

## **A Introduction**

Diesel-powered vehicles are still the most commonly used vehicles for public transport in the residential and commercial area. Harmful emissions, contribution to the greenhouse effect and noise are some of their negative effects. In recent times public transport in Suceava was still provided using old, pre-Euro buses and some Euro 2 minibuses. Even though some attempts to use particulate traps and other emission control devices had been made, the level of traffic pollution generated by public transport remained very high. The use of LPG and particularly biogas for the operation of public transport vehicle fleets was only initiated in Romania after 2004.

### **Measure 5.6 Alternative Fuel Bus Fleet**

One major objective is therefore to increase the number of public transport vehicles using clean and renewable fuels, thus reducing the use of diesel and leading the way to a sustainable transport system. Suceava Municipality together with the public transport company initiated the implementation of a new public transport plan, which included introduction of 15 new Euro 3 buses. This provided a good opportunity to reduce public transport pollution by starting the implementation of alternative fuel equipment on the buses. Gaseous fuels such as biogas and LPG offer the additional benefit of potentially reducing noise by 50 % and this is very important for the quality of life in the city.

### **Measure 8.8 Bus priority measures and other bus improvements**

Suceava Municipality planned to provide a modern public transport system in order to increase the number of passengers, reduce the use of the private car in the city centre and at the same time to reduce traffic congestion and pollution in the city centre.

The sustainable local development strategy included provisions about the Traffic and Transport Plan, which defines the transport policy for the city. Current planning policy for Suceava places an emphasis on concentrating development and regeneration activities in order to encourage the use of sustainable forms of transport.

Big investments in new vehicles and alternative fuels are not enough for a successful implementation of a new attractive PT Plan in Suceava. For this reason Suceava Municipality planned to implement supporting measures like bus priority, park and ride and other bus improvements with the objective of supplementing the increased number of passengers due to new alternatively fuelled buses by improving PT conditions and also with special traffic priority for PT.

### **Measure 8.9 Improved Public Transport Information**

The main reason for the implementation of this measure was to reduce the environmental impact of traffic and to increase the number of passengers using public transport in order to reduce local car journeys over 3 years.

Public transport in Suceava was not attractive because of the poor travel conditions on board the existing buses. It was expected that the combination of modern and less polluting buses (measure 5.6) together with bus priority and other support measures (measure 8.8) and other measures such as a new information system, would produce a substantial increase in passenger numbers whilst reducing the number of private car journeys.

## A1 Objectives

The measures' objectives are:

- **Objective 1:** Reduce PT emissions to reduce the environmental impact of public transport, by 10-15% at end of project, in 2009.
- **Objective 2:** Improve the quality of local public transport, which may in turn increase the attraction of public transport for people from the adjacent residential areas and increase the number of passengers by 4 – 8 % in 2009.
- **Objective 3:** Reduce congestion in the city centre by making PT a feasible alternative solution to car journeys, responding in a superior manner to the local mobility demand generated by recent economic development.
- **Objective 4:** Improve quality of life in the city
- **Objective 5:** Optimise the use of LPG (and in the future biogas) locally by clean public transport vehicles that are used in environmentally sensitive and densely populated areas in the city centre in order to replace the existing pre-Euro buses with Euro 3 buses

The citizens of Suceava city will benefit from a public transport system at European standards by having PT information available on the internet, printed timetables, info kiosks, panels and timetables into the PT stations, on the VMS installed into the city centre, at the Mobility Centre located in the Municipality Building.

## A2 Description

### Measure 5.6 Alternative Fuel Bus Fleet

The main activity was to be the introduction of an alternative fuel bus fleet. This activity was divided into two stages: LPG buses were to be introduced in the first stage (by the end of 2007) and followed, if feasible, by the introduction of the biogas buses (concurrent with the development of biogas facilities) by the end of 2009. It was expected that introduction of biogas buses might be more difficult and would depend on several factors (e.g. bus manufacturers, biogas suppliers, local and national regulations).

The new Local Transport Company planned to purchase 15 buses with Euro 3 engines powered by LPG and if feasible with biogas. This was increased with the addition of 15 further new vehicles later in the project.

Four of the identified new bus routes were redesignated as "Eco-routes" and have been operated, from the PT point of view, only by the clean buses belonging to LTC. The Eco-routes pass through the whole city, including residential areas.

The secondary routes were re-designed and routed to use smaller streets in residential areas.

A large amount of publicity was produced to promote the introduction of these new vehicles both in Suceava and at the national level.

At the end of the SMILE project the vehicles which provide public transport in Suceava city were to be:

- 40% of all Euro 3 buses owned by the public transport company will use LPG or biogas fuel
- 20% of all Euro 3 minibuses (vans) owned by the public transport company will have FPT (filter particulate traps) systems

### Measure 8.8 Bus priority measures and other bus improvements

Together with investments in new alternative vehicles Suceava Municipality together with the new PT Company planned to implement some measures in order to increase the number of passengers up to 4 – 8% by 2009. In addition there were to be local actions for introduction of

“park and ride” and “park and walk” concepts which will be linked with the improvements in PT in order to provide feasible alternatives to private car journeys.

The main objective, as mentioned previously, is to make PT a viable alternative for daily/commuting journeys especially in the city centre. Traffic congestion is one of the major problems facing local authorities in this moment. When PT becomes a more feasible option, is safer and the journey time reduced by several traffic priorities, then local authorities could start implementation of the “park and ride” and “park and walk” concept. The final expected result was a reduction of car journeys of 12% by 2009.

Following the conclusion of a feasibility study, the measures to be implemented were: separate routes adjoining intersections, new traffic lights and new technology, “green way” system and priority traffic lights for buses. In addition the potential for new bus priority at peak hours will be studied and steps planned for future interventions (the poor road infrastructure and the constraints posed by the city’s spatial limitations are a serious barrier when planning to favour certain vehicles access vs. the entire city vehicle park). A new integrated ticketing system and new GPS system for locating the buses was to be tested and implemented by 2008 on a demo bus and if successful extended to the rest of the whole fleet. The monitoring of PT fleet and traffic discipline was to be performed using video cameras in one or two intersections, close to two bus stations in the city centre and one place along the main route, where accidents involving pedestrians occurred. Also special bus services and facilities for elderly and disabled people – the new alternative buses have facilities close to the European standard regarding elderly and disabled people.

Once the new Public Transport Plan became operational in Suceava from the half of year 2006 new routes for residential areas and for the local tourist attractions were introduced. Some of the new separate routes connect the city centre with several leisure areas in order to encourage people to use public transport instead of their own car when they want to reach several destinations including green areas.

Possibilities for the extension of the local bus fleet usage have been sought by offering night bus service and additional buses at peak hours.

### **Measure 8.9 Improved Public Transport Information**

On the basis of prior work and experience that has been acquired, the plan was to build a new concept of integrated and clean public transport and a new attitude towards PT as a viable alternative to local road transport rather than a social service as it is regarded in the beginning phase of the project.

As part of other measures Suceava Municipality intended to provide a modern public transport system (providing efficient and comfortable running conditions and an appropriate service during the off-peak and on-peak hours). This aims to increase the number of passengers, reduce reliance on private car use in the city centre and at the same time to reduce traffic congestion and traffic pollution in the city.

VMS (variable messages signs) will be implemented in the city, backed up by timetables available in visible locations, including at a mobility centre located in the municipality building in order to provide information on public transport and other information of public interest.

A well-documented marketing strategy for informing all travellers: campaigns, signs, free bus tickets and subscriptions. The aim will be to adapt the information, so it reaches all citizens evenly.

## **B Measure implementation**

### **B1 Innovative aspects**

#### **Measure 5.6 Alternative Fuel Bus Fleet**

##### **Innovative Aspects:**

- Use of new technology
- New organisational arrangements or relationships

The innovative aspects of the measure are:

- **Use of new technology, nationally** The use of alternative fuel technology in vehicles in Romania is extremely rare. The measures will optimise the use of LPG (in the first phase) and biogas (in the second phase) locally by clean public transport vehicles that are used in sensitive and densely populated areas in the city centre in order to replace the existing Euro 0 and Euro 1 buses.
- **New organisational arrangements or relationships, regionally** – In order to facilitate this investment changes were required in the way that the public transport company in Suceava is owned and administered.

#### **Measure 8.8 Bus priority measures and other bus improvements**

##### **Innovative Aspects:**

- Use of new technology/ITS

The innovative aspects of the measure are:

- **Use of new technology/ITS, locally** – A new GPS system for bus location and new ticketing system and a new public transport safety system (by installing video cameras in two intersections close to two bus stations in the city centre) and one VMS in one point where accidents involving pedestrians occurred will be tested. Speed detectors sensors will be placed in one major intersection in the city centre. A “green way” software system for traffic lights will be procured and implemented starting with year 2008 by 2009. To support the software implemented, new traffic lights using updated technology will be purchased and included in the traffic lights city system.

#### **Measure 8.9 Improved Public Transport Information**

##### **Innovative Aspects:**

- New conceptual approach
- Use of new technology/ITS
- Targeting specific user groups
- New organisational arrangements or relationships

The innovative aspects of the measure are:

- **New organisational arrangements or relationships, locally** – The constant contact with PT passengers is to enable us to work on demand forecasting and to be prepared to re-dimensioning or re-structuring the PT fleet response, according to people needs and expectations. The citizens of Suceava city will be informed about local sustainable mobility opportunities and activities

- **Targeting specific user groups, locally** - The measures foreseen are designed to reach all categories of people, with different mobility needs and to give equal chances for accession and serving of different locations
- **Use of new technology/ITS, locally** – VMS (variable messages signs) was implemented in the city in order to provide information both of pollution level and of public transport.
- **New conceptual approach, locally** - The creation of a Suceava Mobility Centre that provides public transport and traffic information.

## **B2 Situation before CIVITAS**

The level of traffic and emissions from public transport exceeded EU limits. The percentage of existing LPG and alternative fuel vehicles (buses, taxis, vans, minibuses) in Suceava was very low (approximately 4-7% in 2004). Diesel-driven vehicles were still the most used vehicles for goods distribution, private companies and public transport in the residential and commercial area. Public transport in Suceava was performed with old pre-Euro buses and Euro 2 minibuses. Buses emitted high levels of polluting emissions, noise level was high because they were old and there were no special priorities for public transport in order to reduce journey times.

The CATCH demo-project in Suceava proposed and implemented several measures, designed to introduce improvements in the Suceava public transport, by means of providing more comfortable, accessible and efficient services, using cost efficient and environmentally friendly solutions.

Until July 2005, The Services and Public Transport Company was the provider of the public transport services within the city. Its fleet consisted of 18 trolleybuses (simple and articulated) of which 10 vehicles have undergone refurbishment within CATCH project, 10 Euro 2 minibuses, which were equipped with filter particulate traps, and 15 pre-Euro buses (all manufactured between 1978 and 1995). Before the SMILE measures, the status of local public transport was very poor: the fleet was obsolete and the technical and operating parameters were inadequate. A major part of the fleet has been exploited technically for an excessive period of time; few financial resources were allocated for vehicle maintenance, rehabilitation, modernisation and renewal, also the lack of care for promotion and awareness campaigns led to an improper, unreliable, economically inefficient and environmentally damaging public transport system.

The status of the services and Public Transport Company worsened over the years and in 2005 the Public Transport Company reached the point of insolvency and the company's administrative board made the decision to declare its bankruptcy. They set up a new company, the Local Public Transport Company (LTC), benefiting from strong financial and political support from the City Hall representatives and the local councillors. That was the main important legal decision that launched the forthcoming public transport system, performed with a modern bus fleet in the Suceava city.

Apart from these vehicles, the public transport was operated at that time by 100 privately owned minibuses. This fleet was not uniform in quality and year of fabrication and they had a negative impact on quality of service and congestion incurred on the main routes operated by them.

The number of people using public transport in Suceava was limited and one of the main reasons was the poor service offered by the local public transport companies. However, the local General Urban Plan for Suceava City, approved by the Local Council, included a Traffic and Transport Plan that defined the transport policy for the city, with special emphasis on concentrating development and regeneration activities in order to encourage the use of sustainable forms of transport.

Baseline evaluation of the initial situation, before CIVITAS, showed that there was a low and insufficient level of public transport information available to the citizens. The information about routes, time schedule, public transport facilities were situated at a very low level and not accessible for all the citizens (on the internet for example) and public transport was perceived as a social service rather than as a viable, modern means of getting around the city. Because of this the number of passengers was not high enough to generate the income needed to develop the service without significant external investment. This negative situation, along with a rise in personal disposable income, resulted in an increased use of private cars to the detriment of public transport, especially in the city centre. Hence traffic congestion particularly in the city centre was still one of the main problems in Suceava. It was anticipated that the implementation of these measures should reduce private car journeys and therefore ease traffic congestion and create an alternative mode of transport for the public.

### **B3 Actual implementation of the measures**

The measures were implemented in the following stages:

**Stage 1: Organising the implementation team and assigning the tasks** (*Date: February 2005 – March 2005*) to be accomplished by each member, at each level – decision makers and executive staff; issuing the communication strategy for local media, citizens, and public transport (PT) passengers as a separate category, relevant to the project.

Mr. Ion Lungu, the mayor from 2004-2008 and re-elected for 2008-2012, communicated, informed and consulted with the local media, all stakeholders, citizens, and Traffic Police. He had the authority to co-approve the expenses made for the project and also to take decisions with regard to the actions during the project lifetime. He was part of the major Procurement Committees that were in charge with designating the main Contractors to deliver the goods and the services demanded.

Mr. Dan Dura, the head of the European Integration and Development Strategies Office, as site manager, was in charge of:

- The procurement of the Feasibility Study and collaboration with the Contractor for identifying the main public transport drawbacks and seeking the solutions,
- The consultation process, coordination and supervision of all activities, organisation and implementation of : the cooperation with the local police for designing new bus routes “Eco-routes”, identification of the suitable equipment and suppliers, the tendering for LPG converter system procurement, coordinating the testing of the equipment for the demo-bus, coordinating the redesign of the street network and of separate routes for PT,
- Collaboration with the LTC staff to identify solutions to help elaborate The Public Transport Plan. Identification of solutions for designing tools to improve the LTC buses performance informing network. Organising, together with representatives from Local Transport Company SM, staff training sessions for the new drivers. Collaboration with the new buses supplier and the LPG converting process and ensuring bonds between all measure team members.

Mrs. Angela Zarojanu (vice-mayor from 2004-2008 and her replacement Mr. Viorel Seredenciuc for the 2008-2012 term) had important tasks with regard to cooperating with the WWTP owners for finding a good solution for rehabilitation and modernisation of the plant and the biogas production from the sludge.

Mrs. Elisabeta Vaideanu, the Executive Manager of the City Hall was responsible for:

- The planning of the expenditure and with the payments co-approval,
- Tasks related to the identification of suitable Contractors for equipments and services, their financial offers and along with the technical team made the technical-economical assessment of the proposals.



- Tasks related to the creation of the demo-bus and emphasising the good results for potential future planning of investments in a GPS vehicle locating system infrastructure.
- Tasks related to cooperating with the representatives of EPA for making surveys, measurements of the main pollution indicators and data analysis and compiling.
- Being in part responsible for the management of the promotion campaigns in the city and the dissemination activities for the measure implementation.

Mr. Florin Cerlinca, the head of the Technical Direction, took part as he was directly involved in surveys and measurements, as well as in devising dissemination campaigns and the strategy.

Mrs. Gabriela Potorac, the head of the Automated Data Compilation Office, was assigned tasks for giving support to the Contractor for the Feasibility Study designing, coordinating the campaigns of informing the citizens (web-site, newspaper campaigns), managing promotion campaigns in the city and participating in activities regarding the Impact Evaluation process: collaboration within the evaluation team and with the EPA Suceava for registering values of the pollutants available at the local level.

Mrs. Geta Prisaca, councilor within the European Integration and Development Strategies Office, was assigned tasks regarding the organisation of tenders, the assessment of the received offers and she was actively involved in the design and management of interactive promotion campaigns for new PT system. She worked in the dissemination and marketing campaigns in the city and at the national level, and offered consultancy for the citizens who demanded information regarding PT information from the Mobility Centre.

Ms. Magda Sniatowschi (2005) and later Ms. Narciza Nenec (from 2006-2009) were responsible for the DET activities, being nominated the LDMs in Suceava, having tasks to design and organise marketing and promotional activities (mainly with regard to the new service offered by the LTC buses and private minibuses), to issue dissemination materials and publish news online, to offer consultancy for citizens demanding information from the Mobility Centre

Ms. Narciza Nenec became the LEM from 2006 on and was responsible for all activities implied by the evaluation processes and the reporting templates.

### **Stage 2: Taking over of the former Services and Public Transport Company by the City Hall** (Date: March 2005 - July 2005)

The Services and Public Transport Company was at the point of insolvency, when in 2005 the company's administrative board made the decision to declare its bankruptcy and set up the new company, the Local Public Transport Company (LTC), benefiting from financial and political support from the City Hall and the local councillors. That was the main important legal decision that launched the forthcoming public transport system, performed with a modern bus fleet in the Suceava city.

### **Stage 3: Procurement of the Traffic Study for the city centre**

#### **3.1 Organising the tendering procedure for procurement of the traffic study and the contracting process** (Date: March 2005 – April 2005)

The project implementation team developed a market survey to identify the consultancy companies with relevant experience in this domain. The technical consultation between the City Hall team and the representatives of these market operators resulted in a well structured information base which was used to elaborate the Tender Documentation in a very professional manner.

The procurement procedure was organised according to the legal provisions and the contract was concluded.

### **3.2 Receipt of the City centre Traffic Study deliverable** (Date: March 2006)

The contract resulted in a Traffic Study deliverable, a traffic strategic analysis of the zone and the main roads crossing the city and the city historical center.

This received deliverable emphasised the main problems of road traffic in Suceava, also re-assessed the needs for mobility in Suceava city, made recommendation about bus routes, locations for bus stops, timings for bus running, and stood as a base for further decisions at the road infrastructure allocation level. An important part of this traffic study referred to the main road crossing the city, which is significant for finding solutions to the motorised city traffic, parking facilities and PT.

The traffic study identified technical solutions for providing extra lanes exclusively for buses, as well as special priority at traffic lights in intersections. The traffic study revealed other possibilities to create adjacent roads and new parking facilities, concurrent with the city's economic development.

## **Stage 4: Procurement of the Feasibility Study to design the SMILE measures implementation**

### **4.1 Organising the tendering procedure for designating the contractor** (Date: April 2005 – July 2005)

The organisation of the tendering procedure began with market research designed to identify consultancy companies with expertise in this field. The implementation team got involved in consultations about topics related to the situation of road traffic and the state of pollution and quality of life in Suceava. The Feasibility Study proposes measures for improvement of public transport, designs promotion campaigns for measures related to decreasing the traffic levels and the resultant pollutant emissions.

The procurement procedure was organised according to the legal provisions and the contract was concluded.

### **4.2 Receipt of the Feasibility Study** (Date: March 2006)

The contract resulted in a Feasibility Study deliverable.

This deliverable ascertained activities for marketing alternative fuel, for selecting new alternative vehicles and for improving public transport and general traffic. These have informed further decisions with regard to road traffic regulations, to closure of some roads, to transforming them into one-way routes and to giving a higher importance to PT buses.

Based on these findings, the SMILE measures have been designed.

## **Stage 5: Preparing tendering documentation and organising the tendering procedure for acquisition of 15 clean new buses** (Date: May 2005 – July 2005)

The project implementation team developed a market survey to identify manufacturers and suppliers of buses. The technical consultation between the City Hall team, the LTC technical staff and the representatives of these market operators resulted in a well structured information base which was used to elaborate the Tender Documentation in a very professional manner.

The technical details for this procurement have been set in collaboration with specialists from LTC, after participating in consultations with other municipalities' representatives and vehicles manufacturers. The procurement procedure was organised according to the legal provisions in force, involving the relevant compartment within the City Hall.

**Stage 6: Receipt of the first set of 15 PT buses and making them operational** - These buses were produced by IRISBUS-IVECO in France and they are equipped with Euro3 engines and have a capacity of 107 people. They have modern passengers' security systems, facilities for disabled people and electronic panels for providing variable message information, as well as being more comfortable and attractive for passengers.



