Measure title: Transition Towards Clean Fleets

City: Craiova Project: MODERN Measure number: 01.07

Executive summary

The measure aims to find an appropriate grant in order to replace the old buses fleet running daily in Craiova with a new low pollution one. The strategy of the Municipality and RAT Craiova to replace old buses with clean buses has begun in November 2008 with the purchasing of 17 new buses, MAN Lion's City Euro 4, using the Municipality own financial resources. Within the measure, the Municipality wanted to continue replacing old buses with new ones that could be purchased with grant funds available. Either open calls could not be accessed by RAT for various reasons.

The project team carried out an analysis of the public transport needs in Craiova and an environmental impact evaluation o understand the importance of the fleet renewal. The conclusion was that the buses fleet in Craiova is old and polluting because it consists of NON EURO, EURO 2 and EURO 3 buses and should be replaced with new ones more comfortable and cleaner. Technical documentation and requirements have been developed in order to purchase new buses and the open calls analysis was performed as well.

Unfortunately, either open calls could not be accessed and the only appropriate solution found for renewing the buses fleet was based on the budget of the Municipality that reserved money for buses purchasing.

In 2010 the Mayor of Craiova was suspended from his position and the Deputy Mayor replaced him. For 2011 the Deputy Mayor included in the budget of the Municipality the amount of money needed to purchase 20 new buses. At the end of 2011 the Mayor has returned into the position and reconsidered the Municipality budget, cancelling the acquisition of 20 new buses in favour of other priorities considered at that time more important for the city.

Regarding the evaluation activity, we assessed the impact of the 17 buses purchased by the Municipality with its own budget on environment and public transport users. In this sense it has been estimated, with the help of the COPERT IV program, the annual emissions of 17 old buses from the NON EURO category which were replaced with those new 17 from the EURO IV category and we observed a clear difference of the emissions produced by those two bus categories. The emissions' estimation in COPERT was made taking into account the Km run and the fuel quantity used by those two bus categories. We also estimated the annual emissions of the entire fleet of old buses and the emissions produced by the entire fleet in which 17 old buses were replaced with new ones. We observed a slight decrease of the annual emissions made by the fleet, thing which demonstrates a positive impact over the environment. Under these conditions, it is obvious that the replacement of the entire old bus fleet with a new ecologic one will lead to a significant decrease of emissions in this city.

After the results obtained by comparing the emissions coming from 17 NON EURO buses versus 17 EURO IV buses and taking into consideration the opinion of the public transport users after the replacement of the 17 old buses, the Municipality decided to continue the replacement of old buses starting with the taking out of circulation of NON EURO buses.

The Municipality is willing to renew in the near future all the bus fleet of Craiova and that is why it decided at the end of 2012 to allocate in the budget funds for buying of 50 ecologic buses. For this reason, at evaluation purposes, a scenario considering the availability of a completely new fleet has been developed.

Following the COPERT estimation, the emissions from the 17 NON EURO buses decreased comparing with emissions from the 17 EURO IV buses, as follows:

- CO2(g/vKm) decreased with 1%
- CO(g/vKm) decreased with 76%
- NOx(g/vKm) decreased with 36%
- Pm exhaust(g/vKm) decreased with 96%

In order to evaluate the impact over the public transport users, a survey was conducted asking the interviewed people to state their opinion regarding the quality of services brought by the public transport.

The conclusion of the survey was that the population appreciated the new clean and comfortable buses traveling in Craiova. An improvement of the quality of the service was perceived, and an higher level of comfort and safety was emphasized. The result of the survey will be used as part of the documentation that the Municipality will produce in order to prepare the public tender for the acquisition of 50 new buses foreseen for 2013.

A Introduction

A1 Objectives

The measure objectives are:

(A) High level / longer term:
- To reduce emissions in the city.
- To modify the modal share.

(B) Strategic level:
- To increase the service quality of PT.

(C) Measure level:
(1) To identify the typology of buses suitable for decreasing the emissions by 5 %.
(2) To identify a proper granting program for eco-buses acquisition.

A2 Description

The huge number of circulating vehicles represents one of the major pollution sources in urban areas. A clean public transport system is thus needed in cities to reduce the pollution level and the new technologies for buses offer a viable solution.

This measure wants to bring a contribution to the improvement of the quality of life by decreasing the pollution level, increasing the travellers comfort and, generally, the image of the city by defining a realistic funding scheme to renew Craiova's public transport fleet with 100 new ecological buses.

The transport of passengers by bus in Craiova was not an environmental friendly transportation mode and did not offer attractive travel conditions for passengers. Craiova public transport fleet consisted in old buses, NON EURO, EURO 2, EURO 3, and most of them were older than 10 years. Due to practical reasons of material type and the general bad financial conditions generated by the financial crisis an important percentage from the Romanian Public Transport Companies fleet is composed of vehicles in a bad condition, either because of the long exploitation, or because they were bought second-hand. This fact leads progressively to the degradation of the quality and image of the urban public transport, proving imperative to reform the system of public transport, by acquiring vehicles with an increased capacity and more efficient from the point of view of fuel consumption and transport quality.

The strategy of the Municipality and RAT Craiova to replace old buses with clean buses has begun in November 2008 with the purchasing of 17 new buses, MAN Lion's City Euro 4, using the Municipality own financial resources.

Within the measure, a specific analysis was carried out in order to find out how to use in an optimal way and according with the urban necessities, different funding sources including the Structural Funds

(European Regional Development Fund – Transport Operational Regional Programme 2007-2013), funds from the European Bank of Investments (BEI), COMPRO for purchasing eco buses and ELENA programme. The activities developed within the measure consisted in appraising the funding programs mentioned above in order to decide in accordance with the financial possibilities of Public Transportation Company and Municipality.

On one hand, some of the Funding programmes analysed do not finance acquisition of clean buses, being these programmes focused on financing the transport infrastructures only, on the other hand, others are not suitable for the current economical context because they would increase too much the indebtedness of the Municipality. In fact Romania is living a severe economic restriction period, which affected the capability of the municipality to finance own investments.

As a result, the funding programmes analysed within the measure, cannot be used in order to purchase the new clean buses. This means that Craiova Municipality has to consider funding the acquisition of the new buses with its own financial resources, or national financial resources.

The 17 new buses were bought according to the 2008 investment plan of the Municipality. RAT Craiova and the Municipality acquired these buses based on the analysis of appropriate buses typology, in terms of pollutant emissions and passengers comfort. The 17 new buses were included in the 100 active buses that are running daily in the city, provide travel comfort with low pollution.

RAT Company estimated emissions for these 17 new buses, using COPERT IV program, and made demo activities to prove the high quality of the services provided by these buses in order to decide if the typology MAN Lion's City is the best solution for Craiova if the entire fleet of buses could be renewed.

All this 17 new buses were included in the e-ticketing integrated system and the fleet mobility network.

B Measure implementation

B1 Innovative aspects

The innovative aspects of the measure are:

- **New conceptual approach –** Acquisition of 100 new buses for the Craiova fleet by accessing different grants and programs is a new conceptual approach and a solution to reduce emissions in the city of Craiova

B2 Research and Technology Development

- **Analyzing the necessity of a sustainable transport network and its impact on the environment**

Research activity started with meetings with Municipality representatives and general considerations regarding the measure design.

The public transport needs and environmental impact of bus travel in Craiova was assessed when considering bus replacement. This analysis considered the public transport network (Fig. B2.1), population and the bus fleet status in Craiova

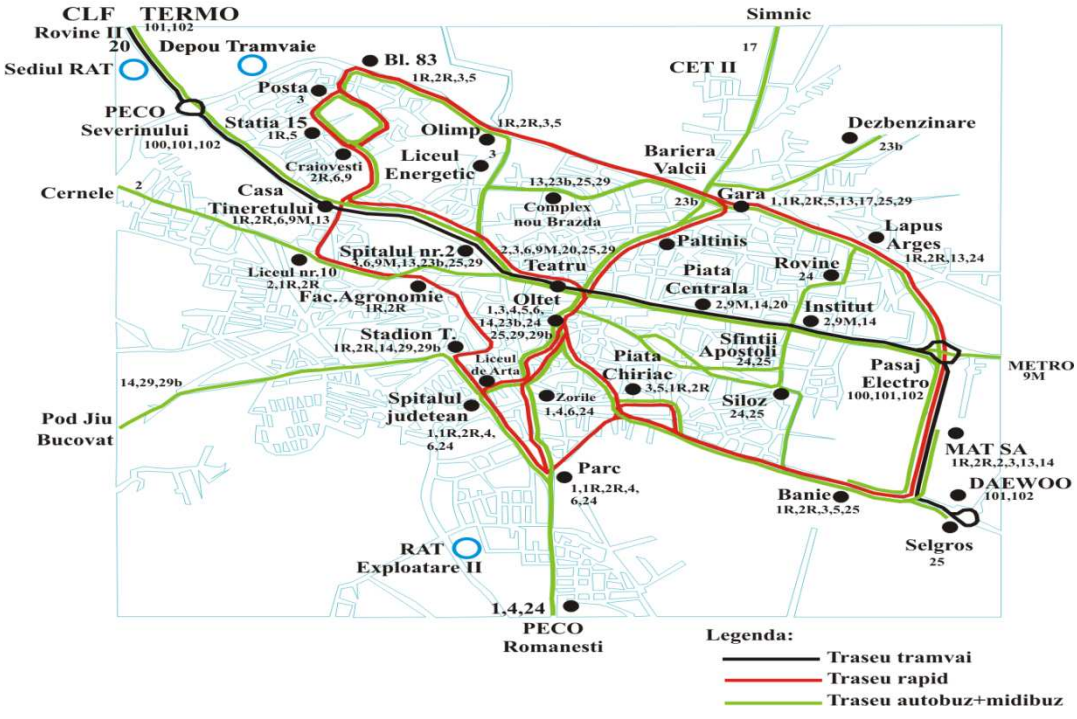

Figure B2.1 – Craiova PT network

A study was carried out on the requirements of the capacity of the Craiova public transportation. The study covered the features of the Craiova metropolitan area and the public transportation network. The final part of the study included the analysis of air quality in Craiova and environmental impact of bus fleet renewal

In the study, the environmental data were provided by the Agency for Environmental Protection Dolj County that collected them from automatic monitoring system which includes 5 automatic stations. The pollutants monitored are those regulated by the national legislation (ORDIN 592/2002) that calculates the limit values, threshold values, criteria and the evaluation methods of SO2, NO2, NOx, CO and PM10.

The air monitoring stations from Craiova are placed in key locations for air quality so that they collect data from various pollution sources. The structure of the monitoring network is the following:

1. Calea Bucuresti Station (DJ1) – traffic station. This location is the most crowded point from the traffic in Craiova.
2. Primarie Station (Town Hall) (DJ2) –urban station, situated in urban area, near the city centre.
3. Billa Station (DJ3) - mixed station – industrial and traffic station, found under the influence of both thermal plants, of the Chemical Plant and of the heavy traffic network from the west part of the city
4. Isalnita Station (DJ4) - industrial station, situated in the suburban area, found under the influence of the Chemical Plant and of the thermal plant in the area.
5. Breasta Station (DJ5) - regional station, situated at a distance to all major pollution and agglomeration sources.

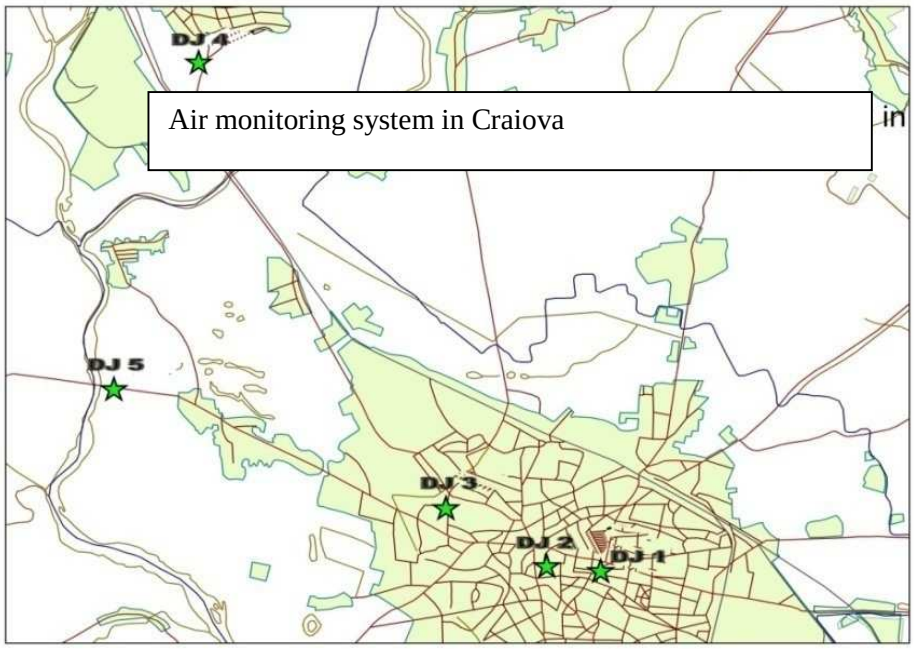

Figure B2.2- Craiova map presenting the air quality monitoring stations

The monitoring stations are situated in the urban area and in the industrial area. Two of these stations are important for the transport pollutant emissions. The emissions registered by the Calea Bucuresti station (DJ1) result from the urban transport, the station being placed in one of the most crowded intersections from the area. Billa station (DJ3) is placed near the western industrial area of Craiova and in a crossroads with intense traffic. From the 2009 report regarding air quality in Craiova, made by the Agency for Environmental Protection Dolj we took over the data monitored in those 5 stations. The data related to 2008 and 2009 are shown in the following table:

MONITORING STATIONS			Concentration - Annual average (µg/m^3)	
Monitoring station	Pollution source	Pollutant type	year	
			2008	2009
DJ1 Calea Bucuresti	traffic	SO2	21	17
		NO2	33.7	32
		NOx	55	57
		CO	0.40	0.36
		PM10	47	38
DJ2 City Hall	urban background	SO2	19	15
		NO2	35	24
		NOx	58	41
		CO	0.32	0.35
		PM10	50	38
DJ3 Billa	traffic and industry	SO2	21	16
		NO2	30	34
		NOx	60	75
Station has no CO sensor		X	X	X
		PM10	60	40
DJ4 Isalnita	industry	SO2	23	18
		NO2	17	16
		NOx	29	25
Station has no CO sensor		X	X	X
Station has no Pm sensor		X	X	X
DJ5 Breasta	regional background	SO2	17	18
		NO2	16	16
		NOx	25	24
		CO	0.30	X
		PM10	34	X

The data from the table shown that the stations DJ1 and DJ3 registered high values of nitrogen oxides (NOx) and material particles (Pm). These pollutants are specific to transport activities.

The nitrogen oxides values registered in 2009 are a little bit higher than those of 2008 thing that is explicable through the fact that the number of cars increased and the traffic is more intense.

The conclusions of the study were the following:

- Craiova city has a network of public transportation with a developed infrastructure that covers the entire surface of the city and makes the connections between the industrial areas and the general interest areas in conditions of average comfort for the passengers.
- Because of the objective conditions of material type, the quality of public transportation has degraded gradually in the last 15 years. This is hard to accept by the citizens. More than that, the bad state of some means of transportation, led to an irregular traffic, with low speed for these means of transport.
- It is necessary a renewal of the buses park with new ecologic buses.
- It is necessary to change of the attitude to use low capacity buses, by using this type of auto vehicles only on the transport routes with a low number of passengers, and adopting high capacity buses on the more important lines.
- Because of the bad state of many of the vehicles from the PTC Craiova, the use coefficient of the bus and microbus fleet is of only 75%.

