.

Of the NICHES+ innovative concepts, Trondheim focuses on Mobile Travel Information Services for the Public (MTIS). MTIS enhance convenience and confidence when travelling by various transport modes, particularly Public Transport.

MTIS provide a more reliable, convenient service to end users, contribute to improved operational practice, and permit more efficient network management. Within Trondheim, MTIS are viewed as an important component of the wider strategy to promote Public Transport use, through the delivery of real time information on Public Transport on vehicles, at stops/stations and to mobile devices, delivering integrated ticketing and communications solutions, and bus priority.

The re-introduction of road tolling in March 2010 means that revenues are hypothecated to finance improvements to Public Transport. Trondheim's MTIS measures are funded by 35 million NOK (approx. 4.5 million EUR) hypothecated from the road tolling component of the environmental package.

These revenues will be used for the implementation of MTIS on the bus network, with Trondheim's MTIS objectives guaranteed until 2025. This enables long term planning with a high degree of flexibility, with an additional one third of revenue set aside to be spent as required e.g. to meet new demand or to develop new concepts.

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Policy measures included increased funding for Public Transport, reduced free car parking and an increased environmental tax on petrol. Infrastructures have been upgraded, notably the city's tram terminal, and in 2009 a further set of objectives were identified, designed to encourage car pooling and the reintroduction of road tolling.

Specific local transport policy objectives include:

- A reduction in CO2 of 20%
- A 25% increase in public transport speed in the CBD
- An 8% reduction in car travel
- A 15% drop in noise levels A 20% reduction in accidents.

MTIS will be implemented in Trondheim through the following key measures:

- GPS-based bus localisation and priority
- Real time information on buses and at bus stops
- Real time information delivery by text message (SMS)
- Smartphone-based map application with real time information

Tram customers currently enjoy real time information, e-ticketing and payment on mobile phones. The ability to communicate with transport operators by mobile phone is being investigated in order to enable passenger feedback to the operator.

Implementation of MTIS in Trondheim will benefit from the fact that the key stakeholders are in place and strong working partnerships established. Finance is also available until 2025 through the re-introduction of road tolling finance and hypothecation of revenues.

Long-term sustainability of MTIS in Trondheim will ultimately be measured by a number of indicators. Key to this will be achieving the specific local transport policy objectives including a 33% increase in the number of bus travellers, a 4% reduction in car traffic, a reduction in CO_2 of 20%, a 25% increase in Public Transport speeds in the CBD, an 8% reduction in car travel, a 15% drop in noise levels and a 20% reduction in accidents by 2018 (from 2008).

Brno (CiViTAS ELAN) –Czech Republic

Public transport in Brno consists of 13 tram lines, 13 trolleybus lines (the largest trolleybus network in the Czech Republic) and almost 40 day and 11 night bus lines. Trams have a long tradition in Brno, they first went to the streets in year 1869, it was the first operation of horse-drawn tram in the current Czech Republic. The local public transport system is interconnected with regional public transport into one integrated system called IDS JMK and directly connects also a few nearby municipalities with the city. Its main operator is the DPmB company (Brno City Transport Company) which also operates a ferry route serving mainly for recreational purposes at the Brno Dam Lake, and for interested also a tourist minibus providing a brief tour of the city. The city also plans to build a metro system (S-Bahn) because of locally overloaded trams and to lessen the congestion on the surface.

In Brno is responsibility for local public transport centralised to the hand of the city, but is still coordinated with integrated transport system in south-Moravian region. Regional public transport is in hand of `integrator`, which is company named KORDIS JMK. They provide all services for public transportation in region including railway and city transportation in small sized cities of south-Moravian region. Integrator is responsible for transportation on strategic level (planning, tendering...).

The project of Integrated Mobility Centre (IMC) is aimed to improve the quality of the service in public transport and thus increase the number of PT users. IMC is place where the sustainable transport modes are promoted. IMC is focused on providing transport information. Trained employees are providing information from Brno public transport, also the information fro Integrated Transport System of the South Moravia Region, the information about cycling, etc. The employees closely cooperating with the traffic control centres thus they can inform about possible problems in traffic. The IMC is also providing tourist information and it is a place where the city can presents its project. The IMC is situated at the one of the most important PT interchange in the city Brno. As a part of this project the stops at this interchange are equipped with the electronic information panels (4 x two-side panels). On these panels the real time information about the arrival of the PT vehicles are displayed.

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Before the installation of the IMC the architectonical study was prepared. In this study IMC design suitable for the historical centres of the cities was prepared. Part of this study was also the design of the electronic information panels according to the user needs.

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In the preparation of the operation of the IMC and Electronic Information Panels the responsible city's organization were involved. The cooperation with the Brno Public Transport Company and KORDIS JMK (coordinator of the Integrated Transport System of the South Moravia) was established for the providing the transport information. Also the cooperation with NGO working in the field of transport was established. 6 months before the opening the discussion with the citizens was prepared. The aim of this discussion was to obtain ideas about the scope of the service of IMC. The questionnaire is also available on project's website.
The location for the installation of IMC and electronic information panels was choose because this place (Joštova Street) is one of the most important PT interchanges. The location is close to the city centre with the big movement of the people.

The idea was to install the information centre, where the new technologies (such as internet, phone) will be used. The selected location was in the historical city centre thus the design had to correspond with this limitation. During the preparation of the implementation some of the planned technologies turned out to be outdated (e.g. the LED panel on the top of the IMC) and in opposite in some cases (e.g. touch screen) the acquisition costs were decrease on acceptable level. The changes are only in type of the equipment.

The evaluation of the operation of IMC revealed that 67 % of provided information was on Transportation issues (tickets, timetables, connections, vending machines, info for car users, pedestrians, cyclist, etc.) while 33 % on other (accessibility, tourist info, culture info.).

The cost of the IMC Instalation is 200.000 euros (5,5 milions CZK), the electronic information panel 100.000 euros (2,5 milions CZK).

South-Moravian region contains 673 villages including second largest city of Czech republic – Brno. Region is divided into small tariff zones. This system is accurate for passengers to travel between municipalities without need to travel through central city (Brno). With 721 connected municipalities (673 are in South-Moravian region itself, other are outside the region, but still connected with transportation into integrated transport system) is about 4 or 5 municipalities per zone usually. Brno itself is divided into two zones. In September 2009 they started to run a WAP mobile service for passengers to obtain actual timetables for any bus stop in region and about other travel information also. There was start of actual vehicle position service too. It was first pilot operation of service of this kind in Czech Republic.

In ELAN project this service was put in wide operation with installing RTI displays in the city centre.

Special dispatching and operating system called RIS was developed like a experiment somewhere about millennium in Brno city transportation company (DPMB) as part of new system installed in vehicles. In beginning of new millennium DPMB started works on public transportation priority, especially for trams. In cooperation with integrator KORDIS-JMK DPMB continue to equip bus and tram stops in city of Brno with RTI displays.

South-Moravian region and especially second largest city of Czech republic Brno facing transportation problems in scope of traffic congestions and less budget to provide adequate public transportation. In the city of Brno is running project for public transportation traffic lights priority, which contains few never traffic light crosses and few bus lanes.

Ljubljana (CiViTAS ELAN) – Slovenia

Ljubljana as the capital city in Slovenia is a city with approximately 275,000 inhabitants and covers area of 271,67 km². It lies in the centre of the country in Ljubljana Basin as part of so-called Osrednjeslovenska region with approximately 530,000 inhabitants and it is also the cultural, educational, economic, political and administrative centre of Slovenia.

Its transport connections, concentration of industry, scientific and research institutions and cultural tradition are contributing factors to its leading position in the Osrednjeslovenska region and in the country.

The city bus network of public transportation in Ljubljana is managed by Ljubljana public transport company (Slovene: Ljubljanski Potniški Promet – LPP), which offers public transportation services also to neighbouring regions. The buses cover 21 city routes and 35 suburban routes. Bus lines operate in total length of around 320 kilometres and cover around 97% of urban area of Municipality of Ljubljana. In other words around 97% of households in municipality are less than 500 meters away from the nearest bus stop. In LPP they carry about 80 million passengers per year with 210 buses on road (urban transport) and is a most used mean of public transportation. Since 1994 LPP acts as a public, limited liability company, under Municipality of Ljubljana. Buses connect the city centre with urban areas and outlying villages within the boundaries of Ljubljana Municipality, some lines also operate in adjacent municipalities.

The modal split of the public transport and private trips represent 57,70% of private trips made with personal car and 42,30% of trips made with public transport and walking or with a bicycle. Whereby 13,10% of public transport trips are made with bus or train transportation modes, 9,90% of trips are made with bicycle, 19% of trips are made by walking and 0,3% trips represent trips made with different transportation means and vehicles.

For providing better, safe and comfortable urban public bus transportation as replay to increasing passenger expectations with lowering number of bus users the LPP operator started with measures for increasing the level of services. One of the main goals was to improve passengers travel information to enhance their journey experience and to meet passenger demand of highest in quality services. Key to this information are real time passenger information systems, which provide accurate departure and arrival times, enabling traveller to plan their journeys and thus make better use of their time.

One of the objectives was so to equip 33 bus stops with remotely managed Electronic Real Time Passenger Information displays which were controlled from public transport operators Control Centre. LED information displays primarily serve for real time information about estimated time of arrivals for passengers to know when next buses are arriving. Implementation of wireless direct communication technology (Zigbee) at the bus stops helped for higher information accuracy so that passengers get as reliable information as it gets.

The planning phase included a review of present AVL system with backup system utilized by LPP in order to provide real time passenger information data transfer and integration with electronic display. The AVL and fleet management system currently utilized by LPP was enhanced, in particular bus centre and ETA prediction calculations program was upgraded. New communication protocol for system integration between bus centre and bus stop was designed (also between PT fleet and bus stops) and a study to define electronic display connection based on new communication protocol and direct communication equipment configuration has been prepared. Which later then led to implementation of test electronic display at bus stop Konzorcij.

The measures and implementation of dynamic RTPI system into existing public bus transport system was also co-financed with a help of Civitas – Elan project from European Union.

First 15 LED panels were installed at the most frequented public transport bus stops with highest passenger rate. 10 bus stops were equipped with 2-line displays and 5 bus stops with 6-line displays together with technologically advanced city buses or modernization of bus fleet in general. Therefore 20 new buses using alternative fuel system (methane gas) were purchased and first public filling station for methane gas vehicles was opened. Improving safety on city buses for passengers was realized with installation of 53 cameras on public buses for providing safety for passengers and also for monitoring current traffic situations in city.

Whereby putting citizens first by giving priority to their needs and making them part of the solution was also considered into implementation program.

Integration with other systems for improving public transport services were made with measures like:

Smart chip-card ticketing system called Urbana, for easier, faster and more flexible use of public transport. User can now use chip card as electronic payment system for all bus routes, as payment for parking in certain areas, for funicular railway and latter in future also for national ticketing system on other public transport systems (railways).

Park & Ride - Construction of additional parking spaces for park and ride system.

Cycling strategy as a wide range of actions to promote the use of bicycles for movement in the city centre and new bicycle lanes were constructed. Consequently for reducing car use in city centre a new bicycle rental system was established.

Measures were aimed at securing cleaner and more efficient urban mobility by integrating the public transport system, restricting car access, introducing new concepts for goods distribution and increasing the number of clean vehicles.

There is also participation of civil society in shaping sustainable mobility in Ljubljana focusing on increasing the use of bicycles and promoting use of so called clean vehicles in PT running on alternative fuels.

Real time information system is a part of integrated approach to build up sustainable transport in city of Ljubljana bus public transport fleet..

Barcelona (CiViTAS MIRACLES) – Spain

Barcelona is the second biggest city in Spain and the capital city of Catalonia. Barcelona has an extensive motorway network and is a hub of high-speed rail links with cities in France, Spain and Portugal. The urban area is confined between the sea and the Collserola Mountains, and, like most Mediterranean cities, is very densely populated. With a population of 1,6 million people within city administrative limits and covering land area of 101 km² Barcelona today has status as one of the world’s major global cities.

Public transport in Barcelona is operated by several PT companies, most of which are part of the Autoritat del Transport Metropolità (ATM), a transport authority managing services in the Barcelonès and the rest of the metropolitan area of Barcelona. The public transport network includes a metro, bus network and tram lines, as well as several funiculars and cable cars. In 2007, the city council introduced the successful Bicing public bicycle service, comprising 100 rental stations around the city.

Public transports main branches are operated by following companies:
- railway:
Owned by Renfe and Ferrocarrils de la Generalitat de Catalunya (FGC)
- trams:
Operated by Tramways de Barcelona S.A. To additional operating tram system Tramvia Blau in 2004 two new tram systems were introduced: Trambaix and Trambesòs.
- bus:
Transports Metropolitans de Barcelona (TMB) is the main public transit operator in Barcelona and it runs most of the metro and local bus lines. It seeks to coordinate and integrate other public transport companies (such as TRAMMET, for the local trams) into the same network as well.

The bus network serves Barcelona and the metropolitan area through total of 109 lines that cover a total distance of around 920 kilometres. The Barcelona Metro service has 123 stations. It is formed by six lines and a funicular railway. In 2008, TMB carried 572.39 million passengers.
Due to a high population and density the modal split of the public transport and private trips are in favour of public transport where 26,6% represent private trips made with personal car and 73,4% represent trips made with public transport and walking or with a bicycle. 20,5% of trips are made with different transportation modes, only 1,2% of trips are made with bicycle and 4,9% trips represent trips made with different transportation means and vehicles. Walking, with 46,8% of all trips, is the most desirable way of moving in the city of Barcelona.

With modernizing public transport services the main objective was to improve the quality of passenger information by demonstrating real-time messaging based on a multi-operator system by combining the AVM system (Automatic Vehicle Monitoring System) with standard information panel system. The installation of a 3rd generation AVM system covering more than 20 operators (with small, medium and large bus fleets) within the metropolitan area made it possible to provide better messages about bus arrival or departure times. Information panels were installed on the buses as well as at the interchange points.

To achieve the primary objective of demonstrating a full integration of real-time arrival times of all services, this “de facto” standard had to be linked with the information of the main operator TMB. The system architecture finally adopted to achieve this involved ATM accessing information of TMB bus arrivals using a mobile GPRS based SMS web service. This agreement included the design of the bus stop panels and the protocol for rotation of messages.

The funding of the metropolitan public transport infrastructures in municipality of Barcelona is carried out through Funding agreements between the State and the Autonomous Government of Catalonia. These Agreements, with a term of 3-4 years, establish the contributions of the two administrations, at a rate of 2/3 by Autonomous Government of Catalonia and 1/3 from the General State Administration to fund a given investment programs for the Underground networks, the Barcelona Metropolitan Transport buses (TMB) and the Railways of the Autonomous Government of Catalonia (FGC). The list of the actions to be funded is decided by the Governing Board of the ATM.

Transports Metropolitans de Barcelona is the management unit of the companies Ferrocarril Metropolità de Barcelona, S.A. and Transports de Barcelona, S.A. TMB is the main public transport managing company in the metropolitan area of Barcelona. As the main public transport operator in Barcelona, and part of the daily routine of thousands of citizens, they provide two transport networks (bus surface transport and metro underground network) and several leisure transport services.

When starting with project it was recognised that the consolidated operation of ATMs AVM system requires further development work before information diffusion to passengers is considered (using not only bus stop LED panels). That's why work on developing web-based application began so that all PT operators in the region could manage their fleet via the web and with simplified user friendly interface rather than spending on additional equipment and staff. Surveys with small operators and surveys on tram were carried out for implementation on new AVM system and upgrading communication systems with more economical solution using GPRS based telecommunication technology.

In 2003 the ATM started with proposals to main operators of PT in region (bus, tram, metro) for the interchange of information between their AVM systems and the new ATM AVM system. The outcome was business integration with largest bus operator TMB in region for exchanging info about bus arrivals and design of bus stop LED panels. Latter in 2005 ATM has established agreements with local municipalities for the implementation and operation at first 4 bus stops. With positive experiences in 2006 more bus stops LED panels along corridor were installed.

Barcelona’s public transport mainly consists of a local public transport network with bus lines, metro, tram and aerial cable cars. To reduce growing traffic volumes and rising private car trips in city centre and in the end also for environmental reasons, the City of Barcelona introduced several solutions for this problem. To achieve this goal, reducing growing traffic, one solution was installing also a new “Biking Service”, a free bicycle service which is also considered as a means of public transport and another solution was installing of LED panels for RTPI and promoting use of PT.

A new AVM system was developed with integration of old, already functioning, AVM system from largest bus operator in Barcelona (TMB). With standardization of new AVM system the easy and smooth integration for small and medium bus operators in the region was made available.

System so enabled each operator to use the GPS location system to track its own vehicles, and issue commands via its own control centre. The modules serving each operator were also integrated at ATM's servers.

Multi-use lane was installed along Travessera de Garcia Street. The lane during peek hours served as bus dedicated priority lane, between peak hours as delivering goods lane and over night also as on-street parking lane. The lane was equipped with Variable Message Signs to clearly communicate the regulations to all road users. Along the Trambaix corridor were bus routes met with the new tramway LED panels were installed for providing Real-Time Passenger Information about Arrival/Departure Times of buses and trams on this route. Another positive contribution was a new intermodal Smart Chip-card ticketing system that was introduced for all users of public transport services.