**6.1 The diesel powered vehicles** (*Date of acquisition: March 2006*) - At this stage, the old bus fleet was partly disposed of and replaced with these new buses and the trolleybus fleet was totally put off duty. The fleet consisted at that time of: the 15 new procured vehicles and 10 old Euro 0 vehicles, in total 25 buses.

*Figure 1: The beginning of the bus fleet renewal – the first 15 new buses*



**6.2 The LPG powered vehicles** (*Date of conversion: February 2007 – September 2007*) - The designated company, after completing the procurement procedure, delivered this lot of 15 buses in March 2006, initially with the standard fuelling - diesel, because the technology for LPG fuelling was not present in the production process, at the factory in France. This shortcoming was eliminated in a subsequent process, as during the year 2007, after making the second set of 15 new buses operational, 14 buses from the first set were converted to LPG functioning by the manufacturer. The 15<sup>th</sup> bus was equipped with a LPG converter system prototype, in collaboration with a Romanian company, designated within a public procurement process. From October 2007 on, all 15 buses received in the first set were entirely transformed into LPG fuelling.

**Stage 7: Designing of the provisional PT plan (routes, timetables, bus stops, number of buses for each route) for the new bus fleet running** (*Date: April 2006 - May 2006*) - design of 8 routes to be operated by the LTC bus fleet and preparation of the pre-established viable timetables, according to the number of passengers and their travel needs, identified by the traffic study and implemented in collaboration with the experienced operators.



The needed infrastructure for a modern PT minibus performance was set up and the routing was signalised, the minibus stops were marked and at the moment they serve the PT with a good coverage, in conditions of security and good time keeping.

**Stage 10: Training of the new buses drivers (the 1<sup>st</sup> set of 15 buses procured)** (Dates: April 2006 – June 2006; September 2006 - October 2006; Date: September 2007 – October 2007 completion of training skills for LPG converted vehicles)

The new public transport system was designed to be more attractive and the new bus drivers have been trained and now have “eco-driving” skills. Their training included technical information regarding the buses, as well as good driving behaviour and good customer service. Drivers are now partially responsible for good patronage of buses and their performance is continually monitored.

This undertaking was repeated periodically and the sessions were multiplied along with the new buses lot implementation.

**Stage 11: Installation of the bus stop shelters, in several locations, modernising the bus stops** (Date: May 2006 – June 2006, 2008 and onwards)

Out of the 37 bus stops, 25 underwent an initial modernising process, by being equipped with shelters, inside which information panels regarding local public transport have been displayed - through boards with maps showing the timetables and the routes in all 37 bus stations.

These panels can also be found by PT passengers inside buses.

*Figure 3: Bus stop with shelters modernised and PT plan on display*



This process is still ongoing and further activities for modernising the bus stops are under way.





**Stage 12: Promotion of new bus fleet running** – Boards with information regarding timetables, bus stops, routes; have been designed, produced and put up inside buses in visible locations, for the use of passengers; each bus have been equipped with two such boards.

**12.1 Installation of promotion and informing boards within first bunch of buses** (Date: June 2006)

The 30 boards have been put up, in visible places for all passengers.

*Figure 4: PT plans on display onboard the buses*



**12.2: Installation of promotion and informing boards within second bunch of buses** (Date: February 2007)

The information boards have been replicated in other 30 copies (2 for each new bus) and the process of displaying within new buses took place as previously completed.

**Stage 13: Preparing tendering documentation for acquisition of 2<sup>nd</sup> batch of 15 new buses**, based on the experience already gained with the previous acquisition. (Date: April 2006 – June 2006)

Due to the impact and the growing prestige of the bus fleet renewal and supported by continuous consultations with the political class and its support, In May 2006 a new bidding process was organised for purchasing a further quantity of 15 buses of the same quality and in June the contract was signed with the same contractor as previously. The decision was taken considering the price tendered in conjunction with the technical characteristics.

The acquisition process was a few months shorter, due to the previous experience gained by both: beneficiary (City Hall) and the Contractor. Therefore, these buses entered into service quicker than the buses provided in the first contract.

As a result, the City Hall procured as a result of public procurement an additional set of 15 buses, entirely replacing the old buses, which have been removed from service for good.

**Stage 14: Implementation in partnership with a specialised IT company of one VMS in the City Centre main junction, located close to the central bus stop** (Date: August 2006 – September 2006)

Integration of other 2 VMS equipments already mounted in main areas of the city into the current project, extending the network of real-time information panels. These two VMSs are installed in two demo places, one at the end of the Low Emission Zone (near by important financial institutions) and the other one at the roundabout near the eastern entrance to the city.

The newly mounted VMS equipment is located in the historical, representative zone of the city and monitors an area seriously affected by traffic congestion, which has led to a rise in pollution and noise levels and a poorer quality of life in the area. Within the intersection in the city centre, the 3<sup>rd</sup> VMS installed offers, due to its technical structure, qualitative information about three pollutant factors: CO, NO<sub>2</sub> and SO<sub>2</sub>. Also, the display offers information about temperature, date and time, which are necessary when making a general analysis, at a certain time unit period. Its location enables the citizens and the project evaluation team to make notes about the state and evolution of pollution factors caused by motorised traffic within the city center junction (neighbouring LEZ and historical part of the city), because the internal sensors are placed at a low height above the street level.

They are a good support for evaluation in focal points of the pollutants levels. VMSs are very reliable support for real time information (including information about the project), because of the obviousness of their location and visibility; no one can pass them by without being aware of their existence and use. Therefore, they will have a significant impact on increasing public acceptance and awareness of the need to protect the environment and improve quality of life.

*Figure 5: New VMS installed in the City Centre, at the fringe of the historical part*





**Stage 15: Implementation of 3 CCTV cameras in partnership with a specialised IT company** (Date: August 2006 – October 2006), to monitor the general traffic on some road segments and jammed junctions and the public transport vehicles performance, in particular.

These three video-cameras are mounted in three “hot” locations alongside the main road (one in 1 May Blvd. junction, Ana Ipatescu Street junction = City Centre junction, Calea Unirii Blvd., in areas where traffic is busy and accidents can occur and can be viewed through the Internet by all the Internet users. The CCTV cameras implemented have multiple benefits: supervising of some road segments or junctions to detect incidents or cases of law infringement in real time; classification of vehicles; tracking of the visibility range and climate conditions. The CCTVs will have an impact on PT too, because due to the technical characteristics (like flexibility to adjust the angle, position and magnification) they offer the possibility to better monitor the general traffic and PT in particular. All the information received from these systems is sent through an Internet connection to the server located at the City Hall premises.

The CCTV cameras are integrated into an online advanced management platform, designed to monitor road traffic according to European standards. The online management platform is connected to a Control and Monitoring Centre, consisting of two software applications: application “main operator” (for remote supervising and configuring of the system of data acquisition), and a digital map with important information about traffic that can be accessed through a link on Suceava City Hall website.

The results achieved refer to finding solutions to avoid congestion, increasing traffic fluency, improving drivers’ behaviour, strengthening discipline among the drivers and optimising the time keeping and journey duration of the new buses.

*Figure 6: CCTVs installed alongside the main road (1 May Blvd. and Calea Unirii Blvd.” hot” locations)*



**Stage 16: Implementation of 3 traffic sensors in the junction in the city centre** (Date: August 2006 – October 2006)

In order to get information in real time about traffic and PT, three traffic sensors are mounted along the main route, in the city centre, being useful to provide data about detection of number of vehicles on one direction; measuring the car speed of each vehicle and determination of degree of lane usage. This data is necessary for evaluation activities. The data is collected and stored in a server located within the City Hall premises. Data can be visualised in real time.

Figure 7: Traffic sensors installed in the City Centre junction



**Stage 17: Introduction of 2 LTC minibuses equipped with filter particulate traps** (December 2006) – Out of the 10 LTC minibuses owned by the municipality serving public transport, two are equipped with FPT, to bring down the pollution factors caused by the PT minibus fleet belonging to LTC and to give an example of good practice to other road traffic.

**Stage 18: Receipt of the second set of 15 clean buses** (Date: January 2007)

Previously, the projected image of a PT bus fleet included 15 new buses and 10 old Euro 0 vehicles. They were designated to operate 8 routes, established after a thorough analysis and consultation with PT passengers, out of which 4 were planned to become Eco-routes. The other part of transport demand (secondary routes), not served by the bus fleet belonging to LTC SA, was subcontracted to a private company, consisting of an association of smaller firms authorised to operate PT with minibuses.

After the 1<sup>st</sup> of January 2007 when these newly procured buses became all operational, the new public transport provision consisted of 30 new buses (all 10 old Euro 0 vehicles have been pulled over), having in view a modernisation and, in the same time, an extension of the service.

**Stage 19: Extension of the concept of “eco-routes” and “eco-driving”** (Date: September 2007 – October 2007)

This measure was extended along with the extension of the number of new buses, at this moment all 8 routes were declared “Eco-routes” and were operated solely by the public transport provided by the clean vehicles belonging to the LTC.

**Stage 20: Training of the new buses drivers (the 2<sup>nd</sup> set of 15 buses procured)** (Dates: January 2007 – March 2007; July 2007 – September 2007)

The new public transport system was designed to be more attractive and the new bus drivers have been trained to get “eco-driving” skills. Their training included technical information regarding the buses, as well as good driving behaviour and good customer service. Drivers are now partially responsible for good patronage of buses and their performance is continually monitored.

This undertaking was repeated periodically for 3 months and the sessions were multiplied along with the new buses lot implementation.

The second session of training classes, with regard to the new set of buses and new drivers appointed to operate them, benefited from the existing experience in training and initiated the

drivers within the scope of eco-driving and made them responsible for a good patronage and a proper technical handling of the buses.

### **Stage 21: Eco-routes signalling and promotion**

**21.1: Designing of the new eco-routes post signs** (Date: December 2007 – January 2008) – For marking the presence of the 8 “Eco-routes” operated by the LTC new buses fleet, we produced a more significant traffic sign, which is on display alongside the main routes of Suceava city. This gives the chance to a large majority of citizens to come across this information and to become aware of the SMILE project.

**21.2: Installation of the Eco-routes post signs** (Date: February 2008) – Alongside the 8 Eco-routes, these post signs mark the concept and the SMILE project co-financers.

Figure 8: Eco-route post sign



**Stage 22: Modernisation of crossroads and important intersections as well, through widening lanes** (Dates: August 2005 – September 2005; April 2006 – June 2006, August 2006 - October 2006; June 2007 – July 2007, September 2007 – October 2007; April 2008 – June 2008)

This activity was carried out gradually, during the 4 years of project. One by one, every important junction (almost all are passed by the PT vehicles) has been modernised, through widening the road space in the neighbourhood of intersections, adding adjacent extra lanes to junctions, which are available for de-congestion of traffic in these “hot points”. At the same time, more attention was paid to the smaller crossroads that have increased in importance due to the raised mobility demand; these junctions have been properly signalled for pedestrians and for drivers to regulate the fluency of traffic in these areas.



*Figure 9: Modernised crossroads in important intersections*

*a) 1 May Blvd. – Universitatii Street – before and after*



*b) Ana Ipatescu Street – Mitropoliei Street*



*c) Calea Unirii – Gh. Doja Street – before and after*



*d) Selgros supermarket (Cernauti Street);*



**Stage 23 Installation of new traffic lights with updated technology and creation of roundabouts** (Date: August 2005 – September 2005; April 2006 – June 2006, August 2006 - October 2006; June 2007 – July 2007, September 2007 – October 2007; April – June 2008); in the intersections with increased demand – 8 new intersections have been equipped with traffic lights, in order to regulate road traffic and the accessibility for pedestrians within these crowded points. Usually, these junctions have increased traffic caused by the city economic and social development.

*Figure 10: Modernised intersections with new traffic lights and roundabouts*

*a) George Enescu – Calea Obcinilor – before and after*







*b) 1 December 1918 Blvd. – Sofia Vicoveanca Blvd. (entrance in Suceava from south)*



*c) George Enescu Street – Scurta Street – before and after*



*d) George Enescu Blvd. – Universitatii Street*



*e) Marasesti Street – Zamcei Street*



*f) Cernauti Street – Acad. Vasile Greacu Street*



*g) Calea Unirii Street – Carrefour shopping centre*





*h) Calea Unirii Street – Iulius Mall*



**Stage 24: Organising the public procurement of an LPG fuel converter prototype and the contract implementation** (Date: January 2007 – October 2007) – in order to demonstrate the feasibility of the LPG fuel converters within private and municipally owned public transport, the City Hall equipped one of the new buses with such a converter. Through a proper promotion campaign this action was brought to the awareness of relevant target groups with the view of obtaining the multiplication effect. This example was taken by Iasi municipality (which contacted the LPG manufacturer designated within the procurement process) when they have been accepted as partners in the CIVITAS PLUS project.

It is expected that due to this initiative, all actors that can play a role on the LPG market: LPG converter system producers, potential LPG car users, garages authorised to install LPG systems, LPG fuel suppliers, potential LPG car manufacturers will be spurred to increase their activity.

Figure 11: LPG converting system on a bus



**Stage 25: Marking the 15 LPG fuelled buses for raising citizens’ knowledge** (Date: February 2008 - March 2008) - Bearing in mind that LTC new buses running around the city would not be equally relevant for all citizens, especially for private car drivers who more rarely (or never) use the PT means comparing to the regular passengers, the dissemination team decided to design and produce a wide sticker with information about the project and its financiers. This was attached at the back of the 15 LPG converted buses, part of the SMILE project. With this initiative, the team intended to mark the LPG fuelled buses, so they could be recognised out of the complete new bus fleet and, at the same time, to specify the project name in which this measure is integrated.

This dissemination product is very efficient as it is visible for all citizens; especially it is easy for all participants in road traffic in Suceava to notice it.

Figure 12: LPG bus marked with a sticker



**Stage 26: “Green way” system for traffic lights along the main city route**

**26.1 Procurement of the “green way” system software for a fluent running of the road traffic** (*Date: September – October 2008*): - Another initiative referred to the purchase of the “green way” system operation equipment. This was the subject of deep market research to find companies able to introduce all the traffic lights in one informational system and to make the needed correlation to ensure fluency in important junctions. In consequence, with all these data at hand the project team prepared the tendering documentation and the call for tenders, respecting the legal provisions into force for public bidding.

This measure will help improving the fluency of traffic for all vehicles, especially for certain bus lines that are serving these routes and the main residential areas.

**26.2 Installation of the “green way” system software** (*Date: October – December 2008*)

The “green way” system software was implemented to ensure a fluid traffic flow along the roadway Universitatii Street – George Enescu Blvd. – Calea Obcinilor, where the junctions created have been equipped with new, modern technology traffic lights that support the software running. This is not only an efficient solution for decongestion but at the same time an experimental demonstration of the feasibility of such measures, designed to minimise the effects of increased road traffic demand that puts pressure on the same, relatively poor, road infrastructure.

**Stage 27: Implementation of a vehicle locating system** (*Date: October 2007 – December 2007*) – an experimental hardware system consisting of a GPS location system and a station able to monitor position of the vehicle in running; the data collected is monitored and stored. This activity involved an active participation of our team in collaboration with a regular partner of the City Hall.

**Stage 28: Implementation of e-ticketing equipment** (*Date: October 2007 – December 2007*) – an experimental hardware system containing equipment devised to issue electronic tickets, to recharge these tickets, devices able to control and validate the tickets into the bus, a wireless network for ensuring communication with the central station regarding the daily transactions, trip fees and lines. This activity involved an active participation of our team in collaboration with a regular partner of the City Hall.

**Stage 29: Implementation of a system for delivering information to passengers** (*Date: October 2007 – August 2008*) - inside the vehicle, within bus stops, and at a station to gather and manage the data from the stops and give estimation for the arrival time of the bus in each bus stop. This activity involved an active participation of our team in collaboration with a partner of the City Hall.

**Stage 30: Creation of the Mobility Centre** (*Date: June 2007 - July 2008*) – This system is meant to make public transport more attractive by informing people about public transport and local sustainable mobility opportunities. It is designed to become a stationary device, featuring touch screen equipment where citizens can extract fully updated information about PT services and other related topics. The content of information is selected to respond to many citizens needs and the location is chosen to be easy to see, to be visited by all kind of citizens, the City Hall premises.



Figure 13: Mobility Centre within the City Hall premises



### Stage 31: Public Transport information on Internet

#### 31.1: Public Transport information on Internet, updating and modernising facility (Date: May 2007 – December 2007)

Within collaboration with the IT specialists from the University of Suceava, the City Hall website acquired a new, friendly face, with improved and easy accessibility and offers better structured and more extensive information about the activities developed within the City Hall. On this interface, a very handy link leads the user toward a list with European funded projects with descriptions attached, a .jpg format of the hand-outs issued, among which one of the most important projects included is project SMILE.

The website provides information about PT fleet, timetables, bus stops and the news related to PT that have a significant impact on citizens and passengers.

#### 31.2: Improving accessibility and facilitate access to public information, including public transport service, through the City Hall web portal (Date: June 2008 – November 2008)

Becoming beneficiaries of non-refundable financing for the local public administration modernisation, the City Hall of Suceava procured a complete software tool able to help in managing the integrated activity of the entire City Hall, which allows the citizens' access to all information of public interest and supports an extended version of City Hall webpage. The preparatory analysis of the testing version revealed an improved situation of the webpage utilization and accessibility, offering also available links to the information related to LTC activity.

The new link to the modernised City Hall webpage is: [www.primariasv.ro/portal/suceava/portal.nsf](http://www.primariasv.ro/portal/suceava/portal.nsf)

### Stage 32: Evaluation activities

The *process evaluation* was the task of all measure leaders and reports were drawn periodically, according to the GUARD data base and templates received. Having support from measure leaders and the information withdrawn from the monthly Time Sheets, the evaluation manager drew out and filled out the Access data base forms, provided by Guard. The data base is tool to help follow the steps taken in measures implementation.

(Date: February 2006; September 2006; November 2007 – December 2007; ongoing 2008)

The *impact evaluation* began with establishing the Baseline position (data was taken out from the CATCH project final reporting issued late 2005), and with estimating the Business-as-usual scenario (using the forecasting from historical data and projecting a possible future); having this initial data, the evaluation team organised surveys and collected ex-post information relevant to the technical analysis.

The first step was to establish the population to be sampled and the sample size. The sample size interviewed was calculated to get a +/- 5% confidence interval at 95% level of confidence. The pilot questionnaire and the staff appointed to administer the surveys received proper training, in collaboration with the local University and the professor of statistics. The questionnaires were deployed over 3 months on a yearly basis in a face-to-face interview method, which produced a good response rate, complete coverage and best quality data.

The pollution indicators emissions with reference to PT fleet were calculated using data obtained using the tailpipe measurements made in accordance with the legally demanded annual tests and the bus fleet financial records are provided by LTC accountancy.

*(Date: November 2005 – January 2006; July 2006 – September 2006; July 2007 – September 2007;*

*May 2008 – June 2008)*

### **Stage 33: Promotion campaigns and Dissemination activities for LTC bus fleet service** *(Date: July 2005 – till end of the project)*

Dissemination of all measures, initiatives, results and outcomes, changing the life of target groups, was a continuous process, it was evenly distributed throughout the year, all the years of project, updating the achievements of project targets and considering the step by step progress. PT was tackled as an important topic and information was delivered accordingly, at workshops in schools, in the consultations with citizens, within local events.

The local and national events are good occasions for gathering groups of citizens together. Such mentioned events were: New Years and Christmas parties, Romania's accession to EU structure, Suceava Days 22<sup>nd</sup>-26<sup>th</sup> of June, yearly organised Mobility Week, Europe's Day 9<sup>th</sup> of May, traditional local festivals, auto show rooms. These events are having the base within the LEZ and public transport is promoted at these occasions.