The operation of the public transportation network under the actual conditions lead to economic losses for the operator PTC Craiova, low comfort for passengers and also increase the level of pollutants that are released in the atmosphere. Public transportation must be made in correlation with the organization of the urban general traffic for assuring an optimum service and a fluent traffic, in safety conditions and with a favourable impact over the protection of the environment.

The result of this activity was the deliverable 01.07.02 –"Analysis of necessity and environmental impact"

- **Renewal fleet**

Technical specification for the purchase of clean buses was produced. The technical requirements for the new buses were compliant with the norms EURO 4 as minimum and contained all the technical, functional, constructive and qualitative specifications as well as the environmental impact

The result of this activity was the technical requirements for purchasing clean buses which will be used as a part of public tender documentation that the Municipality of Craiova intends to launch in 2013 for the tender for acquisition of 50 new clean buses.

- **Finding of available financial support**

There were analysed various open calls for access, available for purchasing new clean buses

The following open calls and opportunities were found:

- Transport Regional Program(ERDF- European Regional Development Fund, Structural Funds- 2007-2013)
- ELENA Program – support the cities in acquisition of ecological buses.

- COMPRO project
- Own financial resources(money coming from the Municipality)

After analysing these available funding opportunities, solution for renewing the fleet of buses was to use the available budget of the Municipality, according to the deliverable 01.07.08- "Report on funding scheme plan".

B3 Situation before CIVITAS

Before the CIVITAS project, Craiova's public transport fleet consisted in old buses and a considerable part of them were older than 10 years, according to the table below (Table B3.1) that shows the fleet structure, in 2008. There were 100 buses used in daily operations leading to a not so attractive public transport for passengers.

Table B3.1 – Fleet composition in 2008

Number of buses in inventory	Year of fabrication	EURO Classification
64	1995	Non EURO
63	1997	2
16	2000	2
2	2002	3
19	2002	2
10	2003	2
12	2004	3

The vehicles mentioned above suffered a bad technical condition because of long exploitation.

Taking into account the endowment of the public transport in Craiova, the purchasing of new vehicles that could give a cleaner and ecological public transport in the city would be needed.

B4 Actual implementation of the measure

The measure was implemented in the following stages:

Stage 1: Planning and design of the measure (Sept 2009 – March 2010)

This activity was R&D one and it was described in detail within the chapter "Research and Technology Development".

An analysis of the public transport needs in Craiova was carried out and an environmental impact assessment was completed.

The analysis included the characteristics of the Craiova metropolitan area, description of the public transport network and the needs of the public transport. The analysis shown that the quality of public transportation has degraded gradually in the last 15 years and the bad state of some means of transportation, led to an irregular traffic, with low speed for these means of transportation.

The analysis of air quality shown that the stations DJ1 and DJ3 which are directly affected by traffic, registered high values of nitrogen oxides (NOx) and material particles (Pm), specific to transportation activities.

The conclusion of the analysis was, on the one hand, to renew the buses park with new ecologic buses, and, on the other hand, to use low capacity buses only on the transport routes with a low number of passengers, and adopt high capacity buses on the more important lines

Stage 2: Plan for renewal fleet (April 2010 – March 2011)

Technical specification for the purchase of 20 clean buses was produced. The technical requirements for the new buses were compliant with the norms EURO 4 as minimum and contained all the technical, functional, constructive and qualitative specifications as well as the environmental impact. The result of this activity was the technical requirements for purchasing clean buses, which will be used as a part of public tender documentation that the Municipality of Craiova intends to launch in 2013 for the tender for acquisition of 50 new clean buses.

TECHNICAL SPECIFICATION

1. GENERALITIES

1.1. Object and domain of application

The acquisition of products packages made out of:

''Bus for public transport"

a. **number of units: 20;** ± 20%
b. **motoring: minimum EURO 5 without AdBlue;**
c. **Lot: 2010.**

All those 20 buses will be manufactured by the same producer:

CPV Code: 34121100 – 2 –public bus.

The Job specification refers to the technical and quality conditions that the buses must meet. The buses will have RAR (Romanian Automobile Register) approval or an equivalent for the ones coming from the C.E. member states. The buses must have identity cards issued by RAR, for obtaining the registration certificate. The approval given by RAR or its equivalent must be presented at the moment of the bid.

The bidder has to present to the buyer's commission, for viewing and evaluation, an urban bus, found under serial production for at least two years, which would satisfy the requirements of the present job specification. The bidders can present to the evaluation commission a bus with materials and technical equivalent solutions, with the condition that it would meet the minimal performance requirements, anti-corrosive protection, warranty and long life, imposed by the present job specification.

1.2. TECHNICAL CONDITIONS

1.2.1. Requirements for the environment

The bus is destined for the exploitation in areas with temperate climate **N** and that is:

a) ambient temperature: -33°C up to +50°C;
b) maximum relative humidity (to + 20°C): 80 %;
c) maximum altitude: 1200 m;
d) exterior agents: powder, rain, fog, mud, snow, frost, ice, salt water, petrochemical products.

1.2.2. Mechanical conditions

Noise level: according to the European bus norms (CEE ONU R 51)

1.3. General constructive description of the bus

a) Buses must fulfil the special conditions of viability, security, comfort, ambient protection at the level of the European norms and must assure a low maintenance and easy accessibility to aggregates. Buses will have low floor for the entire length or at least at two doors they will respect the CE 2001/85 norms.
b) The exterior design and the design of the elements inside the bus must be modern and must offer corresponding comfort to passengers.
c) The bus will have a transport capacity of app. 100 people out of which 25 - 35 seated.
d) The body will be self-supporting modular type, on the whole available surface for the standing passengers. The body will have a warranty to corrosion for at least 12 years. It will have 3 access doors for passengers, on the right side.
e) The position of the doors, the configuration of the passengers' room and of the climbing platform will assure a good circulation of passengers with a corresponding load of the axles.
f) The driving room will have a modern design, separated from the passengers' room. (cabin).
g) The direction will be of „servo-assisted" type and it is preferred the hydraulic variant.
h) The suspension will be fully pneumatic, with a "kneeling" system controlled electronically. The failure of suspension will be signalled on board.
i) The bus will be endowed with secondary break with compressed air with 2 independent circuits.
j) The front axle will be of rigid type, and the back axle compact, with crown and hypoid pinion teeth attack. The back axle can be equipped with two-stage reducer.

1.4. Documentation

The offer will comprise:

- design presenting the view (frontal, back, lateral, up) of the bus. The designs contain the indication of main dimensions.
- designs that will indicate the position of chairs, doors, stop buttons, windows, and safety exits.
- the scheme of the electric circuit and the cable plan.
- the arrangement of the driver's seat and the board panel, in detail.
- the scheme of the pneumatic circuits with the value of the pressures in the circuits and the mounting plan.
- the scheme of the oiling installation.

2. Technical quality conditions

2.1. Constructive specifications

a) All the buses that are the object of the present job specification must present a unitary solution, verified in practice for at least two years on a series product approved and delivered to at least 3 municipalities from CE countries. There will be presented testimonials, in original, from users.
b) All the sub-ensembles and the component parts must be of series type, interchangeable to the entire delivered lot.
c) The origin of the sub-ensembles, aggregates and equipment from these buses will be kept for the entire delivered lot.

2.1.1. Materials

The important sub-ensembles (engine, gearbox, front, motor axle), as well as the body, will be given warranty from the bidder of the bus, through warranty certificates accompanied by conformity certificates from the producers of the sub-ensembles, respectively of the bus, regarding an increased reliability, low maintenance, assuring a good accessibility for the execution of maintenance operations.

In the stage of bid, the bidder will present a model of the warranty certificate, accompanied by conformity certificates from the producers of the sub-ensembles mentioned above.

Stage 3: Funding scheme study (March 2011- Jun 2011)

Finding available financial support

Various calls and funding programs were analysed, for purchasing new clean buses. The following open calls and opportunities were analysed:

- Transport Regional Program (ERDF- European Regional Development Fund, Structural Funds-2007-2013)
- ELENA Program –support the cities in order to facilitate the access to financing from European Investment Bank in acquisition of ecological buses.
- COMPRO project.
- Own financial resources(money coming from the Municipality), through the investment budget, without using any external financial resources.

- European Investment Bank – facilities to access to financing in acquisition of ecological buses.

After analysing these available funding opportunities, solution for renewing the fleet of buses was to use the available budget of the Municipality, as reported in the deliverable 01.07.08- “Report on funding scheme plan”. This for the following reasons:

STRUCTURAL FUNDS

In the framework of Structural Funds- 2007-2013 of the Europe Union, the acquisition of buses and trams are not considered as eligible costs, so this financial opportunity cannot be used for the purpose of the measure. In order to find a possible financial source for the acquisition of new buses, the Municipality of Craiova sent a request related to this subject to the Ministry of Transport which is the management authority for the **Structural Funds** devoted to the transport domain which could provide support for the acquisition of clean buses. Unfortunately, the response of the Ministry was negative and we were informed by a formal letter that in the current programming period for the structural funds, the public transport topics cannot be addressed not only to Romania, but to all European states.

GUVERNUL ROMANIEI

MINISTERUL TRANSPORTURILOR
ŞI INFRASTRUCTURII

AUTORITATEA DE MANAGEMENT POS TRANSPORT

DIRECŢIA GENERALĂ RELAŢII FINANCIARE EXTERNE

Bucureşti 15 / 03 / 2011

Nr.40/DP/CC/ 100.PC

Domnului Ciprian Predescu, SC IPA CIFATT Craiova

Ref: ***Răspuns la solicitarea de informaţii***

La solicitarea cumneavoastră privind posibilitatea achiziţionării de autobuze urbane prin POST, vă informăm că această acţiune nu este eligibilă în cadrul programului pe care îl gestionăm.

Programul Operaţional Sectorial Transport finanţează în principal proiecte de construcţie, reabilitare sau modernizare a infrastructurii naţionale de transport.

Investiţiile aferente DMI 3.3 se adresează minimizării efectelor asupra mediului pentru infrastructura naţională de transport (drumuri naţionale, autostrăzi, căi ferate, Dunărea etc.).

Cu stimă,

DIRECTOR GENERAL
ŞERBAN ALEXANDRU CUCU

Bucureşti, B-dul Dinicu Golescu, nr. 38, Sector 1
tel.: 0750.032.291; fax: 319.61.78; e-mail: dgrfe5@mt.ro

Figure B4.1 – Ministry of Transport reply to Craiova request

ELENA PROGRAM

Another analysed financing source was the ELENA program devoted to cities for the acquisition of ecological buses. The ELENA project comes to support the applicants with the preparation of technical and economic assistance without any financial participation, but the buses acquisition must

be acquired through a bank loan. The applicant should submit a description of the planned investments for the project, the foreseen cost and the development plan.

THE INSTRUMENT OF TECHNICAL ASSISTANCE FOR THE ENERGETIC EFFICIENCY –ELENA (EUROPEAN LOCAL ENERGY ASSISTANCE).

The budget of the program is of 15 million euro, The financier of the program is the European Investment Bank, The purpose of the program is the support of the local and regional innovative investments in the domain of renewable energies and energetic efficiency, mainly for constructions and transports.

Approximate financing domains

- The development of eco-efficient energetic systems
- The integration of renewable energy systems at the level of building: solar panels, photo-voltaic panels, etc.
- The development of a public clean and efficient transport system from the energetic point of view.

THE DESCRIPTION OF THE ELENA PROGRAM

In order to facilitate the mobilization of funds for investments in sustainable energy at the local level, The European Commission and the European Investment Bank came up with the ELENA technical assistance mechanism (European local energy assistance), financed through the Intelligent Energy-Europe program.

ELENA covers a part of the cost for the technical support that is necessary to train, and to put into practice the financing of the investment program, such as *feasibility and market studies, the programs structuring, business plans, energetic audits, preparation for tender procedures* – in short, all that is necessary to make the cities and regions "sustainable energetic projects" ready for EIB finance.

INVESTMENT PROGRAMS THAT CAN BE SUPPORTED BY ELENA

Many cities and regions from the EU started recently to prepare projects for the energetic efficiency and project proposals for renewable energy, in order to approach challenges connected to climate changes. Nevertheless, most of them are still in the stage of project and their putting into practice proves difficult, because most regions and cities, especially average and small, do not have the technical capacity to develop large programs in this domain.

ELENA helps the public authorities solve such problems by offering specific support for the application of investment programs and projects, such as the renovation of public and private buildings, sustainable constructions, low energy consumption for heating and cooling, of ecologic transport, etc. The urban areas represent approximately 70% from the energy consumption from the EU.

Several studies show that there is a high potential for improving the energetic efficiency and for developing energy from renewable sources in cities and regions for urban transport. As a consequence, cities and regions will play an important role in attaining the energetic need of the EU and for climate changes through the clean, ecologic urban transport. In order to attain these objectives large investments that can be made through projects with European finance are necessary.

EIB CONTACTING

ELENA Program can facilitate the access to financing from European Investment Bank or to the financing from another bank. The ELENA program is managed by EIB.

The contacts with EIB can be under any form:

- by phone, by fax, by e-mail or letter (the preferred method is the e-mail at elena@eib.org).

For a first contact, it is needed a short description to comprise all the planned investments (for example, type of investments, approach of putting into practice), the cost of investments foreseen and the calendar for program, plus the sum of the project and the application domain. The European Union (EU) made from the global fight against climate changes a top priority, and the local authorities will play a significant role in attaining this objective.

ELENA Program offers technical assistance to facilitate the grant awarding for preparing investment programs in this domain. The local authority has an important role for the realization of the strategic objectives of the EU connected to the energetic politics and especially for the efficiency that they represent as significant investments. The realization of these objectives at a local level brings benefits to the local economy, the improvement of life quality for the citizens and the attenuation of climate changes.

EXAMPLES OF INVESTMENT PROGRAMS THAT CAN BE SUPPORTED BY ELENA:

- Energetic efficiency in public buildings,
- Development of solar energy in public buildings,
- Public transport in clean and energy efficient cities.

PUBLIC TRANSPORT IN CLEAN AND ENERGY EFFICIENT CITIES

The transport authorities see for the improvement of services through the renewal of its public bus fleet. The new fleet must be characterized through a high environment performance, superior to the one already existent and also, up to date with the standards imposed by the EU regulations.

Different technological options were taken into consideration (hybrid engines, etc), considering to be the best available solution on the market. Nevertheless, the costs connected to the acquisition and to the function of the new fleet can be larger than the conventional technologies and it is needed corresponding financing, including the potential participation of the private sector. The ELENA assistance is required for building a business plan, including the preparation of reference terms for bus offer request.

THE TECHNICAL FACILITY OF ELENA ASSISTANCE

The European Commission and the EIB launched the ELENA facility, with a fund of 15 million EUR managed by EIB, to improve the quality training of projects in the domain of energetic efficiency and of renewable energy sources. This facility has as objective the preparation of investment programs in cities that can be afterwards replicated in other cities or regions. This subvention/ support are offered inside the EIE II program.

The public organisms prepare the investment program in the sectors mentioned above and can apply for direct assistance from EIB. There will be no request for proposals, the assistance will be granted based on the principle "first come, first served" in the limits of the budget. The applicants must present the EIB investment project and to indicate the technical assistance necessity inside the facility.

In order to start the discussion for ELENA assistance, at least the following information must be presented at EIB:

- Short description of planned investments inside the project, including the type of investments for the putting into practice and approach of the program;
- The cost of foreseen investments and the development plan for the program;
- The sum, the application domain and the main needs that must be approached by the required AT.