Toledo (SUA)

In the city of Toledo the Toledo Area Regional Transit Authority (TARTA) functions as the primary mass transit operator in the Toledo metropolitan area and provides approximately four million trips per year. Service is provided weekdays from 5:30 a.m. to 11:30 p.m. with additional service on weekends and holidays. TARTA’s current fleet consists of 121 vehicles with capacity ranging from 19 passengers to 45 passengers.

When modernizing public transport service started in 2011 the TATRA aimed toward implementing measures that would meet some of the following conditions:

- The Passenger Information component of this project shall provide the public with real-time vehicle location information on a digital map and arrival/departure predictions via their own personal computers connected to the Internet.
- Furthermore, arrival/departure predictions will be presented to riders at selected TARTA shelters and transit stations.
- The Internet system shall also provide computer users with the ability to set alarms that will notify them by a popup alarm on their computer when their bus is a specified distance away as well as tie in with TARTA’s existing Intelligent Voice Response (IVR) system to automatically generate phone calls to a cellular phone.
- Finally, the bus stops will be coded with signage that will allow our passenger to text TARTA’s existing Textmarks service to get real-time information for the next three buses that are scheduled to arrive at that stop.
- When multiple routes intersect at the same stop, it should be possible to text the stop number and the route number to get the next three times that the bus will arrive at the

location. The system shall also include an application for use with smartphones that will give all functionality of the website interface.

Malmő (Sweden)

Starting in 2004 and completed in 2007 all city buses and some regional buses were equipped with AVL units and computers that can communicate with a central server and thereby provide its exact position and time. This information can for example be shown on bus stop signs and other information signs. In 2004 during the pilot phase real time information has been added to the existing traffic information system and some bus stops in Malmö have been equipped with first real time signs that show the traffic situation on these routes passing that specific bus stop.

In the city of Malmö, which is the Sweden's third largest city with a population around 290,000, later during SMILE project period a total of about 100 bus stops and shelters have been equipped with dynamic information boards informing PT users when the next bus is not only planned to arrive, but also when it actually will arrive. Two larger sign's have also been erected at the main bus square in Malmö giving the citizens access to accurate real time information on departures for several different bus routes simultaneously.

During 2007 all 40 real time information signs in Malmö were installed. About 60 older electronic information signs have also been updated to now provide real time information. At the main bus square were in 2008 two larger real time information signs erected showing departure times for the buses.

A complete real time system like this gives unique possibilities for travellers to get updated information at bus stops, internet and through mobile phones; gives better service; and makes it easier to plan a journey with different bus lines. Previously no such complete system, with both real time information and traffic messages, existed in Sweden.

The main measure objectives with implementation of RTPI are:

- To increase public transport by 0.5 million more journeys, which is about 2%. The increase is expected when all the signs are installed and working, i.e. from 2007 to the start of 2009, when SMILE ends;
- Increased awareness of good public transport of all the inhabitants and visitors of Malmö.

Cornwall County (UK)

Good example of combining of RTPI system with Park & Ride system that is currently available along the route of the "Park for Truro" park and ride service.

The route runs from Langarth Park pass the College and Hospital into the Truro city centre to main rail station and county hall. Every day 14,000 people commute from surrounding areas into Truro. Treliske Hospital has 4,000 staff and 400,000 annual patient appointments, Truro College attracts 10,000 students per year, and the city is a major visitor destination in Cornwall. This demand for travel is creating congestion in Truro and is why the Council have developed a park and ride strategy for the City.

The first phase of the park and ride scheme opened in August 2008 with 1,200 spaces at Threemilestone on the western side of Truro. It has been a great success with almost one million journeys recorded, 600,000 car journeys removed from the network and it has attracted several national awards for its high quality design and service.

The LED displays give passengers a countdown in minutes until the arrival of the next park and ride bus as well as showing the stop name and current date and time information.

The Park for Truro buses are equipped with technology that sends messages about their whereabouts, via satellite, to a central computer with use of AVL system. These are then sent to the receiving equipment in the bus shelters and turned into real time messages that are displayed on the LED screen.

Park for Truro RTPI is also available on computers via World Wide Web page (www.parkfortruro.org.uk) and on smart phones with possibility of access to the Internet. This

Real Time Passenger Information is currently only available at the Park for Truro stops, and only provides information on Park for Truro buses. Cornwall Council is keen to extend the technology in future to other services and hopes to work with local bus operators to enable this on all services into and out of Truro.

This site to the east of the City offers the perfect opportunity to provide the second phase to the bus based park and ride system given its ability to intercept traffic travelling from the east into the centre. Buses would link the eastern and western park and ride sites, stopping at key locations and providing a high frequency service every 10 minutes for commuters, shoppers and visitors.

Tab. II.19 – Identified best practices – ATTAC Programm

Case city/City measures	Year	Size	PT mode	SUTP
Achterhoek (Netherland)	1998-	334,500	Mini bus	Introduction of new Demand Responsive Service using easily accessible minibuses. It is open to the general public in rural area and is completely flexible regarding routes, stops and timetables. MobiMax operates under the taxi licence scheme administered by the central government. Clusters of routes are made via software in travel dispatch centre.
Almelo (Netherland)	1999-	72,000	Bus and rail	AVL tracking system with traffic intersection priority system and providing Real Time Passenger Information of trains, regionally buses and city buses. The measure is part of Strategy high Quality Bus Service
Barcelona (Spain)	2002-2006	4.5 milion inhabitants	Bus, trams, metrou, rail, cycling	The metropolitan transport authority worked with more then 30 private bus companies that operate in the municipalities of the Barcelona region to develop and install a multi-operator automatic vehicle monitoring (AVM) system with RTPI service.
Bolonia (Italy)	2008	380,000	bus	FTS for rural area in the province of Bologna Italy, with a low level of public transport usage but with the function of feeding 3 main reilway stations. FTS SRM provides improved access to healthcare facilities.

Tab. II.19 - Identified best practices – ATTAC Programm

Case city/City measures	Year	Size	PT mode	SUTP
Bremen (Germany)	2002-2006	550,000	Bus, car sharing, cycling	The implementation of new PT user system ''mobil.punkt'' scheme focused on the interchanges between public transport, cycling and car sharing,
Brescia (Italy)	2008-2012	194,500	Bus	Implementation of new e-ticketing system for Park and ride and public transport.
Brno (Czech Republic)	2008-2012	400,000	Bus	New minibuses for improving public bus service for disabled users on special and common public lines in non pick hours. Upgrading bus and tram stops with RTPI panels and new integrated local-regional public transport control centre.
Cornwall (UK)	2008	535,500	Bus, park and ride	Combining of new RTPI system with Park & Ride system that is currently available along the route of the “Park for Truro” park and ride service.
Cuneo (ItalY)	2011	55,000	Bus	Improving accessibility and quality with construction of electronic fare collection system for regional and city bus, bike sharing, parking and with this improving provincial accessibility and quality of public transportation service.

Tab. II.19 - Identified best practices – ATTAC Programm

Case city/City measures	Year	Size	PT mode	SUTP
Donostia/San Sebastian (Spain)	2008-2012	186,200	Bus	The city is implementing a new system which offers display screens next to the 40 bus stops providing information about the waiting time and the occupation level of the buses.travel information is accessible also to the visually impaired PT users.
Fano (Italy)	2001	64,100	Mini bus	Fixed line service was replaced with DRT in non pick hours which lead to passenger increase.
Florence (Italy)	1997-2000	370,700	Mini bus	New flexible bus service or Demand Responsive Transport service developed for connecting low-density areas. System is based on a Telematic architecture supporting the operator in both off-line and on-line booking procedures and in the dynamic route planning for buses on the basis of customers' requests.
Genova (Italy)	2004	610,500	Bus	Service between traditional fixed bus routes and totally flexible taxi service is ideal to serve low-demand urban areas characterized by accessibility problems.
Gray (Austria)/Maribor (Slovenia)	2007-2008	Graz: 265,500 Maribor: 95,000	Bus Train Mers pe jos	Cross border Internet based door-to-door travel information service - integration of separated technical systems. The creation of a cross-national trip-planner for the entire public transport within the geographic and economic region Graz-Maribor..

Tab. II.19 - Identified best practices – ATTAC Programm

Case city/City measures	Year	Size	PT mode	SUTP
Jőnkőping (Sweden)		98;400	Bus	The city has a number of interchange points, which are primarily meant for changes to / from the City buses. The main principle is that the regional bus timetables are set with reference to the timetables of the City buses (incl. ITS Strategy within BHLS).
Krakow (Poland)	2005	759,500	Bus	Introducing and testing new demand-responsive transport service in three districts. With corporate image, clear regulations between actors and good service availability for public transport users. First FTS in Poland based on the transfer of technology and know-how from Genoa..
La Rochelle (France)	2005-2009	79,000	Bus	A new e-ticketing service for bus, taxi, bike and ferry allowing recharging passes through easily accessible online payment system on the website instead to go to the central bus station.
Livorno (Italy)	2008	161,000	Mini bus	Feasibility study on FTS. The design of the most suitable flexible transport service for an Urban Quarter and the verification of the role of DRT’s as feeder to the main PT lines.

Tab. II.19 - Identified best practices – ATTAC Programm

Case city/City measures	Year	Size	PT mode	SUTP
Ljubljana (Slovenia)	2008-2012	270;000	Bus	Increased attractiveness of the PT network with a RTPI system integrated with existing PT management system, with analysis of prediction accuracy for managers and control of displayed information for passengers.
Malmő (Sweden)	2004-2007	290,000	Bus	40 Bus stops and shelters have been equipped with dynamic information boards informing PT users when the next bus is actually arriving. Additionally evaluation of RTPI was elaborated. Aim was to increase the passenger volume and rise the image of PT.
Modena (Italy)	2003	180,000	Mini bus	Flexible transport service as support to the line buses linking different areas with a low populated areas, and then at a low transport demand, with the main cities and the regular line stops.
Potenza (Italy)	2009	68,600	Bus	Organizing an intermodal transport system supporting interchange and integration between the DRTS and other transport systems within the city in order to improve the accessibility for peri-urban users. Customer satisfaction analysis and feasibility study on basic indicators was performed.

Tab. II.19 - Identified best practices – ATTAC Programm

Case city/City measures	Year	Size	PT mode	SUTP
Purbacj (Austria)	2008	2,675	Mini bus	Improving the existing DRT service in the municipality (small city in rural region) with minimal costs, ensuring a sustainable mobility service.
Thessaloniki (Greece)	2005	330,000	Bus	Real time information for the passengers about the arrival time of the bus at the stop and visual and optical announcement of the next stop inside the bus. Additionally Evaluation of a bus passenger information system from the users' point of view reveals the passengers willingness to pay for RTPI.
Timisoara (Romania)	2009-2010	310,000	Bus Tram Troley	Methodological and practical steps for introducing and operating of an e-ticketing system, expanding of local public transport services from the local level to the metropolitan one, regional operator.
Toledo (USA)	2011-2012	650,300	Bus	International tendering of RTPI system and proposals for the delivery and installation of the Automatic Vehicle Location and RTPI system for 121 fixed route transit buses, 10 workstations and 4 mobile supervisor vehicle workstations including support equipment.

Tab. II.19 - Identified best practices – ATTAC Programm

Case city/City measures	Year	Size	PT mode	SUTP
Trondheim (Norway)	2008-2011	170,400	Bus	Innovative concepts for more accessible, efficient and sustainable urban transport and integration into transport policies. Implementation guidelines of Mobile Travel Information Service (MTIS) for the public.
Verona (Italy)	2006-2010	265,000	Bus	Introduction of new faster electronic smart card ticketing service allowing also payment and can be recharged online on website.
Vicenza (Italy)	2006-2009	115,100	Bus	Integration of electronic and magnetic ticketing processes, info-mobility and service certification.

NICHES+ is an EU funded project which studied and promoted the uptake of innovative transport solutions in order to transfer them from their "niche" position to a mainstream urban transport application.

Berlin – Germany

Improve public transport accessibility

Approximately one third of all public transport users in the Berlin region have a reduced mobility, including impaired users, but also many older people, parents with prams or travellers with heavy luggage. There are still many barriers for these users, but public transport actors in Berlin are doing a lot to enhance barrier-free travelling opportunities. An innovative example is the traveller information of the public transport association VBB. Within the BAIM project VBB developed, in cooperation with the public transport association RMV in Frankfurt/Main (lead partner), a mature journey planner that gives information on barrier-free travel chains in public transport. The user enters his requirements towards barrier-free travelling for a planned trip. The journey planner provides information on connections that are barrier-free and also gives additional details on the accessibility of interchanges (e.g. interactive station plans), stops and vehicles. VBB is also offering a free of charge door-to-door travel assistance service for all mobility or visibly impaired persons and older people that need help to use public transport. Furthermore a lot has been done in Berlin to improve the physical accessibility of public transport vehicles (low-floor, ramps) and stops (elevators, ramps). Special orientation tools have been introduced for hearing impaired and visually impaired users. Public transport is not fully accessible yet, but Berlin has much to show already.

Promoting Intermodal Travel Solutions and Cycling

Berlin's Traffic Management Centre (VMZ) offers an innovative intermodal dynamic route planning service, combining both private cars and public transport. It integrates transport into a single city centre management system for public, private and commercial transport. Mobility information is supplied to trip-makers through an internet-based intermodal route planner and can

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also be accessed via mobile devices. Berlin has also made a remarkable step ahead in cycling culture (13% modal share). The city's cycling strategy understands cycling as a "system", which requires an integrated approach to developing infrastructure like bicycle paths and parking facilities, traffic regulations, signage and marketing measures. The connection between public transport and the own or public bicycles is an important element as well.

Eindhoven – Netherland

Cleaner and faster public transport system

One of the key projects in this regard is the Rapid Bus Transit line Phileas, connecting the city with the airport. The bus service is environmentally clean using hybrid and electric propulsion. The bus' electronic guidance increases its fuel economy, enabling more accurate and quicker stops, in addition to an increased average speed and decreased need for road space. This average speed is about 30 km/hr for the total route. The system can carry 1000 passengers at a travel schedule interval of 10 minutes at the busiest time of the day. The operation costs lie between a conventional bus on a free lane and a fast tram, but fuel use is 25% lower than a conventional bus. The bus provides quick and easy access for all passengers, including those with mobility impairments. The city has installed a low emission zone for heavy duty vehicles. Heavy duty vehicles below EURO4 are excluded from accessing the zone.

Increasing the Modal Share of Cycling

In the city centre free and secure cycle parching facilities have recently been opened. To stimulate use the Eindhoven citizen's pass can be used to accumulate points in the monthly contest Bike and Win. To popul arise cycling the city opened 60 kilometres of cycle routes throughout the city which provide access to the most interesting Eindhoven locations.

Gotheburg - Sweden

Integrated Approach to Enhance Access for People and Freight

The City of Gothenburg is a forerunner in several fields of sustainable urban transport. It is an absolute leader in the field of urban freight logistics. One of the key measures in this regard is the Environmental zone for Heavy Duty Vehicles. Access restrictions for dirtier trucks and buses are now enforced.

So far this approach has proved successful ith measured reductions of NOx and particulate matter emissions. The city has a fully operational real time travel information system (GoTIC – Gothenburg Travel Information Centre), providing information about public transport arrival times and routes at stops and through mobile services.

Stakeholder Involvement for a Better Public Transport Service for All

The city of Gothenburg has developed a project to transform the public transport system into an accessible-to-all public transport system. This project is called KOLLA. The project started in 2004 following an analysis carried out to study how people with disabilities can use public transport in an easier and less costly way.

The project is built around three axes:

- increased accessibility of streets, stops,
- stations and vehicles.
- Increased comfort through training
- schemes, IT support and personal
- services such as a call centre.
- intensified cooperation and dialogue
- with stakeholders.

Helsinki - Finland

Mobile Travel Information for Public Transport Users

KAMO is a mobile guide for public transport users in Helsinki providing journey planning, stop-specific timetable information and fare payment.

Improve e-ticketing system

Occasional public transport users in Helsinki can also purchase tickets directly with mobile phones by sending a simple code as an SMS message to a service number. After a few seconds, the user receives a mobile ticket including the validity time and area of the ticket, the identification number and the sender number. The price of the ticket is included in the phone bill. The mobile ticket is valid on trams, on the metro, on the Suomenlinna ferry, on several buslines and the commuter trains.

La Rochelle - France

Yélomobile: Self-service Electric Cars

The first electric car share club was the Liselec scheme in La Rochelle, France, which has operated since 1999. It provides 50 electric cars parked in seven recharging stations near high use locations in the city, such as the main train station, the bus station and the university. The cars are available for pick-up round the clock, every day of the week. Users must have a driving licence in order to take out a subscription. Users can leave the cars at any recharging station, so they effectively have free parking in the city.

Optimising Multimodality through Integrated Ticketing

La Rochelle has developed over the years a large range of public transport modes on its territory and in the last years has aimed to improve the attractiveness of its public transport network by launching a new service offer and pricing combined with a new unique identity called ‘YELO’. With Yélo, the network offer and pricing system has been upgraded, making all modes of transport easier and more practical to use with one single smartcard: buses/coaches, bike-sharing, park-and-rides, electric boats, electric car sharing and train.