## **B4 Deviations from the original plan**

The deviations from the original plan comprised:

- **Late alternative fuel bus fleet entering into operation** – In the initial project plan it was foreseen to renew the LTC bus fleet in the second year of project, by replacing the old ones with 15 new buses running with alternative fuel. The action was only partly fulfilled as the French manufacturer designated after the procurement process hadn't had the technical solution for LPG fuelled engines for buses. The contract was completed by the contractor by sending the set of 15 buses within the deadline but the buses were equipped with regular diesel engines. The conversion process was carried out afterwards, by producing and equipping the engines with the converters, with the support of a specialised company in this field. The buses returned to Suceava with their new features one by one, minimising the effect of the initial insufficiency and bringing about the expected improvements.
- **Extra buses purchased** – During the project a decision was taken to purchase an additional 15 buses to complete the modernisation of Suceava's bus fleet.
- **Biogas fuelled buses remission** – The project initial plan foresaw to implement the introduction of biogas in the PT and private transport in the second phase of the project, The biogas production will be possible after Wastewater Treatment Plant (WWTP) rehabilitation; this process is now foreseen to be completed by the end of 2009, and the deadline is middle 2010. Therefore, the biogas fuel into PT fleet was subject of an amendment to the initial contract and for the course of the current project, it is agreed that we organise campaigns for biogas fuel as being available in the future, from 2010 on, in order to raise citizens' awareness of the benefits of this fuel. At this moment, biogas fuel is not locally available and local and

national vehicle markets don't offer opportunities to procure such cars. LPG fuel is currently well regarded and the LPG promotion campaigns gave good results. LPG is available on the local market and represents an intermediary phase towards biogas fuel.

- **The integration of the LPG powered heavy vehicles into the heavy traffic was not realised as planned**, because the whole market composed of: converting systems constructors, authorised specialists - companies to install the systems and the final beneficiaries were not all attracted to a joint effort to invest and take the appropriate actions in relation to this development. The dissemination of LPG and examples of good practice from PT vehicles were used to prove feasibility and the promotion campaign was directed towards them too. We estimate that if the LPG buses implementation would have been completed as foreseen, before end of 2007, the expected results of this initiative could have been to a certain extent reached.
- **Emissions assessment.** It had been hoped to conduct some form of area wide assessment of emissions from transport as part of the evaluation using appropriate emissions factors for the vehicle fleet in Suceava in combination with information collected about the overall mileage travelled. However, the lack of any form of traffic model presented a major barrier to this. After considerable research it was decided that the data collected from a range of count points could not reliably be translated into accurate vehicle kilometre data for the city as a whole without investment in such a model – a situation that is likely to be replicated in many small – medium sized cities in the recent accession countries. Instead the emissions impacts have focused on emissions measurements taken from individual vehicles in order to understand the changes due to the upgrading of the public transport fleet.

## **B5 Inter-relationships with other measures**

The measure is related to other measures as follows:

- **Measure 5.7** - Marketing for alternative fuels in the public and private sector  
The situation prior to CIVITAS where public transport was provided by low quality vehicles means that promotion activities lacked credibility. Once the public transport fleet is renewed then wider promotion of alternative fuels can be conducted based on the activities of this measure as an example.
- **Measure 6.4** – Low Emission Zone  
The new public transport Eco Routes will be focused on and support the new Low Emission Zone being implemented in the city centre.
- **Measure 11.7** – Information and Awareness Raising  
The information and awareness raising in measure 11.7 is aimed at supporting the use of the upgraded public transport system (measure 8.8) and also integrates with the information specific to public transport in measure 8.9.

## C Evaluation – methodology and results

### C1 Measurement methodology

#### C1.1 Impacts and Indicators

Figure 14: Table of Indicators.

NO.	INDICATOR	DESCRIPTION	DATA /UNITS
1	Operating revenues	Revenues per PT pkm	Euros/pkm, quantitative, derived
2	Operating costs	Costs per PT pkm	Euros/pkm, quantitative, derived
3	Vehicle fuel efficiency	Fuel used per vkm, per vehicle type	MJ/vkm, quantitative, derived
8	CO <sub>2</sub> emissions	CO <sub>2</sub> per vkm	G/vkm, quantitative, derived
9	CO emissions	CO per vkm	G/vkm, quantitative, derived
10	NOx emissions	NOx per vkm	G/vkm, quantitative, derived
11	Small particulate emissions	PM <sub>10</sub> per vkm	G/vkm, quantitative, derived
12	Noise perception	Perception of noise	Index, qualitative, collected, survey
13	Awareness level	Degree to which the awareness of the policies/measures has changed	Index, qualitative, collected, survey
14	Acceptance level	Attitude survey of current acceptance with the measure	Index, qualitative, collected, survey
16	PT services relative cost	Cost of PT related to average personal income (i.e. cost of a weekly, monthly or annual pass in proportion of the average weekly, monthly or annual income, respectively)	Index, quantitative, measurement
18	Accuracy of PT timekeeping	Percentage of services arriving/departing on time compared to timetables (each city should fix the interval of time considered as a delay compared with timetable)	%, quantitative, collected, measurement
19	Quality of PT service	Perception of quality of PT services	Index, qualitative, collected, survey
Local indicator - Average number of passengers/month for LTC vehicles		Percentage of average no. of passengers / month evolution	Index showing evolution, quantitative, derived

Referring to public transport provided by LTC in SM, the fleet was composed of 15 Euro 0 buses, diesel fuelled (model UD 112) and 10 minibuses, from the beginning of LTC in July 2005 till December 2005 and of 12 old buses from January 2006 to March 2006. The analysis starts with July 2005 because at that point the old TPS (The services and public transport company) was declared bankrupted and the new LTC (Local Transport Company) was set up.

When the first set of 15 new buses arrived in March 2006, the fleet consisted of a combination of 15 EURO 3 IRISBUS IVECO buses (diesel fuelled), 10 Euro 0 buses (UD 112 model) and 10 minibuses, and from January 2007 when other 15 buses the same type have been received, a clean fleet consisting of 30 EURO 3 buses (diesel fuelled) and 10 minibuses were into service. Out of this fleet, 15 buses were converted to LPG fuel, in a 7 month long process, and from September 2007 onwards a set of 15 new buses run on diesel fuelling and the other set of 15 buses run on LPG fuel.

Detailed description of the indicator methodologies:

- **Indicator 1 - Operating revenues** – this indicator is focused on the changes in total income generated from fares and tickets / month, as a result of integrated implementation of the bundle of measures, during the 4 years of project. The necessary figures are collected from official data processed and transmitted by the LTC to the City Hall.

The relevant measurement unit will be derived from basic data collected as: total income (Euro), total number of passengers per month and the amount of driven kilometres per vehicle per month.

The data collection is made monthly and the analysis will be extensively performed on a quarterly basis, throughout the whole year, starting with July 2005 and finishing with June 2008.

*The first (half) year evaluated:* operating revenues results are quantified at the beginning of July 2005 – December 2005, for 2 quarters: July 2005-September 2005 and October 2005-December 2005. The analysis starts with July, because at that point the old TPS (The services and public transport company) was declared bankrupted and the new LTC (Local Transport Company) was set up.

The data will be submitted as an average for the two quarters, initially collected from LTC on monthly basis.

*The second year evaluated:* January 2006 – December 2006, for 4 quarters: January-March 2006, April-June 2006, July-September 2006 and October-December 2006.

The first quarter of this evaluation period will provide data about the old LTC vehicles and is used for establishing the baseline position.

The second quarter must emphasise the contribution of the first batch of 15 new buses and the legislative changes that have been locally introduced. It should refer to the laying-down of the public transport scheme - reduction of the number of private minibuses from 100 to 40, the selection of a single private operator (an association of few operators, designated through a public tendering procedure) and the re-designing of the routes to be run and the new stops made available.

*The third year evaluated:* January 2007 – December 2007, on quarterly basis, for 4 quarters: January-March 2007, April-June 2007, July-September 2007 and October-December 2007. This analysis sets light on the contribution of the second lot of 15 new buses coming to complete the clean bus fleet and the trend of PT popularity as a synergic result of various measures taken. It focuses on modernisation of PT performance (increased quality of service, information disseminated, other bus improvements and the continuous promotion and information campaigns directed towards all citizens). It is important to mention the contribution of LPG fuel registered within the last quarter, October-December 2007, when the first 15 new buses procured were all fuelled with LPG (the fuel price and consumption will generate differences in this financial data).

*The fourth (half) year evaluated:* January 2008 – June 2008 – brings accurate results depicting the degree in which the project was successful. The analysis will be carried out in the same manner, on quarterly basis for: January-March 2008 and April-June 2008.

For a complete picture of the economic performance of the new integrated measures, it's relevant to analyse this indicator in conjunction with "Operating costs".

- **Indicator 2 - Operating costs** – are considered to be all the costs incurred from making the PT service available / month; the source of the required data is the local PT Company. The relevant measurement unit will be obtained deriving from basic data collected as: total costs (Euro), total number of passengers per month and the amount of driven kilometres per vehicle per month.

The data collection is made monthly and the analysis will be extensively performed on a quarterly basis, throughout the whole period, starting with July 2005 and finishing with June 2008.

The operating costs analysis is made similarly with the indicator 1, ensuring the conjunctive analysis and establishing the economic increase of the LTC, the public transport company.

For a complete picture of the economic performance of the new integrated measures, it's relevant to analyse this indicator in conjunction with "Operating revenue".

- **Indicator 3 – Vehicle fuel efficiency** – it's appropriate to use this indicator to assess the improvements incurred with the purchase of the new Euro 3 buses comparing to Euro 0 old



buses and the part replacement of the diesel buses with LPG fuelled buses. To achieve this goal, the procedure utilised is to get measurements on a monthly basis of the total fuel consumption for each type of bus: LPG and diesel (litres/month), the number of kilometres/vehicle of the new buses, the average fuel consumption per 100 km for each type of vehicle (l/100km) and to compare results with the fuel consumption registered for the old buses.

Having data about the number of kilometres run and the total consumption in litres per each vehicle type, registered on a monthly basis, it enabled us to calculate, on a quarterly basis, the indicator vehicle fuel efficiency for each type of vehicle and the type of fuelling.

- **Indicator 8 - CO<sub>2</sub> emissions** – carbon dioxide is the most significant greenhouse gas and in the transport sector results primarily from the use of fossil energy sources. Due to the exponential growth of car numbers and respectively the emissions caused by road traffic, the quantification of PT emissions is relevant for the results achieved after the project measures implementation. The data is collected twice for the diesel powered engine and for the LPG powered engine after it was converted, with the vehicle under little load and during acceleration period; taking form of the annual test, as required.
- **Indicator 9 – CO emissions** – The data is collected twice for the diesel powered engine and for the LPG powered engine after it was converted, with the vehicle under little load and during acceleration period; taking the form of the annual test, as required by law. Although, the results are not particularly representative, no other more reliable methods are currently available in Romania to do this.
- **Indicator 10 – NO<sub>x</sub> emissions** - The data are collected twice, for the diesel powered engine and for the LPG powered engine after it was converted, with the vehicle under little load and during acceleration period; taking form of the annual test, as required by law. Although, the results are not particularly representative, no other more reliable methods are currently available in Romania to do this.
- **Indicator 11- Small particulate matter emissions PM<sub>10</sub>** - The data is collected twice, for the diesel powered engine and for the LPG powered engine after it was converted, with the vehicle under little load and during acceleration period; taking form of the annual test, as required by law. Although, the results are not particularly representative, no other more reliable methods are currently available in Romania to do this.
- **Indicator 12 – Noise perception** – The measurement of noise level is made only with reference to small but crowded areas, in locations where road traffic is more intense and the number of residents is large, therefore the degree of dissatisfaction is manifested by a larger number of citizens. In crowded urban agglomerations, the effect of noise is further aggravated by high concentrations of people living together, therefore the surveys for collecting the qualitative data are deployed in such areas.

The target group comprised inhabitants and visitors. The sample size interviewed was 380 persons, calculated to get a +/- 5% confidence interval at 95% level of confidence.

Analysis was undertaken according to % of population exposed with perceptions broken down into 5 different perception bands of L<sub>day</sub>: classified by five answer options, two negative, two positive and one neutral (absolutely dissatisfied, partly dissatisfied, absolutely satisfied, partly satisfied and neither satisfied nor dissatisfied - neutral). The frequency of questionnaires was once a year, within a 3 months period/year, in 3 crowded locations.

An index of average perception was then produced by allocating a score to each type of response, as follows: *positive* +2, *partly satisfied* +1, *neutral* 0, *partly dissatisfied* -1, *negative* -2, and then converting these percentages into a weighted value, where 0 = neutral and the degree >0 or <0 indicates the average satisfaction or dissatisfaction with the noise level.

- **Indicator 13 – Awareness level** – this indicator assesses the awareness of the inhabitants and visitors of a city of new integrated measures and it is carried out by means of

surveys that took the form of face-to-face interviews and in-person questionnaires. In order to assess the knowledge and the impact of the information campaigns, the data collected is processed and the results are quantified for further conclusions.

The frequency of the questionnaires deployment was once a year and the results take the form of an index of the value awareness of every surveyed person, that showed us what percentage of people have been reached and to what extent they have actually gained knowledge about the new measures, and thereby, whether or not and to what degree an information campaign has been successful.

The target group referred to citizens and PT passengers; each target group was represented in the survey. The sample size interviewed was 380 persons, calculated to get a +/- 5% confidence interval at 95% level of confidence.

- **Indicator 14 – Acceptance level** – or the favourable reception / approval of the measure intends to assess satisfaction with the existence and the use of the measures. The method of data collection used was by means of surveys, using face-to-face interviews and in-person questionnaires. The frequency of the questionnaires deployment was once a year and the result took the form of an index of the value satisfaction of every surveyed person and set emphasis on the measures and their results, both in terms of existence and use.

Acceptance is classified according to four answer options: i) satisfied with both existence and use, ii) satisfied with existence and unsatisfied with use, iii) unsatisfied with existence and satisfied with use, iv) dissatisfied with both existence and use. A classification as such allows intercepting the twofold dimension of satisfaction with one indicator.

The target group referred to citizens classified by age, profession and whether they were PT passengers; each target group was represented in the survey. The sample size interviewed was 380 persons, calculated to get a +/- 5% confidence interval at 95% level of confidence.

Indicators 13 and 14 are analysed in conjunction, because those who are aware of a measure may not be satisfied with its use or existence.

One method of assessing acceptance is to establish the frequency of use of the various modes. This was then converted to get an indexed rating for the degree of usage of each means of transport by allocating a score to each option: very often (+2), often (+1), rarely (-1), accidental (-2) and never (-3). These percentages were converted into a weighted value, where 0 = neutral and the degree greater or less than zero indicates the average acceptance as judged by actual usage.

- **Indicator 16 – PT service relative cost** – refers to economic accessibility and it is understood as the average cost of a PT pass in relation to the personal available income of PT users. This is an important indicator, because the pricing regime (not directly adjusted to the personal available income) in conjunction with the personal income of a potential PT user can be a major obstacle to using PT. In rare cases this could become an obstacle to getting access to some factors of social well-being, such as employment, education, health care provision, and so on. Pupils, students, unemployed persons and to some extent pensioners could be found in this situation.

The source of information comes from the local PT Company, considering the number of free of charge and reduced subscriptions granted to pensioners with lower income and to students, veterans (people who participated in WWII), and people with disabilities and the number of regular subscriptions and tickets sold.

The frequency of data collection is considered to be two times, once at the outset and another time at the end of the project.

- **Indicator 18 – Accuracy of PT timekeeping** – or the service reliability accounts for the real reliability of arrival and departure times of PT buses at stops. Lack of reliability can be regarded as one of the most important barriers to using PT services. An error in timekeeping longer than a couple of minutes from the time given by the timetable could cause discomfort,

longer travel times and unpredictable waiting times which in conjunction with the lower security and lack of privacy could lead to a shift to another mode of transport, namely cars. It is well-known that public transport is in continuous competition with other transport modes mainly private cars; most passengers still prefer to use the private mode, irrespective of the distance instead of resorting to public transport or non-motorised modes. Therefore, this indicator values will count to show the attractiveness and the competitiveness of PT mode of transport against private cars.

The method of measurement used is derived from raw data collected through surveys and observations and counting within stops, for two main bus lines crossing residential areas, important for the measures implemented. The indicator will be expressed as an average difference from scheduled time.

The information about timetables is collected from LTC Company.

The frequency of data collection is once every three months, in seven consecutive days and the results are expressed as an average difference from scheduled time.

- **Indicator 19 – Quality of PT service** – this is an indicator that provides direct information on the formulation of PT policies aimed at attracting more users and at avoiding shifts from public transport to other means of transport. It is translated as the user perception of the overall quality of public transport policies (comfort, travel time, reliability and security), all measured on a scale based on five answer options: two negative, two positive and one neutral.

The source of information is data from local public transport company and surveys. The target group: PT users. The sample size interviewed was 380 persons, calculated to get a +/- 5% confidence interval at 95% level of confidence.

Two sets of questions were asked with survey questions asking respondents to rate various aspects of the public transport service for quality and importance. These responses were then converted to get an indexed rating for each set of questions as follows:

Quality: very good +2, good +1, acceptable 0, partly dissatisfied -1, dissatisfied -2

Importance: very important +2, partly important +1, neutral 0, not important -1, not very important -2

and then converting these percentages into a weighted value, where 0 = neutral and the degree greater than or less than zero indicates the degree of attribute quality and importance

- **Local indicator - Average number of passengers/month for LTC vehicles** – this indicator will show to what extent the objective related to the number of passengers, assumed at the beginning of the project have been achieved. It will be calculated as an average for several relevant periods of evolution:

- First 9 months of old bus fleet transported passengers (July 2005 – March 2006)
- Next 9 months (April 2006 – December 2006)
- Next year 2007 (January 2007 – December 2007)
- Half year evaluated in 2008 (January 2008 – June 2008).

## C1.2 Establishing a baseline

To assess the LTC baseline status at this project beginning stage in 2005, we use data received from the public transport company accountancy and some conclusions drawn in the report laid down at the end of “CATCH – Clean Accessible Transport for Community Health” project. These conclusions were re-analysed in the Feasibility Study, which formed the base for making the decisions on the recommended SMILE measures, general ideas and the detailed proposed work plan. The CATCH project was a prime example of pan-European collaboration

with the view of exploring the possibilities for improving air quality and raising the locals' awareness about the concept of sustainability and the problems associated with traffic congestion and high car ownership and usage.

CATCH demo-project in Suceava proposed and implemented few measures, designed to introduce improvements in Suceava public transport, by means of providing more comfortable, accessible and efficient services, using cost efficient and environmentally friendly solutions. The financial data was removed from LTC accountancy records, provided on monthly basis, showing accuracy and thoroughness.

### *Economy category indicators*

To ensure good comparative basis and make comments on the progress of financial status, the economic analysis will be carried out for 4 quarters/year, chosen for their impact on public transport demand and relevant for the main events of the year: January-February-March (winter traffic conditions), April-May-June (full activity and proper conditions for walking and driving as well), July-August-September (summer holiday for pupils and holiday leaves for many employees), October-November-December (full activity for pupils and employees and Christmas and New Year events).

In 2005 public transport reached the point of insolvency and the company's administrative board made the decision to declare its bankruptcy and set up a new company, the Local Public Transport Company (LTC), benefiting from strong financial and political support from the City Hall representatives and the local councillors.

In order to demonstrate the LTC financial status progress, we will take as baseline the records provided by the LTC accountancy, for July 2005 – March 2006 (before purchasing the new clean buses). The analysis will reveal the situation on quarterly basis, it is worthwhile to remember that the assessment of the period July 2005 – December 2005 is made for the bus fleet consisting of 15 UD 112 Euro 0 buses and of the period January 2006 – March 2006 for a bus fleet containing 12 UD 112 Euro 0 buses (due to the malfunctioning of the 3 of them which could not be restored and put again into service).

In the Table presented below, it is easy to notice in these records that the number of kilometres run by each vehicle belonging to LTC public transport decreased by 8.5% (from 4738 to 4335 km) which in conjunction with the 3 buses pulled over (accounting for 14214 km of distance operated by LTC buses) gave a total of 19050 km/month reduction of monthly service coverage.

Also, the reduced distance run per month by each bus modified the PT timetable, decreasing the frequency of buses at the bus stops and increasing the waiting time for passengers.