Based on this information, EIB will see if the proposal fulfils the selection criteria and will evaluate the technical assistance necessity (AT) of the specific investment program.

After receiving a positive result for this evaluation, an assistance request can be prepared and EIB will present the proposal to the European Commission for approval. The selection criteria and the eligible costs are detailed below.

EIB will select the investment programs that are to be supported inside the facility based on the following criteria:

- The eligibility of the applicant;
- Considering the eligibility of the investment programs (type of program, location in an eligible country);
- Financial and technical capacity of the applicant for putting into practice and the finalization of the investment program;
- The verification of the fact that the financial assistance inside this mechanism should not be used for investment programs that can be better supported by other similar facilities from the European Union, including the cohesion and the Structural Funds. In the case in which the funds can be obtained from other facilities, the applicant should justify why the use of this mechanism is more appropriate;

ELIGIBLE COSTS

Technical assistance can be given for the development of feasibility and market studies, programs' structuring, business plans, energetic audits, the elaboration of bid procedures for the units that implement the programs and which include any other type of assistance necessary for the development of investment programs. Nevertheless, the hardware costs, such as measurement equipment, computers or office spaces, are excluded.

The required technical assistance must be for the realization of the investment programs and must respect the principles of a good financial management, for money and for cost efficiency. The auxiliary personal cost allocated for the application of a TA is an eligible cost. The staff costs must correspond to the effective salaries plus the taxes with social security and other costs connected to payment. The EU contribution can cover up to 90% from the eligible costs.

The financial aid for technical assistance inside this mechanism cannot be given retrospectively. The financial assistance must not have as purpose or as effect the providing of a profit for the beneficiary.

COMPRO PROGRAM FOR THE ACQUISITION OF ECOLOGIC BUSES

Based on criteria as eligibility of the applicant, eligibility of the investment, financial and technical capacity of the applicant to put into practice the investment, the technical assistance from European Investment Bank makes an evaluation followed by a proposal to the European Commission in order to be approved.

This program unfortunately does not represent a solution for the actual economic context because it would raise the degree of debt of the Municipality which is already involved in a package of large investment projects for whose implementation the Municipality must partially participate with its own resources. Additionally, due to the economic situation, the Municipality has not now the possibility to access new loans.

So, the appropriate (and remaining) solution for renewing the buses fleet was the budget of Municipality that reserved money for buses purchasing. Unfortunately, after the budget analysis made as usually in June 2011, the Municipality was forced to redirect the budget for buses purchasing to other investments that were considered of major importance for the year 2011. In these conditions, the Municipality transferred the buses acquisition initiative at the beginning of 2013. The current difficult economic situation generated by the general economic crisis is not favourable for investment and any investment is being made with caution and is very well weighed before the final decision. Often the decisions and priorities are changing according to the economic context and more, according to the forecasts in the global economy.

The Municipality of Craiova, although has a large number of projects in its local strategy, was forced to establish some priorities concerning the local budget allocation and its targeting to different projects. In the local strategy of the Craiova Municipality, the buses acquisition was a priority but the difficult economic circumstances, which have begun to be perceived in 2009, allowed the purchase of only 17 clean buses.

Stage 4: Operation with new buses (Nov 2011-Sept 2012)

Emissions estimation was made by COPERT IV software, to evaluate the reduction of pollutant emissions by renewing the fleet. The emissions coming from the 17 new buses – Lion's city type – were estimated and compared with the emissions coming from NON Euro buses which were scrapped.

A survey was done on public transport users in order to see the passengers' opinion regarding to the buses fleet which was a little upgraded by replacing of 17 NON Euro buses with 17 Euro IV type buses.

Stage 5: Plan for renewal fleet (September 2012 –December 2013)

As a result of this measure outcomes, the Municipality of Craiova City decided to consider a priority the acquisition of new clean buses. In this regard it was decided for 2013 to purchase 50 new clean buses, this acquisition being included in the investment list. The acquisition will take place on the basis of the technical specification and the tender documentation developed within this measure and described above, in the stage 2 of measure implementation.

B5 Inter-relationships with other measures

The measure is related to other measures as follows:

- **M 01.02** Alternative Fuels in Craiova aims to decrease the emissions in the city by introducing alternative fuel.

C Impact Evaluation Findings

C1 Measurement methodology

C1.1 Impacts and Indicators

Table C1.1: Indicators. Insert your own table where available, use landscape layout as necessary

No.	Impact	Indicator	Data used	Comments
8-11	Environment	CO2 emissions CO emissions NOx emissions Particulate emissions	-Km travelled/year for the 100 active buses -Annual fuel consumption for the 100 active buses	Modelling using COPERT IV model for daily active fleet consisting in 100 buses.
19	Transport	Quality of service	Index %, qualitative	Face to face surveys Perception of quality of service of the buses fleet (From survey)

Detailed description of the indicator methodologies:

- **Indicator 8 -11(CO2, CO, NOx, PM exhaust)**

The emissions (CO, NOx, PM, CO2,) are estimated with COPERT IV program, version 7.1, using the input data provided by Transport Company.

The steps followed for calculating the emissions have been:

- Step 1: Install COPERT IV version 7.1 program
- Step 2: Create a file: .mdb extension
- Step 3: Input data entry and obtaining report:

Table C1.1.1

RAW DATA INPUT				**REPORTS**	
Country data:	**Fuel info:**	**Fleet configuration**	**Activity data**	**Emissions factor**	**Total emissions**
- min temperature - max temperature atmospheric	- fuel type - annual consumption (tones)	- Select the sector: buses - Select the	-input the number of buses for which calculate the	CO, CO2, NOx, Pm Emissions factors(g/Km)	-All emissions (t/year): CO2, CO, NOx, Pm

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RAW DATA INPUT				REPORTS	
Country data:	**Fuel info:**	**Fleet configuration**	**Activity data**	**Emissions factor**	**Total emissions**
pressure - length trip(Km) - time trip(h) - Comments: First of all, set the year for emissions determination then input min and max. temperatures and atmospheric pressure for each months of the reference year . There are set the trip length and the time /trip	Comments: Input the fuel type consumption(tonnes) coming from the buses for which calculate the emissions	subsector: Urban buses midi,<=15 t - Select Legislation standard: Euro 1, 2, 3, 4 or Conventional	emissions - input km travelled annual by the buses for which calculate emissions - input the average speed-(km/h) of buses for which calculate the emissions - input the travel area: urban only	Comments: The emissions factors are calculated automatically based on the raw input data	(exhaust) Comments: The emissions are calculated based on raw input data and emissions factors

- **Indicator 19 (Quality of Service)** - Survey based perception of quality of service

The survey was made to see the impact on PT users of the 17 clean buses purchased by RAT and the impact of the all fleet renewing 160 questionnaires were circulated to evaluate the 17 clean buses purchased by RAT and the same number of questionnaires to evaluate the impact of all buses fleet that could be new one.

The feedback for evaluation of the 17 buses (BAU situation) was 120 filled questionnaires and the feedback for the ex-post evaluation of the all fleet consisting of new buses were 110 filled questionnaires. The questionnaires for BAU situation were disseminated to public transport users in stations, inside buses and during workshops organized by MODERN project team.

The workshops were organized during the Communication Campaign and seminar presentation that took place between 3 - 5 May 2010), 6-7 hours per day in the street in a pavilion located in the prefecture market (in the downtown) In agreement with the target group it was kept e-mail and phone

to be contacted for ex-post evaluation period, too. The feedback of 120 and 110 questionnaires are satisfied for a population of 300'000 people in Craiova.

To be sure of obtaining such a sample we launched a number of questionnaires-160 The questionnaires were structured in 2 sections:

- General information about citizens (job, edge, gender, education level, contact data)
- Questions referring to the measure. The most important questions were:
    - "How do you estimate the quality of public transport in your city?" (satisfaction scale: 1-3)
    - "Do you consider that the quality of services in PT have been improved lately?"(Yes/No)

The sample size was estimated according to GUARD guideline – Annex G- " Sample size estimation formulae" (see Annex 3)

C1.2 Establishing a Baseline

In October 2008, in Craiova, RAT Craiova had 186 buses in inventory, structured as follows:

- 64 buses non-Euro,
- 108 buses Euro II,
- 14 buses Euro III

Public Transport Company in Craiova was operating, daily, with about 100 buses, according to existing requirements. The 100 buses in operation were polluting and didn't offer a good comfort for passengers because they are worn and old. Also, the image of the old buses was contrasting with the image of Craiova city which was under the modernization process. For this reason, Craiova Municipality decided to find a solution for renewing the buses fleet to improve the comfort of public transport.

This measure involves finding available funds for purchasing clean buses in order to replace the old buses that currently travel in Craiova. Therefore, evaluation compares the quality of service and pollution of old buses travelling in the city with new clean buses that could replace them.

The starting point is to calculate the emissions coming from the 100 old buses that were running in the city between (January – October) 2008, using the program COPERT IV, version 7.1**.** The 100 daily running buses included 60 Euro II buses, 30 Non euro buses and 10 EIII buses.

COPERT IV programme needs input data referring to country, length and time of trip, number of buses, fuel consumption and Kms travelled by fleet taking into consideration the EURO category

In the Table C1.2.1 are calculated emissions from entire fleet consisted of 100 old buses (NON EURO, EURO II and EURO III) :

Measure title: Transition Towards Clean Fleets

City: Craiova Project: MODERN Measure number: 01.07

Table C1.2.1 – emissions calculation

<table>
<tr><th>Name of raw data input</th><th>Values of ex-ante raw data</th></tr>
<tr><td>Country</td><td>Romania</td></tr>
<tr><td>Year</td><td>2008</td></tr>
<tr><td>length of trip in Craiova city
Provided by RAT</td><td>20 Km</td></tr>
<tr><td>Time trip
Provided by RAT</td><td>1 h</td></tr>
<tr><td>Country info – refers to the min. and max. temperatures and pressure recorded each month , from January to December 2008, in Romania
Statistic data</td><td>
<table>
<tr><th>Month</th><th>Temp min(^{0}C)</th><th>Temp max(^{0}C)</th><th>RVP(kP)</th><th>calculate Beta</th></tr>
<tr><td>Jan</td><td>-20</td><td>8</td><td>100</td><td>0.15064</td></tr>
<tr><td>Feb</td><td>-15</td><td>9</td><td>100</td><td>0.14452</td></tr>
<tr><td>Mar</td><td>-12</td><td>2</td><td>100</td><td>0.12820</td></tr>
<tr><td>Apr</td><td>6</td><td>15</td><td>100</td><td>0.11698</td></tr>
<tr><td>May</td><td>12</td><td>25</td><td>100</td><td>0.10066</td></tr>
<tr><td>Jun</td><td>17</td><td>27</td><td>100</td><td>0.09352</td></tr>
<tr><td>Jul</td><td>20</td><td>38</td><td>100</td><td>0.07924</td></tr>
<tr><td>Aug</td><td>18</td><td>34</td><td>100</td><td>0.08536</td></tr>
<tr><td>Sep</td><td>14</td><td>27</td><td>100</td><td>0.09658</td></tr>
<tr><td>Oct</td><td>8</td><td>17</td><td>100</td><td>0.11290</td></tr>
<tr><td>Nov</td><td>5</td><td>10</td><td>100</td><td>0.12310</td></tr>
<tr><td>Dec</td><td>-10</td><td>6</td><td>100</td><td>0.14248</td></tr>
</table>
</td></tr>
<tr><td rowspan="3">Annual fuel consumption (tones of diesel)- refers to fuel consumed by the old fleet in 2008 by type
RAT provided the data relating to 2008</td><td>1064 tones for 60 Euro II buses</td></tr>
<tr><td>368 tones for 30 Non Euro buses</td></tr>
<tr><td>139 tones for 10 Euro III buses</td></tr>
<tr><td>Fleet configuration- refers to the buses size
Provided by RAT</td><td>HD Urban buses midi <=15 tones</td></tr>
<tr><td rowspan="2">Fleet data – refers to number of buses traveling in the city and the respective mileage by Euro category
RAT provided the data relating to 2008</td><td>Population: no of buses by Euro category(EII, EIII and NON Euro)
- 60 Euro II
- 30 NON EURO
- 10 Euro III</td></tr>
<tr><td>Mileage:
- 4400907 Km travelled by 60 Euro II buses
- 1185229 Km travelled by 30 NON Euro buses
- 605143 Km travelled by 10 Euro III buses</td></tr>
<tr><td>Circulation data referring to the buses speed in the city
Provided by RAT</td><td>Speed(Km/h): about 17Km/h in urban</td></tr>
</table>

Names of indicators calculated automatically	Values of indicators calculated automatically by the software (t/year)	Values of indicators (g/vKm)
CO2 exhausted by 60 Euro II buses	232’400	880.1216052
CO2 exhausted by 30 NON EURO buses	42’430	1193.299635
CO2 exhausted by10 Euro III buses	5’660	935.3161154
Total quantity CO2 exhausted by 100 old buses	**280’490**	
CO exhausted by 60 Euro II buses	602	2.279833074
CO exhausted by 30 NON EURO buses	258	7.255981755
CO exhausted by10 Euro III buses	15	2.478752956
Total quantity CO exhausted by 100 old buses	**875**	
NOx exhausted by 60 Euro II buses	2736	10.36150048
NOx exhausted by 30 NON EURO buses	446	12.54328629
NOx exhausted by10 Euro III buses	60	9.915011824
Total quantity NOx exhausted by 100 old buses	**3’242**	
Small particulate emissions exhausted by 60 Euro II buses	48	0.18178071
Small particulate emissions exhausted by 30 NON EURO buses	43	1.209330293
Small particulate emissions exhausted by10 Euro III buses	1.15	0.190037727
Total quantity Small particulate emissions exhausted by 100 old buses	**92.15**	

In order to have a clear picture of how emissions decreased by replacing of NON EURO category buses with new buses EURO IV category, we can calculate emissions from the 17 NON EURO buses versus 17 EURO IV clean buses.

Considering 17 NON EURO buses ROMAN UMD type that were proposed for scrapping can estimate annual quantity of emissions function of Km travelled and fuel consumption. The results for the 17 buses that are proposed for scrapping are shown in the table below.