Madrid - Spain

Network of Transport Interchanges

In timp ce numeroase orase au construit puncte intermodale izolate, Madrid a demarat un plan ambitios prin care sa implementeze o intreaga retea de puncte intermodale, capabila sa preia peste un milion de calatori pe zi si care sa acopere intregul flux de calatori atras de oras. Pana acum au fost construite 5 din cele 7 puncte intermodale ale retelei. Complexitatea mobilitatii urbane si metropolitane necesita ca transportul public sa ofere flexibilitate, acoperire spatiala si confort, pentru a putea face fata concurentei autoturismului personal. Sustenabilitatea sistemului de transport public din Madrid a crescut simtitor datorita aparitiei acestei retele de puncte intermodale.

Transportul public din Madrid – accesibil pentru toti

Madrid has invested great efforts in ensuring the universal accessibility of its urban transport systems through a series of measures with regard to the different modes of transport (underground, light rail and tram, commuter trains, urban and intercity buses), based on the ‘design for all’ approach. Accessibility measures implemented in the interchange stations relate to both horizontal (e.g. tactile paving) and vertical movements (stairways, lifts), as well as furniture, evacuation, restrooms, customer service centre, wayfinding information, and screen design. The aim is to provide at least one accessible adapted route to connect the street both in a horizontal and vertical way with the interchange’s public facilities and services.

Rotterdam - Netherland

Optimising the Usage of Road Infrastructure through ITS

With the implementation of an extensive ITS system, the city of Rotterdam is optimising the usage of existing infrastructure. Rotterdam and the surrounding and higher level of governments are working together on an integral dynamic information system for road users. The cooperation between different cities and regions makes it possible to regulate traffic on a network level. The basis is a set of rules, which describes for each possible event which actions should be undertaken. The ITS system is not only for informing drivers, but also as a tool to regulate the traffic. The next step will be to evaluate the events and the effect of the ITS system.

Stuttgart - Germania

Integrated Traffi c Management Centre Focuses on Collaboration and Information Sharing

What is most impressive about Stuttgart's exemplary integrated traffic management system is the collaboration among the parti cipating partners: the city's traffic management department, the police traffic division, the fire department, emergency services, and the public transport operator (SSB). This collaboration allows the partners to collect traffic information, evaluate it, and react in an informed and unified way to situations that arise. The centre brings information on traffic situations in the city together in one place. The information collected allows for better management of traffic around accidents, major events, and construction projects, and has enabled the provision of strategic right of way for public transport vehicles. The use of dynamic information boards, parking management systems and flexible signal controls allows them to have an active influence over the ongoing traffic situation.

Electronic Car Pooling System

The online car pooling service Pendlernetz Stuttgart is a free Internet-based system that arranges door-to-door car pools for commuters in the Stuttgart Region. It provides communication by SMS and e-mail, route mapping and public transport information. The Stuttgart administration has successfully promoted the Pendlernetz among major employers; both Daimler and Bosch have integrated the Pendlernetz system into their Intranet platforms to organize car-pooling among their employees.

Turin - Italy

5T: Telematic Technologies for Transport and Traffi c in Turin

The project was launched in 1992 in order to help citizens move around the city more quickly, encourage use of public transport and reduce pollution. 5T has a fully integrated approach covering all mobility issues in Turin keeping a multimodal focus, involving bus, tram, metrou and suburban rail networks.

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Ulm - Germany

Flexible Car Sharing

The car2go concept was developed by the car manufacturer, Daimler. It is based on standard car-sharing but takes the notion of flexibility a step further. car2go has no fix rental-stations, so the cars can be rented and parked anywhere within car2go's operating area. Making shared cars easily available may encourage some to leave their own vehicles at home or even to dispose of a personal car.

Smart Ride Sharing

Ride sharing systems exist in many places that allow you to arrange occasional or regular ride-shares through web portals, but Daimler is using social networks and smart phone technology to pilot a new system called car2gether that also offers the possibility of a spontaneous lift. Registered members can post their journey offers or requests through a smart phone application; the content is up dated every 15 seconds.

6.2.2 Key results summarized

6.2.2.1 Alternative car use measures

City	Measure	Description	Success of implementation*	Success of outcome
a) Car-pooling				
Burgos	Car-pooling	Car pooling system for the university, industrial area and selected neighbourhoods	1	1
Debrecen	Car-pooling service for students	Car pooling system for students	3	2
Krakow	Car pooling system	Car pooling system for university employees and students	2	-
Norwich	Car-pooling	Car pooling system for commuters and events	3	2
Potenza	Development of car pooling	Car pooling system for commuters	0	0
Preston	Promotion of car pooling	Car pooling system for region	2	1
Stuttgart	Carpooling and mobility marketing	Car pooling system for commuters and event traffic	2	1
Toulouse	Promotion of car-pooling and integration with PT services	Develop communication and reservation system and integration to enlarge car pooling	2	3

b) Car-sharing				
Genoa	Car sharing service	To extend the car sharing service and develop a range of services across city	-	3
Krakow	Policy options for car sharing	Feasibility study for car sharing service	1	-
La Rochelle	Deployment of new car sharing fleet	To update the city car sharing service	1	2
Malmo	Car sharing for business & private travel	Car sharing service for city	2	2
Norwich	Development of a car sharing club	Car sharing services for university and city centre	2	1
Preston	Promotion of Car clubs	Car sharing club for city	0	0
Toulouse	Implementation of a new car-sharing service linked to PT service	Car sharing service for conurbation	1	1
Venice	Expansion and diversification of the car-sharing scheme	Range of car sharing services across city	3	3

*Rating of success – 0 = not successful; 1 = moderat successful; 2 = successful; 3 = very successful

6.2.2.2 Measures for clean vehicles and fuels

City	Measure	Description	Success of implementation*	Success of outcome
a) Alternative fuels				
Burgos	Support for clean fuels and introduction of clean public and private fleets.	Implementation of clean fuel collection, storage, use and promotion, with initial bus application of CNG and biodiesel.	2	3
La Rochelle	Implementation of biofuel filling stations.	Provision of 2 biofuel stations for a 30% pure plant oil and 70% diesel mix, addressing legal issues, and promoting the use of biofuels.	2	3
La Rochelle	Cooking oil recycling pilot projects.	Implementation of a cooking oil collection system and processing plant.	1	3
Malmo	Biogas on the net.	Injection of biogas from a waste treatment plant into the local gas grid and establishing two fuelling facilities.	2	3
Norwich	Clean vehicle trials.	Create and promote a biodiesel supply chain and test the technical feasibility of a range of blends.	3	2
Toulouse	Solutions for alternative fuels and complementary measures to achieve a 100% clean fleet	Assessment of technical and market potential of biodiesel, biogas and soot filters and testing of B30 on 81 converted buses and soot filters on 129 diesel buses.	3	3

b) The operational impact of alternative fuels				
Debrecen	Operation of biofueled and CNG vehicles and framework condition for alternative fuel use.	Introduction and testing of CNG buses (3 new and 3 converted from diesel). Biodiesel tests of 10, 20, and 50% against a 4% standard.	1	2
Genoa	Transition towards clean fleets.	Introduction and testing of range of cleaner buses, (EURO IV, EEV, particulate filters) extension of zero emission zone and a special project.	-	3
Cracovia	Transition towards clean vehicle fleets.	CNG demand responsive mini buses introduced and hybrid bus trialled.	1	-
La Rochelle	Development of clean collective transport.	Hybrid technologies reviewed and 2 petrol/electric hybrid mini buses trialled as park and ride shuttles and the technology promoted.	1	1
La Rochelle	Introduction of new clean buses.	Implementation and testing of EEV buses with selective catalytic reduction that injects an aqueous urea solution into the fuel stream.	1	3
Ljubljana	Implementation and large-scale deployment of biodiesel and CNG fleets.	Biodiesel generation and testing on pure biodiesel (B100) buses converted from Pre-Euro.	1	1
Malmo	Clean municipal fleet.	Introduce clean (mostly E85) vehicles in the municipal fleet of light vehicles and use the visible presence of these vehicles to promote the adoption of clean vehicles more generally.	1	1
Malmo	Clean heavy vehicles.	Introduce alternative natural gas/biogas fuelled heavy vehicles and provide eco-driving training.	1	2
Malmo	Clean fleet UMAS.	Introduce clean vehicles in the Malmö Hospital (UMAS) fleet by influencing the staff responsible for vehicle purchasing to choose more environmentally sustainable vehicles.	1	1
Ploiesti	Conversion of buses to LPG.	Introduction of new LPG buses and assess technical/attitude/economic impacts.	3	2
Potenza	Introduce clean vehicles in a large fleet of urban buses.	Methane/natural gas mini-buses purchased	2	2
Preston	Introduction of clean buses.	Trials of engine cleaning technology (including fuel conditioner) and biodiesel.	0	1

Suceava	Alternative fuel bus fleet and support measures	New LPG buses, new priority and related traffic management measures and bus information systems	3	3
Toulouse	Large scale operation of clean bus fleets and preparation of sustainable supply structures for alternative fuels.	To introduce new CNG buses, provide a new CNG filling station for 125 buses and promote a CNG micro-compressor for home use with passenger cars.	3	3
Venetia	Deployment of CNG buses.	Introduce CNG buses and increase attractiveness of Public Transport.	1	1
Venetia	Deployment of LPG boats.	Introduce LPG on pilot fleet of 10 pilot boats (new bi-fuel outboard motors), raise awareness, and develop a local action plan.	1	1

c) User attitudes and behaviour towards alternative fuels

Ljubljana	Set up information posts and campaign on clean vehicles and alternative fuels.	Integrated dissemination programme to promote clean vehicles and alternative fuels.	3	3
Malmo	Marketing of clean vehicles by subsidised parking.	Identification and application of a strategy to encourage the purchase of clean cars by subsidised parking.	2	1
Norwich	Influencing the choice of vehicle towards smaller and more fuel-efficient vehicles.	Development and implementation of parking incentive/awareness scheme to encourage the purchase of more environmentally sustainable cars.	3	2
Suceava	Marketing for alternative fuels in the public and private sectors	Demonstration of the financial benefits of LPG conversion for taxi operators.	2	3

*Rating of success – 0 = not successful; 1 = moderat successful; 2 = successful; 3 = very successful

6.2.2.3 Measures for cycling and walking

City	Measure	Description	Success of implementation*	Success of outcome
a) Cycle infrastructure - lanes and parking				
Burgos	Increasing bicycle use	Increasing bicycle use	2	2
Debrecen	Integrated and extended cycling network	Integrated and extended cycling network	2	2
La Rochelle	Implementation of new structure for alternative modes	Implementation of new structure for alternative modes	1	2
Ljubljana	Participatory planning and promotion of sustainable mobility with emphasis on safe and increased bicycle use	Participatory planning and promotion of sustainable mobility with emphasis on safe and increased bicycle use	3	3
Malmo	Internet tool for travel planning	Internet tool for travel planning	0	1
Ploiesti	Planning for alternative transport modes and implementing new infrastructures for walking and cycling	Planning for alternative transport modes and implementing new infrastructures for walking and cycling	1	3
Preston	Planning and new infrastructure for alternative modes	Planning and new infrastructure for alternative modes	3	2
Toulouse	Public space redesign	Public space redesign	3	3
b) Cycles on buses				
Krakow	New leisure related mobility service	New leisure related mobility service	1	-
La Rochelle	Extension of bike-bus scheme	Extension of bike-bus scheme	1	3

c) Cycle rental				
Burgos	City bike scheme	City bike scheme	3	3
Cracovia	Inchiriere biciclete	Planul punctelor de inchiriere a bicicletelor	2	-
La Rochelle	Bicycle renting	Bicycle renting	2	3
Toulouse	integration with PT services	integration with PT services	3	3
d) Safety for cyclists and pedestrians				
Burgos	Safe access for pedestrians to peripheral neighbourhoods	Safe access for pedestrians to peripheral neighbourhoods	2	3
Burgos	Safety & accident prevention plan	Safety & accident prevention plan	2	2
Malmo	Integration of cycling with public transport	Integration of cycling with public transport	1	1
Odense	Interactive traffic training for children	Interactive traffic training for children	3	3
Venetia	Promoting safe and increased bicycle use	Promoting safe and increased bicycle use	3	3

*Rating of success – 0 = not successful; 1 = moderat successful; 2 = successful; 3 = very successful

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6.2.2.4 Measures on logistics and good distribution

City	Measure	Description	Success of implementation*	Success of outcome
a) New distribution schemes				
Burgos	New goods distribution scheme	New goods distribution scheme	1	1
Genoa	Enlarged goods distribution scheme	Enlarged goods distribution scheme	1	1
Krakow	New goods distribution scheme	New goods distribution scheme	1	-
La Rochelle	City logistics strategic extension	Optimise current logistics platform; develop warehousing and delivery software tool; new 'clean' vehicles (not implemented	2	3
La Rochelle	Customer services associated with goods distribution	Extend B2B (Business to Business) activities to include B2C and C2C (Customer to Customer) activities, using P+R (Park & Ride) facilities	3	3
Norwich	Urban consolidation centre [joint with 10.3 & 10.4]	Development of urban consolidation centre	0	0
Norwich	Goods delivery to Park & Ride sites	Promotion of P&R use by enabling customers easier transport and storage of goods purchased in city centre	2	0
Toulouse	Clean urban logistics and goods distribution platform	Access restrictions; development of urban delivery centre (not implemented); use of 'clean' vehicles	1	1
b) Vehicle and driver support				
Malmo	Freight driver support	Computer-based environmental and distribution information system	0	0
Malmo	Sustainable SME logistics for the food industry	Web-based logistics coordination system; use of 'clean' vehicles (not implemented)	0	0

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Norwich	Customised traffic and travel information service for freight operators	Web- and mobile phone-based information service; greater use of clean vehicle technologies (not implemented)	0	0
Ploiesti	Freight partnership, planning, routeing, signing	Promote cooperation between operators; improve signing; encourage best practice	1	3
Preston	Freight routeing and signing	Improve routeing and signing	2	3
Venetia	Clean urban logistics	Web-enabled information exchange for canal boat parking management	3	3
c) Freight partnerships				
Norwich	Development of Strategic Freight Stakeholders Club [Joint with 10.4 & 5]	Promote cooperation between operators (not implemented fully)	0	0
La Rochelle	Development of partnership with logistic operators	Promote cooperation between operators	1	3
Preston	City logistics partnerships and strategic planning	Promote cooperation between operators	2	3

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6.2.2.5 Measures on mobility management

City	Measure	Description	Success of implementation*	Success of outcome
a) Mobility agencies				
Genoa	Mobility service agency	Mobility service agency	1	2
Odense	Mobility management service of Odense Harbour	Mobility agency for redevelopment area	1	2
Toulouse	Set-up of a mobility agency and customised services	Mobility agency as walk-in mobility house	3	3
b) Mobility plans				
Debrecen	Sustainable city-traffic development plan	Mobility workgroup composed of experts and decision makers to develop a sustainable transport plan with stakeholders	2	2
Genoa	Integrated mobility plan for San Martino Hospital	Extends the Home-Work mobility plan to visitors to the hospital	1	1
Genoa	Integrated mobility strategy for trade fairs	Development of the employee mobility plan for trade fairs to visitors and tourists visiting the trade fairs	2	1
Cracovia	Integrated mobility plan at university	Mobility plan for staff and students at the University	1	-
La Rochelle	Business travel plans	Extension of business travel plan to a wider area, with carpool service and late night transport	2	3
La Rochelle	Student travel plans	Information and incentives to encourage to switch mode for Home-to-School journeys	2	3
La Rochelle	Development of integrated transport management systems	To increase efficiency through improving political and technical common understanding, with implementation concentrated on the urban freight sector	1	2
Malmo	Managing mobility needs of citizens and business sector	Information and incentives to encourage modal shift	3	2
Norwich	Travel planning	Mobility plans for schools and businesses to encourage modal shift	3	3
Norwich	Individual travel advice	Personalised travel planning to complement existing Travel Plan and promote behaviour change	2	1

Odense	Creating alternative mobility options for owners of older cars	Targeted marketing and advice to encourage marginal car users to switch to public transport and cycling	2	2
Potenza	Mobility management	Mobility centre, mobility offices and mobility plans	1	1
Preston	Personalised travel planning	Large scale, household-specific personalised travel information for behaviour change	3	3
Preston	Business travel plans	Business Travel Plan advisory service	1	2
Preston	School travel plans	Travel awareness, advice and information for schools, parents and children, to comply with a national target	1	3
Toulouse	Implementation of Urban Mobility Plan	Comprehensive mobility plan for soft modes, with parking plan implementation, to capitalise on the new tram system in Blagnac, suburban city of the Toulouse agglomeration	1	1
Toulouse	Company and administration mobility plans	Micro-mobility schemes to provide alternatives to the car for employees, visitors and stakeholders in business areas of sparse density and low public transport service	2	2
c) Mobility marketing				
Burgos	New mobility services for visitors	Environmentally friendly travel choices information and guided itineraries for tourists	1	2
Burgos	Sustainable mobility marketing	Information and awareness campaign on sustainable travel choices for people and freight	3	3
Burgos	Mobility Forum	Structured consultation with wide range of stakeholders to generate ideas and commitment to delivery of mobility plans	1	2
Genoa	Sustainable mobility marketing and Ecopoints	New fare policy and customer loyalty scheme with associated marketing to encourage public transport use	2	1
Genoa	Mobility Forum	Stakeholder meetings, e-consultation, mobility bus and mobility office giving information and receiving comments	3	1
Cracovia	Sustainable mobility marketing	Information seminars, incentives and a mobility education programme to encourage sustainable travel choices	2	-
Cracovia	Mobility Forum	Stakeholder meetings among public and private sector to influence transport plans	1	-
Odense	Personal transport choice marketing	Direct personal individualised marketing of environmentally friendly travel	2	3
Preston	Information dissemination	Development of a web portal for real time, all modes travel information	3	3