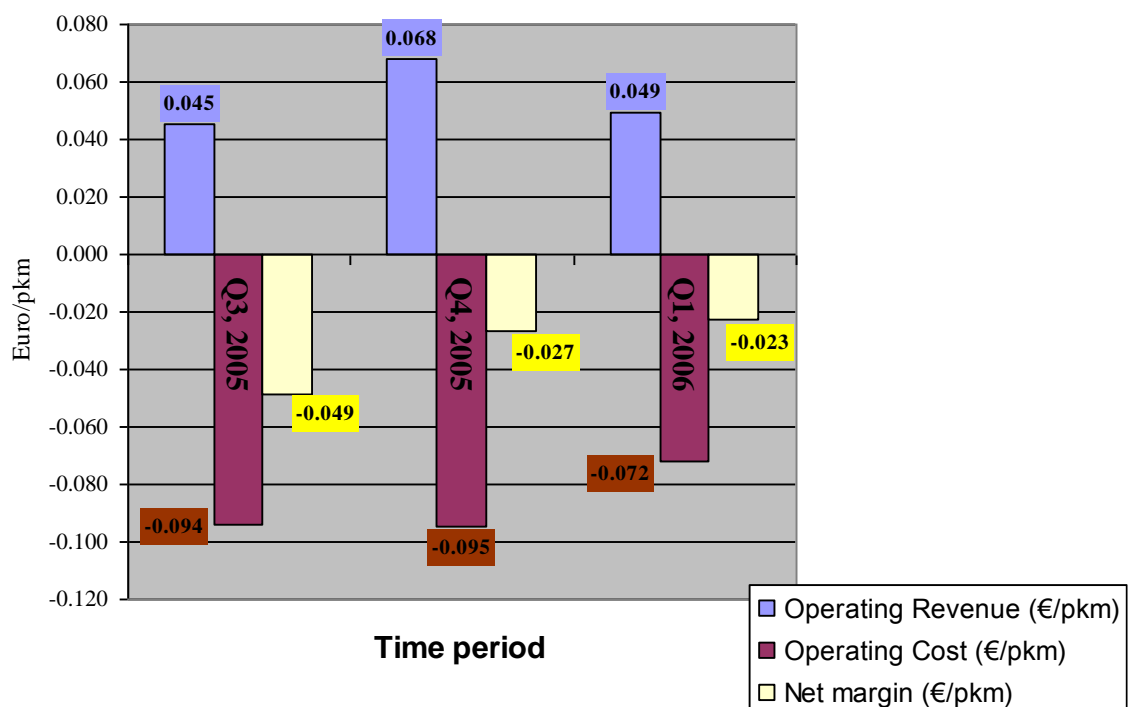
That phenomenon occurred onto a background of increased need for mobility inside the city and a raised monthly disposable income and bank credits relaxation. Although public transport was very affordable (In 2005 the ticket fare for one journey regardless of the distance was only 0.194 Euro, a monthly subscription for 1 line was 6.8 Euro, for 2 lines 10.97 Euro and for all lines 12.77 Euro), because of the less attractive public transport and the increased access to purchasing new private cars, the increased demand for mobility led to an exponential growth of privately owned cars.



Figure 15: Table with the Baseline position for economy indicators for LTC, operated with old Euro 0 buses:

	July-August-September 2005	October-November-December 2005	January-February-March 2006
No. of vehicles UD 112	15	15	12
Revenue – quarter total (Euro)	35889.77	53955.9	53484.8
Cost – quarter total (Euro)	74434.17	75328.15	77861.01
No. of passengers total/quarter	200474	263305	198162
Distance (km) run/month*vehicle	4738	4738	4335
Operating revenue (Euro/pkm)	0.045	0.068	0.049
Operating cost (Euro/pkm)	0.094	0.095	0.072

Figure 16: Graph with the General outlook on operating costs and revenues of old Euro 0 buses



### 1. Operating revenues

From the Chart 1, we can conclude that for all three quarters the revenues were extremely low comparing to costs. The operating revenue increased from quarter to quarter; the first increase could be explained by the fact that summer July-September 2005 is mainly a period of holiday for pupils and employees as well. For January-March 2006, the operating revenue increased again, but analysed in conjunction with the operating costs, the result was disadvantageous.

### 2. Operating costs

In the Chart 1, it is clear to see that for all three quarters, the costs exceeded the revenues and in the costs considered we included only the costs for buses operating process: maintenance and spare parts and the wages of employees involved in the running: drivers, cashiers and fuel. The additional costs (office staff) make the imbalance more evident.

The trend assigned to the old fleet was clearly downwards, because although we could try to spur PT usage by using soft measures to increase the revenues, the operating costs rose significantly due to the growing maintenance costs, fuel price and the need to raise the employees' wages. The issue was even more serious, as the old buses became worn out, the spare parts weren't available on the market (they were not fabricated anymore for those models of buses) and one by one, these outdated buses were pulled over as they could not be repaired any longer.

That was the disastrous financial status of LTC (when it appeared as judicial entity and began to operate) and the public transport in Suceava city, before implementing the SMILE measures.

### *Energy category indicator*

#### **3. Vehicle fuel efficiency**

In order to calculate this indicator value for the old UD 112 Euro 0 buses, we collected data from LTC records, regarding the monthly kilometres run and the total fuel consumed, for month July 2005. The average fuel consumption for one vehicle/month in July was 40 l / 100 km.

Therefore for the UD 112 buses, with regular diesel fuelling (38.5 MJ/l), the vehicle fuel efficiency calculated was 14.98 MJ/vkm.

### *Environment category indicators*

#### **8. CO<sub>2</sub> emissions**

Based on the fuel/energy consumption data we can conclude that the new diesel fuelled buses emitted 2.6 kg CO<sub>2</sub> per litre of diesel. Considering the first quarter of 2007, when the new 30 Euro 3 buses run 8250 km/month each, the entire fleet emitted 292050 kg CO<sub>2</sub>, per month.

#### **9. CO emissions**

The new diesel fuelled buses emitted 3.7 g CO /vehicle for each km run.

Bearing in mind that for the period January-March 2007 the average distance travelled by each bus per month was 8250 km, the fleet emissions of 30 new diesel Euro3 buses amounted in total to 915.8 kg CO per month.

#### **10. NO<sub>x</sub> emissions**

The new diesel fuelled buses emitted 13.6 g NO<sub>x</sub>/vehicle for each km run. Therefore the bus fleet composed of 30 Euro3 buses emitted on average in the first quarter of 2007, 3366 kg NO<sub>x</sub> per month.

#### **11. Small particulate matter emissions PM<sub>10</sub>**

The PM<sub>10</sub> emission value measured for a diesel bus was 0.27 g/vehicle for each km. The 30 new Euro3 buses emitted monthly in the first quarter of 2007, in average, 66.8 kg PM<sub>10</sub>.

#### **12. Noise perception**

The surveys for collecting the qualitative data are deployed in: the city centre, Obcini district – in the vicinity of the Suceava main entrance road from south, direction Bucharest and in Burdujeni district – in the vicinity of the exit toward east.

The noise level monitoring and measurements were made by the EPA Suceava and the data collected from their statistical records – averages calculated on semester basis and the results shown are summed up in the following table:

*Figure 17: Table regarding the Measured noise level*

Location	L <sub>max</sub> admissible	Semester II 2005		Semester I 2006	
		Noise maximum level after measurements	Exceeding values	Noise maximum level after measurements	Exceeding values
	dB	dB	% of measurements with exceeded admissible values	dB	% of measurements with exceeded admissible values
City Centre intersection	70	71.38	25	75.4	33.3
Burdujeni intersection	70	73.90	50	71.6	33.3
Obcini intersection	60	69.60	100	68.1	100

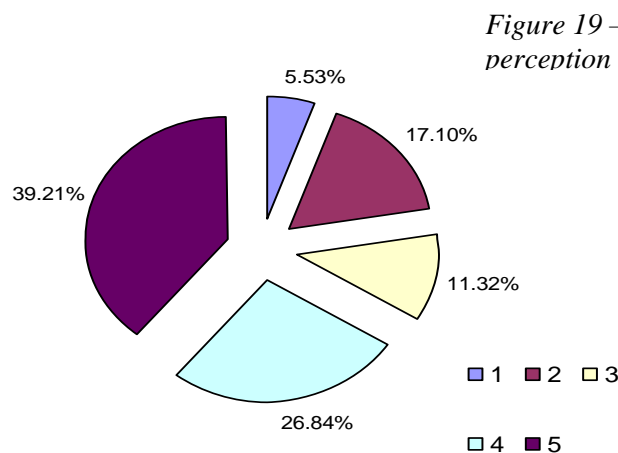
These values enabled us to assess the baseline position for the general noise level in 3 intersections, in the middle of crowded residential areas, crossed by a high traffic level and by the PT buses. We mention additionally that in these areas, the main source of noise is generated by road traffic (vehicle engines - both commercial and private - and horns), as the contribution of industry has decreased as the old factories have closed.

As for the qualitative value, within the structure of the questionnaire designed for general public, one question pointed at determining the citizens' perception upon the noise levels, broken down into 5 different perception bands of L<sub>day</sub>. The evaluation team considered it irrelevant to collect data reflecting the noise perception at night time, due to the fact that road traffic is very low during the night. However, the option of extending the night bus service was taken into consideration, to prevent a certain trend from happening.

*Figure 18: Responses in 2005 for the question "How acceptable is the noise caused by the daytime road traffic in the Suceava city?"*

2005	1. Positive	2. Partly satisfied	3. Neutral	4. Partly dissatisfied	5. Negative
Noise	21 5.53%	65 17.1%	43 11.32%	102 26.84%	149 39.21%

**Noise level - citizens' perception**



*Figure 19 – 2005 Noise level perception*

Therefore, we can underline that 5.53% of citizens have a "positive" perception, 17.10% appear to be "partly satisfied", 11.32% express a neutral position, 26.84% have a "partly dissatisfied" position and 39.21% are negative about the issue.

Converting these percentages into the index value provides a score for 2005 of -0.771.

### *Society category indicators*

#### **13. Awareness level**

To establish a baseline for citizens' acceptance level for measures related to finding the best pattern for urban transport in the city of Suceava, the "CATCH – Clean Accessible Transport for Community Health" project results were considered and furthermore exploited. These sub-indicators referred to the citizens' knowledge about the project measures and objectives, accessibility of information, the quality (accuracy) of information, the quantity of information and the channels used to deliver the information. The evaluation results emphasised a high level of knowledge 75% for the LEZ extension (for various reasons, including the direct and instant impact on all citizens), 67% for alternative fuels and vehicles and 58% of the interviewed sample recognised the measure taken to rehabilitate the trolleybuses with the view of reducing the pollution caused by PT. The last measure mentioned was less acknowledged due to the delay in implementation and, we assume also due to the fact that the trolleybus fleet didn't really serve the passengers' needs in a superior manner but produced a slight decrease in pollutant gas emissions, which was less perceived as significant.

The increased demand for mobility and the growth of privately owned vehicle numbers in the city don't need any awareness raising among citizens but imposed efforts to find alternative solutions to serve the need for journeying within the city.

With regard to the quantity and format of the information delivered, 40% of those interviewed declared that they received a useful amount of information, 45% considered that information was insufficient and improperly delivered to reach the citizens at large scale and 15% said that they didn't get any format of information material. The results brought out in relief the effectiveness of some information channels: 33% public events – face-to-face contact, 27% - printed materials, surveys/questionnaires – 26% and public meetings – 14%.

The accuracy of information was considered to be good by 45% of the respondents and 30% expressed a negative opinion about that.

These results and conclusions were very useful in building the promotion campaign strategy and the dissemination activities and tasks.

#### **14. Acceptance level**

To establish a baseline for acceptance level, the CATCH project results were used, regarding the public perception, acceptance and attitudes toward the measures implemented, and in general toward demo measures that tackled issues about environmental friendly measures related to increase the attraction of public transport. The mentioned project was focused on demonstrating at a small scale the impact upon the environment of the LPG fuelled vehicles, the feasibility and effect of the introduction of emission reduction systems on municipal vehicles and vehicles performing PT, the citizens' perception of LEZ and the perspective of transforming the city centre into a pedestrian area, hosting quality walking facilities. The first steps in doing structural changes in the PT fleet occurred during this project with the rehabilitation of trolleybuses. This project became a forerunner for all the forthcoming measures related to urban road traffic and innovative solutions devised to respond to the new mobility demand in the context of the rapid economic development.

The introduction of CATCH measures was regarded with satisfaction by the majority of respondents, out of which 70% agreed with alternative/LPG fuel promotion, 61% of them agreed with LEZ in the city centre introduction; the others' opinions were mainly situated on the 3 intermediary levels of agreement. The disagreement of 25% of the interviewed sample came from private car users and non-PT means users. 61% of the respondents were negative with regard to the installation of FPT systems on PT vehicles. That was a good start for the City Hall to begin treating the problems caused by the PT fleet more radically, undergoing a serious modernisation of the vehicles and facilities offered to PT users.



With regard to the PT passengers group, they had a positive attitude (48%), a moderate attitude (27%) and a negative attitude (25%) for the LEZ partial introduction. Another important measure for this category was the promotion of alternative vehicles and LPG fuel, their answers were positive for 60% of the interviewed persons, whilst 20% proved neutral and 20% had a negative attitude. As regard the cleaner vehicles included in the PT fleet, 64% of them showed increased interest, proving that they became the most affected category by the road traffic pollution and increased private car usage.

In extension, this study considered the category of private LPG car owners, to determine the feasibility of LPG fuel converting systems, and 90% of the responders were satisfied with the equipment, as regards the lifetime and number of kilometres run, and the costs of fuel consumption.

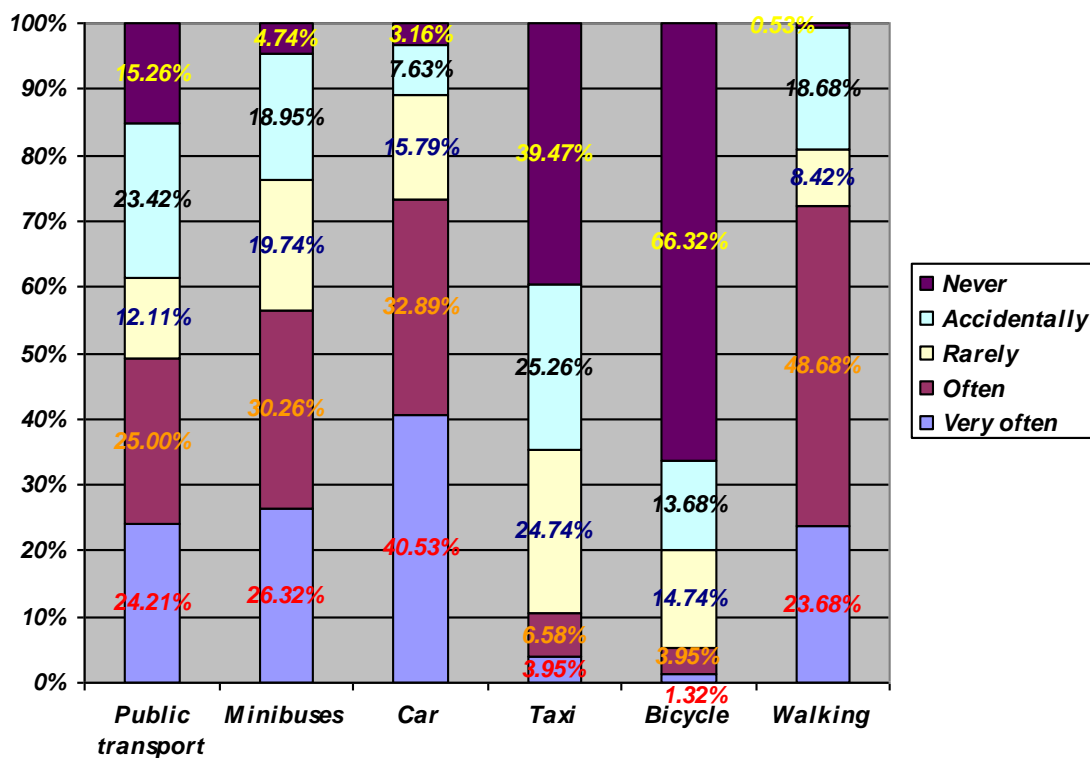
The sample groups (subject of questionnaires) addressed were chosen from all age categories, users (100) and non-users (50) of public transport means. Among these categories, a demarcation line was traced between politicians' category, stakeholders that are directly influenced by such measures and operators that put into practice the results of demo measures. Socially, this project had an important impact on citizens' mentalities, behaviour and understanding, preparing them to accept new bolder actions and laying the foundation for implementing more outstanding measures and innovative solutions for urban public transport. Practically, these results and conclusions were very useful in building the promotion campaign strategy considering the perception and the degree of interest shown by each category apart.

To analyse to what extent the quality of public service influenced the mobility pattern, at the beginning of the project initiative of renewing the PT fleet (mid 2005 along with data collection for CATCH reporting), face-to-face interviews and questionnaires in-person were deployed. The result is summarised as percentages in the table below.

*Figure 20: Responses in 2005 to the question: "To what extent do you travel with the following means of transport?"*

<b>2005</b>	Very often	Often	Rarely	Accidentally	Never	Acceptance Index
Public transport	24.21%	25.00%	12.11%	23.42%	15.26%	-0.3131
Minibuses	26.32%	30.26%	19.74%	18.95%	4.74%	+0.1104
Car	40.53%	32.89%	15.79%	7.63%	3.16%	+0.7342
Taxi	3.95%	6.58%	24.74%	25.26%	39.47%	-1.7919
Bicycle	1.32%	3.95%	14.74%	13.68%	66.32%	-2.3447
Walking	23.68%	48.68%	8.42%	18.68%	0.53%	+0.4867

Figure 21: Graph depicting the Mobility pattern before SMILE measures (2005):



Obviously, walking was an option for travelling purposes and in this respect modernising pedestrian infrastructure was considered a priority.

### 16. PT services relative cost

The source of information comes from local PT Company, considering the number of subscriptions and tickets sold. The information related to incomes for employees will be taken from statistic data available at the level of Suceava County, from National Institute for Statistics, Suceava County.

The frequency of data collection is considered to be two times, once at the outset and another time at the end of the project. To make an up-to-date comparison, we'll take the available data for the monthly average net income for year 2005, provided by the National Institute for Statistics, Suceava County. We consider that although we speak about the County level, we make the remark here that the rural areas don't distort the values as the incomes there are nearly zero and the agriculture barely provides subsistence incomes.

To calculate the PT relative cost for employed people, we used data for the average monthly net income provided by and the price for a monthly subscription for 1 route, 2 routes and all bus road networks and apart for one ticket.

Figure 22: Table with data about PT relative cost for 2005

2005	Subscription 1 line	Subscription 2 lines	Subscription all lines	Fare price
PT relative cost related to monthly subscription price and unit fare price	3.83%	6.18%	7.20%	0.109%

**Transport category indicators****18. Accuracy of PT timekeeping**

The PT vehicles timekeeping is regarded as a very important decisional factor when making one choice between the multiple modes of transport. Accuracy in the PT timekeeping, the correspondence between the bus timetables (collected from LTC Company) and the actual running (data collected through surveys and observations and counting within stops) means recognition of the overriding need for ensuring reliability and good timekeeping in delivering a quality public transport service to the people of the City.

The frequency of data collection is once every three months, in seven consecutive days (four times a day at on-peak and off-peak hours), and the results are expressed as an average difference from scheduled time.

It has been decided to deploy surveys and observations for two main bus lines, crossing residential areas, important for the SMILE measures implemented; it was estimated that these lines will not change significantly or at all, when the new bus fleet operation will be implemented along with the supporting soft measures, to ensure good comparability.

At the beginning stage of the project SMILE, it was decided to choose the following routes for analysis:

Line 2: Gara Burdujeni, Cantina Gh.Doja, Moldova, Orizont, IRIC, Combinat, Bazar, Sala Sporturilor, Grup Scolar no.2, Centru, Banca, Policlinica, Spital, Obcini, G.Enescu, Nordic, Marasesti, Policlinica, Tipografie, Centru, Grup Scolar no.2, Sala Sporturilor, Bazar, Combinat, Pasaj CFR Burdujeni, Gara Burdujeni.