<table>
<tr><td>Name of raw data input</td><td colspan="5">Values of Ex-Ante raw data referring to 17 buses to be replaced</td></tr>
<tr><td>Country</td><td colspan="5">Romania</td></tr>
<tr><td>Year</td><td colspan="5">2008</td></tr>
<tr><td>length of trip in Craiova city</td><td colspan="5">20 Km</td></tr>
<tr><td>Time trip</td><td colspan="5">1 h</td></tr>
<tr><td rowspan="13">Country info – refers to the min. and max.

temperatures and pressure recorded each month , from January to December 2008, in Romania

Statistic data</td><td>Month</td><td>Temp min(^{0}C)</td><td>Temp max(^{0}C)</td><td>RVP(kP)</td><td>calculate Beta</td></tr>
<tr><td>Jan</td><td>-20</td><td>8</td><td>100</td><td>0.15064</td></tr>
<tr><td>Feb</td><td>-15</td><td>9</td><td>100</td><td>0.14452</td></tr>
<tr><td>Mar</td><td>-12</td><td>2</td><td>100</td><td>0.12820</td></tr>
<tr><td>Apr</td><td>6</td><td>15</td><td>100</td><td>0.11698</td></tr>
<tr><td>May</td><td>12</td><td>25</td><td>100</td><td>0.10066</td></tr>
<tr><td>Jun</td><td>17</td><td>27</td><td>100</td><td>0.09352</td></tr>
<tr><td>Jul</td><td>20</td><td>38</td><td>100</td><td>0.07924</td></tr>
<tr><td>Aug</td><td>18</td><td>34</td><td>100</td><td>0.08536</td></tr>
<tr><td>Sep</td><td>14</td><td>27</td><td>100</td><td>0.09658</td></tr>
<tr><td>Oct</td><td>8</td><td>17</td><td>100</td><td>0.11290</td></tr>
<tr><td>Nov</td><td>5</td><td>10</td><td>100</td><td>0.12310</td></tr>
<tr><td>Dec</td><td>-10</td><td>6</td><td>100</td><td>0.14248</td></tr>
<tr><td>Annual fuel consumption (tons of diesel) for the 17 buses proposed for scrapping- ROMAN UDM type

RAT provided the data relating to 2008</td><td colspan="5">174,15 tons for 17 NON EURO buses, ROMAN UDM type</td></tr>
<tr><td>Fleet configuration - refers to the buses</td><td colspan="5">HD Urban buses midi <=15 tones</td></tr>
<tr><td rowspan="2">Number and mileage of buses - refers to number of buses and the respective mileage related to the 17 buses proposed for scrapping

RAT provided the data relating to 2008</td><td colspan="5">Population: no of buses

17 NON EURO buses, ROMAN UDM type</td></tr>
<tr><td colspan="5">Mileage:

561784 Km travelled by 17 NON Euro

buses, ROMAN UDM type</td></tr>
<tr><td>Average speed of buses in urban area Provided by RAT</td><td colspan="5">Speed(Km/h): 17 Km/h in urban</td></tr>
</table>

Name of indicators calculated automatically	Values of indicators calculated automatically (t/year)	Values of indicators (g/vKm)
CO2 exhausted by 17 NON EURO buses	11400	1193.67628
CO exhausted by 17 NON EURO buses	69.23	7.24896569
NOx exhausted by 17 NON EURO buses	119.9	12.55454263
Small particulate emissions exhausted by 17 NON EURO buses	11.64	1.218806307

The results are included in the Annex 1 as screen-shots of COPERT IV reports.

C1.3 Building the Business-as-Usual scenario

Without CIVITAS project, the Municipality started the renewing the buses fleet by purchasing of 17 clean buses, in the end of 2008. So, 17 old buses were scrapped and replaced with the new ones. The Public Transport Company included the 17 new clean buses (Euro IV- MAN Lion's City) in the 100 buses that were operating daily in Craiova, therefore, canceling 17 old buses NON EURO category from their daily routine. The investment of the 17 buses was made with private resources, in the first month of the project, October 2008. Therefore, in 2009 the active buses fleet included the buses type as follows:

- 60 EuroII
- 13 NON EURO
- 10 EuroIII
- 17 Euro IV- MAN Lion's City

For these 100 active buses, that include 17 clean buses, the emissions were calculated using the same methodology COPERT software The input data and results are shown in the tables below:

<table>
<tr><th>Name of raw data</th><th colspan="5">Values of row data in BAU</th></tr>
<tr><td>Country</td><td colspan="5">Romania</td></tr>
<tr><td>Year</td><td colspan="5">2009</td></tr>
<tr><td>length of trip in Craiova city Provided by RAT</td><td colspan="5">20 Km</td></tr>
<tr><td>Time trip
Provided by RAT</td><td colspan="5">1 h</td></tr>
<tr><td rowspan="8">Country info – refers to the min. and max.
temperatures and pressure recorded each
month , from January to December 2009, in Romania
Statistic data</td><td>Month</td><td>Temp min(^{0}C)</td><td>Temp max(^{0}C)</td><td>RVP(kP)</td><td>calculate Beta</td></tr>
<tr><td>Jan</td><td>-20</td><td>8</td><td>100</td><td>0.15064</td></tr>
<tr><td>Feb</td><td>-15</td><td>9</td><td>100</td><td>0.14452</td></tr>
<tr><td>Mar</td><td>-12</td><td>2</td><td>100</td><td>0.12820</td></tr>
<tr><td>Apr</td><td>6</td><td>15</td><td>100</td><td>0.11698</td></tr>
<tr><td>May</td><td>12</td><td>25</td><td>100</td><td>0.10066</td></tr>
<tr><td>Jun</td><td>17</td><td>27</td><td>100</td><td>0.09352</td></tr>
</table>

Measure title: Transition Towards Clean Fleets

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Name of raw data	**Values of row data in BAU**				
	Jul	20	38	100	0.07924
	Aug	18	34	100	0.08536
	Sep	14	27	100	0.09658
	Oct	8	17	100	0.11290
	Nov	5	10	100	0.12310
	Dec	-10	6	100	0.14248
Annual fuel consumption (tons of diesel) of the fleet consisting in 83 old buses and 17 *MAN Lion's city* new buses. The data were provided by RAT relating to 2009	1054 tones for 60 Euro II buses				
	335 tones for 13 NON Euro buses				
	137 tones for 10 Euro III buses				
	256.26 tones for 17 *MAN Lion's city* new buses				
Fleet configuration – buses size Provided by RAT	HD Urban buses midi <=15 tones				
Number of buses and mileage - refers to number of buses and the respective mileage related to 83 old buses and 17 *MAN Lion's city* new buses The data were provided by RAT relating to 2009	Population: no of buses by Euro standard - 60 Euro II - 13 NON EURO - 10 Euro III - 17 Euro IV *MAN Lion's city type*				
	Mileage: - 3119295 Km travelled by 60 Euro II buses - 1080229 Km travelled by 13 NON Euro buses - 595154 Km travelled by 10 Euro III buses - 732190 Km travelled by 17 Euro IV new buses MAN Lion's city type				
Average speed of buses in urban area Provided by RAT	Speed(Km/h): 17Km/h in urban				

Name of indicators calculated automatically	**Values of indicators calculated automatically(t/year)**	**Values of indicators (g/vKm)**
CO2 exhausted by 60 Euro II buses	164700	880.0065399
CO2 exhausted by 13 NON EURO buses	16760	1193.479132
CO2 exhausted by 10 Euro III buses	5567	935.3881516
CO2 exhausted by 17 Euro IV buses *MAN Lion's city type*	14750	1185.002607

Name of indicators calculated automatically	**Values of indicators calculated automatically(t/year)**	**Values of indicators (g/vKm)**
Total quantity CO2 exhausted by 100 buses which consist in 83 old buses and 17 new buses	**201777**	
CO exhausted by 60 Euro II buses	426.8	2.280429819
CO exhausted by 13 NON EURO buses	101.8	7.249175157
CO exhausted by 10 Euro III buses	14.81	2.488431566
CO exhausted by 17 Euro IV buses *MAN Lion's city type*	22.49	1.767461516
Total quantity CO exhausted by 100 buses which consist in 83 old buses and 17 new buses	**565.41**	
NOx exhausted by 60 Euro II buses	1939	10.360247
NOx exhausted by 13 NON EURO buses	176.2	12.54719708
NOx exhausted by 10 Euro III buses	59.41	9.982290298
NOx exhausted by 17 Euro IV buses *MAN Lion's city type*	100	8.03391598
Total quantity NOx exhausted by 100 buses which consist in 83 old buses and 17 new buses	**2274.61**	
Small particulate emissions exhausted by 60 Euro II buses	33.88	0.18102381
Small particulate emissions exhausted by 13 non-euro buses	17.12	1.219114722
Small particulate emissions exhausted by 10 Euro III buses	1	0.168023738
Small particulate emissions exhausted by 17 Euro IV buses *MAN Lion's city type*	0.78	0.062664545
Total quantity Small particula emissions exhausted by 100 bus which consist in 83 old buses and clean buses(Euro IV category)	**52.78**	

To have a clear picture of decreasing emissions by replacing the old buses NON EURO category with clean buses EURO IV category, estimate the emissions of the 17 EURO IV *MAN Lion's city type* , travelled in 2009. The results are shown in the table below:

Measure title: Transition Towards Clean Fleets

City: Craiova Project: MODERN Measure number: 01.07

Name of raw data	**Values of row data in BAU**				
Country	Romania				
Year	2009				
length of trip in Craiova city Provided by RAT	20 Km				
Time trip Provided by RAT	1 h				
Country info – refers to the min. and max. temperatures and pressure recorded each month , from January to December 2009, in Romania Statistic data	Month	Temp min(^{0}C)	Temp max(^{0}C)	RVP(kP)	calculate Beta
	Jan	-20	8	100	0.15064
	Feb	-15	9	100	0.14452
	Mar	-12	2	100	0.12820
	Apr	6	15	100	0.11698
	May	12	25	100	0.10066
	Jun	17	27	100	0.09352
	Jul	20	38	100	0.07924
	Aug	18	34	100	0.08536
	Sep	14	27	100	0.09658
	Oct	8	17	100	0.11290
	Nov	5	10	100	0.12310
	Dec	-10	6	100	0.14248
Annual fuel consumption for the 17 MAN Lion's city type replacing 17 NON Euro buses	256.26 tones for 17 clean buses				
Fleet configuration Provided by RAT	HD Urban buses midi <=15 tones				
Number and mileage of 17 MAN Lion's city buses The data were provided by RAT relating to 2009	**Population**: 17 EURO IV buses				
	Mileage: 732190 Km travelled by 17 EURO IV buses				
Input the average speed of buses in urban area Provided by RAT	Speed(Km/h): 17Km/h in urban				

Name of indicators calculated automatically	**Values of indicators calculated automatically(t/year)**	**Values .of indicators (g/vKm)**
CO2 exhausted by 17 EURO IV buses	**14'750**	1'185.002607

CO exhausted by 17 EURO IV buses	**22.49**	1.767461516
NOx exhausted by 17 EURO IV buses	**100**	8.03391598
Small particulate emissions exhausted by 17 EURO IV buses	**0.78**	0.062664545

The tables below, show emissions from 17 NON EURO buses versus 17 EURO IV buses expressed in t/year and g/vKm.

Indicators	**Ex-ante values NON-EURO category (t/year)**	**Mileage(Km travelled in 2008) Related to 17 NON-EURO buses**	**BAU values EURO IV category (t/year)**	**Mileage(Km travelled in 2009) Related to 17 EURO IV buses Lion's city type**
CO2	11'400	561784	14'750	732'190
CO	69.23		22.49	
NOx	119.9		100	
Small particulate emissions (PM)	11.64		0.78	

Indicators	**Ex-ante values NON EURO category(g/vKm)**	**BAU values EURO IV category(g/vKm)**
CO2	1'193.67628	1'185.002607
CO	7.24896569	1.767461516
NOx	12.55454263	8.03391598
Small particulate emissions (PM)	1.218806307	0.062664545

Fig C1.3.5 – CO2 emissions

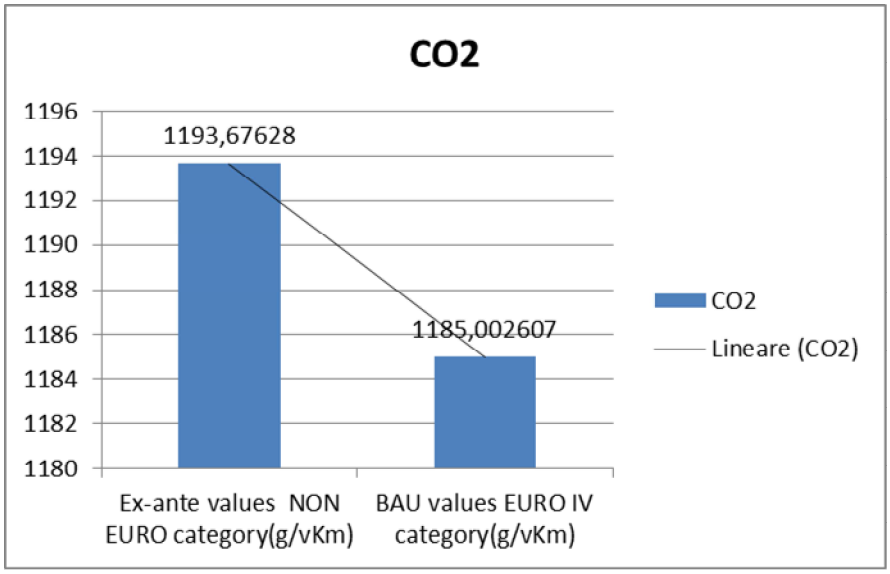


Fig C1.3.6 – CO emissions

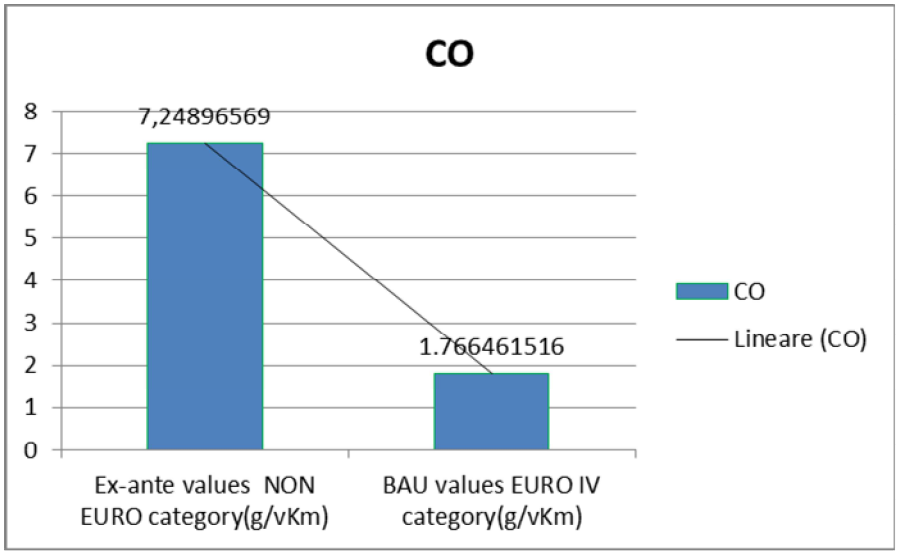


Fig C1.3.7 – NOx emissions

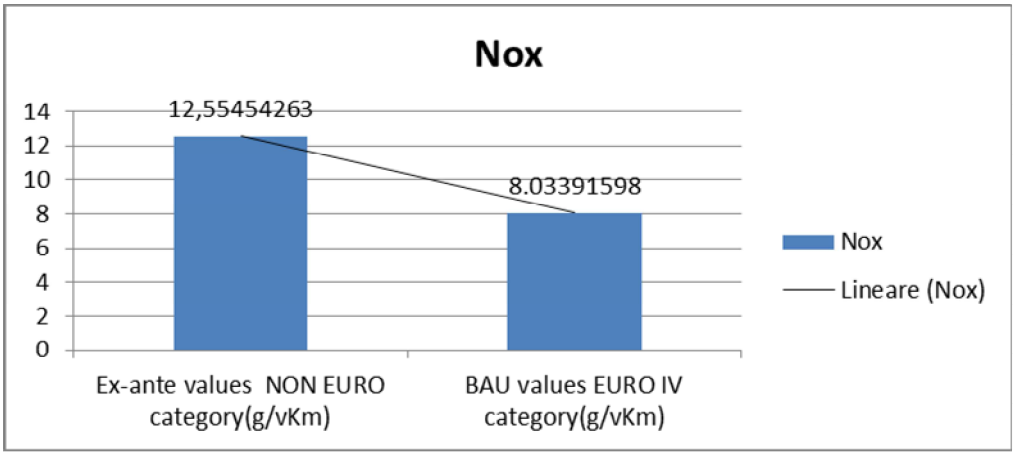
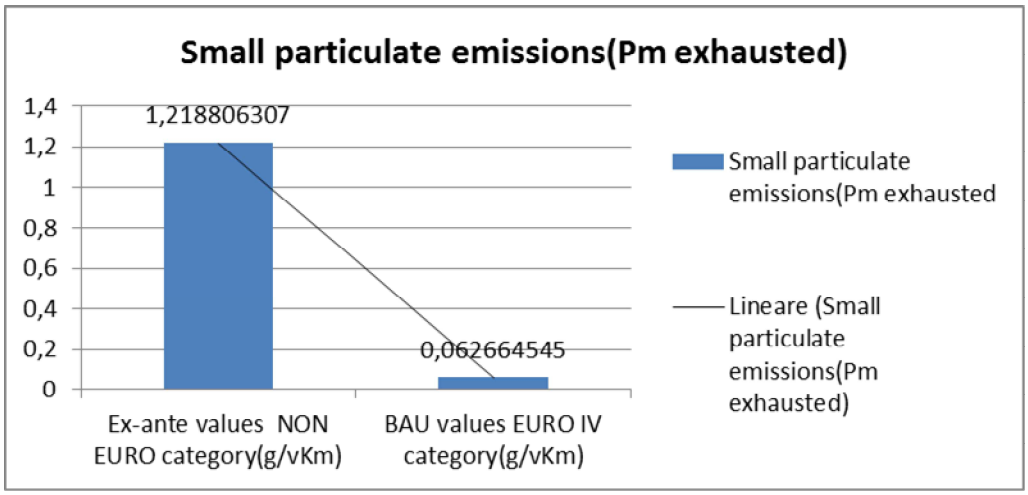


Fig C1.3.8 – Small particulate emissions



The quality of services given by the buses fleet including the new 17 buses purchased by RAT, has been shown through a survey on Public Transport users

160 questionnaires were circulated and 120 feedbacks were received. The people expressed their opinion about the fleet buses and they commented the emergence of new 17 buses as a commendable initiative of Municipality.