Stuttgart	Sustainable mobility marketing	Mobility information centre, travel awareness campaign, support to carpooling development	-	-
Suceava	Information and awareness raising	Promotional materials, media communications and website launch, seminars, workshops and conferences	2	2
Toulouse	Awareness raising campaign	Impact assessment of combined personalised travel planning alongside a general public transport marketing campaign	3	3
d) Eco-driving				
Malmo	Eco-driving for municipal employees	Eco-driving training for 1000+ municipal employees in order to demonstrate benefits and provide civic leadership	1	1
Malmo	Eco-driving for hospital employees	Eco-driving training for staff undertaking patient transfers and other functions, with extension planned	1	1
Malmo	Heavy eco-driving	Combined eco-driving and road safety training for truck drivers employed by or contracted to the city	3	3

*Rating of success – 0 = not successful; 1 = moderat successful; 2 = successful; 3 = very successful

6.2.2.6 measures on traffic management and control

City	Measure	Description	Success of implementation*	Success of outcome
a) Public Transport priority				
Genoa	Bus lane control system in Genoa	The use of fixed optical gates for bus lane control and enforcement – a camera to ensure that only buses use the lane	2	2
Cracovia	Clean high mobility corridor	Implementation of tram stations with model character and introduction of environment friendly vehicles	2	-
Cracovia	Public Transport priority system	Design study of 9 corridors with full PT priority	1	-
La Rochelle	Implementation of dedicated bus lanes	Creation of dedicated bus lanes and accessible bus stops	2	3
Malmo	Bus priority system	Implementation of Malmö bus priority systems at 42 intersections to improve public transport in the urban and suburban area	3	1
Suceava	Bus priority measures and other bus improvements	Implementation of supporting measures for improving PT conditions such as special traffic priority for PT, new GPS	1	1

		system for bus location and new public transport safety system		
Tallin	PT priority system	Implementation of a number of measures such as Automatic Passenger Counting, public transport lanes, priority signals for public transport, etc.	1	1
Toulouse	High-quality bus corridors and development of PT segregated and secured lanes in the city centre	Development of two High Quality Corridors on roadways and PT lanes in city centre	3	3
Toulouse	Implementation of bus priority scheme	Study and implementation of a new radio priority system	3	3
b) Monitoring and Control				
Burgos	Traffic visualisation system	Implementation of new visualisation tools for assisting the task of controlling and monitoring traffic	1	3

Genoa	Monitoring centre for road safety & accident prevention	Implementation of an exhaustive multi-source data warehouse system, a set of elaboration and representation methods, and new methods of data gathering from the field	2	2
Genoa	Decision support tool for environmental impact assessment of traffic planning measures	An integrated set of tools based on simulation packages and models to evaluate the environmental impact of the traffic planning measures	1	2
Krakow	Monitoring centre for road safety & accident prevention	A new and open system able to integrate the existing system (GestInc) and connected to an exhaustive multi-source data warehouse system of road accident and safety	1	-
La Rochelle	Implementation of a common transport information data base	Creation of databases compatible with the Geographical Information System (GIS) in order to facilitate and optimise the monitoring and management of the public transport network	2	2
Malmo	Satellite based traffic management for SMEs	Implementation of a GPS based traffic dispatch system	1	1
Malmo	Traffic monitoring	Installation of an adaptive traffic signal control system (Utopia/SPOT) at 10 traffic signals in Malmö	0	0
Ploiesti	Development of a GPS system for the PT fleet	Implementation of GPS system on 250 public transport vehicles based on a common database and common communication protocol	3	3
Preston	Management and control	The development of a Strategy Integrator which uses information with preset strategies as part of the Common Database (a single and standard database) to improve capability in detecting traffic incidents	1	0
Preston	Data collection	The development of a Strategy Integrator which uses information with preset strategies as part of the Common Database (a single and standard database) to improve capability in detecting traffic incidents	1	0
Preston	Development of common database	The development of a Strategy Integrator which uses information with preset strategies as part of the Common Database (a single and standard database) to improve capability in detecting traffic incidents	3	1

Stuttgart	Event-oriented traffic management in Stuttgart	Development and demonstration of traffic control in case of events (e.g. sports event, incidents) for the strategic traffic network in Stuttgart	3	3
Toulouse	Demonstration of EGNOS/ Galileo services use for the PT control and information system	Experimental measurements and analysis of current GNSS performances and simulation study over the urban bus network for GPS, Galileo and EGNOS	3	3
Venetia	Electronic control of restricted access zone	Installation of electronic vehicle access control systems at optimal points for intercepting traffic along the main access points of the city	2	2
Venetia	Satellite control (GPS-GPRS) for water PT services	Creation of a GPS-GPRS system which enables the location of all vessels for monitoring and communication between waterbuses and control centre and gives real time information to the public on board and at the waterbus stops	2	2
Venetia	Management decision support system for waterborne traffic	Development of a dynamic waterborne traffic management decision support system as a prototype for the management and control of boat traffic circulation in the Venice lagoon in both ordinary and extraordinary situations	2	2

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6.2.2.7 Measures on public transport

City	Measure	Description	Success of implementation*	Success of outcome
a) Information				
Burgos	Infomobility tools	Promotion of sustainable transport though electronic displays (parking panels, information panels, web site, touch screens, bus stops shelters)	1	2
Genoa	Intermodal infomobility platform	Traffic and travel information, real time and mode-specific, with special services for disabled users	2	1
Cracovia	Intermodal infomobility platform	Web based origin-destination trip adviser with environmental impact measure for trip options	2	-
La Rochelle	Real time information systems	Real time information at the bus station, bus stops and via SMS	3	3
Malmo	Marketing of new bus route system	Campaigns, signs, events, information and staff training to promote new “main lines” bus network	2	2
Malmo	Use of real time applications for travellers	Real time bus information at bus stops, shopping centres and strategic locations	2	2
Malmo	Mobile internet services in connection to bus information	Bus timetables, maps and departure point information plus ticket purchase on mobile phones (SMS, WAP, Java and 3G)	1	1
Norwich	Linking individual passenger transport information with healthcare appointments	Not implemented in full. Study of hospital journeys carried out and public transport information leaflets provided for the hospital instead of the intended electronic journey planner	0	0
Norwich	Provision of real time passenger information	Service disruption messages added to bus stop RTI; away from stop, bus timetable electronic displays introduced, also with real time disruption messages	0	1
Ploiesti	Implementation of real time information system for PT	Expanded real time information at bus stops, integrated with existing telematics systems	3	0
Preston	Information and promotion for PT	New network concept to promote bus use – not carried out fully due to bus market changes	2	3

Suceava	Improved public transport information	Support measure to the alternative bus fleet (5.6) and bus priority (8.8): information boards at bus stops and on buses; VMS signs in the city centre showing pollution levels	1	1
Tallin	Automatic stop calls & info sign in bus	Electronic displays in vehicles	2	1
Toulouse	Development of an integrated multimodal traveller information system	Real time information screens at metro interchanges with other modes; P&R information and journey planner to follow	1	2
b) Public Transport ticketing and tariff measures				
Cracovia	Integrated ticketing and tariffs in Krakow	Integrated bus and rail ticket with multi-operator agreement	2	-
La Rochelle	Implement further integration of ticketing system	Ticketing mix enhanced by smartcards for schoolchildren and tourist passes covering bus, sea bus and yellow bikes with discounts for entry to attractions	3	3
La Rochelle	Strategies for integrated pricing system	Simplified structure for multi-modal tickets	2	2
La Rochelle	Enhanced integration of the ticketing pricing system	Web based sales; contactless ticket validators on all public transport and at P&R to pay for parking and PT	1	3
Norwich	On street ticket vending machines	Street machines taking cash and credit/debit cards for tickets across all bus operators to reduce boarding times	2	1
Preston	Implement integrated transport ticketing system	Smartcard for use on all operators' buses in Preston and South Ribble	1	2
Toulouse	Innovative multimodal PT contracts, services and electronic ticketing	Investigation of multi-operator, multi-modal electronic purse ticketing; simple system introduced during CIVITAS	3	3
c) Accessibility				
Burgos	Access for mobility impaired people	Improved information, bus accessibility and footway access	3	3
La Rochelle	Infrastructure improvement for collective transport	Hierarchy for bus and stop accessibility; accessible information at stops and on buses	2	3
Toulouse	Improving the accessibility of PT services	Dedicated mobility service; more low floor buses; lifts and queue priority at metro stations	1	1

Venetia	Introduction of low impact, access-for-all waterbuses	New waterbuses with greater passenger capacity, lower environmental impact and suitable for the transportation of disabled passengers on a busy boat route	3	3
d) Infrastructure				
Debrecen	Tramway priority scheme and real time passenger information system	Traffic control system; Automatic Vehicle Location for priority and real time information at tram stops	2	1
Genoa	Clean high mobility corridor	Bus lanes and enforcement; Automatic Vehicle Monitoring; ecological, comfortable buses; static and real time information at bus shelters, stops and on board	2	2
La Rochelle	P&R	P&R near motorway intersection and on the route into the city centre from nearby towns	2	2
Norwich	Rail station interchange	Bus and cycle access, with improved bus boarding, ticketing and waiting facilities	2	2
Ploiesti	Improved infrastructure for collective transport	Public transport signing, information and access	1	3
Preston	Creation of an overground network for PT services	New network concept to promote bus use – not carried out fully due to bus market changes	2	3
Preston	Improved infrastructure for collective transport	Bus shelters and stops, information and bus priority	2	2
Toulouse	Development of proximity services at important passenger transport hubs	Shops and other services at Metro stations in order to make an attractive environment	2	2
e) PT network				
Burgos	Clean high mobility services	Bus lanes, real time and on-bus information, smart card	2	2
Burgos	Collective mobility services for target users in Burgos	Streamline ad hoc bus and minibus services for companies, to provide clearer routes serving more employers	1	1
Cracovia	Demand-responsive transport services	Development of routes, marketing and management and control centre for demand responsive services in rural areas	1	-
La Rochelle	Reorganisation of the bus network	A simpler, hierarchical bus network, easier to understand and better fitted to demand	1	3
Odense	Integration and quality	Bus priority and information scheme to	3	3

	improvements of sustainable modes	promote alternatives to solo car use: bus, cycle, taxi, car sharing		
Potenza	system	Design of a dial-a-ride demonstration in the peri-urban zone	0	0
Preston	Improving quality and structure of PT services	Quality management system with targets and benchmarks for distinct, demand-related levels of PT service	3	3
Toulouse	Improving quality and structure of PT services	Quality management system with targets and benchmarks for distinct, demand-related levels of PT service	2	2
Toulouse	Integration of the demand responsive transport as a complementary service to PT	Standardise and extend demand responsive services; increase efficiency; improve connections with core PT; improve reservations	3	3
f) Safety and security of Public Transport				
Debrecen	Safety and security training for PT drivers	Driving skills for safety and energy efficiency	2	3
Cracovia	Security action plan for PT	Comprehensive strategy for PT security and safety, including speed reduction near PT stops; supporting measures on infrastructure, information, comfort	1	-
Malmo	Improved security & safety on buses	Security cameras on buses	1	1
Stuttgart	Security action plan for suburban railway	Workshops with bus and train drivers on increasing passenger confidence and diffusing conflict; media launch and leaflets for passengers on travelling safely	1	2

*Rating of success – 0 = not successful; 1 = moderat successful; 2 = successful; 3 = very successful

6.2.2.8 measures on access and parching management

City	Measure	Description	Success of implementation*	Success of outcome
a) Parking management				
Burgos	Parking strategy and management	Increase parking capacity and enforce efficient parking	1	2
Debrecen	Access and parking management for Debrecen city centre	Delivery limited to signal countdown for car traffic at junctions	2	2
Preston	Parking strategy and parking management	Parking pricing structure to act as demand managemen	1	1
Toulouse	New parking management	Reduce parking by 20% and shift priority to residents' and short-stay parking	3	3
Venetia	Parking management for Mestre	Real time information and signing for park & ride with a parking price structure discouraging parking in the centre	2	2
b) Exclusion of non-priority traffic				
Burgos	Integrated access restriction strategy	Traffic restrictions and pedestrian facilities	2	3
Debrecen	Accessibility scheme for the conference centre pedestrian zone	Accessibility scheme for the conference centre pedestrian zone	2	1
Cracovia	Integrated access control strategy	Integrated access control strategy	1	-
La Rochelle	Develop and extend access control zones	Develop and extend access control zones	1	3
Norwich	Time control access restriction	Part time access restriction [not delivered as planned]	1	1
Ploiesti	Development of a clear zone	Pedestrian zone in the city centre, to improve urban quality of life	3	3

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c) Traffic behaviour change				
Cracovia	Enforcement of access restrictions	Electronic access control for the restricted zone in the city centre	1	-
La Rochelle	Design access control scheme for tourist coaches	Reduce coach access through information provision	2	2
Malmo	Extended environment zone	Freight access restricted to environmentally friendly vehicles	3	2
Norwich	Priority access for clean goods vehicles; Development of Freight Holders' club; Urban consolidation centre	'Freight club' to plan load consolidation and identify priority routes, to reduce freight impact on the city	0	1
Venetia	Access management for the city centre in Venice – LTZ buses	Higher charges for buses to reduce numbers, with reductions for Euro IV engines to reduce pollution	2	2
d) Clear Zone / LTZ / LEZ				
Genoa	Integrated access control strategy and road charging scheme	Access control; freight and parking pricing schemes; study for road user charging	-	1
Norwich	Low emission zone	Traffic rules to improve air quality in restricted zone	3	3
Odense	Environmental zones	Restricting car movement and through traffic in housing areas and city centre	3	3
Preston	City centre Clear Zone	Clear Zone strategy, initial 20 mph zone; pedestrian crossing to reduce severance	3	3
Preston	Improve traffic regulation through access control	Creation of a limited access "Quarter" around the University area	3	3
Stuttgart	Policy options for access restrictions	Design and implementation of a policy to reduce pollution	3	2
Suceava	Extension of low emission zone	Access restrictions on polluting public transport vehicles, with improved pedestrian infrastructure	2	2

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6.3 Taking into account the principle of value for invested money (best value for money)

The principle of value for invested money (best value for money - BVM) consider the optimal combination between "total cost" (for ex. acquisition cost, maintenance and operation, decommissioning of etc.) of an acquisition and the correspondence (for example quality and ability to meet all requirements of the beneficiary). This definition gives contracting authorities the possibility to provide requirements that include social, economic and environmental conditions in the procurement procedure. "Total" includes both quantifiable costs and benefits, and others that can not be quantified.

Some of the costs mentioned above occur from the beginning, but most of them occur in the process (energy costs with equipment maintenance, staff training, environmental impact, etc.).

To determine the cost of full implementation of measures it is necessary to understand the impact that it will have after implementation. The cost of certain measures should be "annualized" in order to make comparisons between different measures. Below is an example for the acquisition and maintenance of five buses. A bus with automatic transmission, which has a total cost of 270,000 euros and lifespan of 15 years, has an annual cost of 18,000 euros. A bus with manual transmission, which has a total cost of 200,000 euros, but with a lifetime of only 10 years, has an annual cost of 20,000 euros. In other words, if life expectancy is 10 years and the total cost of using the bus with automatic transmission will be 180,000 euros for the first 10 years, then this is the best value for money.

(THE ENTIRE ACTIVITY 6.3 AND 6.4 ARE DEVELOPED IN TERMS OF THE AGREEMENT ESTABLISHED BETWEEN SC OTL SA AND INCERTRANS ON 09/19/2013 ACCORDING TO THE REPORT NO. 10921/19.09.2013 - APPENDIX. 24; THE NEW ANNEX IS ANNEX 25 THAT REPLACES ANNEX 23 WHICH WAS USED IN WORKING PLAN UP TO THIS POINT).

Develop effective package is the center of sustainable urban mobility planning. Only carefully selected measures will ensure that the objectives and targets defined. The selection of the measures should base on discussions with the key stakeholders[74], taking into account the best practice of other places with similar[75], to ensure the value of the money[76] and to exploit as much as possible synergies between measures[77].

The selected measures will be targeted not only by efficiency, but also by the value of money. Especially in times of tight budgets for urban transport and mobility, it is essential to achieve the greatest possible impact for the expended resources. This requires a basic assessment of options, both in terms of costs and benefits. This will also help in choosing only realistic measures that can be implemented and avoid "projects in the wind", in other words it will be chosen measures that seem financially feasible.

The methodology for selection of measures depends on the experience and resources available and may include both qualitative approaches and quantitative. In some cases, a full cost-benefit analysis may be too expensive (eg. Involvement of models for major measures). In such situations, simpler approaches have been applied and / or estimates on the most important measures.

In the below table there are shown all 75 measure proposed in chapter 6.1, evaluated on costs and benefits.