Line 4: Cinema Burdujeni, Depozit, Torino, Piata Burdujeni, Orizont, IRIC, Combinat, Bazar, Sala Sporturilor, Grup Scolar no.2, Centru, Banca, Policlinica, Marasesti, Belvedere, G.Enescu, Mobila, Obcini, Metro, Autoservice, Scoala Generala no.9, Obcini, G.Enescu, Confectia, Policlinica, Tipografie, Centru, Grup Scolar no.2, Sala Sporturilor, Bazar, Combinat, Pasaj CFR Burdujeni, Orizont, Piata Burdujeni, Torino, Depozit, Cinema Burdujeni.

The measurements have been taken four times a day at different hours – on peak and off peak hours: at 7 am, 12 pm, 16 pm and 18 pm, for one bus per each line considered. It is important to mention that, at this moment, there did not exist a time schedule detailed for each bus stop.

The total duration of a complete trip was estimated and measurements were done to assess the total time keeping in comparison with the total time schedule estimated.

Before renewing the bus fleet, the situation of the indicator accuracy of timekeeping, obtained by measurement means was the following:

*Figure 23: Table presenting the average delays of the bus trips evaluated, for the first three quarters of LTC life:*

Quarter	Line 2	Line 4
<b>Year 2005</b>		
July-September	17.86%	32.14%
October-December	32.14%	35.71%
<b>Year 2006</b>		
January-March	25%	39.28%

The total back and forth trip duration for Line 2 was estimated with the bus running as planned in 2005 and beginning 2006, to be 45 min, whilst for Line 4 is 50 min. No time interval for accepted delay was set.

These delays were mainly caused by the improper public transport time planning (an older version that suited a different load degree of traffic), but also by the bad technical state of PT and by the congestion caused by the private fleet of public transport minibuses (100 minibuses running undisciplined within the city and in the bus stops) in their competition for travelers with the bus fleet, especially within the bus stop.

In this situation, not only was the travel duration affected to the detriment of passengers, but also the PT reliability and the total number of trips/day by each vehicle was reduced. The impact was clearly a decrease in the PT vehicles use, congestion and even disorganisation in traffic and a boost of private cars use.

### 19. Quality of PT service

This indicator is translated as being the overall quality of public transport policies (comfort, travel time, reliability, security), all measured on a scale based on five answer options: two negative, two positive and one neutral. To assess the qualitative data necessary for evaluating the trend of public perception upon the quality of PT service, in terms of: comfort during the trip, personal security in traffic, total trip duration, convenient routes and stops, flexibility for transport toward different locations, facilities for disabled people and affordable fare prices.

The sample size numbered 380 persons. The main data was collected using one questionnaire that contained questions related to PT performance personalised for PT passengers and from a second questionnaire drawn out for the general public with questions related to the project measures as a full entity.

In order to assess the PT quality indicators relevant for Suceava city, in 2005, just after the new LTC was set up, we conceived a questionnaire designed for collecting data on passengers' opinions regarding indicators describing the PT vehicles and operation, to figure out a picture of what should have been done with the new created company to better serve the PT passengers' needs.

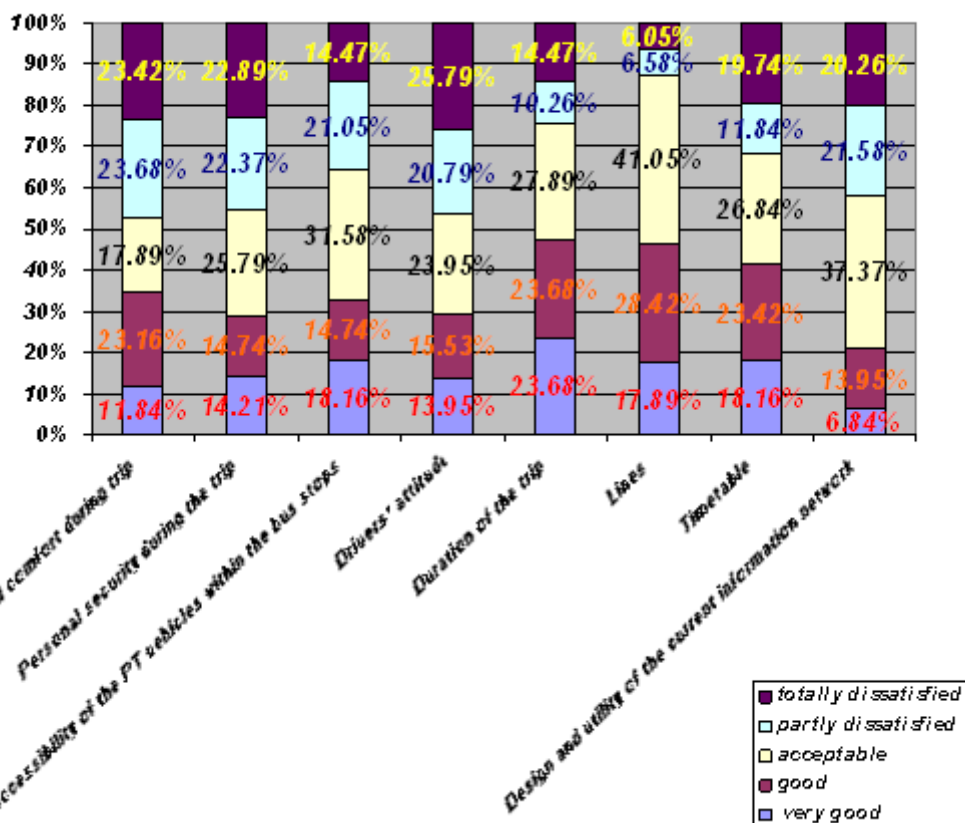
The following question was asked and responses included in Table below.

*Figure 24: Table including responses processed and turned to percentages for the question "How do you appreciate the PT vehicles performance; please rank your opinion on 5 options?"*

2005	very good	good	acceptable	partly dissatisfied	totally dissatisfied	Index
Physical comfort during trip	11.8%	23.2%	17.9%	23.7%	23.4%	-0.2368
Personal security during the trip	14.2%	14.7%	25.8%	22.4%	22.9%	-0.2499
Accessibility of the PT vehicles within the bus stops	18.2%	14.7%	31.6%	21.1%	14.5%	+0.0107
Drivers' attitude	14.0%	15.5%	24.0%	20.8%	25.8%	-0.2894
Duration of the trip	23.7%	23.7%	27.9%	10.3%	14.5%	+0.3184
Lines	17.9%	28.4%	41.1%	6.6%	6.1%	+0.4552
Timetable	18.2%	23.4%	26.8%	11.8%	19.7%	+0.0842
Design and utility of the current information network	6.8%	14.0%	37.4%	21.6%	20.3%	-0.3447



Figure 25: Graph showing the passengers' opinions about PT vehicles quality indicators before SMILE measures:



As a general opinion we notice that public perception for many indicators was below average and many of the answers pointed mainly at the neutral position (acceptable quality), that is not a positive perception but rather a sort of “not expecting too much from it”, being regarded mainly as a social service than an option to travelling within the city.

In order to assess the general public perception upon the PT mobility option, the following question was included: “Mark 5 of the reasons/factors from those in the list below for which would determine you not to take the bus and to resort to private car travel and the level (from 1 to 5) in which your decision is influenced” and the results were:

Figure 26: Table including responses processed and turned to percentages for the question “Mark 5 of the reasons/factors from those in the list below which would determine you not to take the bus and to resort to private car travel and the level (from 1 to 5) in which your decision is influenced”.

2005	not very important	not important	neutral	important	very important	Index
Physical comfort during trip	29.0%	19.6%	28.6%	14.9%	8.0%	-0.4675
Short duration of the trip	5.1%	7.7%	23.8%	33.6%	29.8%	+0.7532
Cost of the trip	10.0%	15.7%	23.3%	19.5%	31.4%	+0.4667
Personal security during the trip	2.4%	3.8%	10.1%	38.3%	45.5%	+1.2057
Flexibility for travelling in multiple directions (coverage degree)	20.4%	12.7%	7.8%	15.5%	43.7%	+0.4929
Insufficient vehicles provided by LTC	7.3%	17.4%	5.8%	32.9%	36.7%	+0.7438

2005	not very important	not important	neutral	important	very important	Index
Insufficient area coverage of PT vehicles networks	15.5%	11.8%	22.7%	23.0%	27.0%	+0.3419
Poor LTC service (improper informing network, low frequency of running, timetables, no. of buses and dispersion for each bus line, lack of safety when trying to reach buses)	16.6%	18.7%	6.2%	17.8%	40.7%	+0.4729
Accessibility of the PT vehicles within the bus stops	23.7%	36.1%	12.4%	11.3%	16.5%	-0.3918

In this table we can easily draw up the PT passenger's profile in 2005. They were less demanding and unaware of what modern public transport should offer, and they did not show much interest for aspects like: the "physical comfort during trip", "accessibility of the PT vehicles within the bus stops". To some extent they even lacked interest in "insufficient area coverage of PT vehicles networks" (that can be explained by the fact that Suceava is quite a compact city and the few major roads are crossing many neighbouring residential areas). The changes in mentality and demands were obviously expected to occur in time and, therefore, this was a task to be taken up earlier by the project team to raise citizens' awareness for what a modern PT fleet should mean.

In terms of mobility needs, the interviewed people clearly pictured their expectations, if we analyse the results obtained for the following factors: insufficient vehicles provided by LTC (only 15 responses rated as "not very important" factor when deciding to travel by private car and 154 responses considered as an "important" and "very important" factor to avoid PT in favour of private cars), insufficient area coverage of PT vehicles networks, poor LTC service, costs of the trip and personal security during the trip. Their responses indicate a negative perception of the quality of general PT service: bus lines, number of buses, frequency of reaching bus stops, price, timetables, security during trip, and poor information network. Also, it appears that a short trip duration is very important for citizens and in great extent they would choose a faster way of transportation, resorting to private cars.

A public transport of quality must take into consideration that passengers need clear and prompt information about the service, in terms of schedule, routes, stops and of important alterations that change the servicing conditions. In this respect, the questionnaire analysis raised a question related to all the informing channels that can be used to deliver information. With regard to the group of informing channels dedicated to PT buses, the questionnaires included a question devised to get data about how useful and accessible are the means used to disseminate information about PT: "Which of the following sources you consider of being more accessible for acquiring relevant and detailed information about PT service?" In 2005, the situation is presented in the figure below:

Figure 27: Table presenting the answers for question: "Which of the following sources you consider of being more accessible for acquiring relevant and detailed information about PT service?"

Year	City Hall webpage	Radio and local TV channels	Mass media (online and printed)	Promotion materials (leaflets)	VMS on street electronic board	Mobility Centre	Others In the bus stations and on-bus
2005	8.3%	22.1%	27.3%	29.5%	11.8%	0	1%

According to these results, in 2005, answers clearly indicate that most important sources of information about PT consisted of promotion materials (leaflets), mass media and radio and TV, explicable due to the CATCH project closure that was focused on public transport service and vehicles. In the same time, we conclude that these channels are most popular in 2005, when alternatives were hardly present.

### **Local indicator - Average number of passengers/month using LTC vehicles**

For the months July 2005 – March 2006 the average number of LTC vehicle passengers was 73,549 passengers/month for the entire fleet.

## **C1.3 Building the business-as-usual scenario**

The business-as-usual scenario in the context of SMILE and the GUARD methodology is a determination of what would be happening at the end of SMILE if the particular measure had not been implemented. For its estimation we will use forecasting from historical data.

The first element to take into account when building the business-as-usual scenario is the complete bus fleet renewal approach which was considered locally when joining CIVITAS II SMILE project and assuming its objectives. The bus fleet in 2005 included 10 minibuses and 15 UD 112 buses, all diesel fuelled and with poor fuel consumption. The remaining travel demand was answered by 100 private minibuses, running undisciplined and therefore disorganised and unplanned.

From the analysis above we can easily draw a conclusion about what LTC was to become in the close future after 2005: the financial status was disastrous (growing losses), the quality of service was poor and that was exploited by the private minibuses fleet competing for travellers, the number of buses was decreasing due to the repeated breakdowns, impossibility to procure spare parts and costs of maintenance. Bearing in mind the disastrous status of the local public transport fleet, it was not difficult to project the future bankruptcy of the company, leaving the city without an important transportation means, especially for those who weren't financially capable in 2005 to procure a different motorised vehicle. The private public transport performed with minibuses was already soaring, becoming a significant business for anyone who applied for and got an authorisation whereas public transport cannot be a profitable business for investors. The disorganisation resulting from the improperly regulated service and the disproportion between the features of demand and the response of offer gave rise to discomfort and congestion in the traffic and in the bus stops that were always impossible to penetrate by the fellow public transport providers.

Also, it is important to emphasise that as modes of transport more than 50% of those interviewed were travelling accidentally, rarely or never by PT.

Although for the quality of PT vehicles indicators, the opinions didn't show distinctly a negative assessment we must consider, when forecasting a BAU scenario, that passengers (as in general all customers made aware about what they must get for their spent money) will become more demanding and their expectations will grow. PT reliability and image will suffer and the consequence will be a partial or total shift of a number of PT passengers from PT vehicles to other modes of transportation.

The buses running were visibly affected by the private public transport, namely the minibus fleet, due to the undisciplined drivers. These vehicles weren't offering a high-quality service, being old vehicles and inadequate for transporting passengers.

All these factors were indicating that sooner or later the bus fleet would have to be entirely removed from operation and having no other alternative, people would have to resort to owned cars or minibuses for longer distances.

Another challenge has come from the increasing monthly disposable income and the relaxed financing opportunities offered by financial institutions that would pose a temptation for citizens to buy cars rather than to use PT vehicles.

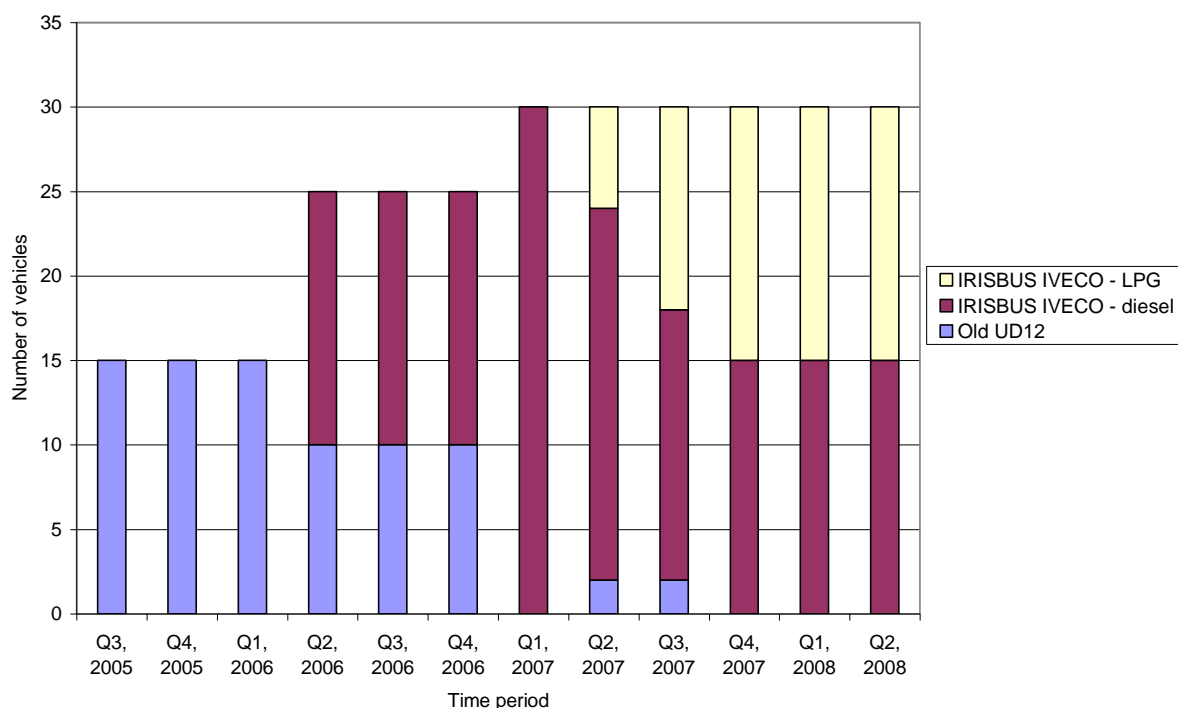
The national increasing tendency towards greater motorisation is valid also for the evolution of the Suceava traffic, which led to a serious aggravation of traffic problems that required the enforcement of specific regulations and introduction of measures at local level, designed to counteract the effects. The degree of motorisation in the city increased from 41 vehicles for 1000 inhabitants in 1990 to 230 at the end of 2004. (This calculated value takes into consideration the vehicles licensed in Suceava Municipality disregarding the number of vehicles that are registered in other counties, owned by companies and the transit traffic vehicles). This created physical discomfort and increased the risks upon the health of the population. In this respect, taking into account the expected changes in the general economic status and the new commercial laws imposed by the liberal market and increased competition values, we estimated that the number of cars will increase uncontrollably.

SMILE project was just in time with the opportunity for taking measures to revitalise public transport, to renew the vehicles, to make even a step forward by procuring clean vehicles, and offered technical assistance and knowledge about the soft measures designed to boost the hard measures, through its coordinators and city-partners.

## C2 Measure results

The results are presented under sub headings corresponding to the areas used for indicators – economy, energy, environment, society and transport. Many of the changes were driven by the introduction of the new public transport vehicles which were phased in from the start of 2006, as shown below.

Figure 28: Graphic presentation of the fleet composition



The new timetable and route pattern which were also introduced at that time involved more kilometres being driven by each vehicle on average, leading to a near quadrupling of the total number of service kilometres driven.



## C2.1 Economy

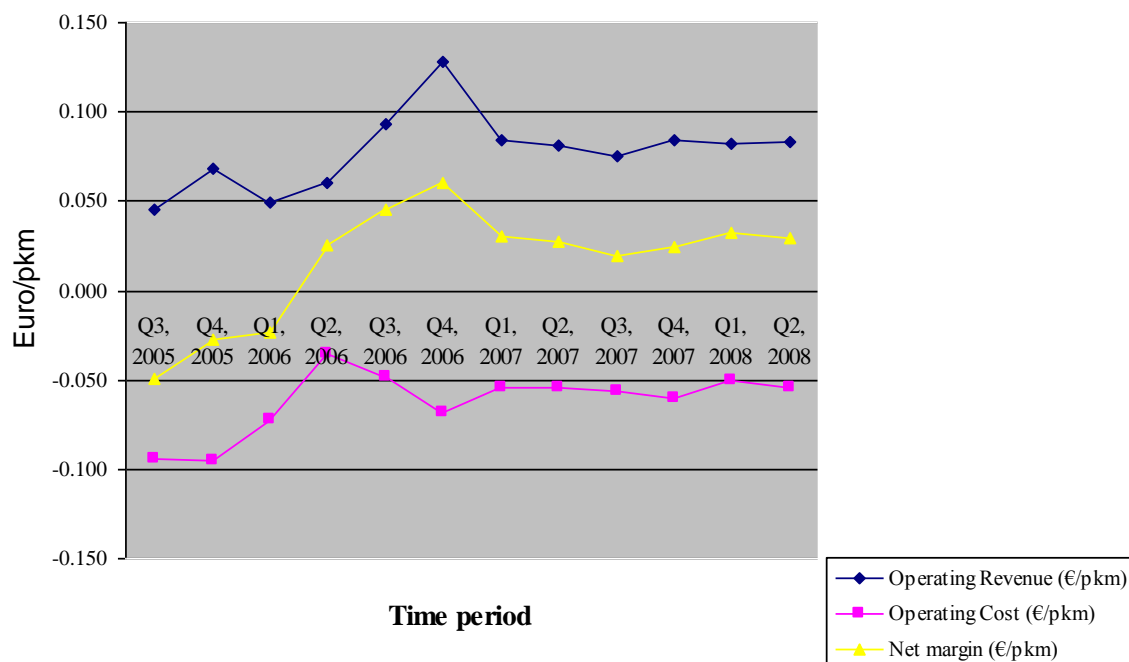
### Indicator 1: Operating revenues and Indicator 2: Operating costs

Data as it was collected can be visualised in the Data Appendix.