Table C1.3.9-a

Quality of Service	BAU
dissatisfied	22%
somewhat dissatisfied	39%
Satisfied	38%
don't know	1%

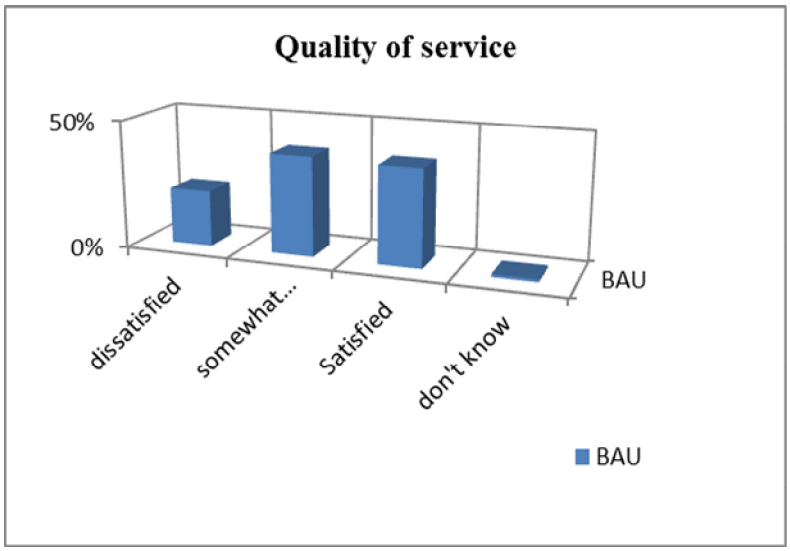


Figure C1.3.9-b – Quality of service results for BAU scenario – question n.1

Table C1.3.10-a

Quality of Service	BAU
uncomfortable	24%
somewhat comfortable	40%
comfortable	35%
don't know	1%

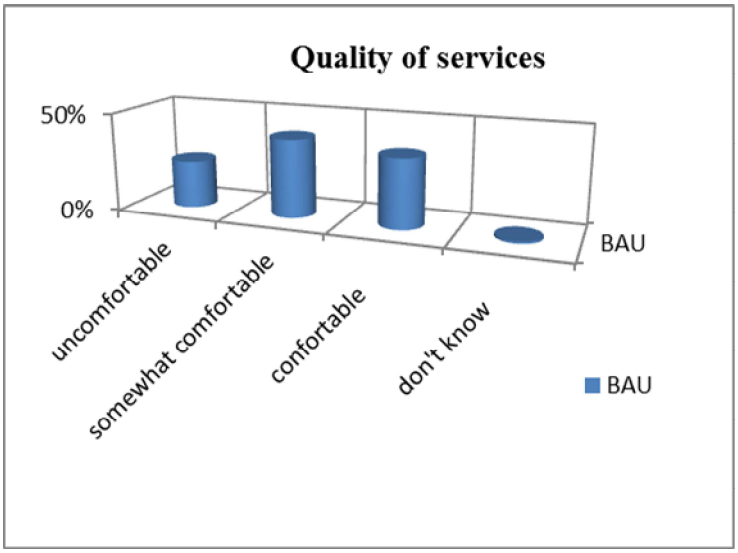


Figure C1.3.10-b – Quality of service results for BAU scenario – question n.2

C2 Measure results

The results are presented under sub headings corresponding to the areas used for indicators – i.e. economy, energy, environment, society and transport.

C2.3 Environment

Ex-post measurements based on the assumption that all active 100 buses are new buses, if RAT would have found a convenient source of financing for purchasing the buses

The emissions are calculated by COPERT software using the same raw data provided by RAT

Table C2.3.1

Name of raw data input	Values of Ex-post raw data
Country	Romania
Year	2009
length of trip in Craiova city Provided by RAT	20 Km
Time trip Provided by RAT	1 h

<table>
<tr><td>Country info – refers to the min. and max. temperatures and pressure recorded each month , from January to December 2009, in Romania
Statistic data</td><td>
<table>
<tr><th>Month</th><th>Temp min(^{0}C)</th><th>Temp max(^{0}C)</th><th>RVP(kP)</th><th>calculate Beta</th></tr>
<tr><td>Jan</td><td>-20</td><td>8</td><td>100</td><td>0.15064</td></tr>
<tr><td>Feb</td><td>-15</td><td>9</td><td>100</td><td>0.14452</td></tr>
<tr><td>Mar</td><td>-12</td><td>2</td><td>100</td><td>0.12820</td></tr>
<tr><td>Apr</td><td>6</td><td>15</td><td>100</td><td>0.11698</td></tr>
<tr><td>May</td><td>12</td><td>25</td><td>100</td><td>0.10066</td></tr>
<tr><td>Jun</td><td>17</td><td>27</td><td>100</td><td>0.09352</td></tr>
<tr><td>Jul</td><td>20</td><td>38</td><td>100</td><td>0.07924</td></tr>
<tr><td>Aug</td><td>18</td><td>34</td><td>100</td><td>0.08536</td></tr>
<tr><td>Sep</td><td>14</td><td>27</td><td>100</td><td>0.09658</td></tr>
<tr><td>Oct</td><td>8</td><td>17</td><td>100</td><td>0.11290</td></tr>
<tr><td>Nov</td><td>5</td><td>10</td><td>100</td><td>0.12310</td></tr>
<tr><td>Dec</td><td>-10</td><td>6</td><td>100</td><td>0.14248</td></tr>
</table>
</td></tr>
<tr><td rowspan="4">Annual fuel consumption- assumed for 100 buses fleet consisting in MAN Lion’s city Euro IV type</td><td>1054 tones for 60 buses MAN Lion’s city Euro IV type</td></tr>
<tr><td>335 tones for 13 buses MAN Lion’s city Euro IV type</td></tr>
<tr><td>137 tones for 10 buses MAN Lion’s city Euro IV type</td></tr>
<tr><td>256.26 tones for 17 buses MAN Lion’s city Euro IV type</td></tr>
<tr><td rowspan="2">Fleet data- assuming that all active fleet of 100 buses fleet consisting in MAN Lion’s city Euro IV type
Consider the real mileage of the fleet- in 2009</td><td>Population:
100 MAN Lion’s City buses – Euro IV type</td></tr>
<tr><td>Mileage:
3119295 Km travelled by 60 buses MAN Lion’s city Euro IV type
1080229 Km travelled by 13 buses MAN Lion’s city Euro IV type
595154 Km travelled by 10 buses MAN Lion’s city Euro IV type
732190 Km travelled by 17 buses MAN Lion’s city Euro IV type</td></tr>
<tr><td>Name of indicators calculated automatically</td><td>Values of indicators calculated automatically(t/year)</td></tr>
<tr><td>CO2 exhausted by 60 Euro IV LC buses</td><td>153’800</td></tr>
<tr><td>CO2 exhausted by 13 Euro IV LC buses</td><td>11’540</td></tr>
<tr><td>CO2 exhausted by 10 Euro IV LC buses</td><td>4’891</td></tr>
<tr><td>CO2 exhausted by 17 Euro IV LC buses</td><td>14’750</td></tr>
<tr><td>Total quantity CO2 exhausted by 100 Euro IV LC buses</td><td>184’981</td></tr>
<tr><td>CO exhausted by 60 Euro IV LC buses</td><td>234.6</td></tr>
<tr><td>CO exhausted by 13 Euro IV LC buses</td><td>17.6</td></tr>
<tr><td>CO exhausted by 10 Euro IV LC buses</td><td>7.46</td></tr>
<tr><td>CO exhausted by 17 EIV buses</td><td>22</td></tr>
</table>

Total quantity CO exhausted by 100 Euro IV LC buses	281.66
NOx exhausted by 60 Euro IV LC buses	1’046
NOx exhausted by 13 Euro IV LC buses	78.47
NOx exhausted by 10 Euro IV LC buses	33.26
NOx exhausted by 17 Euro IV LC buses	100
Total quantity NOx exhausted by 100 Euro IV LC buses	1’257.73
Small particulate emissions exhausted by 60 Euro IV LC buses	8.206
Small particulate emissions exhausted by 13 Euro IV LC buses	0.61
Small particulate emissions exhausted by 10 Euro IV LC buses	0.26
Small particulate emissions exhausted by 17 Euro IV LC buses	0.78
Total quantity Small particulate emissions exhausted by 100 Euro IV LC buses	9.856

As shown above, emissions could decrease significantly if all 100 old buses would be replaced with new buses MAN Lion’s city Euro IV type.

The table below (Table C2.3.2) presents the comparison between Ex-ante, BAU and Ex-post values of emissions expressed in t/year**,** considering the emissions from the entire active fleet of 100 buses.

Table C2.3.2 – emissions results

Indicators	**Ex-ante values (t/year)**	**BAU values (t/year)**	**Ex-post values all fleet consisting of EURO IV category (t/year)**
CO2	280’490	201’777	184’981
CO	875	565.41	281.66
NOx	3’242	2’274.61	1’257.73

Indicators	**Ex-ante values (t/year)**	**BAU values (t/year)**	**Ex-post values all fleet consisting of EURO IV category (t/year)**
Small particulate emissions	92.15	52.78	9.856

See annex 1- ex-ante, BAU and ex-post emissions calculation and emissions print screens

As shown in the table, the entire fleet emissions decrease slightly by replacing the 17 buses but a significant decrease could be recorded if the whole active fleet would be replaced with clean buses- MAN Lion's city Euro IV type.

Fig. C2.3.3 Graphic presentation of CO2 emissions from all active fleet travelling in Craiova

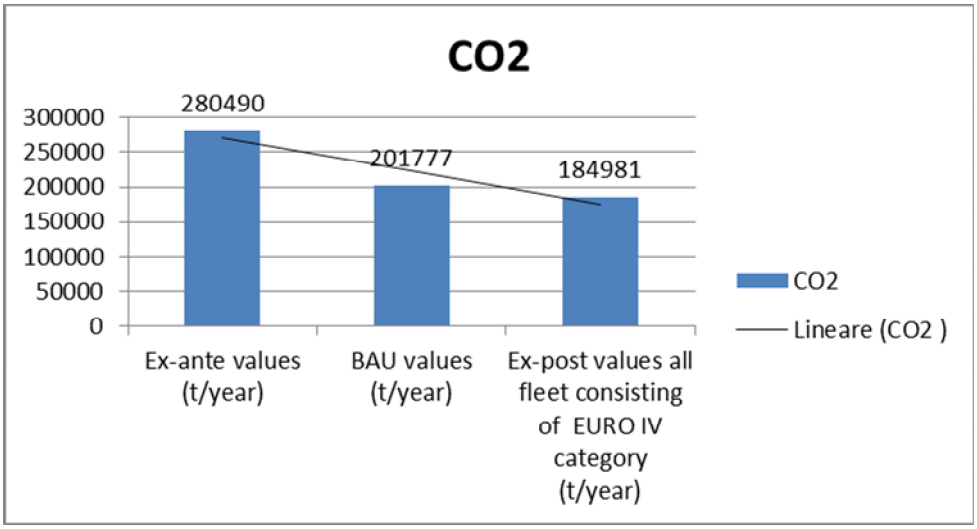


Fig. C2.3.4 Graphical presentation of CO emissions from all active fleet travelling in Craiova

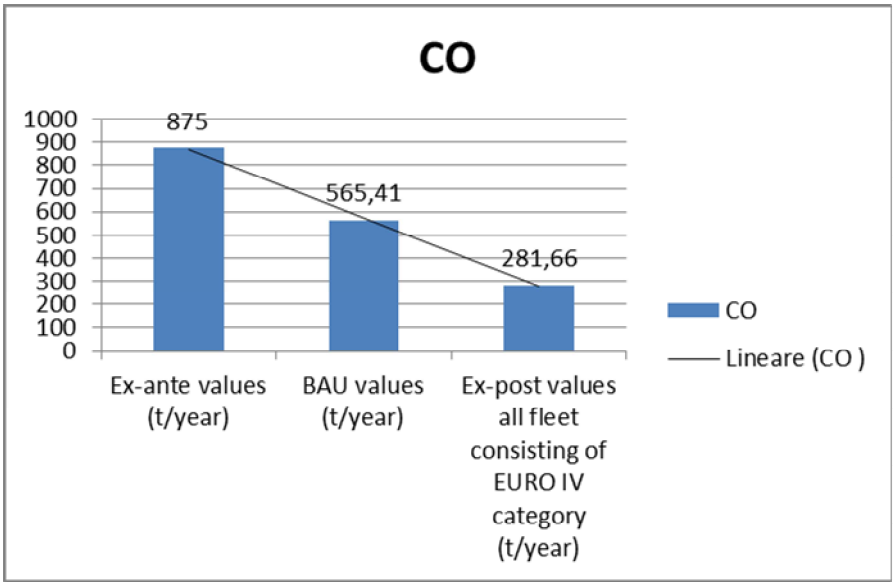


Fig. C2.3.5 Graphical presentation of NOx emissions from all active fleet travelling in Craiova