74 This aspect hasn't been yet materialized.
75 This aspect has been already materialized.
76 This aspect has been already materialized.
77 This aspect will be materialized right in this chapter.

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Tab. II.20 – Estimation of revenues and costs of proposed measures

Measures	Physical unit	Unit cost	Total cost	Revenues	Benefits	Observations
I.1 - electronically payment systems	-	-	50,000 EUR	-	The decrease of trips number	The current system is old and it is necessary to upgrade and expand to the Oradea municipality administration
I.2 - systematically educational measures in schools – in the idea of a sustainable development culture	-	-	-	-	The decrease of trips number	
I.3 - to activate and stimulate the activity of department working with citizen's associations (regular meetings organization)	-	-	-	-	The decrease of trips number	
I.4 - information campaigns on innovations in administration system that reduce the number of travels for citizens to administrative institutions	-	-	120,000 EUR	-	The decrease of trips number	
I.5 - periodical analysis of the section of streets on which have to be increased the speed, or on which have to be reduced (effectiv reduced by traffic	-	-	-	-	The decrease of accidents number	
I.7 - set up bicycle parkings	4 parking	200,000 EUR	800,000 EUR	325,000 EUR/year	The decrease of motorized trips and externalities	

Tab. II.20 – Estimation of revenues and costs of proposed measures

Measures	Physical unit	Unit cost	Total cost	Revenues	Benefits	Observations
I.8 – prepare technical and commercial framework for bicycle transport in public transport vehicles	-	-	-	The increase of revenues of SC OTL SA	The increase of public transport users' number and the externalities	
I.9 - regulate and promote car-sharing and car-pooling (including tax incentives for rental companies which declares as an activity object these activities	6 promoting campaigns	10,000 EUR	60,000 eur	-	The decrease of trips number and externalities	
I.10 - SC OTL SA has to initiate cooperation actions with public transport passengers and regular meetings with amateurs drivers	-	-	-	-	The decrease of trips number and externalities	
I.11 - it would be recommendable that local authority to develop a regulation that not only to allow the public presence but to ensure the public presence in the decisions regarding the community	-	-	-	-	The decrease of trips number and externalities	
I.12 – public transport operator to administer public parking	-	-	-	-	The decrease of trips number and externalities	

Tab. II.20 – Estimation of revenues and costs of proposed measures

Measures	Physical unit	Unit cost	Total cost	Revenues	Benefits	Observations
I.13 – prepare maps for spreading of main utilities in the city (the next implants will be done only based on the equal spread in territory principle)	-	-	-	-	The decrease of number of trips by private car and the externalities	
I.14 - improving some streets (planning and funding) and changing their classes into upper classes – possibly with one-way traffic – in order to increase the traffic capacity	10 km	1,000,000 EUR	10,000,000 EUR	-	Ease traffic and decrease of externalities The decrease of time for transport The decrease of operational costs	
I.15 - installing on ground passages or building underground passages for pedestrians on the streets with high flows of traffic – instead of crosswalks – where signaling / traffic lights programs is insufficient for combined flows vehicle-pedestrians	1 passage	1,500,000 EUR	1,500,000 EUR	-	Ease traffic and decrease of externalities The decrease of time for transport The decrease of operational costs	It is justified at least one pedestrian underground passage between Catedrala Episcopala and Casa de Cultura from Independentei Square
I.16 - taxation of cars passing through a „protected ring" in the city's center	-	-	-	Tax/veh x veh. number It is proposed a tax of 1 EUR/veh./entry in the protected area*	Traffic decrease = 14-23% Emissions decrease = 10–15% Accidents decrease = 5-10%	*The correspondent of 2 trips by public transport

Tab. II.20 – Estimation of revenues and costs of proposed measures

Measures	Physical unit	Unit cost	Total cost	Revenues	Benefits	Observations
I.17 - modification in starting hours of the economic agents activity situated on the same street or in the same point – marginal – of destination	-	-	-	-	Reduce the number of trips at peak hours and the externalities	
I.18 - parking spaces on public domain and which are „given" to some economic agents (in order to be used by their employees): with payment done to economic agent	-	-	-	Parking tax/veh. veh. no. It is proposed a tax of 0,5 EUR/veh./day*	Reduce the number of trips at peak hours and the externalities	*Corespondentul unei calatorii cu TP
I.19 – tickets to concerts, sport events etc. should include the price of two trips by public transport - to be given the right to travel	-	-	-	No. of shows x audience x round ticket price	Reduce the number of trips by private car and the externalities Increase the number of PT passengers	
I.20 - the development of a center equipped with a management traffic system in the city	1 buc.	1.000.000 euro	1.000.000 euro	-	Ease traffic and reduce the externalities The decrease of time for transport The decrease of operational costs	Depending of monitored area this value can be modified
I.21 - introduce a „no car day" (monthly)	-	-	-	Crestere cu 1,5% a veniturilor/luna	Increase the number of PT passengers and reduce the externalities	Instead of every stationary car it is consider a trips by PT

Tab. II.20 – Estimation of revenues and costs of proposed measures

Measures	Physical unit	Unit cost	Total cost	Revenues	Benefits	Observations
II.2 - to analyze the possibility of implementing of a system type „city-vignette" in a central area of the city	-	-	-	The price of city-vignette/year x veh. no. 300 EUR/year x no. of freight vehicles	Ease traffic and reduce the externalities The decrease of time for transport The decrease of operational costs	The price for city-vignette is recommended to be as much as the price of vignette for national road
II.3 - establish a working group formed by municipal institutions and freight transport operator in order to organize on days and neighborhoods the freight transport activity in the city area	-	-	-	-	Ease traffic and reduce the externalities The decrease of time for transport The decrease of operational costs	
III.1 - the reducing of private car use	-	-	-	The increase with 5-10% the revenues of SC OTL SA	Ease traffic and reduce the externalities The decrease of time for transport The decrease of operational costs	
III.2 – public transport development budgeting	-	-	-	-	The increase of PT passengers	The increase of subsidy with 2% every year
III.5 - it is recommendable to modify the opening & closing times of big stores	-	-	-	-	Reduce the number of trip at peak hours	

Tab. II.20 – Estimation of revenues and costs of proposed measures

Measures	Physical unit	Unit cost	Total cost	Revenues	Benefits	Observations
III.7 - an echeloned schedule for starting working hours in case of the companies	-	-	-	-	Reduce the number of trip at peak hours	
III.8 - creating the framework for tele-activities and teleworking development, including finding ways to reduce taxation for companies who practice tele-activities and teleworking	-	-	-	-	Reduce the number of trips and externalities	
IV.1 - purchase a medium capacity vehicle – an electrical vehicle – initiating an ecumenical route inside the city	1 piece	250,000 EUR	250.000 euro	2 trips/day x 20 passenger/trip x 3 EUR/passengers x 365 days = 43,800 EUR/year	Promote the touristic objectives of Oradea	The trip between the 14 touristic objectives is fixed to 50% of corresponding number of trips (approx.. 3EUR)
IV.3 - local authority straight actions to remove any obstacles on the sidewalks or on the rest of paths needed for pedestrians mobility	-	-	-	-	Reduce the number of trips by private car and the externalities	
V.1 - new pedestrian areas	6 km	100,000 EUR	600.000 euro	-	Reduce the number of trips by private car and the externalities	
V.2 - rehabilitation of tram railways (in the same time with grassing of the embankment)	2,5 km double line	300,000 EUR	1.500.000 euro	-	Reduce the pollution and improve the city's landscape	

Tab. II.20 – Estimation of revenues and costs of proposed measures

Measures	Physical unit	Unit cost	Total cost	Revenues	Benefits	Observations
V.3 - street infrastructure rehabilitation	60 km	600,000 EUR	36,000,000 EUR	-	Ease traffic and reduce the externalities	
V.5 - public transport fleet renewal	10 trams 10 mini buses 3 articulated buses	2,750,000 EUR 80,000 EUR 250,000 EUR 300,000 EUR	30,450,000 EUR	-	The increase of PT passengers and reduce the externalities	
V.7 - carrying out punitive actions against polluters	-	-	-	-	Reduce the emissions and noise	
V.8 - purchase non-euro vehicles – extra charged	-	-	-	-	Reduce the emissions and noise	
VI.1 - definitively settle (long term – 20-30 years) of Oradea ring road	60 km	2,000,000 EUR	120,000,000 EUR	-	Ease traffic and reduce the externalities	
VI.3 – correlated projects to ensure the utilities in every neighborhood	-	-	-	-	Reduse the number of trips and externalities	
VI.4 - the necessity to create a unit – construction – infrastructure for motorized and non-motorized access and green area (for every new building/construction)	-	-	-	-	Ease traffic and reduce the externalities The decrease of time for transport The decrease of operational costs	

Tab. II.20 – Estimation of revenues and costs of proposed measures

Measures	Physical unit	Unit cost	Total cost	Revenues	Benefits	Observations
VI.6 - systems of incentives for placing the new schools, healthcare centers, commercial centers etc. within residential neighborhoods or close to them	-	-	-	-	Redu ce the number of trips and the externalities	
VII.1 - local authority should provide new regulations on parkings which to reduce the possibilities to park on the streets	-	-	-	-	Ease traffic and reduce the externalities The decrease of time for transport The decrease of operational costs	
VII.2 - restructuring of parkng system (by introducing a progressive payment type, distinctiv on peak hours and off peak hours and even on target groups – for example for the small capacity vehicles the tax could be more reduced)	-	-	-	-	Reduce the number of trips and the externalities	
VII.3 - allocation – in case of institutions subordinate to local authority – of the parking spaces for their employees on the principle of the distance from employee’s residence	-	-	-	-	Reduce the externalities	

Tab. II.20 – Estimation of revenues and costs of proposed measures

Measures	Physical unit	Unit cost	Total cost	Revenues	Benefits	Observations
VII.4 - regulate the „park and ride" transport system	6 pieces	2,000,000 EUR	12,000,000 EUR	Parking tax x number of spots 1 EUR/day x 3000 veh. x 365 days = 1,095,000 EUR/year	Ease traffic and reduce the externalities The increase of PT passengers The decrease of time for transport The decrease of operational costs	
VIII.1 - SC OTL SA has to make a plan for design, redesign and improve the general infrastructure and trams infrastructure	2 km double line	800,000 EUR	3,200,000 EUR	-	Reduce the externalities	
VIII.3 - periodical analysis of „becoming black spots" from the SC OTL SA perspective	19 intersections *	-	1,000,000 EUR	-	Reduce the number of accidents and externalities	* Intersections where is likely to occur blocks and accidents
IX.1 - completion of a network of bicycle routes which will include Oradea Metropolitan Area	42 km	30,000 EUR	1,260,000 EUR	-	Reduce the number of trips by private cars and the externalities	

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Tab. II.20 – Estimation of revenues and costs of proposed measures

Measures	Physical unit	Unit cost	Total cost	Revenues	Benefits	Observations
IX.2 - promote a program of re-construction the elements of streets infrastructure (streets widening, modification of curves radius, modification of intersections geometry in order to increase the public transport service operation etc.)	6 passages	5,000,000 EUR	30,000,000 EUR	-	Ease traffic and reduce the externalities	
IX.3 - the development of several projects that aim to enhance the capacity of main network of streets – starting with streets that now have the lowest capacity to take vehicles flows	20 km	1,000,000 EUR	20,000,000 EUR	-	Ease traffic and reduce the externalities The decrease of time for transport The decrease of operational costs	
X.1 - removal of the tramway section from Iosia Sud Neighborhood - which, given the neighborhood's specific , does not justify the public transport by tram	-	-	-	The increase of revenues of SC OTL SA	The increase of PT passengers	
X.3 - Oradea Municipality Administration has the obligation to recalculate periodically the compensation of public urban transport - SC OTL SA	-	-	-	-	Adapting compensation to the real situation of persons receiving facilities in PT	

Tab. II.20 – Estimation of revenues and costs of proposed measures

Measures	Physical unit	Unit cost	Total cost	Revenues	Benefits	Observations
X.5 - it has to enhance the efforts for increase transports regularity and even the public transport vehicles punctuality – according to schedules	-	-	-	-	Reduce the time of trips and increase the confidence in public transport system	
X.6 - it is necessary to ensure the second access to trams depot; in the same vein: it is to consider a "shed" for trams in order to reduce the travel distances for the withdrawn trams at the end of the peak hours	400 m	600,000 EUR	600,000 EUR	-	The decrease of operational costs	
X.7 - it can be obtained a higher elasticity in public transport operation if it will be done the third "triangle" which to serve Line 2	1,6 km	1,000,000 EUR	1,600,000 EUR	-	The increase of electric public transport competitiveness (tram)	
X.8 - from the point of view of efficiency, the main route which can be served by a tram line is between the point of intersection of tram line 2 with central ring and the second access of depot	2 km double line	1,100,000 EUR	4,400,000 EUR	-	Reduce the externalities	
X.9 - SC OTL SA has to redo the schedule for public vehicles so as the intervals at peak hour to reach 7-8 minutes between the vehicles of the same line/route	-	-	-	-	Reduce the time of trips by reducing the waiting time	

Tab. II.20 – Estimation of revenues and costs of proposed measures

Measures	Physical unit	Unit cost	Total cost	Revenues	Benefits	Observations
X.10 - local authority has the obligation to tax at the lowest level the vehicles of SC OTL SA	-	-	-	-	-	Venituri mai scazute pentru primarie si mai mari pentru SC OTL SA cu aceeasi diferenta
X.11 - SC OTL SA has to take into account the purchase of mobile means with high access possibilities (by different capacities, with low floors etc.)	Min. 10% of fleet mentioned at V.5	-	3,450,000 EUR	-	Increase the accessibility of PT vehicles	
X.12 - general interests of the citizens – not those specific to a part of the citizens – request to reassess the gratuity award system for retirees (the gratuity may be a right but using this for the time during students are traveling by public transport can not be tolerated)	-	-	-	-	Improve the quality and accessibility of PT services	
X.14 - SC OTL SA has to make a project proposal for the first lanes dedicated to public transport	-	-	-	-	The decrease of operational costs The decrease of operational costs and costs of accidents	
X.15 - it is recommended to initiate a project for modern boarding-unboarding stations (to standardize – to customize these contact points between the public transport operator and the public)	285 stations	12,000 EUR	3,420,000 EUR	-	Improve the comfort, quality and attractiveness of PT services	

Tab. II.20 – Estimation of revenues and costs of proposed measures

Measures	Physical unit	Unit cost	Total cost	Revenues	Benefits	Observations
X.17 - it is necessary a new public transport regulations (which to envisage also rewarding the loyal passengers)	-	-	-	-	Improve attractiveness of PT services	
X.18 - it has to be introduced and then generalized express transport system (or maxi-taxi), in the same time with normal routes	-	-	-	-	Reduce the time of trips Improve the quality and attractiveness of PT services	
X.19 - it is necessary to redesign the bus routes so as to be excluded the parallelism of the two modes of transport	-	-	-	-	The decrease of time for transport The decrease of operational costs Increase the quality of PT services	
X.20 - in line with the above objective: it is necessary to reconsider the set of public transport stations for boarding and unboarding	-	-	-	-	The decrease of time for transport Improve the quality and attractiveness of PT services	
X.21 - take into consideration the possibility to implement the transport system by trolley	10 pieces 8 km	300,000 EUR 500,000 EUR	7,000,000 EUR	-	Reduce the externalities	

Tab. II.20 – Estimation of revenues and costs of proposed measures

Measures	Physical unit	Unit cost	Total cost	Revenues	Benefits	Observations
X.22 - it is necessary that some of the trams lines to be transform in light rail lines	5,25 km	750,000 EUR	3,937,500 EUR	-	Reduce the time of trips and the number of accidents	
X.23 - in order to make profitable the SC OTL SA activity, it should be defined the threshold between social transport and solitary transpor	-	-	-	-	-	Increase of management quality, support of developing the decisions with impact on improvement of PT quality service
XI.2 - prepare a program of transport service for peri-urban area (particularly to Băile Felix and Băile 1 Mai resorts but also to Borş – link with European Western)	-	-	-	-	Ensure the interoperability of urban public transport and peri-urban transport, PT by rail and PT by road Reduce the time of trips	
XI.5 - analyze the possibilities to standardize the payment into a single pass for urban trips in combination with peri-urban trips	-	-	-	-	Improve the quality and attractiveness of PT services	
XI.6 - it should be necessary to be rethought the granting systems of transport licences for peri-urban area and even county area – in order to have the obligation to use as arrival and departure in/from oradea only the bus - stations – to strictly forbid the public transport of passengers within the city	-	-	-	-	Improve the quality and attractiveness of PT services Ease traffic and reduce the externalities Reduce time of trips Reduce operational costs	

Tab. II.20 – Estimation of revenues and costs of proposed measures

Measures	Physical unit	Unit cost	Total cost	Revenues	Benefits	Observations
XI.7 - actions and rules against „piracy" (unauthorized urban public transport by private cars) on urban transport market	-	-	-	-	Improve the quality and attractiveness of PT services	Increase of revenues and a higher percentage of revenues obtained form PT service operation.
XI.8 – it should be introduce a tax / fee – contribution of the non-local transport operators in order to cover the costs of maintenance the boarding-unboarding stations used by them	-	-	-	-	-	
XI.9 - remove the taxi stations near to boarding-unboarding stations of SC OTL SA	-	-	-	-	Improve the quality of PT services and increase the number of passengers	
XII.1 - central railway station modernization so as the transition from railways system to roads system to represent an action of establishing a intermodal hub of maximum importance; same for Nufărul node	3 intermodal stations	1,000,000 EUR	3,000,000 EUR	-	Reduce the time of trips Improve the quality and attractiveness of PT services Ensure the intermodality of urban PT with suburban transport and regional transport, respectively with transport by rail	
XII.3 - organize the public transport program performed by public transport operator in accordance with the rail and air transport program	-	-	-	-	Reduce the time of trips Improve the quality and attractiveness of PT services Ensure the intermodality of urban PT with suburban transport and regional transport, respectively with transport by rail	

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The strategy used by cities that are in the second or third edition of SUMP included a mix of measures, different from case to case, but in all cases to the concrete actions have been initiated with the most "profitable" - which create at least a revolving fund for the actions that consume money.