Figure 29: The centralised data is presented in the table below, in conjunction the indicators operating costs and operating revenues.

	July-September 2005	October-December 2005	January-March 2006	April-June 2006
Operating revenue (Euro/pkm)	0.045	0.068	0.049	0.060
Operating cost (Euro/pkm)	0.094	0.095	0.072	0.035
Result	-0.049	-0.027	-0.023	0.025
	July-September 2006	October-December 2006	January-March 2007	April-June 2007
Operating revenue (Euro/pkm)	0.093	0.128	0.084	0.081
Operating cost (Euro/pkm)	0.048	0.068	0.054	0.054
Result	0.045	0.060	0.030	0.027
	July-September 2007	October-December 2007	January-March 2008	April-June 2008
Operating revenue (Euro/pkm)	0.075	0.084	0.082	0.083
Operating cost (Euro/pkm)	0.056	0.060	0.050	0.054
Result	0.019	0.024	0.032	0.029

Figure 30: Graph with primary data and results financial results of LTC



It is obvious that the quarter based analysis reveals a negative for the period July 2005 – March 2006. The financial results were negative throughout the period. Beginning with April 2006, the situation reversed trend and went up over 0.

The next 12 months analysed, July 2006 – June 2007, show positive values for the economic results, with a slight increase from July-September 2006 to October-December 2006, presuming due to the summer time holidays for pupils and employees comparing to the next quarter analysed. January-March 2007 quarter register a slight decrease due to the more difficult winter running conditions and then LTC performance gets almost stabilised.

The next 12 months analysed show a less favourable situation at the level of quarters July-September and October-December compared to the previous year. However, little by little, after the economic boost determined by the bus fleet renewal and the promotion activities carried out within the SMILE project, in January-March 2008 and April-June 2008 the LTC appears to have constant results, proving that, so far, the structural and operational organisation were accurately planned and implemented.

It is important to mention here that in 2006 the fares per trip and monthly subscriptions slightly went up and then remained unchanged until the end of the period analysed in the current report. From 2006 onwards, the trip fare (regardless of the distance journeyed) became 0.277 Euro, the monthly subscription for 1 line increased to 8.3 Euro/month, for 2 lines 13.88 Euro/month and for all lines 16.66 Euro/month (all prices include VAT). This price modification was considered greatly important as there is a need to maintain prices at the lowest margin, in order to keep the public transport affordable, convenient and attractive to many citizens. That was possible through means of optimising the performance, the vehicle and fuel efficiency, of maintaining a limit on employees' salaries and keeping maintenance costs low due to the new vehicles.

These values resulted from primary economic data provided by the LTC accountancy and make the fair picture of the local/national condition and possibly are hardly transferable or applicable to other sites, from other countries (even within Romania changes are rapid); rather the activities and results are an important source of information and represent an example of good practice.

## C2.2 Energy

### Indicator 3: Vehicle fuel efficiency (MJ/vkm)

In order to calculate this indicator values for the new buses, diesel and converted to LPG, we collected data from LTC records, regarding the monthly kilometres run and the total fuel consumed, for the month of July 2007. Therefore we had as a base the average fuel consumption/100 km per vehicle per month for diesel and LPG vehicles.

We found the new diesel buses run on 45.5l/100 km and the LPG buses had a fuel consumption of 53l/100 km. The energy values for LPG is 26.0 MJ/l and for diesel 38.5 MJ/l. Therefore the fuel efficiency is for the new diesel vehicles: 17.5 MJ/vkm and for LPG vehicles 13.8 MJ/vkm.

It is important to note that the new diesel buses had worse energy consumption (17.5 MJ/vkm) than the old buses (15.0 MJ/vkm) due to the larger capacity of passengers transportation and heavier load than the previous buses, but when converted to LPG improved the performance expressed by this indicator (13.8 MJ/vkm).

In percentage terms this means that the Euro 3 diesel buses were 16.7% less energy efficient in terms of MJ/km, than the original pre-Euro diesel buses (not allowing for any changes in occupancy, size or capacity) whilst the conversion to LPG led to a net improvement in energy efficiency on the same basis of 8%, again as compared to the original pre-Euro buses.

## C2.3 Environment

Environmental impacts are based on direct changes in emissions from the public transport vehicles as a result of the vehicle upgrades. There would also be indirect changes resulting from a change in number of passenger car trips made by those bus users who used the public transport system as a result of the presence of the new vehicles.

*Figure 31: Table reflecting the general environmental impact of the new bus fleet and in the process of partial conversion*

	CO <sub>2</sub>	CO	NO <sub>x</sub>	PM <sub>10</sub>
2005 - 2006	For the old buses running in 2005 and first quarter of 2006, values were not available			
2007 Average value for January-March, 30 diesel fuelled buses	292050 kg /fleet average distance run per month	915.8 kg /fleet average distance run per month (3.7 g/vkm for a diesel bus)	3366 kg/fleet average distance run per month (13.6 g/vkm for a diesel bus)	66.8 kg/fleet average distance run per month (0.27 g/vkm for a diesel bus)
2008 Average value for January-March, 15diesel +15LPG fuelled buses	261112.5 kg /fleet average distance run per month	891kg/fleet average distance run per month (3.5 g/vkm for a LPG bus)	2852.4kg/fleet average distance run per month (9.45 g/vkm for a LPG bus)	34.6kg/fleet average distance run per month (0.01 g/vkm for a LPG bus)
Monthly reduction	30937.5 kg /month	24.8 kg/month	513.6 kg/month	32.2 kg/month

### Indicator 8: CO<sub>2</sub> emissions

From October 2007 onwards, the bus fleet was composed of 15 Euro3 diesel buses and 15 Euro3 LPG buses.

The new diesel buses have a CO<sub>2</sub> emission rate of 1.18 kg/km.  
When operating on LPG the CO<sub>2</sub> emission rate was 0.93 kg/km

For the first quarter of 2008, the total CO<sub>2</sub> emissions amounted to 261112.5 kg CO<sub>2</sub>. The total reduction of CO<sub>2</sub> emissions per month, as a consequence of the 15 buses conversion to LPG, was 30937.5 kg CO<sub>2</sub>. For one year, the total direct increase from the bus fleet is 371250 kg CO<sub>2</sub>

### Indicator 9: CO emissions

From October 2007 onwards, the bus fleet was composed of 15 Euro3 diesel buses and 15 Euro3 LPG buses.

The measurements taken proved that the LPG bus CO emissions were 3.5 g per vehicle km run – a 5.5% reduction as a result of the LPG conversion.

Therefore, for the first quarter of 2008, when the average monthly distance run by each bus was 8250 km, the total emission value was 891 kg CO per month.

The resulting CO emission reduction is 24.8 kg CO per month. For one year, this reduction value will be 298 kg CO.

### Indicator 10: NO<sub>x</sub> emissions

From October 2007 onwards, the bus fleet was composed of 15 Euro3 diesel buses and 15 Euro3 LPG buses.

After conversion, the LPG fuelled bus emitted 9.45 g NOx/vehicle per each km run – a 30.5% reduction as a result of the LPG conversion.

The total average monthly NOx emission produced by LTC fleet, for the first quarter of 2008, was 2852.4 kg.

Comparing this to the same period in 2007, we had an emission reduction of 513.6 kg NOx per month. In consequence, for one year, the total reduction amounts to 6163 kg NOx.

**Indicator 11: Small particulate matter emissions PM<sub>10</sub>**

From October 2007 onwards, the bus fleet was composed of 15 Euro3 diesel buses and 15 Euro3 LPG buses. After conversion, a LPG bus emitted 0.01 g/vehicle for each km run – a 96.3% reduction as a result of the LPG conversion.

The total average monthly PM<sub>10</sub> emission produced by the bus fleet in the first quarter of 2008, amounted to 34.6 kg PM<sub>10</sub>. Comparing to the same period of 2007, the emission reduction was 32.2 kg PM<sub>10</sub>. For one year, the emission would be considerably reduced, by 386.4 kg PM<sub>10</sub>.

**Indicator 12: Noise perception**

The surveys for collecting the quantitative data are deployed in: the city centre, Obcini district – in the vicinity of the Suceava main entrance road from south, direction Bucharest and in Burdujeni district – in the vicinity of the exit toward east.

The noise level monitoring and measurements were made by the EPA Suceava and the data collected from their statistical records – averages calculated on semester basis and the results shown are summed up in the following table:

*Figure 32: Tables showing values of the measured noise level in 3 important intersections*

Location	Semester II 2006		Semester I 2007		Semester II 2007	
	Noise maximum level after measurements	Exceeding values	Noise maximum level after measurements	Exceeding values	Noise maximum level after measurements	Exceeding values
	dB	% of measurements with exceeded admissible values	dB	% of measurements with exceeded admissible values	dB	% of measurements with exceeded admissible values
City Center intersection	71.3	25	76.7	50	78.03	66.7
Burdujeni intersection	70.8	0	75	25	76.6	40
Obcini intersection	66	100	68.1	100	68.10	100



Location	$L_{\max}$ admissible	Noise maximum level after measurements					Exceeding values				
	dB	dB					% of measurements with exceeded admissible values				
		2005 S2	2006 S1	2006 S2	2007 S1	2007 S2	2005 S2	2006 S1	2006 S2	2007 S1	2007 S2
City Center intersection	70	71.4	75.4	71.3	76.7	78.0	25	33.3	25	50	66.7
Burdujeni intersection	70	73.9	71.6	70.8	75.0	76.6	50	33.3	0	25	40
Obcini intersection	60	69.6	68.1	66.0	68.1	68.1	100	100	100	100	100

S1 = semester 1, S2 = Semester 2

These values enabled us to assess the trend of the general noise level in three intersections, in the middle of crowded residential areas, crossed by a high traffic level and by the PT buses. We mention additionally that in these areas, the main source of noise is generated by road traffic (vehicle engines, both commercial and private and horns honking). Analysing this data we notice that the main affected area is the city centre intersection where the noise levels have been severely exceeded on average in half of the measurements done. The variation was from 71.38 dB in semester II 2005 to 78.03 dB in semester II 2007 and the solution could be the complete closure of the LEZ area, as proposed in this project and finding further solutions for its extension. In addition, mobility management solutions could produce a decrease in car use within the city centre and the neighbouring areas.

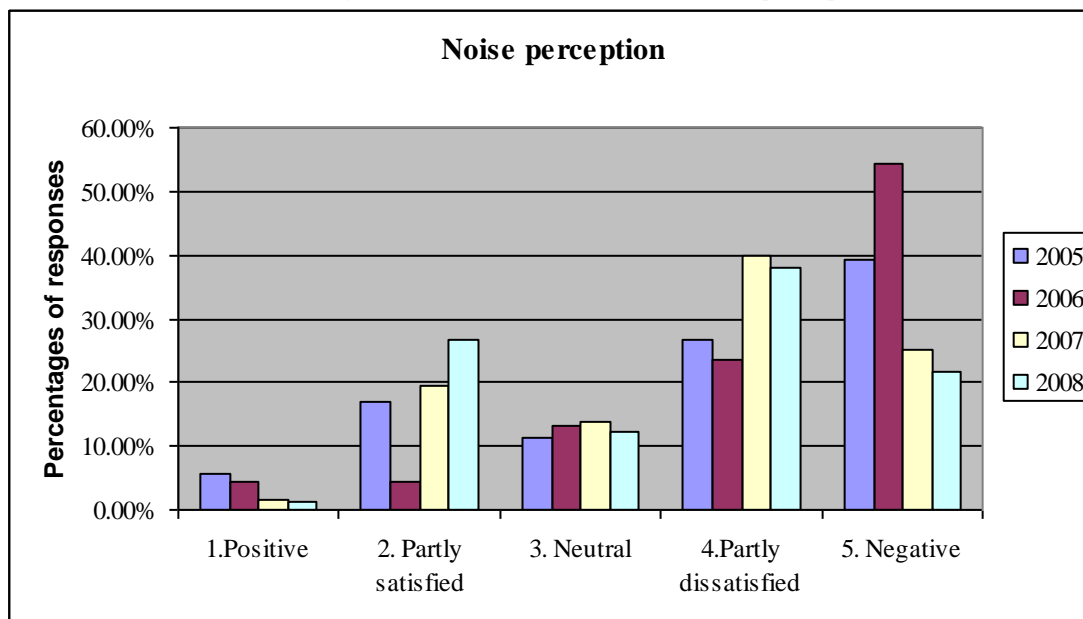
Obcini intersection is also affected as in all the measurements incurred the noise levels have been higher than admitted; the variation was in some extent constant during the considered years. It is a fact that from semester II 2005 to semester II 2007 the noise level has slightly decreased but not sufficiently. Therefore, much still has to be done to counterattack the unfavourable trend and some of the actions could be to re-design the car access on smaller streets along with other hard measures such as finding a solution for offering parking facilities and other mobility management measures.

With regard to qualitative assessment of this indicator (deployed in crowded residential areas, crossed by the new bus fleet), within the structure of the questionnaire designed for general public, one question pointed at determining the citizens' perception upon the noise levels, broken down into 5 different perception bands of  $L_{\text{day}}$ . The evaluation team considered it irrelevant to collect data reflecting the noise perception at the night time, due to the fact that road traffic is very low during the night. However, the option of extending the night bus service was taken into consideration, to prevent a certain trend from happening.

Figure 33: Responses from 2005 to 2008 to the question: "How acceptable is the noise caused by the day time road traffic in the Suceava city?"

Noise perception	Positive	Partly satisfied	Neutral	Partly dissatisfied	Negative	Index
2005	21 5.53%	65 17.1%	43 11.32%	102 26.84%	149 39.21%	-0.771
2006	17 4.49%	18 4.49%	50 13.21%	89 23.50%	206 54.31%	-1.187
2007	6 1.58%	74 19.47%	53 13.95%	151 39.74%	96 25.26%	-0.676
2008	5 1.31%	102 26.84%	47 12.37%	144 37.9%	82 21.58%	-0.516

Figure 34: Chart with the Noise level perception



The chart and index data both show that the noise perception is mostly on the negative side of the chart. But it is important to emphasise that on the scale, from the 5<sup>th</sup> (negative) level, the noise perception registered a shift towards a more positive level in 2007 and improved marginally again in 2008. Therefore we could appreciate that there was a slight improvement of citizens' perception for noise level as partially the noise perception migrated from "negative" level to "partly dissatisfied" and "partly satisfied", as a result of the PT structural changes and the alteration at the level of private car fleet (through the purchase more and more newer cars, less noisy and pollutant), among which the measures 5.6, 8.8 and 8.9 played an important role. The "neutral" perception remained almost unchanged and that must be the general opinion of the residents of less crowded areas, located mostly at the outskirts of the city.

## C2.4 Transport

### Indicator 18: Accuracy of PT timekeeping

The PT vehicles timekeeping is regarded as a very important decisional factor when making one choice between the multiple modes of transport. PT plans set by LTC consisted of precise routes, stops, duration for each bus route and times when each bus must leave/arrive the ends of each route. The monitoring process is realised at these points and consists of total trip duration measurement and the timings of arrival and departure. The analysis carried out by the project team was focused on comparing the data available from LTC and the relevant data that can be collected to ensure a good degree of comparability. Another type of analysis would have provided only a hypothetical model, which could not bring any relevant conclusion to be further exploited.

Accuracy in the PT timekeeping, the correspondence between bus timetables (collected from LTC Company) and the actual running (data collected through surveys and observations and counting within beginning/end stops) means recognition of the overriding need for ensuring reliability and good timekeeping in delivering a quality public transport service to the people of the City.

The frequency of data collection was once every 3 months, in 7 consecutive days (4 times a day at on-peak and off-peak hours: 07.30-08.00 am, 12.00-13.00 pm, 16.00-17.00 pm and 18.00-18.30 pm), and the results have been compiled and turned into percentages of services delayed, at the moments of arriving/departing, compared to timetables. The Line 2 total travel

duration was estimated to be 60 min and for Line 4 - 65 min. The interval of time considered a delay compared to the timetable is  $>+ 2$  min. All the trips exceeding this allowed delay were considered delays and counted in the current analysis.

It has been decided to continue surveys and observations for the two main bus lines, crossing residential areas, important for the SMILE measures implemented, to ensure comparability.

*Figure 35: The average delays of the bus trips, on quarterly basis*

	Q.2 06	Q.3 06	Q.4 06	Q.1 07	Q.2 07	Q.3 07	Q.4 07	Q.1 08	Q.2 08
Line 2	7.14%	21.42%	10.71%	10.71%	14.28%	3.57%	3.57%	10.71%	7.14%
Line 4	14.28%	7.14%	17.85%	10.71%	17.86%	7.14%	7.14%	14.28%	3.57%

The surveys have been deployed at times of maximum traffic: in the morning when pupils go to schools and employees start their working days, at midday working day and in the afternoon when the different kind of employees go home. Also, during the winter the traffic is hardened by the weather conditions. Therefore, the maximum number of delay incidences occurs at these times and the surveys proved that especially in the middle of the day, between 12.00-13.00 pm when the traffic is crowded and for short periods congestion can appear.

Comparing to the LTC performance before bus fleet renewal (included in figure 22), the service re-organisation (in terms of fleet composition, schedules, bus routes, quality of service provided) brought along an important reduction of number of services delayed within the day four time intervals, when the data was collected.

Causes of these delays were sought and conclusions showed that partly, in Q1 and Q4 the values have been influenced by the climate conditions that hamper the good running of road traffic. Also, road works that took place in the course of junctions' modernisation process and building sites that appeared along the main route as a consequence of converting the industrial area into a commercial area produced negative effects on the good running and timekeeping of the bus fleet. Nevertheless, we appreciate that despite these incidental causes that had an impact on all road traffic and flawed to a certain extent the accuracy of data collected and the results obtained at the end of project implementation, the number of bus trips delayed is reduced.

### **Indicator 19: Quality of PT service**

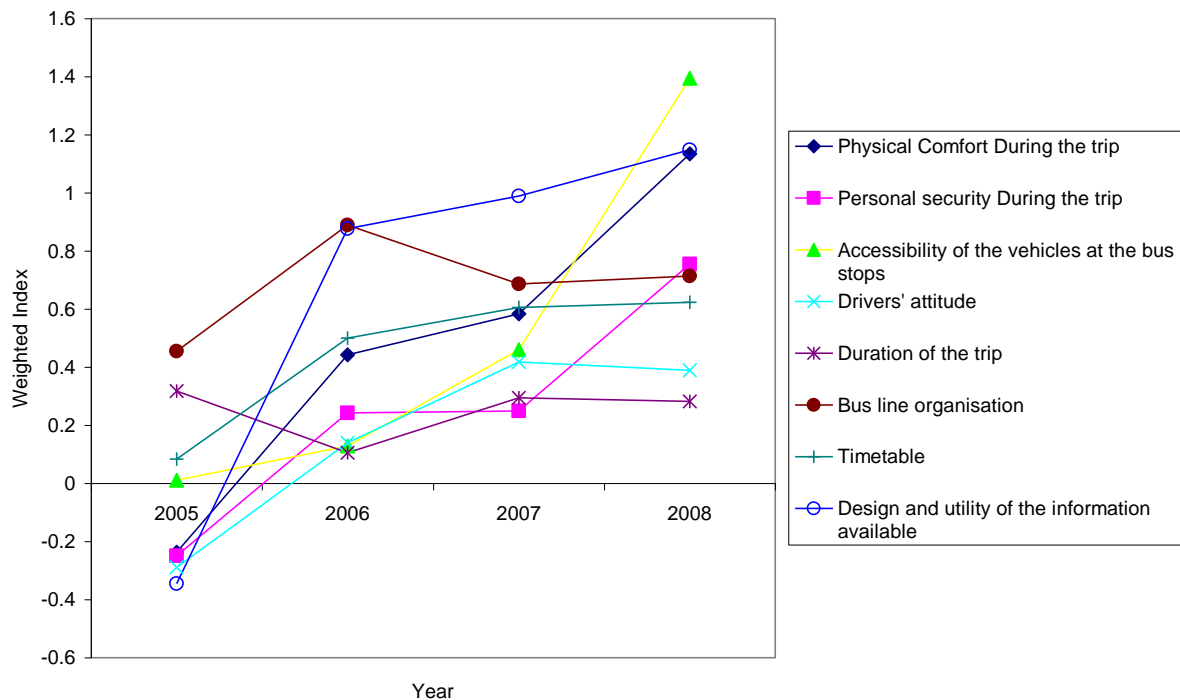
This indicator is translated as being the overall quality of public transport policies (comfort, travel time, reliability, security), all measured on a scale based on five answer options: two negative, two positive and one neutral. To assess the qualitative data necessary for evaluating the trend of public perception upon the quality of PT service, in terms of: comfort during the trip, personal security in traffic, total trip duration, convenient routes and stops, flexibility for transport toward different locations, facilities for disabled people and affordable fare prices.