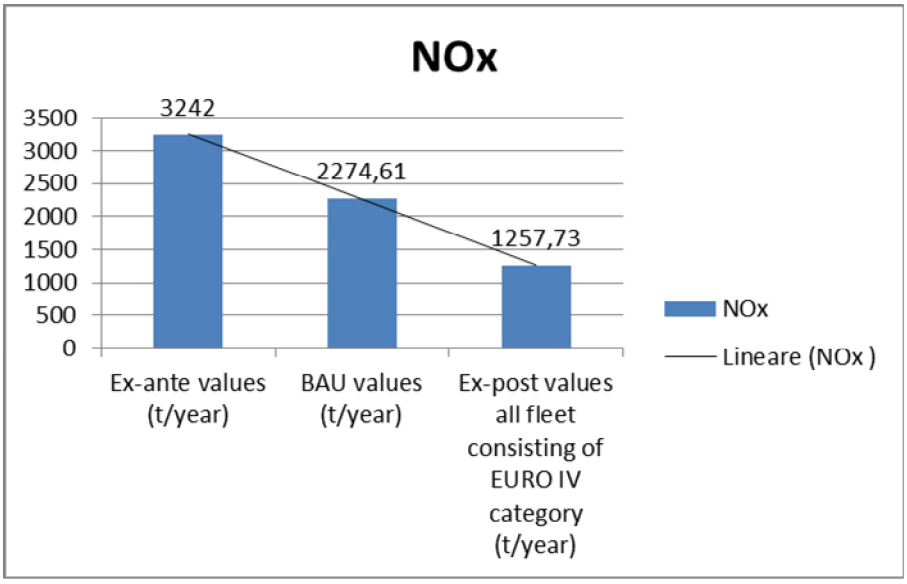
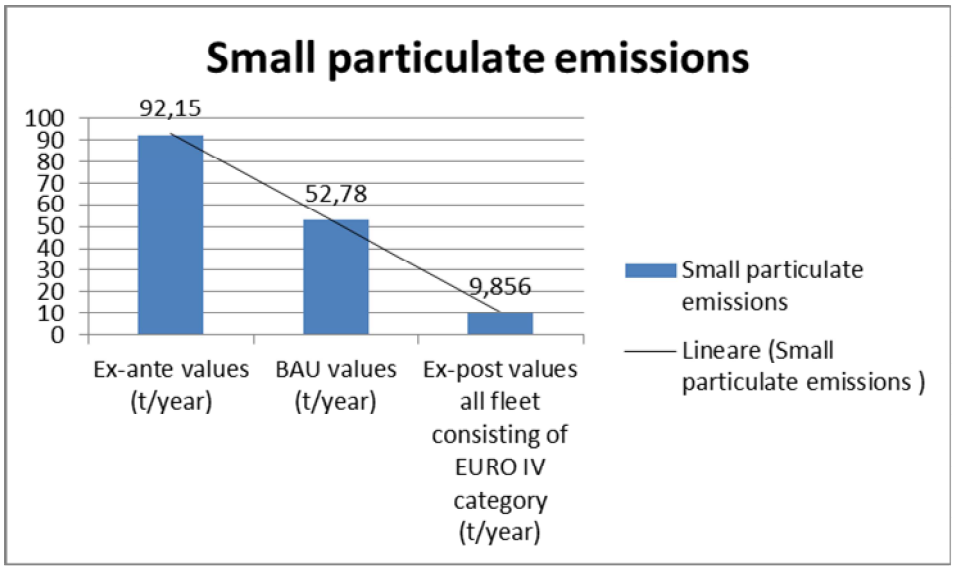


Fig. C2.3.6 Graphical presentation of small particulate emissions from all active fleet travelling in Craiova



By comparing total emissions from the entire fleet of old buses ("before case") with total emissions from the entire fleet, in which 17 NON Euro old buses were replaced with 17 Euro IV new buses we found that CO2 emissions decreased by 34%, CO emissions decreased by 67%, NOx emissions decreased by 61% and PM emissions decreased by 89%.

If considering the entire fleet to be replaced with new one ("after case"), there could be a decrease of CO2 emissions by 8%, CO emissions by 50% , NOx emissions by 44% and Pm emissions by 81% compared with "BAU case", in which 17 buses MAN LC type, only, replaced 17 NON Euro buses of entire fleet.

Table C2.3.1 – emissions from the whole fleet (100 buses)

Indicator	**Before**	**B-a-U**	**After**	**Difference: After – Before**	**Difference: After – B-a-U**
Indicator 8 CO2	280'490 t/year (2008)	201'777 t/year (2009)	184'981 t/y (2009)	-95'509	-16'796
Indicator9 (CO)	875 t/year (2008)	565.41 t/year (2009)	281.66 t/year (2009)	-593.34	-283.75
Indicator 10 (NOx)	3242 t/year (2008)	2'274.61 t/year (2009)	1'257.73 t/year (2009)	-1984.27	-1'016.88
Indicator 11 (Small particulate emissions)	92.15 t/year (2008)	52.78 t/year (2009)	9.856 t/year (2009)	-82.294	-42.924

C2.4 Transport

Table C2.4.1:

The surveys show that the satisfaction level increases and comfort will be improved if the buses old fleet would be replaced with new ones. To evaluate the passengers perception referring to whole bus fleet renewal scenario, 160 questioners were circulated and received 110 feedbacks .

Indicator	Before	B-a-U	After	After –Before	After – BAU
Indicator 19 (Quality of Service)	None applicable (2008)	22 % dissatisfied 39 % somewhat dissatisfied; 38% Satisfied 1 % don't know	10% dissatisfied 19 % somewhat dissatisfied; 70% Satisfied 1 % don't know	Not applicable	-12% -20% 32 %
		24 % uncomfortable 40% somewhat comfortable 35%confortable 1 % don't know **(2009)**	11 % uncomfortable 46 % somewhat comfortable 42%confortable 1 % don't know **(2009)**		-13 % 6 % 7%

Fig. C 2.4.2 Graphic representation of perception on quality of service(satisfaction level)

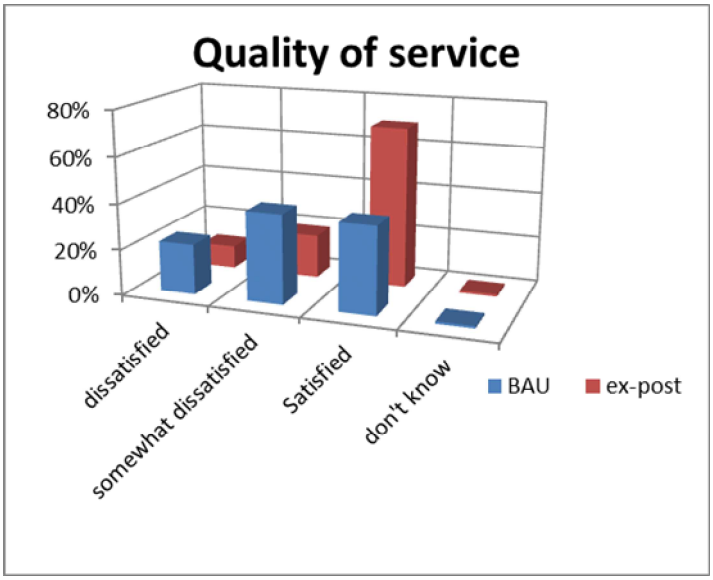
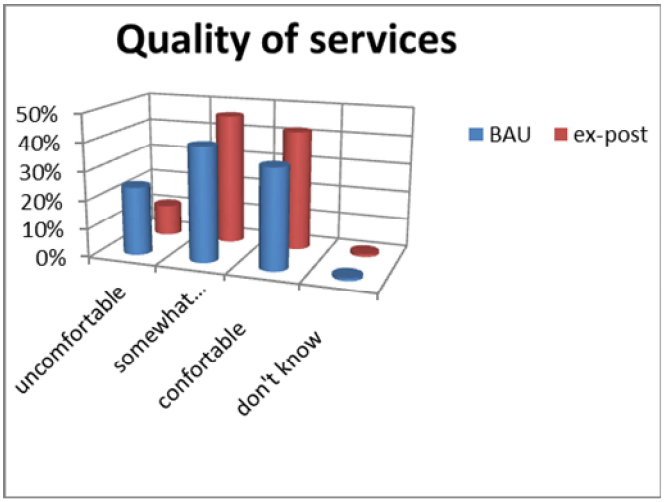


Fig. C 2.4.3 Graphic representation of perception on quality of service(comfortable)



C3 Achievement of quantifiable targets and objectives

No.	Target	Rating
1	To identify the typology of buses suitable for decreasing the emissions by 5%. Following the COPERT estimation, the emissions from the 17 NON EURO buses decreased comparing with emissions from the 17 EURO IV buses, as follows: • CO2(g/vKm) decreased with 1% • CO(g/vKm) decreased with 76% • NOx(g/vKm) decreased with 36% • Pm exhaust(g/vKm) decreased with 96%	★★★
2	To identify a good granting program for eco-buses acquisition.	O = Not Achieved
NA = Not Assessed O = Not Achieved ★ = Substantially achieved (at least 50%) ★★ = Achieved in full ★★★ = Exceeded		

C4 Up-scaling of results

After the results obtained by comparing the emissions coming from 17 NON EURO buses versus 17 EURO IV buses and taking into consideration the opinion of the public transport users after the replacement of the 17 old buses, the Municipality decided to continue the replacement of old buses starting with the taking out of circulation of NON EURO buses.

The Municipality is willing to renew in the near future all the bus fleet of Craiova and that is why it decided at the end of 2012 to allocate in the budget funds for buying of 50 ecologic buses. For this reason, at evaluation purposes, a scenario considering the availability of a completely new fleet has been developed.

C5 Appraisal of evaluation approach

In the evaluation activity we assessed the impact of the 17 buses that Municipality purchased by own budget on the environment and public transport users. In this sense we estimated with the help of the COPERT IV program, the annual emissions of 17 old buses from the NON EURO category which were replaced with new 17 EURO IV category and we observed a clear difference of the emissions produced by those two bus categories mentioned above. The emissions' estimation in COPERT was made taking into account the mileage and the fuel consumed by NON EURO buses and EURO IV buses.

To have a general picture of pollution from all buses fleet we also estimated the annual emissions of the entire fleet of old buses and the emissions produced by the entire fleet in which 17 old buses were replaced with new ones. We observed a slight decrease of the annual emissions made by the fleet, thing which demonstrates a positive impact over the environment. Under these conditions, it is obvious that the replacement of the entire old bus fleet with new ecologic ones will lead to a significant decrease of emissions in this city. That is why we have put together a scenario where we supposed that if an available financing source will be found, the municipality would be able to replace all old and polluting buses with ecological ones.

In order to assess the impact on public transport users, a survey was conducted and the interviewed people were stating their opinion regarding the quality of services brought by the public transport. The conclusion of the survey was that the population noticed the new clean and comfortable buses traveling in Craiova but they would feel more comfortable if all buses would be replaced with new ones.

C6 Summary of evaluation results

The key results are as follows:

- **Key result 1** – Following the COPERT estimation, the emissions from the NON EURO buses decreased comparing with emissions from EURO IV-MAN LC(Lion's city) type buses, as follows:
  - CO2(g/vKm) decreased with 1%
  - CO(g/vKm) decreased with 76 %
  - NOx(g/vKm) decreased with %
  - Pm exhaust(g/vKm) decreased with 96%

If entire fleet would be replaced by new buses Euro IV MAN Lions city type, city of Craiova would record a decreasing of emissions coming from entire fleet, compared with the situation in which 17 buses MAN LC type, only, replaced 17 NON Euro buses of entire fleet:

- CO2 emissions decrease by 8%,
- CO emissions decrease by 50% ,
- NOx emissions decrease by 44%
- Pm emissions decrease by 81%

- **Key results 2** – Quality of services: The result of survey was the people that use public transport vehicles would be more satisfied and feel more comfortable if all old buses travelling in the city would be replaced with new ones

C7 Future activities relating to the measure

The Municipality of Craiova City decided to consider a priority the acquisition of new clean buses, as a result of these measure outcomes. In this regard it was decided for 2013 to purchase 50 new clean buses, this acquisition being included in the investment list. The acquisition will take place on the basis of the technical specification and the tender documentation developed within this measure and described in the second stage of implementation

D Process Evaluation Findings

D.0 Focused measure

Question in Focussed Measure Process Evaluation Form
B4.
In the checklist below you will find a number of possible reasons for selecting this measure as a focused measure

Checklist of possible reasons

1	The measure fits into the EU policy towards clean urban transport (five pillars of the EU Green Paper)
2	The measure fits into the city policy towards sustainable urban transport and / or towards sustainability in general
3	The expected impact on the transport system, environment, economy and/ or society / people is very high
4	The high level of innovativeness of the measure with respect to technique, consortium, process, learning etc
5	The measure is typical for a group of measures or a specific context
6	The possibility of carrying out a good Cost Benefit Analysis
7	Participation of a range of different actors
8	The high degree of complexity of managing the measure
9	The measure is regarded as an example measure
10	Other, *please describe????*

Which are the three most important reasons for selecting this measure as a focused measure?

- *Please fill in the number of the reason from the checklist above in the open box according to importance.*
- *If it is not clear what the reason(s) is (are), please check this with your Local Evaluation Manager and / or your Project Evaluation Manager.*

3	1	Most important reason
1	2	Second most important reason
2	3	Third most important reason

x	0	No focused measure
-	1	Most important reason
-	2	Second most important reason
-	3	Third most important reason

D.1 Deviations from the original plan

The deviations from the original plan comprised:

- **Deviation 1**– *Change the decision of Craiova Municipality to acquire 100 buses by own financial sources and grants.* The initial measure description form focused on searching available grant to acquire 100 new buses. In Romania, in the period 2007-2013. The buses acquisition costs are not eligible within the Structural Funds Program, so the Municipality could not use any support from this program. Although other funding programmes such as ELENA and COMPRO were available, the Municipality could not supported the financial conditions imposed by those programs, as it cannot access to new bank loans.

D.2 Barriers and drivers

D.2.1 Barriers

Preparation phase: No barriers

Implementation phase

- **Barrier 1**: **Institutional –** The SW Oltenia Region did not include in its Operational Regional Program up to 2013 any budget (coming from European Structural Funds) for PT buses. So there are no available funding programmes to finance the acquisition of clean buses, the Operational Regional Program being focused on financing the transport infrastructures. There are no funding programmes opened for accession to finance acquisition of clean buses, these programmes being focused on financing the transport infrastructures, only, on the other hand, others are not suitable for the actual economical context because they would increase the indebtedness of the Municipality.
- **Barrier 2: Financial –** The global economic recession make that the Craiova City Hall changed its priorities in expenditures cutting funds for PT vehicles acquisition, with the perception that the same will come for the next 2- 3 years. Due to the dependency on public funds, RAT cannot achieve the target to improve the PT fleet. The Public Transportation Company depends on public fund, if the expenditures are approved by the City Hall. As a result of the global economic recession the City Hall cut the funds for the acquisition of PT vehicles.

Operation phase

- **Barrier 1: Financial** – Due to the economical context the Municipality was forced to make changes in the budget allocation and to direct the budget for the 20 buses foreseen for investment in 2011, toward other priorities (tramline rehabilitation).

D.2.2 Drivers

Preparation phase

- **Driver 1: Involvement, communication** – It was a good communication between partners. IPA start searching opened calls for applications in order to attract European money for transport infrastructure

Implementation phase

- **Driver 1: Involvement, communication –** The partners established a good communication relationship. IPA started to identify the funding programmes open for accession concerning the financing of clean buses acquisition for RAT.

Operation phase

- **Driver 1 Political / strategic** – The Municipality included in the investment plan for 2011 the necessary budget for 20 buses beside the 17 clean buses already achieved in the first year of the project as an additional initiative which represents an expected finality of this measure not necessary during the project implementation but as future investment plans.