In order to group in the most effective way the proposed measures, we reffered on the European experience in the field. The Institute for Transport Studies Leeds, UK developed a specialized software that comes to help those who want to propose and implement measures to increase mobility. KONSULT software that can use the internet address http://www.konsult.leeds.ac.uk (recommended program and guide for the preparation SUMP), offers a hierarchy of measures based on the involved costs.

In Annex 26 is found, besides framing of INCERTRANS proposed measures in the list of tools of KONSULT, and estimation of costs for each of these measures (high, medium, low, neutral).

In Annex 27 are identified combinations of measures to ensure effective and which support each other to overcome financial barriers, acceptability etc., grouped on three and disaggregated on measures of support, consolidation and reinforcement.

Assumptions were:
- it was given a great importance to reduce congestion, CO_2 emissions and pollution, increase accessibility to key services and confidence in public transport, increase safety, development of walking and cycling;
- it was given a great importance for strategies of reducing the need for travel by personal vehicle, to improve the utilization of space and public transport and an important medium for the transport of goods.

For support measures it can be seen that the best score is recorded by the measures to develop dedicated public transport lanes and "park & ride" parking supported by charging infrastructure.

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Moreover, the most successful combinations of measures, with the highest efficiency and provide the best value for their money are those that contain at least one measure that brings money. The following positions are occupied by combinations containing measures to improve public transport services, the introduction of express bus lines and bike tracks.

On the opposite side there is a combination that includes the introduction of dedicated lanes, improving public transport and making traffic management system, all three groups of measures involving average costs.

For streghthening measures the best score is obtained by the combination: light rail input, removing blackspots, supported by taxing private parking, respectively the progressive taxation of public parking.

At the opposite side there is a combination that includes the introduction of bicycle parking, improving public transport and flexible transport urban areas, all three groups of measures involving average costs.

For reinforcement measures best score is obtained by the combination: intermodal hubs, means of traffic calming and lower fares.

At the opposite side there is a combination that includes regulations that limit operators' activity, pedestrian crossing facilities, management of fleet, all three groups of measures involving high costs.

As discussed above, the most effective package and that take into account and making best use of financial resources, are given below:

Tab. II.21 – Effective packages of measures

Packages of measures	Measures that require financial effort	Measures neutral form financial point of view	Measures that bring money
a) Support measures			
Package 1	VII-4	X-14, VI-1, VI-4, III-5	I-16, II-2, X-12, XI-7, XI-8
Package 2	IV-1, X-15	X-10	
Package 3	IX-1, I-14, IX-3, I-20	I-9, II-3	
Package 4	X-6, X-7, X-8	I-3, I-11, X-17	
b) Strenghthening measures			
Package 1	X-22, V-3, V-1, I-7, IX-2	I-8	I-18, III-1, V-8, VII-2 X-18, X-19, XI-2
Package 2	VI-3	I-13, III-8, VI-6, VII-1	
Package 3	III-2, X-21	X-3	
Package 4	V-5, VIII-1	I-10, I-4	
c) Reinforcement measures			
Package 1	XII-1, I-15	I-1, I-2, I-17, III-7, IV-3, XII-3	I-12, I-21, V-7, X-23 XI-9
Package 2	V-2, X-1	X-20, VIII-3, XI-5, XI-6	
Package	X-11	VII-3, I-5, I-19, X-5, X-9	

6.4 Using synergies and prepare packages of measures

The word "synergy" has Greek origin, being formed from the word "syn" meaning "together" and the word "ergon" which translates to "work". In free translation "synergy" has the meaning of "result after joining and labor" and defines the **enhanced effect that can be achieved by simultaneous action of several elements**[78].

Customizing the case under analysis, we can distinguish several categories of synergy:

- physical synergy: is the effect on the overall level resulting from the simultaneous action of several components on the substance or field;

[78] Note that mathematical laws do not apply to synergy.

• economic synergy: measuring the effects of different values of output in relation to the effects of the value of inputs in the production process or the provision of services.

• psychological synergy: the realities of the material world gathers impact on behavior (ie in the world of ideas);

• social synergy: private aggregation of human crowds depending on size and context leads to results, instant or duration, impossible to obtain by separating people from each other.

The set of connections that are established intentionally or not, between the various economic and social activities, form a dense and complicated network whose elements are associated, resulting in accumulation and amplification of expected effects, and the occurrence of unpredictable, with passage of time, all these determine a multitude of other changes with predictable consequences or not. It is important to anticipate these consequences as well as to stimulate the production effects and consequences friendly and at the same time, to avoid the possible unfavorable. Occur inevitably questions:
"How or higher the does the power grow, respectively the effect of simultaneous action of two or more measures that work together? "...
"Does the effect of simultaneous action" will be equal to the sum of two or more "effects" that have associated? Will be lower ...? It will be higher ...? ...

The concept of synergy helps to establish **a new type of approach of the management** able to develop a whole treatment in complex decision-making processes. Complex decision-making processes oriented on synergy take into consideration the "optimal combination" of functions and individual effects of each component of an assembly to achieve greater effect than the sum of the effects of the components.

More specifically, not the effects of combinations of elements that complete each other have to constitute the objective of a complex decisions, but follow the optimal integration of the components and relationships in a system so as to achieve effects (results) maximum favorable. Oriented decisions should seek synergistic positive effect amplified after simultaneous action of several factors, so that the effect produced is greater than the sum of the effects of each factor

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separately. For example, in Annex 25 which contains the matrix of 25 indicators / 95 possible measures be reviewed the following items:

E = **length of dedicated lanes for public transport network to all the main streets**. It can be seen that for this indicator are incident 18 of the 95 measures:

I-9 establish the legal conditions, and also the development of dissemination events regarding systems of using private car: car-sharing and car-pooling (including tax breaks for companies that rents and declares object of activity this activity).

I-10 SC OTL SA must initiate action in cooperation with the passengers of public urban transport, respectively regular meetings with amateur drivers;

I-18 parking spaces on public domain and which are „given” to some economic agents (in order to be used by their employees): with payment made by the economic agent to municipality;

I-19 tickets to concerts, sport events etc. should include the price of two trips by public transport - to be given the right to travel;

III-1 the reducing of private car use (through pricing policy and awareness);

III-2 the budgeting of public transport development;

VI-2 the development of green networks (the upper level of green spaces);

VII-1 the municipality should develop a new parking regulation to reduce the possibility of parking on the street/carriageway;

VIII-1 SC OTL SA has to elaborate a plan for design, redesign and implement the rehabilitation works for city’s trams infrastructure;

IX-2 promote a program of reconstruction of some elements of streets infrastructure (widening of streets, changes of radius curves, modification of intersection geometry in order to increase the level of service etc.);

X-4 organize the regular bicycle competitions (especially in areas where public transport gets more difficult);

X-11 SC OTL SA has to aim the purchase of vehicles with enhanced access possibilities (of different capacities, with low floor etc.);

X-14 SC OTL SA needs to develop a proposal to allow emergence of the first public transport lanes;

X-18 it has to be implemented and then generalized the transport system by express lines (or maxi-taxi) along normal lines;

X-19 it is necessary to redesign the bus lines in order to exclude the redundancy/parallelism between the two modes of transport;

X-21 take into consideration the possibility to implement the transport system by trolley;

X-22 it is necessary that some of the trams routes to become light rail routes;

XI-1 high qualitative demands for public transport operators that participate to auctions for peri-urban routes.

OBVIOUS BY THE ITS CONTENT X-14 IS ESSENTIAL DEDICATED LANES EMERGENCE.

Prognosis of direct impact leads to situation no. 1: commercial speed means of public transport vehicles should increase substantially and easily. But without VII-1 the streets will become more "narrow" from the perspective of many people who do not use public transport; due to these facts congestion will increase and at the intersections of streets the waiting time of public transport vehicles could negativ compensate the time gained on the section with dedicated lanes.

FINDING: IT IS NOT SURE THAT THE ONLY X-14 WILL BRING THE IMPROVEMENT OF MOBILITY

Prognosis of direct impact leads to situation no. 2:

- without (new) modern vehicles the dedicated lanes could be useless (difficult mobility of SC OTL SA’s vehicles or stationary which actually abolish the dedicated lanes).
- the absence of transport lines which to allow superior speeds, the gains of commercial speed will be insignificant.

FINDING: THE MEASURES III-2 and X-18 INTRODUCE THE SYNERGY WHEN THEY ARE ASSOCIATED WITH MEASURES X-14 AND VII-1

Nevertheless, in the situation in which education lacks nor the 3 mentioned measures will not achieve their full potential, as amateur drivers may not follow the rules concerning dedicated lanes so that, the effort involved by the implementation of the 3 measures can be counterproductive.

FINDING: MEASURES I-10 AND III-1 BRING THE SYNERGY BACK ON A POSITIVE PATH

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Resuming: streets narrowing is still an undesirable effect, the right premise is that the way for public transport can not be “cleaned” to the detriment of other road users. Therefore, it should be considered the measures:

- active: VIII-1, IX-2, X-19
- passive: I-18, I-19, VI-2

Prognosis of circumstantial impact leads to situation no. 3: the municipality can not assign the issue of dedicated lanes to be solved only by the public transport operator and amateur drivers; therefore creating the conditions for measures I-9, X-4 and XI-1 is an obligation before a full acceptance of dedicated lanes.

FINDING: SYNERGY HAS TO BE SUPPORTED BY THE MEASURES AT THE SECOND LEVEL ON INTERVENTION = I-9, X-4 AND XI-1

The goal being reached – that means the emergence of dedicated lanes on bus routes – the common sense measure would be to create conditions for disabled (on the routes with dedicated lanes the buses with low floor can operate without impediments in general traffic – taking into account that the stationary for boarding and unboarding for this type of bus is greater).

IN A EXHAUSTIVE WAY THE SYNERGY IS PLENARY ALSO BY IMPLEMENTING OF X-11 MEASURE.

At the end of exemplification: matrix 25/95 revealed a heterogeneous synergistic potential:

- from dozens of measures that are potentially in situation of "one to support the other" – as in the case of the above „E” indicator
- up to a few measures in synergy

and therefore, further analysis should include a synthesis of the possibilities to achieve the synergy ESPECIALLY THE ORADEA MUNICIPALITY OBVIOUSLY WILL BE ALBE TO SUPPORT ONLY FEW MEASURES PROPOSED BY INCERTRANS.

In addition, also time factor (exactly the „moment” factor) is a very important benchmark (IN MEASURES IMPLEMENTING) because it should be considered the start of implementing -

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sometimes simultaneously, sometimes successive – of the actions, so achieving the optimal level of integration of possible favorable effects, namely the period after that the maximum synergy potential occurs has to correspond to the objectives (taking into account the dynamic of the influence of the components and socio-economic conjuncture and even political).

The estimation of the synergetic effects due to the adoption of measures depends on the time factor, but also by many other factors that can not be controlled, fully measured or predicted, leading to situations of uncertainty and risk.

In function, even being considered as program THE SYNERGY EFFECTS WILL NOT BE ABLE TO BE NEITHER QUANTIFIED OR PREDICTED because the fuzzy[79] character in which is developed a plan of measures (of SUMP dimension), only the resust being abele to be analyzed in a three dimensional space consists of:

- the functional areas involved (administration, finance, marketing, the benefit);
- the types of synergies involved (management, investments, benefits, a social life);;
- the extent and intensity of synergistic potential on which base are made the appreciations in the form of marks, symbols or sometimes numerical value estimated.

As an aside for SUMP implementation: studies and analyzes led to the conclusion that the marketing has the greatest potential synergistic! As marketing will show more professionalism in "selling" ideas of sustainable mobility, the lower the risk of wrong decisions is and it can be provided a higher level of synergy in the implementation SUMP. Taking into consideration the synergistic potential of each alternative decision and/or strategic, the level of this can be one of the criteria of selection of an alternative among the possible others. Therefore, according to the attribute of foresight, successful managers have the ability to distinguish the decisions they adopt to contribute to positive synergistic effects as large as possible and decrease negative synergistic effects that may occur.

[79] The fuzzy phenomena are more complex than probabilistic phenomena: while a probabilistic event is well defined, in study of fuzzy phenomenon event the nature of the event is unclear and thus its occurrence can be **VAGUELY** intuited.

Returning to the paragraph on synergy, conveniently grouping the 25 indicators has obtained a range of possible synergistic effects as follows:

(passengers public transport indicators – public urban or touristic opened)[80]

A. the total number of trips by public transport;
B. accessibility to public transport;
C. bus/tram routes (number, length, density, coverage);
D. electricity consumption in relation with fossil fuels consumption – in public transport;
E. length of lanes dedicated to public transport in relation with the entire network of streets;
F. the ration between total population and active fleet of public transport vehicles;
G. commercial speed of public transport vehicles at the time of peak hours;
H. the daily ending time for public transport;
I. cost on km in public transport;
J. the number of employees in the public transport company;

The simple synergy can be obtained by keeping in the package of actions the most of below measures:

I-18 = parking spaces on public domain and which are „given” to some economic agents (in order to be used by their employees): with payment done to economic agent;

X-23 = in order to make profitable the SC OTL SA activity, it should be defined the threshold between social transport and solitary transport;

XI-2 = prepare a program of transport service for peri-urban area (particularly to Băile Felix and Băile 1 Mai resorts but also to Borş – link with European Western);

XI-9 = remove the taxi stations near to boarding-unboarding stations of SC OTL SA;

80 ANTICIPATING THE “MONITORING” CHAPTER: GENERICALLY, THE MONITORING OF INDICATORS EVOLUTION IS ANTICIPATED TO BE MADE THROUGH THE ANALYSIS OF SC OTL SA REVENUES.

XII-1 = central railway station modernization so as the transition from railways system to roads system to represent an action of establishing a intermodal hub of maximum importance; same for Nufărul node;
XII-3 = organize the public transport program performed by public transport operator in accordance with the rail and air transport program;

(indicators regarding sustainable development)[81]

K. the rate of motorization in the city;
L. the number of parking places (inclusive the residential spaces);

The simple synergy can be obtained by keeping in the package of actions the most of below measures:
I-19 = tickets to concerts, sport events etc. should include the price of two trips by public transport - to be given the right to travel;
VII-3 = allocation – in case of institutions subordinate to local authority – of the parking spaces for their employees on the principle of the distance from employee's residence;
X-17 = it is necessary a new public transport regulations (which to envisage also rewarding the loyal passengers);

(indicators regarding alternative transport)[82]

M. Routes for bicycle (length, density, percentage in the total network of streets) –– separately for isolated (independent, which are not connected with other) bikes tracks, respectively for the entire network of bikes tracks;

N. The number of bikes rental points;

[81] ANTICIPATING THE "MONITORING" CHAPTER: GENERICALLY, THE MONITORING OF INDICATORS EVOLUTION IS ANTICIPATED TO BE MADE THROUGH THE ANALYSIS OF THE EVOLUTION OF MOTORIZATION RATE OF CITY'S POPULATION.

[82] ANTICIPATING THE "MONITORING" CHAPTER: GENERICALLY, THE MONITORING OF INDICATORS EVOLUTION IS ANTICIPATED TO BE MADE THROUGH THE ANALYSIS OF THE EVOLUTION OF KILOMETERS OF BYKE TRACKS.

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Capital Social: 3.297.325 RON
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The simple synergy can be obtained by keeping in the package of actions the most of below measures:

I-2 = systematically educational measures in schools – in the idea of a sustainable development culture;

(indicators regarding sustainability for urban area)[83]

O. kilometers of new built or rehabilitated streets;

P. square kilometers of city's borders extension (time horizon: 20-30 years);

Q. development of built areas versus green areas (square metters/square meters);

The simple synergy can be obtained by keeping in the package of actions the most of below measures:

I-3 = to activate and stimulate the activity of department working with citizen's associations (regular meetings organization);

I-11 = it would be recommendable that local authority to develop a regulation that not only to allow the public presence but to ensure the public presence in the decisions regarding the community;

(indicators regarding to congestion – general traffic and pollution)[84]

R. the hourly traffic on the street with the highest level of traffic flows;
S. the level of noise at the time of peak hours for the street with the highest level of traffic flows;
T. the level of emissions and dust at the peak hours on he street with the highest level of traffic flows;

[83] ANTICIPATING THE "MONITORING" CHAPTER: GENERICALLY, THE MONITORING OF INDICATORS EVOLUTION IS ANTICIPATED TO BE MADE THROUGH THE ANALYSIS OF THE EVOLUTION OF REHABILITATED OR BUILT STREETS KILOMETERS.