To appreciate the public perception for few of the bus fleet performance indicators, as they have been identified by the project team as being relevant, within the questionnaire designed for PT buses, a follow up survey was conducted. The sample size numbered 380 persons. The main data was collected using one questionnaire that contained questions related to PT performance personalised for PT passengers and from a second questionnaire drawn out for general public with questions related to the project measures as full entity.

Firstly, the following question was asked and responses analysed: *"How do you appreciate the PT vehicles performance; please rank your opinion on 5 options?"*(see Data-Appendix for results).

The trend line in terms of the weighted index for each attribute is shown in the following table and graph. Further data that lies behind the creation of the index values is available as an appendix.

Figure 36: Quality of PT service described through detailed approaches relevant to the passengers



Responses for all attributes except duration of the trip have improved significantly over the 3 year demonstration period.

- Physical comfort during trip: registered a positive evolution, which would be expected given that the bus fleet was continuously renewed as equipments and service provided was improved. The new buses purchased are equipped with modern sitting facilities for passengers and space for persons with disabilities, offer improved possibilities for elderly and disabled people, have boards for displaying information related to the trip; also the reorganisation of the routes released the pressure on the buses.
- Personal security during trip improved as a result of driver training sessions held in 2006 (for drivers of the first set of new buses) and in 2007 (for drivers of the second set of new buses) and the good quality of the new buses themselves. Personal security indicator contains also a degree of subjectivity, as the passengers' perception changed sharply according to their mentality, road traffic education and public attitude and expectations. This is further discussed below and pictured in figure 35.
- In this chart we can emphasise the good impression of the accessibility of the PT vehicles at the bus stops, which increased in the first phase because the number of private minibuses was minimised and in the next phase as the drivers showed more discipline in traffic due to the measures taken with the collaboration of the Traffic Police. This result cannot be questioned, as it is obvious that with the minibus fleet re-organisation and the stricter rules taken in order to enforce the road traffic regulations, the bus stops modernisation, the bus stop space became more accessible to LTC vehicles and therefore the passengers' perception was well improved throughout the studied period.
- For drivers' attitude indicator, the trend was again positive, although the increase was less strong than for other attributes. Drivers' attitude changed as a result of the training sessions and the increased responsibility that was given to them with regard to the bus maintenance and the required conduct during work.
- Attitudes towards duration of trips have remained fairly stable over the demonstration period, which probably reflects an increase in car use and local congestion balancing out the improvements brought about by the reduction in minibus traffic. It is worthwhile to



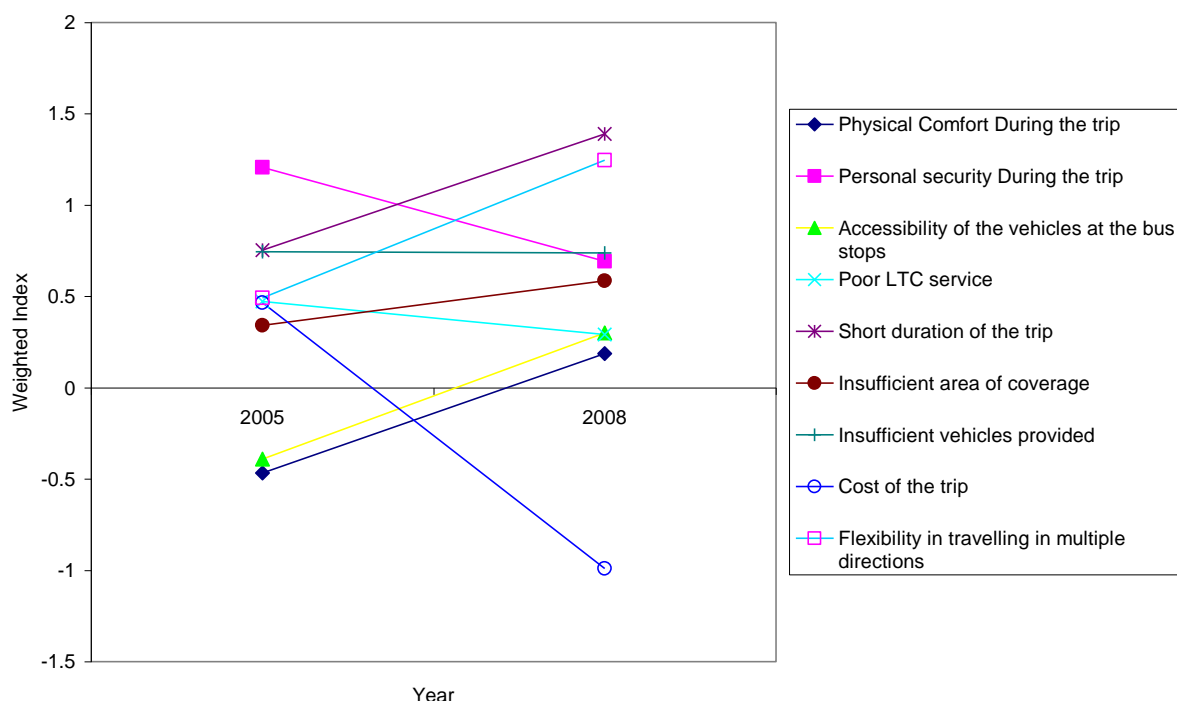
add here that duration of the trip was influenced by external inconstant factors that couldn't be taken into consideration very accurately when LTC established the timetables. This is a situation created by the high degree of transformation and re-organisation of the available space as well as economic activities, especially as a result of closure of all industrial factories and their conversion into commercial areas, supermarkets and parking spaces. Also, occasional works occurred with the road and junctions modernisations, creation of additional lanes adjoining the big intersections and roundabouts implementation. Yet, duration of the trips was positively regarded in 2006, as a result of a more realistic planning of the bus running – timetables and routes.

- For the Lines indicator good progress was registered in 2006 when the public transport plan had been re-designed, although the average perception has since partially dropped back.
- Perceptions towards the bus timetable increased significantly in 2006 following release of the new bus timetable. Since then perception has improved further, although the rate of improvement has slowed.
- Finally, the design and utility of the current information network shows a very significant growth comparing to 2005 when the PT informing network was barely existent.

We chose to make the next analysis to prove that to some extent the PT passengers' profile changed in terms of mentality and perception and also due to the process of attracting new passengers. The level of understanding also altered.

The question used was “Mark 5 of the reasons/factors from those in the list below which would determine you not to take the bus and to resort to private car travel and the level (from 1 to 5) in which your decision is influenced”, repeating that asked in 2005 (see Data-Appendix for results).

Figure 37: Graph with weighted index values showing importance of the factors when making a decision with regard to transportation means



This question was foreseen in the analysis process as it gives important clues related to the citizens' mentality and attitude regarding the altered expectations for what PT should provide to its passengers.

The graph above does indeed show some interesting differences with the situation in 2005. In general the expectations of the public have increased, with more categories being scored with high importance. In particular, there are strong increases in expectations around short duration of the trip, personal comfort and flexibility in accessing multiple destinations. These aspects appear as very important when taking the decision to make use of a personal vehicle instead of using the public transport buses, thus information must stand as base for further undertakings to improve the standard of their delivery. The project team appreciates that this result is explained by the change in citizens' approach towards what quality in local transport should mean and a clear understanding of the concept.

Short duration of the trip is an important factor, as this could be one of the most important factors that could be tackled when personal vehicles happen to linger in crowded traffic.

Accessibility of the vehicles at the bus stops is regarded as very important and undoubtedly this was explained in opposition with the previous situation when the large number of minibuses running in a disorganised fashion for private profit hampered access to public transport buses in the bus stops, making the catching of a bus an adventure.

The expansion of the areas covered by the PT network gives as an impetus for answering in a superior manner to the mobility needs.

The first of these has not shown a significant change in the previous analysis, and the second of these factors is one of the fundamental attributes where car use offers an advantage over public transport. It is also interesting to note the dramatic decrease in importance given to the cost of the journey compared with 2005, presumably related to the changing economic circumstances in the region, but also due to the low cost of journey fares.

It is encouraging that poor performance of the public transport network shows a slight decrease in importance in terms of a significant factor in people not using the bus and also that personal security is less of a barrier. Overall this set of data provides some important pointers about where the challenges for Suceava's public transport system will lie in the future.

The set of integrated measures described here, designed for the development of a sustainable public transport produced important effects on all these factors:

- ✓ The purchase of new vehicles had a positive influence on the LTC service, physical comfort during the trip and gave a solution to the number of vehicles provided by increasing their number
- ✓ The renewal of the bus fleet and the training of new bus drivers were important activities to improve the perception of personal security during the trip and gave possibility to the elders and disabled people to regard the service with much more confidence
- ✓ Re-organisation of the public transport with the identification of secondary routes and the reduction of the number of minibuses increased personal security during the trip, improved accessibility of buses at the bus stops, gave flexibility in travelling in multiple directions and offered an adequate solution at the time to the area of the coverage demands
- ✓ By maintaining the cost of the trip at a very low level, the LTC wanted to make the PT affordable and very tempting, both for long and short distances
- ✓ Information campaigns and materials used for disseminating the information about PT buses service using printed materials, boards put up within buses and the modernised bus stops, The Internet tool and local media. These increased the level of knowledge and raised public expectations putting pressure on continuing the implementation of more measures, such as: monitoring road traffic conditions using CCTVs, traffic sensors, installation of a VMS and its integration in the network existent, modernisation of the crossroads and intersections, mounting of traffic lights with updated technology, Mobility Centre creation, implementation of demo-bus modern facilities.

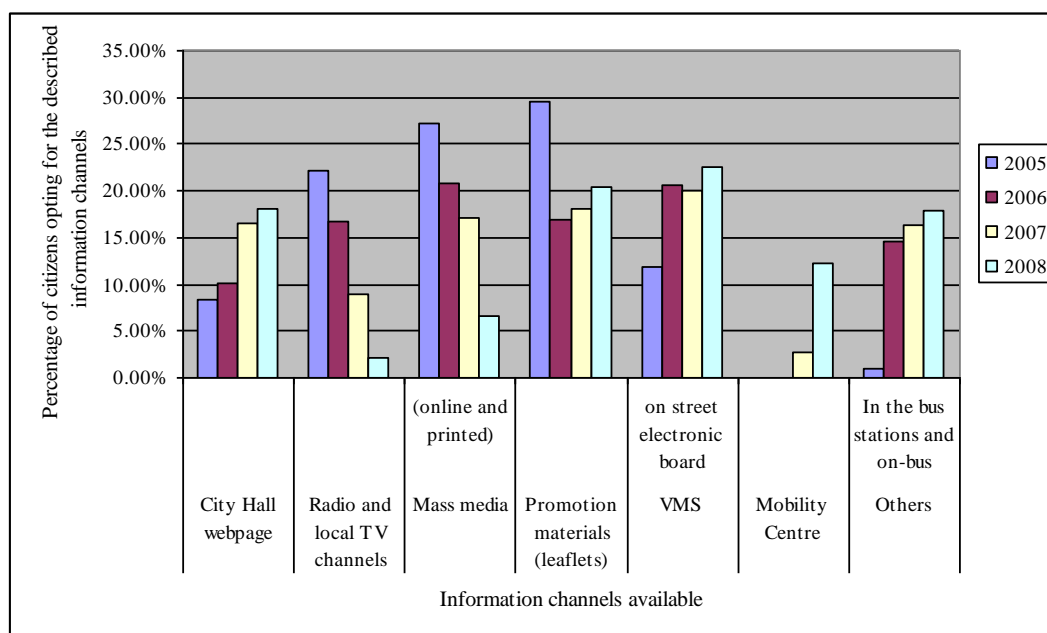
All these integrated measures were complementary and synergic and their implementation was focused on maximising each other's effect and on working hand in hand to bring the PT to expected quality of service. This is the reason for which the evaluation was considered cumulated in one single template and the results were achieved and measured as coming from a synergic number of measures, as described in the implementation process.

With regard to the group of informing channels dedicated to PT buses, the questionnaires included a question devised to get data about how useful and accessible are the means used to disseminate information about PT: *“Which of the following sources you consider of being more accessible for acquiring relevant and detailed information about PT service?”*

Figure 38: Centralised answers to the question *“Which of the following sources you consider of being more accessible for acquiring relevant and detailed information about PT service?”*

Year	City Hall webpage	Radio and local TV channels	Mass media (online and printed)	Promotion materials (leaflets)	VMS on street electronic board	Mobility Centre	Others In the bus stations and on-bus
2005	8.3%	22.1%	27.3%	29.5%	11.8%	0	1%
2006	10.2%	16.8%	20.9%	16.9%	20.6%	0	14.6%
2007	16.6%	8.9%	17.1%	18.1%	20.1%	2.8%	16.4%
2008	18.1%	2.2%	6.6%	20.5%	22.6%	12.2%	17.8%

Figure 39: Graph showing the evolution of the information channels accessibility / degree of utilisation



Comparing to 2005, in the period 2006-2007 the trend reveals an enhanced proportion of accessibility and therefore utility for the City Hall webpage (doubled) and for VMSs – approximately 20% - (the network was supplemented with a new VMS and the other two were integrated in the current project and became an important way of transmitting information in visible locations). Due to the panels mounted within the bus stops and on-board the new buses (initially in the first batch of 15 in 2006, and then in the next 15 buses in 2007), these on the spot channels are being more used and are positively regarded by the citizens; Mobility Centre was firstly heard of in 2007 when the concept began to be partly implemented. Promotion materials, although ceding part of the market share compared to 2005, remained a very important mean to deliver information, mainly due to their easiness to be distributed and the large area of coverage (18.1% in 2007).

In 2008 the upgraded City Hall webpage became a more important source for getting diverse types of information related to the entire activity of the City Hall (including also as a priority the public transport); promotion materials slightly enhanced importance and accessibility being a fluid, easy to disperse material. It has to be underlined here that the newer channels of information distribution, mainly introduced, promoted and marketed within SMILE project, increased and consolidated their share in the market: the new City Hall webpage, VMSs, boards put up in bus stops and within buses, to the detriment of older means of information delivery. The Mobility Centre, which hasn't reached maximum attention yet, only 12.2%, is probably affected by the late implementation – end of 2008 – and its potential can be improved in the close future, this point becoming of great importance for the project team, especially when understanding the growing importance of the information delivered in real time.

## C2.5 Society

### Indicator 13: Awareness level

Within the questionnaire related to the general public, we included the question regarding the awareness of the SMILE project and nominally the measures implemented. The question was:

*Figure 40: Centralised answers to the question “Have you heard of the SMILE project and the following measures implemented as part of the project?”*

	Yes	No
2006 - Introduction of the new alternative bus fleet and the stimulating supporting measures	129 (33,95%)	251 (66,05%)
2008 - Introduction of the new alternative bus fleet and the stimulating supporting measures	313 (82,37%)	67 (17,63%)

Obviously, the percentage of those who heard of this group of measures increased in 2008 compared to 2006 and it is foreseen that within the new campaigns to be organised this year, we intend to raise the figure as close as possible to 100% of people with awareness for these measures.

### Indicator 14: Acceptance level

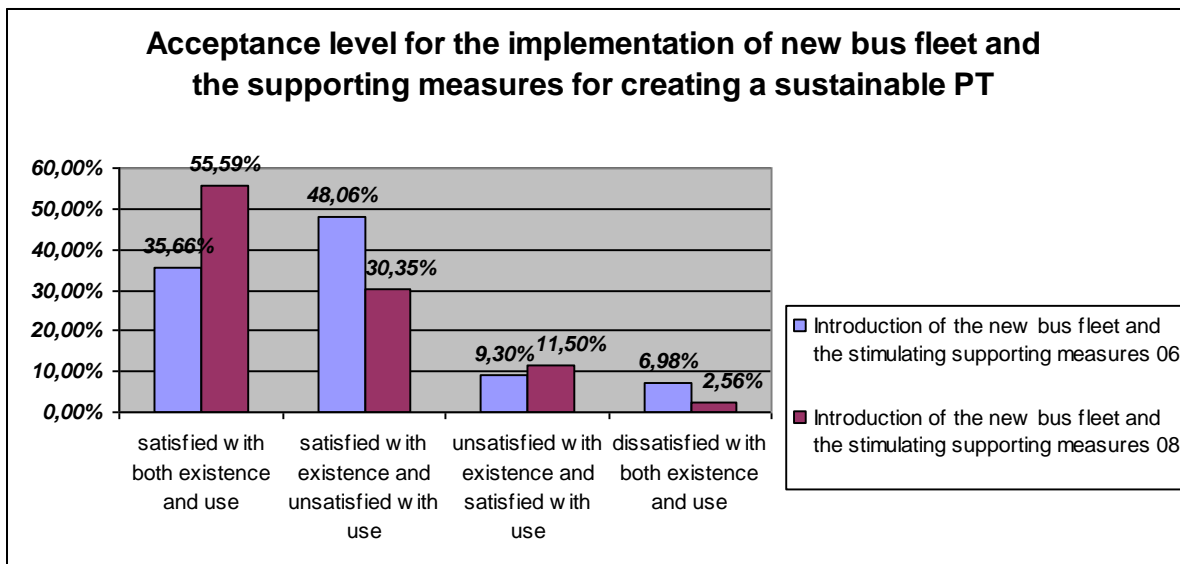
In order to establish the degree in which the main activities carried out in SMILE project and their outputs are accepted and the level of confidence for each of them by those who declared to have heard previously of them, within the questionnaires related to general public it was included the following question:



Figure 41: Centralised answers for the question “How do you appreciate the measures taken by the City Hall within SMILE project to promote and implement a sustainable PT in SM?”

<b>2006</b>	satisfied with both existence and use	satisfied with existence and unsatisfied with use	unsatisfied with existence and satisfied with use	dissatisfied with both existence and use
Introduction of the new alternative bus fleet and the stimulating supporting measures	35.66%	48.06%	9.30%	6.98%
<b>2008</b>	satisfied with both existence and use	satisfied with existence and unsatisfied with use	unsatisfied with existence and satisfied with use	dissatisfied with both existence and use
Introduction of the new alternative bus fleet and the stimulating supporting measures	55.59%	30.35%	11.50%	2.56%

Figure 42: Graph showing the acceptance level for the group of measures studied:



In order to assess the satisfaction for *Introduction of the new alternative bus fleet and the stimulating supporting measures*, four categories of people divided after their opinions were defined: satisfied with existence and use, satisfied with existence and unsatisfied with use, unsatisfied with existence and satisfied with use and dissatisfied with both existence and use. It is important to mark off the limits between these four defined categories of people, because citizens’ attitude and acceptance towards the measures is motivated by personal interests.

The first category (satisfied with existence and with use) includes people who become totally supportive to the implemented activities, without finding any discomfort in launching the new public transport and the supporting measures. Their number increased from 35.66% of total interviewed in 2006 to 55.59% in 2008 (more than half of the population interviewed).