D.2.3 Activities

Preparation phase: No activities

Implementation phase

- **Activities 1 Financial** – Analysis of other than Structural Funds. Partner IPA tried to identify other financing programmes for acquisition of new clean buses than the Structural Funds.
- **Activities 2 Financial** – Craiova participated to the cities working group under COMPRO project to explore the possibility of joint procurement of buses. This project intended to establish the general condition for a common acquisition. But there were no funds foreseen for the acquisition for new buses. Also, the ELENA instrument of the European Investments Bank has been identified as a potential source of loans to be deeply analyzed. But the City hall could not fulfil the financial conditions required by this program due to the actual economical context and the fact that it would increase the indebtedness of the Municipality.

Operation phase

- **Activities 1 Planning** – Evaluation according to the proposed indicators of the 17 buses purchased in the first year of the project and considered as "Business as Usual" scenario.

D.3 Participation

D.3.1. Measure Partners

- **Measure partner 1** – IPA Leading role

  IPA SA is a 47 years old Romanian industrial R & D company and is the Romanian national institute for research and development, engineering in energy, automation and IT, with a large experience in European projects in technology transfer and in information dissemination.
  IPA was responsible for the dissemination activities and carrying out the research activity and technical study in the MODERN project of Craiova.

- **Measure partner 2** – RAT Principle participant

  RAT Craiova is the main Public Transportation Company in Oltenia region. RAT Craiova provides citizen transportation by trams, buses and micro-buses.

  In the measure, RAT provided the mileage and fuel consumption of buses assessed. The buses drivers from RAT helped the evaluation team to disseminate questionnaires to PT users in order to assesses the quality of services from new buses.

- **Measure partner 3** – LCM – Occasional participant

  The Local Council of Craiova Municipality was established according to Law No. 215/2001 regarding Local Public Administration with the subsequent modification and completion.

Municipality as local government institution has, under the conditions imposed by the public administration law, the decisional right in all matters of local interest: political, social, cultural, educational and technical. Through their structures, the municipality is a complex mechanism which can produce major changes in the quality of urban life under an effective management and coordination.

The competencies of these bodies related to the project covers both the services provided to the local community (i.e. Public transport service in various forms) and the technical interventions (the urban infrastructure, constructions) that together change the image of the city and bring added value to the quality of life in the areas where they act.

D.3.2 Stakeholders

- **Stakeholder 1 – Regional Development Agency South-West Oltenia** – In Romania there are eight this kind of regional development agencies. Their purpose is to implement the economic and social cohesion policies at the level of the regions and promote the implementation of development programs and provide the services necessary to community and investors to maximize the economic and social benefits at the level of the region. The agencies coordinate all projects using Structural Funds from the European Commission at the region level. Together we try to find a solution for clean bus acquisition.
- **Stakeholder 2 – Romanian Ministry of Transport -** Trying to find a solution for clean bus acquisition through a scheme using European funds or advantageous bank loan.

D.4 Recommendations

Managing financial resources of the city is a strong element in decisions regarding city development but is the strongest barrier that keeps policy options derived from the vision of the Municipality. Every public administration has its own policy priorities and often political change brings changes in the city's development priorities. Own financial Municipal resources, even if included in their budget, could be changed according to the financial situation and political factors leading to reconsider the priorities list of the cities.

A vision regarding the Mobility Plan, integrated with local and sustainable development measures is absolutely necessary in the medium size cities. When we analyze the mobility, to cut CO2 emissions, we must discuss others options:

- Development of new and clean fleet supported by the green procurement.
- Traffic restrictions and green zones (pedestrian areas, restricted access zones, speed limits, urban charging, etc.).
- Intelligent Transport Systems (ITS), urban traffic management and control.
- Innovative solutions for high quality collective transport, inter-modal terminals for collective transport, and good links between suburban and urban transport networks.
- Education, training and awareness raising activities have an important role to play, as well as development of new knowledge, collection of data and monitoring of trends.

Municipality, as local government institution has, under the conditions imposed by the public administration laws, the decisional right in all matters of local interest: political, social, cultural,

educational and technical. Through their structures, the Municipality is a complex mechanism which can produce major changes in the quality of urban life under an effective management and coordination.

Moreover, other important lessons learnt are:

- The objective to cut CO2 emissions, to develop more sustainable urban transport systems are linked with a program of training, especially for drivers of the buses (eco-driving training).
- Great achievements are made in small steps. We learn that changes do not occur overnight and they are the results of a lot of effort and resources.

D.4.1 Recommendations: measure replication

- **Recommendation 1 –** For the cities that are in the conditions to use structural funds for urban PT, that would be the most convenient solution. In all other situation, the BEI through ELENA program give good financial conditions.

D.4.2 Recommendations: process (related to barrier-, driver- and action fields)

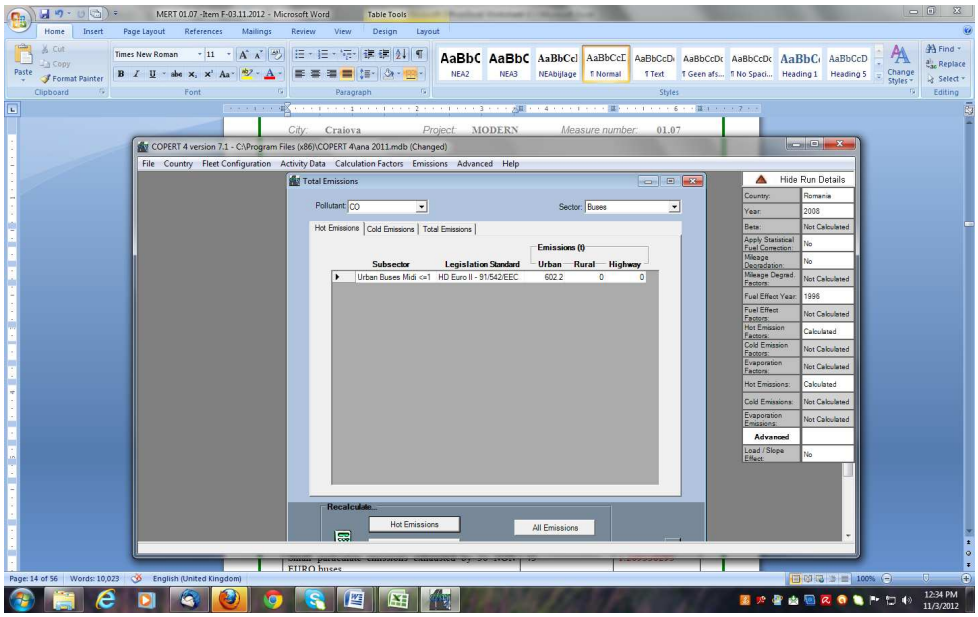
- **Recommendation 1 –** Before undertake a task like improving most of the public transport fleet, in order to make the public transport more utilized we must take into account that a budgets and the financial programs can change from when the feasibility study was made to when the buses will be bought.

Annex 1

Total emissions coming from all fleet in 2008 , consisting in 100 old buses:

- 60 buses Euro II
- 30 buses NON Euro
- 10 buses Euro III

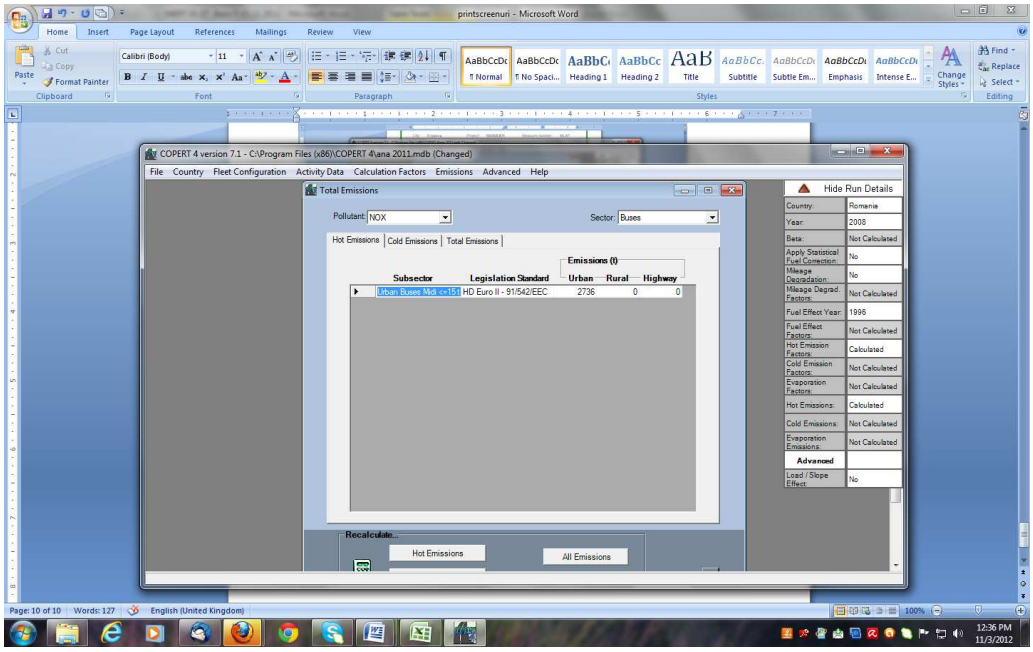
Total emissions CO- 60 buses Euro II in 2008



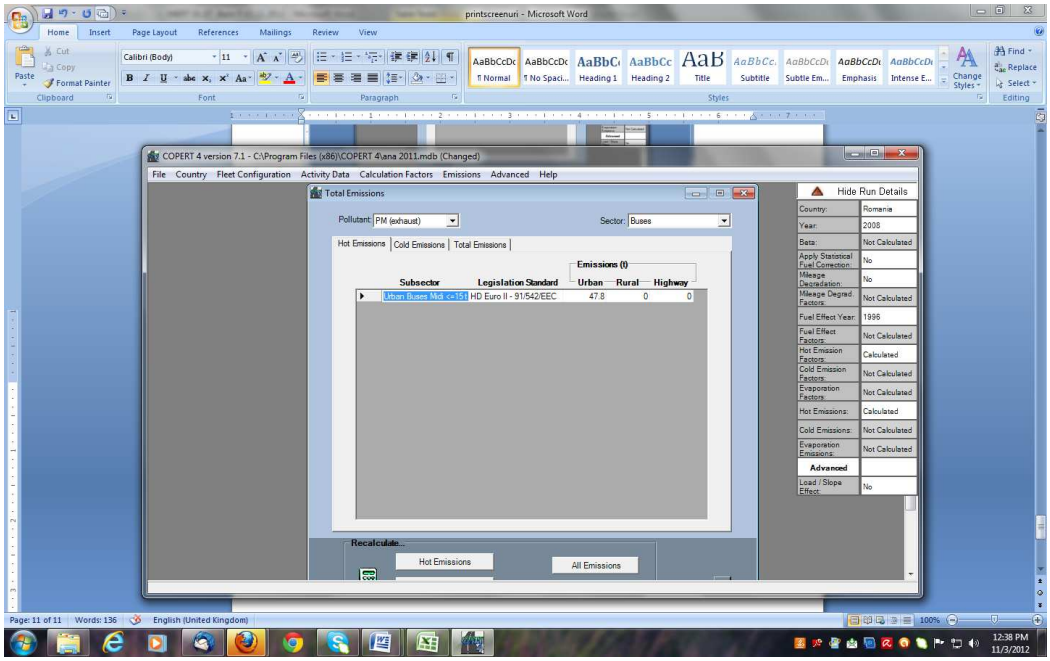
Measure title: Transition Towards Clean Fleets

City: Craiova Project: MODERN Measure number: 01.07

Total emissions NOx- 60 buses Euro II in 2008



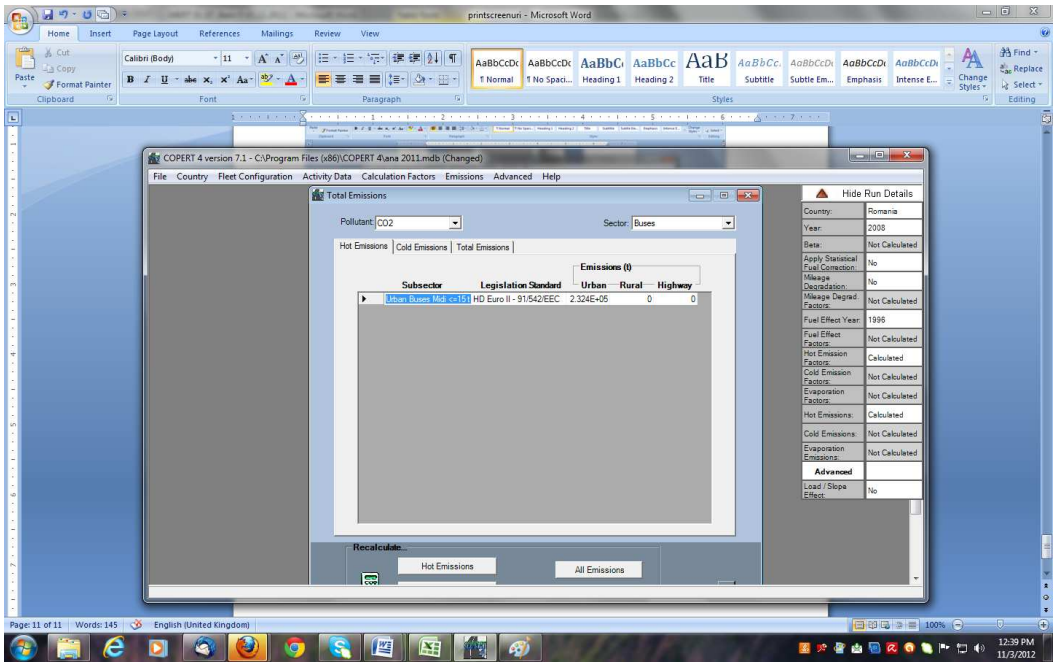
Total emissions Pm- -60 buses Euro II in 2008



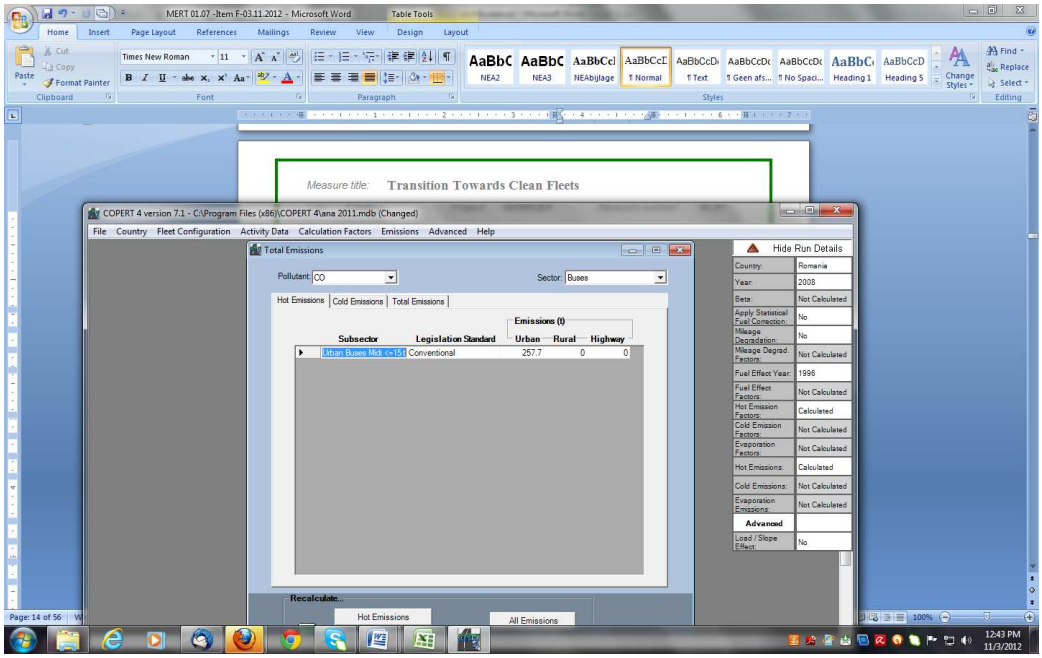
Measure title: Transition Towards Clean Fleets