[84] ANTICIPATING THE "MONITORING" CHAPTER: GENERICALLY, THE MONITORING OF INDICATORS EVOLUTION IS ANTICIPATED TO BE MADE THROUGH THE ANALYSIS OF THE EVOLUTION OF HOURLY TRAFFIC ON THE MOST REQUESTED ARTERY OF THE CITY.

The simple synergy can be obtained by keeping in the package of actions the most of below measures:

I-8 = prepare technical and commercial framework for bicycle transport in public transport vehicles;

I-10 = SC OTL SA has to initiate cooperation actions with public transport passengers and regular meetings with amateurs drivres;

I-21 = introduce a „no car day" (monthly);

II-2 = to analyze the possibility of implementing of a system type „city-vignette" in a central area of the city;

III-7 = an echeloned schedule for starting working hours in case of the companies;

IV-3 = local authority straight actions to remove any obstacles on the sidewalks or on the rest of paths needed for pedestrians mobility;

V-7 = carrying out punitive actions against polluters;

V-8 = purchase non-euro vehicles – extra charged;

VIII-1 = SC OTL SA has to make a plan for design, redesign and improve the general infrastructure and trams infrastructure;

X-19 = it is necessary to redesign the bus routes so as to be excluded the parallelism of the two modes of transport;

XI-6 = it should be necessary to be rethought the granting systems of transport licences for peri-urban area and even county area – in order to have the obligation to use as arrival and departure in/from Oradea only the bus - stations – to strictly forbid the public transport of passengers within the city;

(indicators related to direct progress)[85]

U. the ration between the medium salary and the price of trip (separately for the trip made based on ticket, respectively based on transport card);

VW. the price of a parking hour in relation with the price of a 5 km trip made by public transport;

[85] ANTICIPATING THE "MONITORING" CHAPTER: GENERICALLY, THE MONITORING OF INDICATORS EVOLUTION IS ANTICIPATED TO BE MADE THROUGH THE ANALYSIS OF THE EVOLUTION OF A PRKING HOUR REPORTED TO THE PRICE OF A TRIP OF 5 KM BY PUBLIC TRANSPORT.

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Capital Social: 3.297.325 RON
Nr. Registrul Comerţului: J40/17093/1993 – Cod Înregistrare Fiscală: RO4282451
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WX. the necessary time for a trip by public transport vehicles in relation with average time to travel the same distance by private car;

The simple synergy can be obtained by keeping in the package of actions the most of below measures:

I-16 = taxation of cars passing through a „protected ring" in the city's center;

(indicators related to indirect progress)[86]

Y. the delinquency level of the city;

Z. Z. the freight traffic in the city's area (from the perspective of: number of transport authorizations and estimation regarding tonnes*km/day).

There weren't identified measures which to conduct to simple synergy – independently – only for this assembly of indicators.

Below are complex synergies obtained through the correlation of more assemblies of indicators.

(indicators regarding passengers public transport) +
(indicators regarding general traffic) +
(indicators related to direct progress)

III-1 = the reducing of private car use;

III-2 = public transport development budgeting;

(indicators regarding alternative transport) +
(indicators regarding general traffic) +
(indicators related to direct progress)

VII-1 = local authority should provide new regulations on parkings which to reduce the possibilities to park on the streets;

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[86] GENERICALLY, THE MONITORING OF EVOLUTION OF THIS INDICATORS ASSEMBLY IT IS ANTICIPATED TO BE DONE BY THE ANALYSIS OF EVOLUTION OF TONNES*KM TRANSPORTED GOODS PER DAY IN CITY'S AREA

(indicators regarding sustenability for urban area) +

(indicators regarding general transport) +

(indicators related to indirect progress)

I-13 = maps for spreading of main utilities in the city (the next implants will be done only based on the equal spread in territory principle);

(indicators regarding passengers urban transport) +

(indicators regarding general traffic)

I-12 = elaborate a provisions concerning transit through the city - after the completion of works to city's ring and to street which ensures the link between the villages without passsing through the city);

V-5 = public transport fleet renewal;

X-3 = Oradea Municipality Administration has the obligation to recalculate periodically the compensation of public urban transport - SC OTL SA;

X-21 = take into consideration the possibility to implement the transport system by trolley;

X-22 = it is necessary that some of the trams lines to be transform in light rail lines;

(indicators regarding passengers public transport) +

(indicators regarding alternative transport)

X-18 = it has to be introduced and then generalized express transport system (or maxi-taxi), in the same time with normal routes;

(indicators regarding alternative transport) +

(indicators regarding general traffic)

I-1 = electronically payment systems;

I-4 = information campaigns on innovations in administration system that reduce the number of travels for citizens to administrative institutions;

I-7 = set up bicycle parkings;

I-9 = regulate and promote car-sharing and car-pooling (including tax incentives for rental companies which declares as an activity object these activities);

V-1 = new pedestrian areas;

VII-2 = restructuring of parkng system (by introducing a progressive payment type, distinctiv on peak hours and off peak hours and even on target groups – for example for the small capacity vehicles the tax could be more reduced);

(indicators regarding sustenability for urban traffic) +

(indicators regarding general traffic)

VI-4 = the obligation to make a tandem building, infrastrucutre for motorized access, unmotorized and green area (for every new construction);

IX-2 = promote a program of re-construction the elements of streets infrastructure (streets widening, modification of curves radius, modification of intersections geometry in order to increase the public transport service operation etc.);

(indicators regarding sustenability for urban traffic) +

(indicators regarding indirect progress)

VI-6 = systems of incentives for placing the new schools, healthcare centers, commercial centers etc. within residential neighborhoods or close to them;

(indicators regarding general traffic) +

(indicators regaridng direct progress)

V-3 = streets infrastructure rehabilitation.

(indicators regarding general traffic) +

(indicators regarding indirect progress)

III-8 = creating the framework for tele-activities and teleworking development, including finding ways to reduce taxation for companies who practice tele-activities and teleworking.

In the below table there are summarized the information regarding to specified measures:

Tab. II.22 Full package of measures

	Measures to the level of local authority			Measures to the level of SC OTL SA		
	Support measures	Strenghtening measures	Reinforcement measures	Support measures	Strenghtening measures	Reinforcement measures
	alfa measures	beta measures	gama measures	alfa measures	beta measures	gama measures
Measures that bring money	I-16, II-2, X-12, XI-7, XI-8	I-18, III-1, V-8, VII-2	I-12, V-7, XI-9	-	X-18, X-19, XI-2	I-21, X-23
Measures without money	I-3, I-9, I-11, II-3, III-5, VI-1, VI-4, X-10	I-4, I-8, I-13, III-8, VII-1	I-2, I-17, I-19, III-7, IV-3, VII-3, XI-5, XI-6	X-14, X-17	I-10	I-5, X-5, X-9, X-20, XII-3
Measures that require money - financial effort being moderated	**-**	**I-7, III-2, V-1, VI-3, VI-6**	**I-1, I-15, VIII-3, XII-1**	**IV-1**	**-**	**V-2, X-11**
Measures that require money - financial effort is considerable	**I-14, I-20, VII-4, IX-1, IX-3, X-8, X-15**	**V-3, IX-2, X-3, X-21, X-22**	**X-1**	**X-6, X-7**	**V-5, VIII-1**	**-**

- red: "heuristic[87]" measures = measures for which there was no need to examine whether if they manage to enter in synergistic relationship with other measure, because their impact is so important so as their elimination questions the success of the SUMP
- blue: measures that ensure a level of synergy just for some of the grouped indicators under the title = simple synergy
- green: measures that ensure a level of synergy for all the indicators grouped under the title = complex synergy
- black: in this case could not be identified the context in which it can be possible to ensure the synergy = "no synergy" measures

In the intention to highlight the usefulness of the information contained in the above table should be highlighted, once again, the conclusion - based on the experience of other cities, but also common sense - that there is a set of 10 measures that create the basis for discussion for the

[87] Measures of experience, common sense measures.

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Capital Social: 3.297.325 RON
Nr. Registrul Comerţului: J40/17093/1993 – Cod Înregistrare Fiscală: RO4282451
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final list of feasible measures (with all that is this notion: necessary, appropriate, effective, sustainable, efficient, manageable) - see section 6.1[88].

BY USING THE INFORMATION OF SUMP GUIDELINES IT CAN BE SEEN:

- measures that are suitable to be introduced in the package of measures for traffic decongestion (and for the general traffic):
  I-20 = he development of a center equipped with a management traffic system in the city;
  IX-3 = the development of several projects that aim to enhance the capacity of main network of streets – starting with streets that now have the lowest capacity to take vehicles flows.
  I-14 = improving some streets (planning and funding) and changing their classes into upper classes – possibly with one-way traffic – in order to increase the traffic capacity;
- measures that are suitable to be introduced in the package of measures in order to obtain superior conditions for public urban transport system:
  IV-1 = purchase a medium capacity vehicle – an electrical vehicle – initiating an ecumenical route inside the city;
  X-6 = it can be obtained a higher elasticity in public transport operation if it will be done the third “triangle” which to serve Line 2;
  X-7 = it is necessary to ensure the second access to trams depot; in the same vein: it is to consider a “shed” for trams in order to reduce the travel distances for the withdrawn trams at the end of the peak hours;
  X-8 = rom the point of view of efficiency, the main route which can be served by a tram line is between the point of intersection of tram line 2 with central ring and the second access of depot;
  X-15 = it is recommended to prepare a project of modern boarding-unboarding station (and to be customized these points of contact between public transport operator and the passengers);

[88] **NEXT, PART OF THIS MATERIAL REFERENCES SHALL BE MADE ONLY ON MEASURES INVOLVING FINANCIAL RESOURCES. ALL OTHER MEASURES - THAT CREATES RESOURCES OR ARE NEUTRAL IN THIS VIEW - ONLY DEPENDS ON POLITICAL WILL AND SHALL BE CONSIDERED ONLY AFTER BREAKDOWN PACKAGE OF MEASURES TO REQUIRE FINANCIAL RESOURCES.**

Str. Calea Griviţei Nr. 391-393, Sector 1, Bucureşti, Romania
Capital Social: 3.297.325 RON
Nr. Registrul Comerţului: J40/17093/1993 – Cod Înregistrare Fiscală: RO4282451
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- measures that are suitable to be introduced in the package of measures for sustainable development ensuring in the field of mobility:

  VII-4 = regulate the „park and ride” transport system.

- measures that are suitable to be introduced in the package of measures for alternative transport:

  IX-1 = completion of a network of bicycle routes which will include Oradea Metropolitan Area;

All these measures becoming MEASURES OF LEVEL ONE.

Continuing considerations related to the usefulness of the information contained in Table II.22, the 6 measures - which do not meet the conditions for obtaining synergy (at the level of groups of indicators) - are measures that can not miss in SUMP because their impact can not be substituted by presence of other measures: MEASURES OF LEVEL TWO.

- measures that are suitable to be introduced in the package of measures for increase the pedestrian safety and ease general traffic:

  I-15 = installing on ground passages or building underground passages for pedestrians on the streets with high flows of traffic – instead of crosswalks – where signaling / traffic lights programs is insufficient for combined flows vehicle-pedestrians;

  VIII-3 = periodical analysis of „becoming black spots” from the SC OTL SA perspective

- measures that are suitable to be introduced in the package of measures for reduce the passengers need for travel:

  VI-3 = correlated projects to ensure the utilities in every neighborhood;

- measures that are suitable to be introduced in the package of measures for obtaining superior condition for public transport service:

  V-2 = rehabilitation of tram railways (in the same time with grassing of the embankment);

  X-1 = removal of the tramway section from Iosia Sud Neighborhood - which, given the neighborhood's specific , does not justify the public transport by tram

  X-11 = SC OTL SA has to take into account the purchase of mobile means with high access possibilities (by different capacities, with low floors etc.).

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Capital Social: 3.297.325 RON
Nr. Registrul Comerţului: J40/17093/1993 – Cod Înregistrare Fiscală: RO4282451
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Next are THE MEASURES OF LEVEL THREE: those 11 measures of tab. II.22 – which are suitable to obtain complex synergy – there are **measures that will expedite new mobility within the city of Oradea**.

- measures that are suitable to be introduced in the package of measures for obtain superior conditions for public transport service:
  III-2 = public transport development budgeting
  V-5 = public transport fleet renewal;
  X-3 = Oradea Municipality Administration has the obligation to recalculate periodically the compensation of public urban transport - SC OTL SA;
  X-21 = take into consideration the possibility to implement the transport system by trolley;
  X-22 = it is necessary that some of the trams lines to be transform in light rail lines;
- measures that are suitable to be introduced in the package of measures for alternative transport:
  I-7 = set up bicycle parkings;
- measures that are suitable to be introduced in the package of measures in order to reduce the passengers need for travel:
  I-1 = electronically payment systems;
  VI-6 = systems of incentives for placing the new schools, healthcare centers, commercial centers etc. within residential neighborhoods or close to them;
- measures that are suitable to be introduced in the package of measures to reduce traffic congestion (and general traffic):
  IX-2 = promote a program of re-construction the elements of streets infrastructure (streets widening, modification of curves radius, modification of intersections geometry in order to increase the public transport service operation etc.);
- measures that are suitable to be introduced in the package of measures to reduce the pollution:
  V-1 = new padestrian areas;
  V-3 = street infrastructure rehabilitation.

Finally, as measures of LEVEL FOUR, can be considered measures of tab. II.22 – which are suitable to obtain simple synergy – there are **„auxiliary" measures**.

- measures that are suitable to be introduced in the package of measures in order to obtain superior conditions for public transport service:

  VIII-1 - SC OTL SA has to make a plan for design, redesign and improve the general infrastructure and trams infrastructure;
- measures that are suitable to be introduced in the package of measures to achieve intermodality:

  XII-1 = central railway station modernization so as the transition from railways system to roads system to represent an action of establishing a intermodal hub of maximum importance; same for Nufărul node.

Tab. II.23 The whole of packages of measures requiring financial effort[89]

	Measures to the level of local authority			Measures to the level of SC OTL SA		
	Support measures	Strenghtening measures	Reinforcement measures	Support measures	Strenghtening measures	Reinforcement measures
	alfa measures	beta measures	gama measures	alfa measures	beta measures	gama measures
package of measures to reduce congestion (and for the traffic, generally)	I-14, I-20, IX-3,	IX-2,				
package of measures to achieve better conditions for operating the public transport system	X-8, X-15	III-2, X-3, X-21, X-22	X-1	IV-1, X-6, X-7	V-5, VIII-1	V-2, X-11
package of measures to ensure sustainable development of mobility	VII-4,					
package of measures for alternative transport	IX-1,	I-7,				
package of measures to increase pedestrian safety (and fluidization traffic, generally)			I-15, VIII-3,			
package of measures to reduce the citizens' need of travel		VI-3, VI-6	I-1,			
package of measures to reduce pollution		V-1, V-3,				
package of measures to achieve intermodality			XII-1			

89 Although some measures are singular in the line that defines a package of measures after completing table that requires no effort finanaciar measures, the package will be upgraded: in tab. II.22 there are still 46 measures of all categories.

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Capital Social: 3.297.325 RON
Nr. Registrul Comerţului: J40/17093/1993 – Cod Înregistrare Fiscală: RO4282451
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Regarding the support of the incisiveness of these measures, INCERTRANS used the KONSULT program developed by Institute for Transport Studies, University of Leeds that can be reached at http://www.konsult.leeds.ac.uk (the program is recommended in SUMP Guidelines).

In Annex 29 there is the file which enabled the determination of measures efficciency (to obtain the necessary information for this annex it was prepare a sheet based on Konsult program in which tjhere were introduced the parameters required of the this program structure – see Annex 28). In sheet 1 are the results for the 46 measures of Konsult[90] in the conditions in which the choosing the structure for data input[91] has characterized one by one the directions set by the 12 objectives established as feasible for Oradea SUMP (I ... XII); columns B ... M of Sheet 1 indicate- by percentage - for each of the 46 measures of Konsult which is the rank on a scale from + 100 to - 100, where +100 represents the highest positive impact of the concerned measure on the mobility and - 100 is the lowest negative impact of the measure on mobility (eg:

- for the objective I = “reduce congestion, including reducing general traffic – roads traffic”,
- the measure “PT Focused Development = the development of public transport for passengers”
- will have an impact in changing some parameters of the mobility which are estimated to be +19,94%).

Further explanations will be focused on the „rows” contained by the above mentioned file (and at the end of this chapter will be presented the explanations on the „columns” contained by the file). First of all it can be found that 6 measures:

- Traffic Control Systems
- Parking control
- Management of freight fleet
- Information about the availability of parking
- Conventional signaling
- Panels with variable message for information

[90] It is a coincidence that the number of measures that do not require financial effort is identical to the number of measures considered by Konsult.
[91] These structures are in Annex 28.

are not found in the list proposed by INCERTRANS – in part because of the unusual – for Oradea city (eg. information about parking availability), in part because these measures exceed the previously established framework for Oradea SUMP (eg: the management of freight fleet).