The second category (satisfied with existence and dissatisfied with use) understood the need for making public transport vehicles an important means of transportation and is supportive to any further improvement. In this respect, we highlight here the high percentages of people in this category: 48.6% in 2006, decreasing to 30.35% in 2008. This category of people opinions can be motivated by the fact that they are mainly private car users, they find it important for the overcrowded city to have a viable PT service. Dissatisfaction with use is a sign that there

are other details to be improved; the project team and the LTC’s management discussed and underlined the necessity of setting up precise schedules for buses running, to improve monitoring and to make the timekeeping a very important aim. Of course, extension of routes, area of coverage, number of vehicles, combined with modernising the ticketing system and offering traffic priority in important junctions could improve public transport service delivery and make it a good travelling option for a greater percentage of population.

The third category (dissatisfied with existence and satisfied with use) includes people who would rather use the car than the public transport vehicles, many of these people probably are involved in businesses area, have multiple destinations to reach within a day and the car offers them the needed flexibility. Of course, they don’t show opposition and think that the service is appropriate and useful for other citizens and the bus drivers’ conduct in traffic is correct. The trend is upwards (from 9.3% to 11.5%), allegedly because of increased private car ownership.

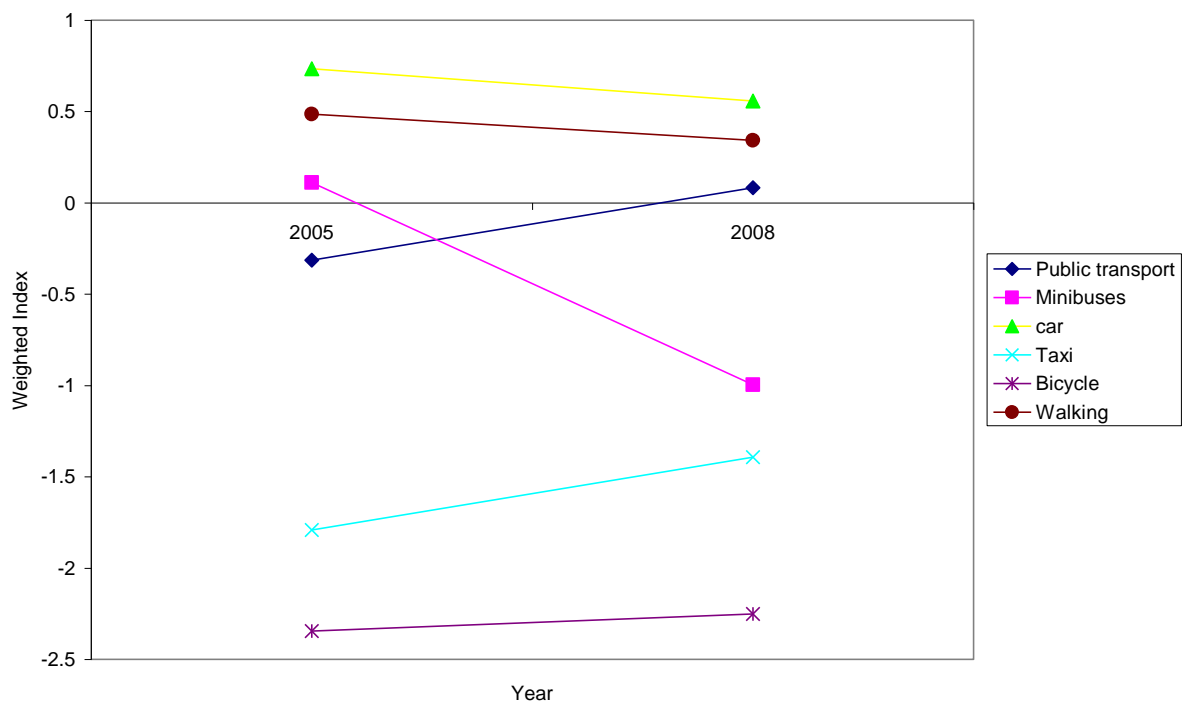
A percentage of people belong to the fourth category (dissatisfied with existence and with use), those who can’t find satisfaction or see advantages both in existence and use of *Introduction of the new alternative bus fleet and the stimulating supporting measures*, their number being minimised to 2.56%. Although, less significant as values, this category is considered to be an opponent of the measure and with the future project of area modernisation, there are hopes to sensitise them and to dissolve this category by merging it into the third category, in the worst case.

To establish the mobility pattern, which also forms the most practical measure of acceptance, following question was inserted in the questionnaire as a repeat of that asked in 2005:

*To what extent do you travel with the following means of transport? (see Data-Appendix for results)*

By converting the data into weighted indices it is possible to pick out some of the trends over the demonstration period, as shown in the following figure.

*Figure 43: Centralised answers to the question  
“To what extent do you travel with the following means of transport?”*



The increase in public transport use appears to be largely at the expense of the use of minibuses, which are now more restricted due to the introduction of the new regulation

regime. Cycling remains a largely infrequent, leisure activity because of the combination of difficult climatic conditions and the difficulty in finding space of the necessary support infrastructure. Some of the increase in the use of taxi may be associated with the fixed public transport lines being unable to 100% fulfil the need left by the removal of most of the more flexible minibus services.

Given the significant increase in car ownership over the demonstration period, a slight reduction in the amount of car use can be seen as a positive outcome, although this challenge will remain and probably increase with expected ongoing increases in prosperity.

#### **Indicator 16: PT services relative cost**

The source of information comes from local PT Company, considering the number of subscriptions and tickets sold. The information related to incomes for employees will be removed from statistic data available at the level of Suceava County, from National Institute for Statistics, Suceava County.

The frequency of data collection is considered to be two times, once at the outset and another time at the end of the project.

It is of relevance to mention here that categories of citizens with low incomes or without incomes at all: pupils, students, pensioners are granted free of charges subscriptions.

People with severe disabilities, veterans and the pensioners categories with very low income (<70 Euro till January 2008 and <280 Euro from February 2008 onwards) were subject to free of charge subscriptions (the difference was supported by the state and local budget).

The pupils, students and pensioners with incomes >70 Euro (until January 2008) and >280 Euro from February 2008 onwards were granted a subscription priced at 50% of its full value (the difference was supported by the local budget).

Definitely, these facilities removed the burden of allotting money from their own budgets to PT transport means, offering the possibility to use whenever necessary this way of transportation, especially because they represent categories that aren't able to procure a more expensive means for travelling.

To make an up-to-date comparison, we'll use the latest official available data for the average net income for month April 2008, provided by the National Institute for Statistics, Suceava County. We consider that although we speak about the County level, we make the remark here that the rural areas don't distort the values as the incomes there are nearly zero and the agriculture barely provides subsistence incomes. The average monthly incomes have a growing trend, observed from month to month; therefore these percentages will get modified in the favour of public transport users.

To calculate the PT relative cost for employed people, we used data for the average monthly net income provided by and the price for a monthly subscription for 1 route, 2 routes and all bus roads network and apart for one fare.

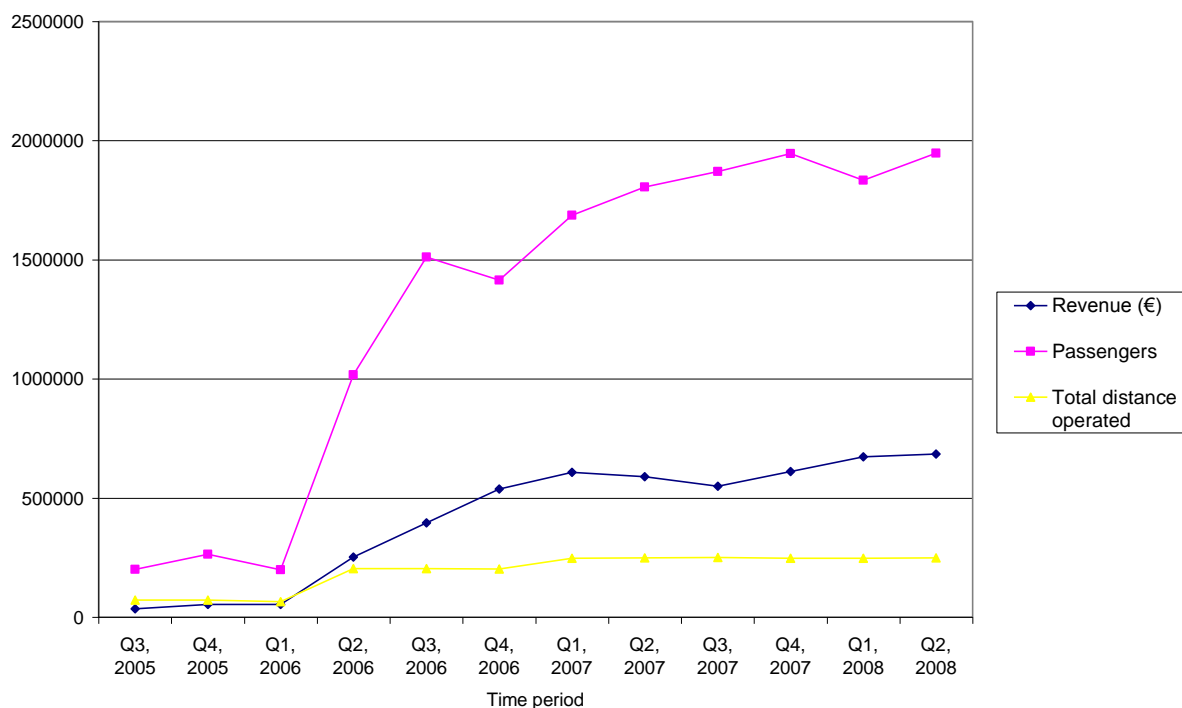
*Figure 44: Table including data about PT relative cost for 2008*

<b>April 2008</b>	Subscription 1 line	Subscription 2 lines	Subscription all lines	Fare price
PT relative cost related to monthly subscription price and unit fare price	3.14%	5.24%	6.29%	0.105%
PT relative cost 2005 compared to 2008	-0.69%	-0.94%	-0.91%	-0.004%

In conclusion, this indicator has a decreased value in 2008 comparing to 2005 and from this point of view the PT is more accessible to current passengers and to the potential new ones.

**Local indicator: Average number of passengers per month for LTC vehicles**

Figure 45: Graph showing the growth in number of passengers, revenue and trend of total distance operated



The average number of passengers/month for the period April 2006 – December 2006 was 438118 passengers / month, for the period January 2007 – December 2007 was 609156 passengers / month and for January 2008 – June 2008 was 630144 passengers / month. In terms of percentages, the result 2008 related to 2005 is 756.77% increase. The relationship with other attributes of the public transport system can be seen in the figure above.

**C3 Achievement of quantifiable targets**

No.	Target	Rating
1	Increase the number of passengers	**
2	Provide public transport information in real time	**
3	Make public transport more attractive	**
4	Reduce traffic emission and promote alternative fuel vehicles	***
NA = Not Assessed    0 = Not achieved    * = Substantially achieved (> 50%) ** = Achieved in full    *** = Exceeded		



## C4 Up-scaling of results

Potential exists to further convert the remainder of the public transport fleet to LPG, with further emissions benefits. The total current PT fleet is 36 vehicles, with the 6 vehicles not included in the current programme mainly operating on infrequent routes outside the city. Clearly there is potential to replace these vehicles from a technical perspective, but because they operate mainly outside the city the priority is to direct the investment at other needs within the city area.

## C5 Appraisal of evaluation approach

The financial evaluation of the new bus fleet was made very precisely, on a month by month basis during its existence. The economy indicators evaluated are therefore very precise, also the increase of number of passengers is correct. We could not get from LTC separate information for the LPG buses running in order to assess the two sets of data and compare them. That will be possible only when they update their bookkeeping program to keep the records apart.

Noise perception was seen from two angles: as a public perception divided in five options and, also, as we handled quantitative measured data, we resorted to this analysis as well in order to present the noise level in three points on the Suceava map.

For PT relative costs, as there isn't available data for the average net income per Suceava city, provided by the National Institute of Statistics – Suceava, we considered the income removed from the statistics at county level. This is not distorting the real income too much, as the rural areas do not really contribute to the county total income and the other cities can only produce a slight decrease of this indicator. Therefore the result obtained is not unrealistic, rather it could have been little lower.

For the citizens' acceptance level, we tried to make a consumer profile as altered within the project years to prove that the demand standards became more refined and the public expectations grew along with the quality of supply. Awareness and acceptance levels at the baseline scenario removed from CATCH project aren't as detailed as for the SMILE approach. The data collected in 2006, when the new Local Transport Company was set up are more relevant for assessing the project impact.

Monitoring of the timekeeping was done considering the entire week coverage and at different moments of the day: morning, noon, afternoon and evening. Quality of PT evaluation referred to a large number of factors that are responsible for a good appraisal of the public perception.

## C6 Summary of evaluation results

The key results are as follows:

- **Key result 1** – Increase in number of PT passengers by 756.77%, and the setting up of a new urban public transport company in the city of Suceava. The financial results became favourable and it was thus possible to save from bankruptcy urban public transport and to restore the activity.
- **Key result 2** – Reduction of emissions caused by LTC vehicles, with the fleet renewal initially and afterwards by converting half of the entire fleet from diesel fuelling to LPG fuelling.
- **Key result 3** – Good acceptance levels for the measures implemented and the creation of a base for the new urban mobility culture, from where other related measures can be built upon.
- **Key result 4** – Improved quality of the PT service; all the quality service parameters have been assessed and the conclusions underlined the importance of these new features for the

passengers (physical comfort, personal security, lines, trip duration, accessibility of PT vehicles within the bus stops, drivers' attitude, information network and real-time information).

- **Key result 5** – Improved energy consumption for the new LPG buses compared to the new diesel buses. In the current international situation, this is a very important result and this demonstration project raises once more the issue of energy efficiency.
- **Key result 6** – Increased awareness for the measures implemented and the whole project, which is a good starting point for the future consultations to be held in order to put in practice new ideas and mechanisms to be designed for a superior traffic management and more qualitative results.
- **Key result 7** – In percentage terms the Euro 3 diesel buses were 16.7% less energy efficient in terms of MJ/km, than the original pre-Euro diesel buses (not allowing for any changes in occupancy, size or capacity) whilst the conversion to LPG led to a net improvement in energy efficiency on the same basis of 8%, again as compared to the original pre-Euro buses.
- **Key result 8** – The total reduction of CO<sub>2</sub> emissions per month as a consequence of the conversion of 15 buses to LPG was 30937.5 kg CO<sub>2</sub>. For one year, the total direct increase from the bus fleet is 371250 kg CO<sub>2</sub>.
- **Key result 9** – The total reduction of CO emissions per month as a consequence of the conversion of 15 buses to LPG was 24.8 kg CO. For one year, the total direct increase from the bus fleet is 298 kg CO.
- **Key result 10** – The total reduction of NOx emissions per month as a consequence of the conversion of 15 buses to LPG was 513.6 kg NOx. For one year, the total direct increase from the bus fleet is 6163 kg NOx.
- **Key result 11** – The total reduction of particulate emissions per month as a consequence of the conversion of 15 buses to LPG was 32.2 kg PM<sub>10</sub>. For one year, the total direct increase from the bus fleet is 386.4 kg PM<sub>10</sub>.

## D Lessons learned

### D1 Barriers and drivers

#### D1.1 Barriers

- Financial barriers - postponed some equipments procurement and made some bolder measures still not yet feasible;
- Mentality – private cars are still regarded as a matter of high social status and public transport is considered as being allocated to poor persons;
- City spatial limitations – our city is quite compact and that makes it difficult to plan widening streets with lanes specially designed for buses use, or building facilities for bicycles;
- Lack of national legal provisions for environmental protection policies – made it more difficult to impose these kind of strict measures at local level;
- Infrastructure constraints – the city had a high density of people in the populated areas and too few adjacent roads to serve all the users;
- Impossibility to obtain biogas fuel during the project lifetime and to promote it on the alternative bus fleet.

## D1.2 Drivers

- Political factors – were always supportive and willing to take measures to improve the citizens' life in the city;
- PT regular passengers attitudes – people who use PT as a single choice to travel;
- People with short distance needs to travel – for whom buses can be faster and more secure than using a private car;
- A visionary and qualitative management of the city, tackling all the problems in a unitary way.

## D2 Participation of stakeholders

- **Stakeholder 1** – The citizens of Suceava city have been supportive to the measures, understood the message conveyed by the project dissemination team and by using the PT vehicles in greater number brought the financial contribution to the LTC salvation. Also, they showed interest in the consultation process and helped the LTC team to take the best decisions at the time of planning the bus service running. By accepting to participate at the questionnaires surveys, they made the input necessary for the project evaluation team to draw out this report.
- **Stakeholder 2** – The business owners of the garages authorised to install the LPG converting systems got actively involved, as they were prepared to answer the entire demand in the case that this would increase throughout the project duration

## D3 Recommendations

The immediate recommendations resulted from the project evaluation at the moment of its completion are:

- **Recommendation 1** – To continue with the bus fleet promotion campaigns and improve the informing network.
- **Recommendation 2** – To complete the GPS monitoring system implementation with the missing infrastructure and to extend the use of this vehicle locating system from the demo bus to the entire fleet.
- **Recommendation 3** – To extend the demo ticketing system from one bus to the entire fleet and improve its use.
- **Recommendation 4** – To maximise use of Mobility Centre to the benefit of all citizens, by making some important information available in real time to the VMSs electronic boards.
- **Recommendation 5** – To re-dimension or re-structure the bus fleet according to the demand and to adjust the timetables according to the running conditions and even to extend the bus routes coverage towards the outskirts of the city, where the residential areas are being built.
- **Recommendation 6** – To modernise the bus facilities and to create better travel conditions.
- **Recommendation 7** – To find feasible hard measures for further road infrastructure allocation, in order to give priority to buses within the main intersections.
- **Recommendation 8** – To increase the use of LPG fuel into the public transport and to implement and develop the use of biogas fuel and distribution facilities.
- **Recommendation 9** – With regard to other cities willing to follow our example in this demo-project, the PT modernisation steps can be followed and be complemented with the supporting measures; in this respect we offer a dissemination material, a very useful brochure,

where all the steps are described as they have been implemented. This is a successful model of how to create greener cities, safe, secure and accessible urban PT and a new urban mobility culture for all the citizens.

#### D4 Future activities relating to the measure

The following initiatives are considered to be undertaken in the future, solutions to be sought to keep the measures results regarding the PT in Suceava city at high standards and to improve the existence and use, restrained, of course, by the scarce financial resources:

- To continue implementing measures for improving the service of local public transport, performed by LTC.

In this respect, it is recommended to further purchase other new buses (a further extension of the bus fleet with 6 new buses, potentially LPG), less polluting and equipped also with modern facilities. The certain benefit will be the improving of public transport conditions, with: the increase of fluency, the reduction of waiting times, wider city coverage of service and the increase of number of buses operational at on-peak hours, and a larger number of citizens served.

- To introduce in local public transport new buses fuelled with alternative fuels (at least demonstratively), especially biogas that will be made available at the end of WWTP (Wastewater Treatment Plant) rehabilitation project. Additionally, it is important to consider the expansion at national level of natural gas as a fuel, although the price evolution could make it inefficient.
- To continue modernisation of the bus stops and the multiplication of stations in other areas of the city that are currently deficient: Burdujeni, Burdujeni Sat, Obcini.

In this respect, any other city horizontal expansion should be considered to be covered by the LTC buses service, to avoid the increase of the privately owned cars.

- The bus routes must be adjusted according to the demand, influx of passengers, the frequency and timekeeping required, but at the same time the efficiency of all the means of transportation, for each line, when needed.
- Taking into consideration the development of the former industrial zone and the transformation into a commercial area, the demand for transport for that zone increased and changed the pattern. In consequence, the public transport service must be reorganised and the routes extended to make the buses a feasible means of transportation for the citizens, forth and back to these commercial area.
- In cooperation with these business developers in the commercial area, the intention is to organise “park and walk” and “park and ride” systems, because in these locations there are appropriate parking facilities
- A better monitoring of the traffic and a more modern ticketing system. Improving systems of traffic monitoring with the view of giving priority to buses in certain crowded intersections
- Measures to improve the use of the informing network and to continue the promotion campaigns
- The city Traffic Study findings, deliverable in January 2009, will have to be put into practice and other adjacent measures to maintain the quality of roads, junctions, traffic lights functioning,
- Measures to promote the Eco-driving and road traffic discipline.