Secondly, it was made a ranking of measures. This ranking resulted for the concrete conditions that characterize the 12 objectives. Konsult results were inserted in the 12 columns already mentioned B ... M and resulted in a list - column R - which highlights:

the fact that the 6 measures "neglected" by INCERTRANS are at the bottom of the ranking: 11, 17, 34, 36, 38, 42

the first 10 measures (taxation of road infrastructure, intelligent transport systems, the discipline of planning the spaces for buildings, the development of public transport for passengers, free or reduced tax in TP (pensioners, students, disabled), planning of the trips, park and ride, light rail, lower cost of the ticket, improvement of TP services, benefit of 31 of the 75 total of measures poposed by Incertrans, respectively 16 of those requiring financial resources.

In Sheet 2 is the calculation that quantifies the incisiveness of measures: AH column indicates that although not provided - single or multiple - all 46 measures, the result raises the efficiency of the measures to above 24% over the unjustified choice of all measures . In Sheet 3 is repeated the above calculation that quantifies the incisiveness just only for the measures which require financial effort: AH column indicates the result of measures efficacy to be more than 38% over the unjustified choice of all measures.

All other measures - not involving financial resources - ARE TAKEN INTO ACCOUNT ONLY AS HELPFUL ELEMENTS OF THE CAUSE - MOBILITY – AND THE MEASURES THAT INVOLVE FINANCIAL EFFORT. Following the above assumptions the packages of measures consists in:

Tab. II.24 – The essenbly of measures that not require financial effort

	Measures to the level of local authority			Measures to the level of SC OTL SA		
	Support measures	Strenghtening measures	Reinforcement measures	Support measures	Strenghtening measures	Reinforcement measures
Measures that bring money	I-16, II-2, X-12, XI-7, XI-8	I-18, III-1, V-8, VII-2	I-12, V-7, XI-9	-	X-18, X-19, XI-2	I-21, X-23
Measures with money	I-3, I-9, I-11, II-3, III-5, VI-1, VI-4, X-10	I-4, I-8, I-13, III-8, VII-1	I-2, I-17, I-19, III-7, IV-3, VII-3, XI-5, XI-6	X-14, X-17	I-10	I-5, X-5, X-9, X-20, XII-3

- blue: measures that ensure a synergy only for some of the indicators grouped under the title = simple synergy
- green = measures that ensure a synergy for all indicators grouped under a title = complex synergy
- black = in case of these measures could not be identified context in which to achieve synergy = 'no synergy "

Explicitly the measures are:

I-2 = systematically educational measures in schools – in the idea of a sustainable development culture;

I-3 = to activate and stimulate the activity of department working with citizen's associations (regular meetings organization);

I-4 = information campaigns on innovations in administration system that reduce the number of travels for citizens to administrative institutions;

I-5 = periodical analysis of the section of streets on which have to be increased the speed, or on which have to be reduced (effectiv reduced by traffic calming means);

I-8 = prepare technical and commercial framework to transport bicyc;e in the urban transport vehicles;

I-9 = regulate and promote car-sharing and car-pooling (including tax incentives for rental companies which declares as an activity object these activities;

I-10 = SC OTL SA has to initiate cooperation actions with public transport passengers and regular meetings with amateurs drivres;

I-11 = it would be recommendable that local authority to develop a regulation that not only to allow the public presence but to ensure the public presence in the decisions regarding the community;

I-12 = elaborate a provisions concerning transit through the city - after the completion of works to city's ring and to street which ensures the link between the villages without passsing through the city;

I-13 = maps for spreading of main utilities in the city (the next implants will be done only based on the equal spread in territory principle);

I-16 = taxation of cars passing through a „protected ring” in the city’s center;

I-17 = modification in starting hours of the economic agents activity situated on the same street or in the same point – marginal – of destination;

I-18 = parking spaces on public domain and which are „given” to some economic agents (in order to be used by their employees): with **payment** done to economic agent;

I-19 = tickets to concerts, sport events etc. should include the price of two trips by public transport - to be given the right to travel;

I-21 = introduce a „no car day” (monthly);

II-2 = to analyze the possibility of implementing of a system type „city-vignette” in a central area of the city;

II-3 = establish a working group formed by municipal institutions and freight transport operator in order to organize on days and neighborhoods the freight transport activity in the city area;

III-1 = the reducing of private car use;

III-5 = it is recommendable to modify the opening & closing times of big stores;

III-7 = an echeloned schedule for starting working hours in case of the companies;

III-8 = creating the framework for tele-activities and teleworking development, including finding ways to reduce taxation for companies who practice tele-activities and teleworking;

IV-3 = local authority straight actions to remove any obstacles on the sidewalks or on the rest of paths needed for pedestrians mobility;

V-7 = carrying out punitive actions against polluters;

V-8 = purchase non-euro vehicles – extra charged;

VI-1 = definitively settle (long term – 20-30 years) the Oradea ring road;

VI-4 = the necessity to create a unit – construction – infrastructure for motorized and non-motorized access and green area (for every new building/construction);

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VII-1 = local authority should provide new regulations on parkings which to reduce the possibilities to park on the streets;

VII-2 = restructuring of parkng system (by introducing a progressive payment type, distinctiv on peak hours and off peak hours and even on target groups – for example for the small capacity vehicles the tax could be more reduced);

VII-3 = allocation – in case of institutions subordinate to local authority – of the parking spaces for their employees on the principle of the distance from employee's residence;

X-5 = it has to enhance the efforts for increase transports regularity and even the public transport vehicles punctuality – according to schedules;

X-9 = SC OTL SA has to redo the schedule for public vehicles so as the intervals at peak hour to reach 7-8 minutes between the vehicles of the same line/route;

X-10 = local authority has the obligation to tax at the lowest level the SC OTL SA vehicles;

X-12 = general interests of the citizens – not those specific to a part of the citizens – request to reassess the gratuity award system for retirees (the gratuity may be a right but using this for the time during students are traveling by public transport can not be tolerated);

X-14 = SC OTL SA has to make a project proposal for the first lanes dedicated to public transport;

X-17 = it is necessary a new public transport regulations (which to envisage also rewarding the loyal passengers);

X-18 = it has to be introduced and then generalized express transport system (or maxi-taxi), in the same time with normal routes;

X-19 = it is necessary to redesign the bus routes so as to be excluded the parallelism of the two modes of transport;

X-20 = in line with the above objective: it is necessary to reconsider the set of public transport stations for boarding and unboarding;

X-23 = in order to make profitable the SC OTL SA activity, it should be defined the threshold between social transport and solitary transport;

XI-2 = prepare a program of transport service for peri-urban area (particularly to Băile Felix and Băile 1 Mai resorts but also to Borş – link with European Western);

XI-5 = analyze the possibilities to standardize the payment into a single pass for urban trips in combination with peri-urban trips.

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XI-6 = it should be necessary to be rethought the granting systems of transport licences for peri-urban area and even county area – in order to have the obligation to use as arrival and departure in/from oradea only the bus - stations – to strictly forbid the public transport of passengers within the city;

XI-7 = actions and rules against „piracy" (unauthorized urban public transport by private cars) on urban transport market;

XI-8 = should be introduce a tax / fee – contribution of the non-local transport operators in order to cover the costs of maintenance the boarding-unboarding stations used by them;

XI-9 = remove the taxi stations near to boarding-unboarding stations of SC OTL SA;

XII-3 = organize the public transport program performed by public transport operator in accordance with the rail and air transport program;

Thus, the packages of measures look like this:

Tab. II.25 The full ensemble of measures packages[92]
(with black are marked the measures that not involve financial effort)

	Measures to the level of local authority			Measures to the level of SC OTL SA		
	Support measures	Strenghtening measures	Reinforcement measures	Support measures	Strenghtening measures	Reinforcement measures
	alfa measures	beta measures	gama measures	alfa measures	beta measures	gama measures
package of measures to reduce congestion (and for the traffic, generally)	I-14, I-20, IX-3, II-2, III-5	IX-2, VII-1, VII-2	I-12, III-7, VII-3	X-14		
package of measures to achieve better conditions for operating the public transport system	X-8, X-15, X-10, XI-7	III-2, X-3, X-21, X-22, III-1	X-1, XI-9	IV-1, X-6, X-7, X-17	V-5, VIII-1, X-18, X-19	V-2, X-11, X-5, X-9, X-20, X-23
package of measures to ensure sustainable development of mobility	VII-4, I-9, I-11, I-16, VI-4		I-19		I-10	I-21
package of measures for alternative transport	IX-1,	I-7, I-8	I-2		I-18	
package of measures to increase pedestrian safety (and fluidization traffic, generally)	VI-1, II-3		I-15, VIII-3, I-17			I-5
package of measures to reduce the citizens' need of travel	X-12, I-3	VI-3, VI-6, I-4, I-13, III-8	I-1, IV-3			
package of measures to reduce pollution		V-1, V-3, V-8	V-7			
package of measures to achieve intermodality	XI-8		XII-1, XI-5, XI-6		XI-2	XII-3

In annex 28 there are 12 sheets by adequate selection of the elements made available by Konsult program, which largely manage to be identified with the objectives of the project: following are the **basic elements**:

I = congestion problem

II = economic growth

[92] It is important to observe that all measures that involves money are supported (or could be replaced with) the measures which not involve money.

III = EU impact

IV = environmental damage

V = CO_2 emissions

VI = access to services

VII = viable streets

VIII = safety

IX = geographic disadvantage

X = reduced accessibility

XI = social equality

XII = travel costs.

In more details, the Konsult strategies cover:

Need to travel = objectives I and III

Car use = objectives I, IV, V and VIII

Space use = objectives I, VI, VII and IX

Urban transport = objectives I, IV, V, X, XI and VII

Alternative trips = objectives I, IV and V

Freight transport = objective II

The results provided by Konsult program - Annex 29 - enabled obtaining percentage values for each objective SUMP, specifying for each measure levels of impact:

objective	I	II	III	IV	V	VI	VII	VIII	IX	X	XI	XII
total amounted	560	182	236	648	521	613	698	628	501	756	719	503
hierarchy	seven	one2	one1	four	eight	six	three	five	zece	one	two	nine
implementing time	9	3	4	10	8	9	11	10	8	12	11	8

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(periods[93])

Comments:

Public transport is the first recommended to improve mobility

Next: measures which take into account commuters and parking management

Influencing freight transport has the small chances to improve mobility, as attempts to reduce the need to travel;

In the following tables are given the 75 measures proposed by INCERTRANS under extensive list:

[93] The refference includes periods of six months in which was divided the whole monitoring period of SUMP and at the end of which it is advisable to carry out checks - see section 8 – Monitoring.

Tab. II.26 – Distribution of measures that support the 12 objectives

Obiectiv	No. period	1	2	3	4	5	6	7	8	9	10	11	12
	extent	**2014**		**2015**		**2016**		**2017**		**2018**		**2019**	
I reduce congestion	9												
II freight transport	3												
III reduce the need for travel	4												
IV alternative transport	10	*											
V reduce CO_2 and unpoluttants means	8												
VI building areas planning	9												
VII parking management	11												
VIII road safety	10												
IX Infrastructure	8												
X public transport	12												
XI plan for the commuters	11												
XII intermodality	8												

First start:

considering that the first two are relatively easy to implement, and the last is the basic element of urban mobility

- Freight
- Parking management
- Urban transport

The second start:

considering that the first three are interrelated, and the last is the basic element of the artificial load texture urban street

- Reduce congestion
- Reduction of CO_2 emissions and clean park
- Road safety
- Plan for commuters

The third start:

considering that all three complete each other

- Alternative transport
- Building areas planning
- Road infrastructure

The fourth start:

considering that the first is the basic element of sustainability and contribute to the final quality level trips that can not be reduced

- Reduce the need for travel
- Passenger intermodality

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Tab. II.27 – Distribution of measures for objective II

II freight traffic		No. period	1	2	3	4	5	6	7	8	9	10	11	12
		Extent of 3 periods	**2014**		**2015**		**2016**		**2017**		**2018**		**2019**	
(-) syn	(+)money													
	0	3 transit												
	(-)money													
(+) syn	(+)money	2 cityvignette												
	0 (-) money													

Tab. II.28 - Distribution of measures for objective VII

VII parching management		No. period	1	2	3	4	5	6	7	8	9	10	11	12
		Extent of 1 period	**2014**		**2015**		**2016**		**2017**		**2018**		**2019**	
(-) syn	(+) money													
	0													
	(-) money													
(+) syn	(+) money	2 Parching restructure												
	0	1 Not on streets												
		3 institutions												
	(-) money	4 park&ride												

Tab. II.29 - Distribution of measures for objective X

X Public transport		No. period	1	2	3	4	5	6	7	8	9	10	11	12
		Extent of 12 periods	**2014**		**2015**		**2016**		**2017**		**2018**		**2019**	
(-) syn	(+) money	1 Iosia sud												
		12 retirees												
	0	5 punctual												
		9 7-8 minutes												
		10 Tax												
		14 tracks												
		20 boarding points												
	(-) money	7 triangle												
		6 the second access												
		8 tram Aradului												
		11 low floor												
		15 boarding station												
		18 Express												
		19 Parallelism												
		23 social level												
(+) syn	(+) money													
	0	17 loyal passengers												
	(-) money	3 compensations												
		21 trolleys												
		22 light rail												

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Tab. II.30 - Distribution of measures for objective I

I reduce congestion		No. period	1	2	3	4	5	6	7	8	9	10	11	12
		Extent of 9 periods	**2014**		**2015**		**2016**		**2017**		**2018**		**2019**	
(-) syn	(+) money	12 OTL fleet												
	0	5 max speed												
		17 start hours												
	(-) money	14 streets cat.												
		15 passage												
(+) syn	(+) money	16 ring tax												
		18 companies fleet												
		21 day no car												
	0	2 prop. schools												
		3 citizens												
		8 byke in bus												
		9 carsharing												
		10 OTL - public												
		11 Participation												
		13 maps												
		19 concert ticket												
	(-) money	1 electronic payment												
		4 improve adm												
		7 byke parking												
		20 dispacher												

Tab. II.31 - Distribution of measures for objective V

V reduce CO_2 and unpoluttants means		No. period	1	2	3	4	5	6	7	8	9	10	11	12
		Extent of 8 periods	**2014**		**2015**		**2016**		**2017**		**2018**		**2019**	
(-) syn	(+) money													
	0													
	(-) money	2 tram infrastr												
(+) syn	(+) money	7 against polluters												
		8 with noneuro												
	0													
	(-) money	1 pedestrian area												
		3 infra rehabilitation												
		5 OTL fleet												

Tab. II.32 - Esalonarea masurilor pentru obiectivul VIII

VIII road safety		No. period	1	2	3	4	5	6	7	8	9	10	11	12
		Extent of 8 periods	**2014**		**2015**		**2016**		**2017**		**2018**		**2019**	
(-) syn	(+) money													
	0													
	(-) money	3 black spots												
(+) syn	(+) money													
	0													
	(-) money	1 improve infra												

Tab. II.33 - Distribution of measures for objective XI

XI plan for cummuters		No. period	1	2	3	4	5	6	7	8	9	10	11	12
		Extent of 11 periods	**2014**		**2015**		**2016**		**2017**		**2018**		**2019**	
(-) syn	(+) money	7 piracy												
		8 inter tax												
	0	5 ticket												
		9 taxi-stations												
	(-) money													
(+) syn	(+) money	2 Felix, 1 Mai												
		6 License												
	0													
	(-) money													

Tab. II.34 - Distribution of measures for objective IV

IV alternative transport		No. period	1	2	3	4	5	6	7	8	9	10	11	12
		Extent of 10 periods	**2014**		**2015**		**2016**		**2017**		**2018**		**2019**	
(-) syn	(+) money													
	0													
	(-) money	1 touristic												
(+) syn	(+) money													
	0	3 sidewalk												
	(-) money													

Tab. II.35 - Distribution of measures for objective VI

VI building areas planning		No. period	1	2	3	4	5	6	7	8	9	10	11	12
		Extent of 9 periods	2014		2015		2016		2017		2018		2019	
(-) syn	(+) money													
	0	1 city ring			■	■								
	(-) money	3 Green constr.				■	■	■	■	■	■	■	■	
(+) syn	(+) money													
	0	4 tandem			■	■	■	■	■	■	■	■		
	(-) money	6 incentives			■	■	■	■	■	■				

Tab. II.36 - Distribution of measures for objective IX

IX infrastructure		No. period	1	2	3	4	5	6	7	8	9	10	11	12
		Extent of 9 periods	2014		2015		2016		2017		2018		2019	
(-) syn	(+) money													
	0													
	(-) money	1 tracks			■	■	■	■	■	■				
(+) syn	(+) money													
	0													
	(-) money	3 streets			■	■	■	■	■	■	■	■		
		2 reconstruct					■	■	■	■	■	■		

Tab. II.37 - Distribution of measures for objective III

III reduce the need to travel		No. period / Extent of 4 periods	1	2	3	4	5	6	7	8	9	10	11	12
			2014		2015		2016		2017		2018		2019	
(-) syn	(+) money													
	0	5 stores												
	(-) money													
(+) syn	(+) money	1 reduce car use												
	0	7 hours of como												
		8 teleworking												
	(-) money	2 budgeting												

Tab. II.38 - Distribution of measures for objective XII

XII intermodality		No. period / Extent of 8 periods	1	2	3	4	5	6	7	8	9	10	11	12
			2014		2015		2016		2017		2018		2019	
(-) syn	(+) money													
	0													
	(-) money													
(+) syn	(+) money													
	0	3 transp schedule												
	(-) money	1 central station												