City: Craiova Project: MODERN Measure number: 01.07

Total emissions CO2- 60 buses Euro II in 2008



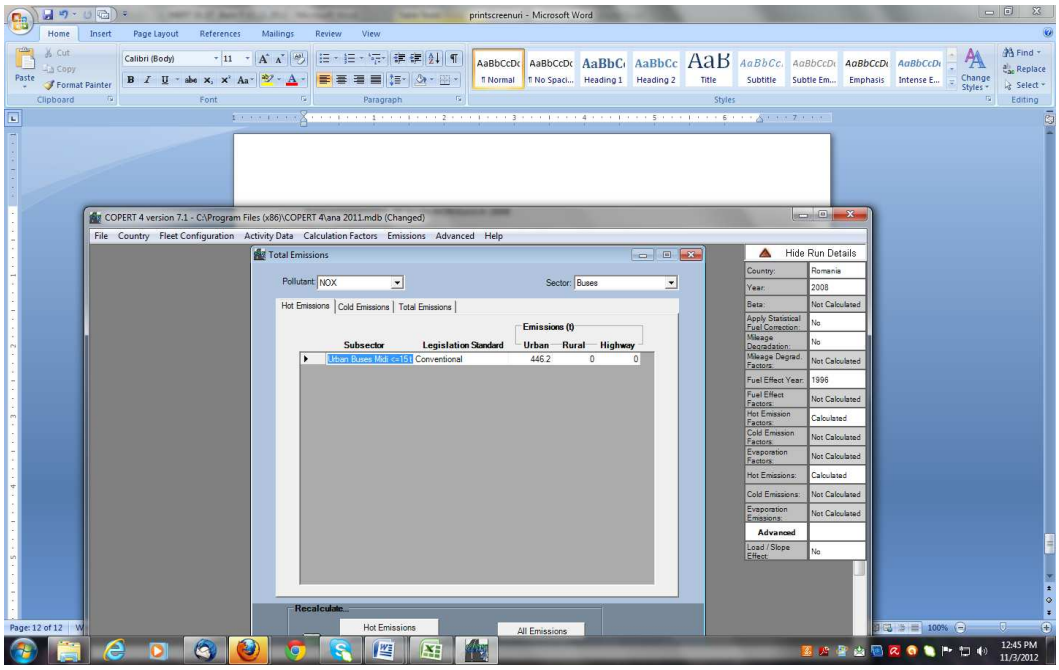
Total emissions CO- 30 buses NON Euro in 2008



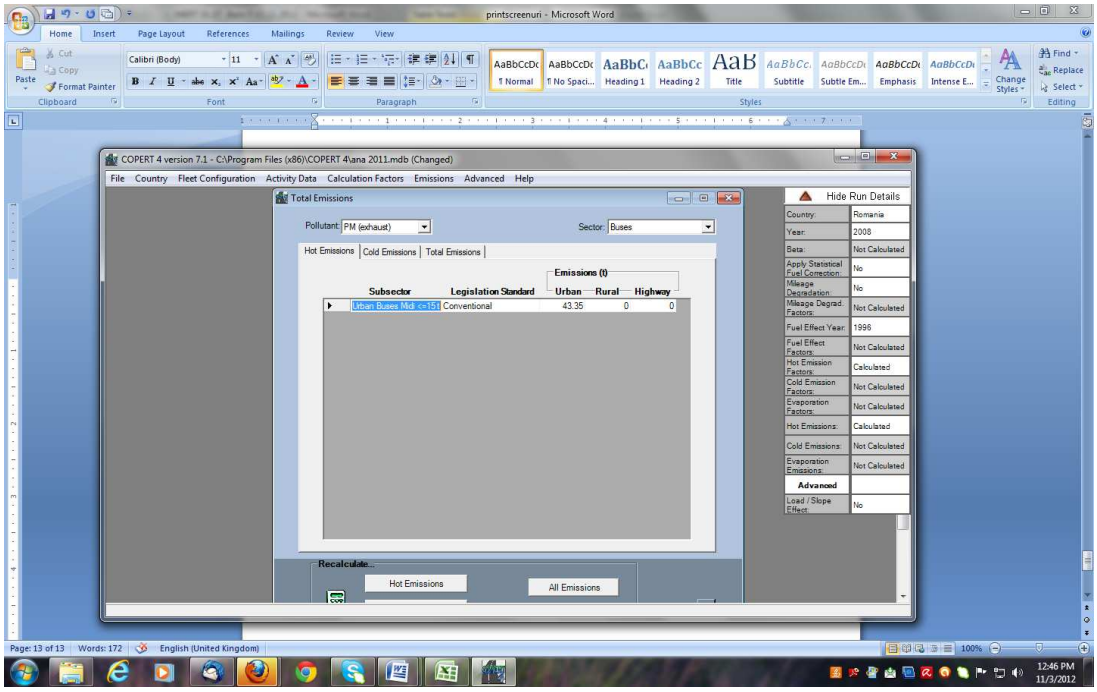
Measure title: Transition Towards Clean Fleets

City: Craiova Project: MODERN Measure number: 01.07

Total emissions NOx- 30 buses NON Euro in 2008



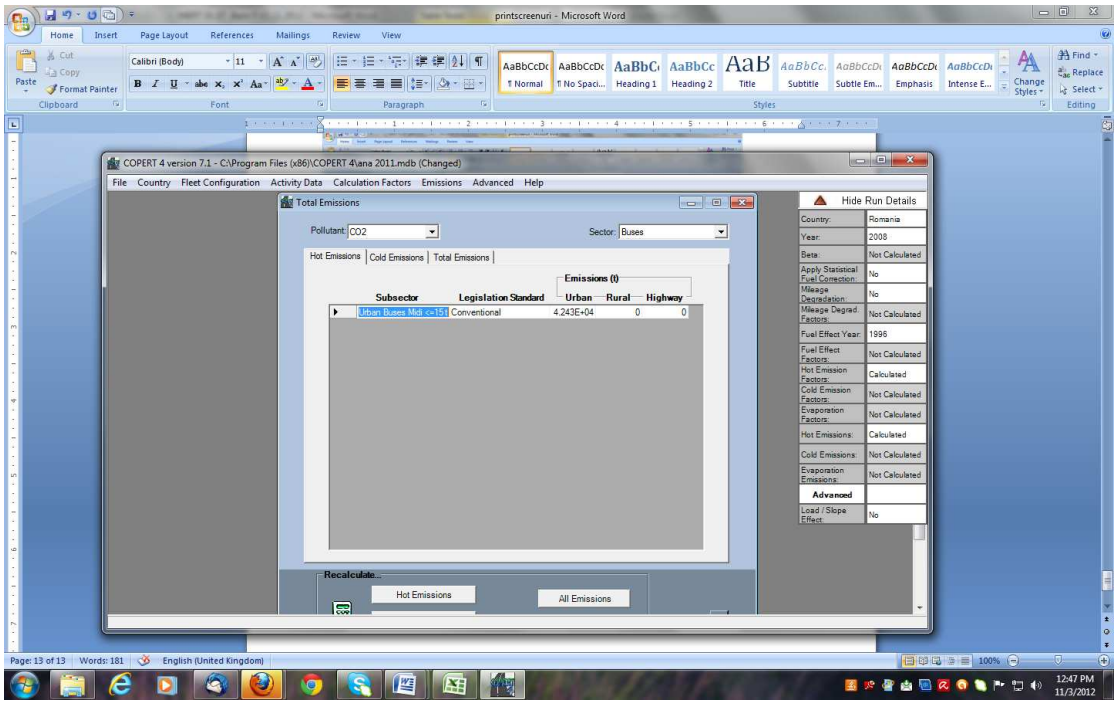
Total emissions Pm- 30 buses NON Euro in 2008



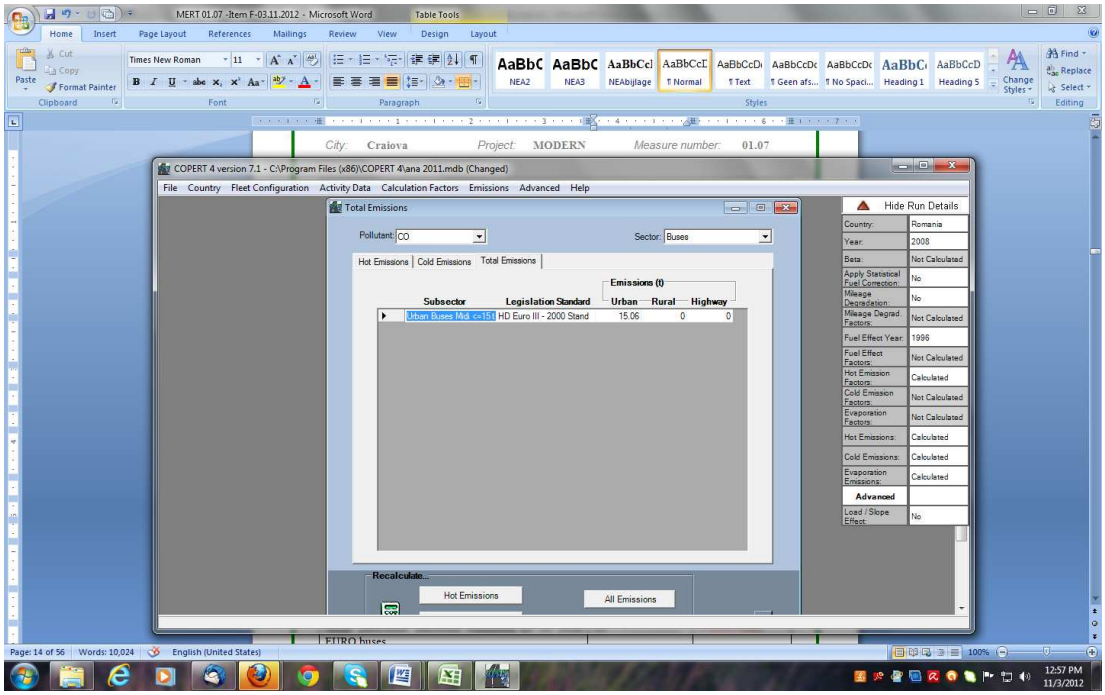
Measure title: Transition Towards Clean Fleets

City: Craiova Project: MODERN Measure number: 01.07

Total emissions CO2- 30 buses NON Euro in 2008



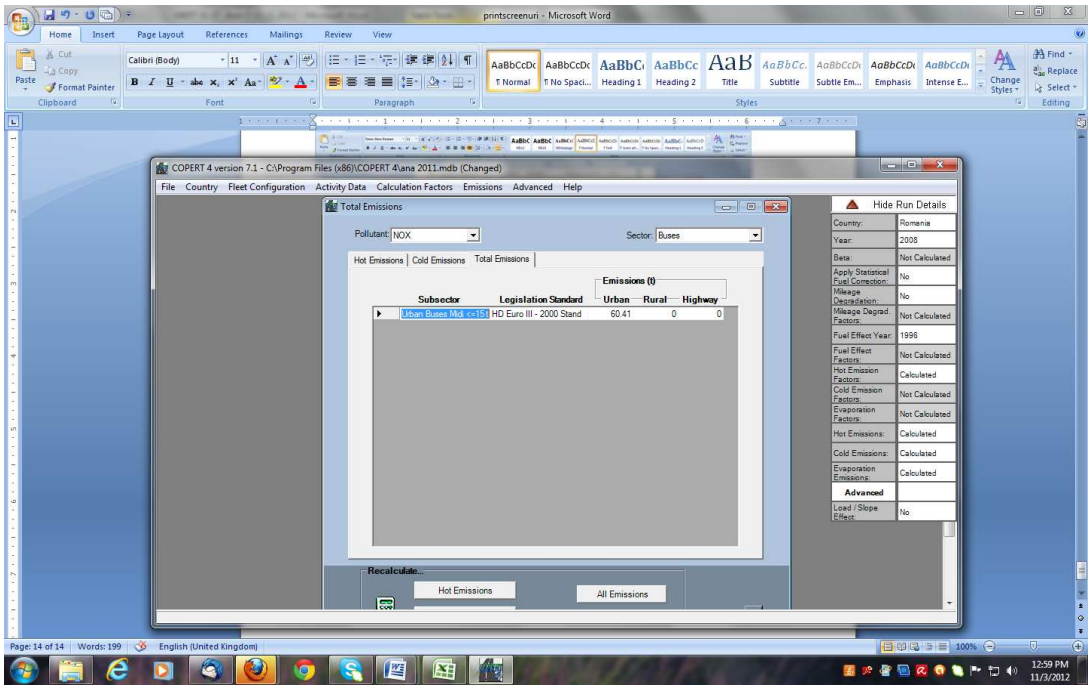
Total emissions CO- 10 buses Euro III in 2008



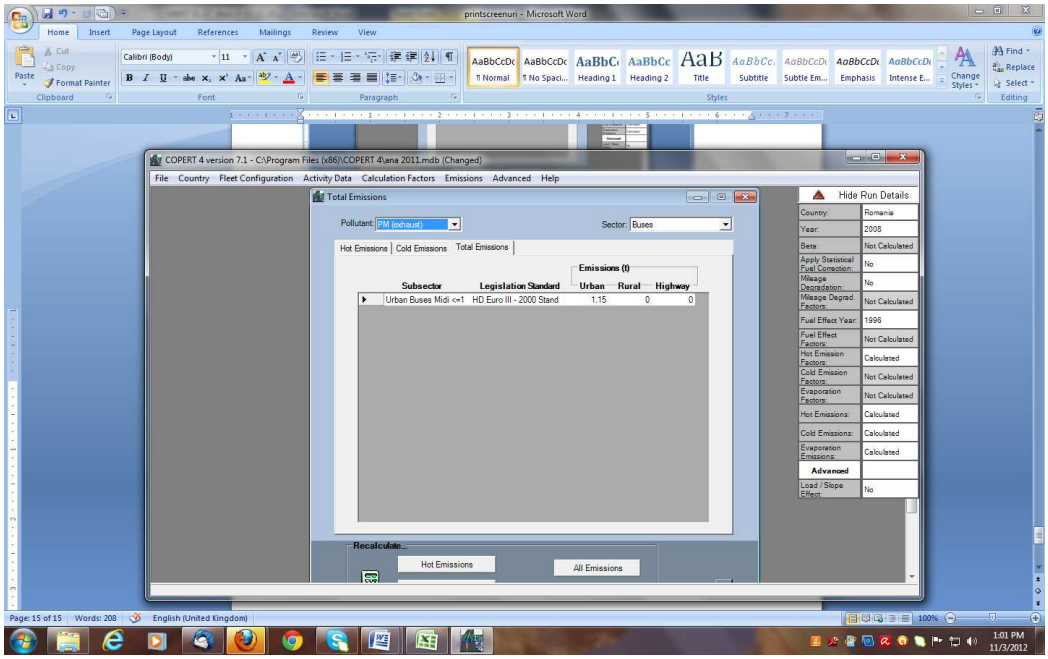
Measure title: Transition Towards Clean Fleets

City: Craiova Project: MODERN Measure number: 01.07

Total emissions NOx- 10 buses Euro III in 2008



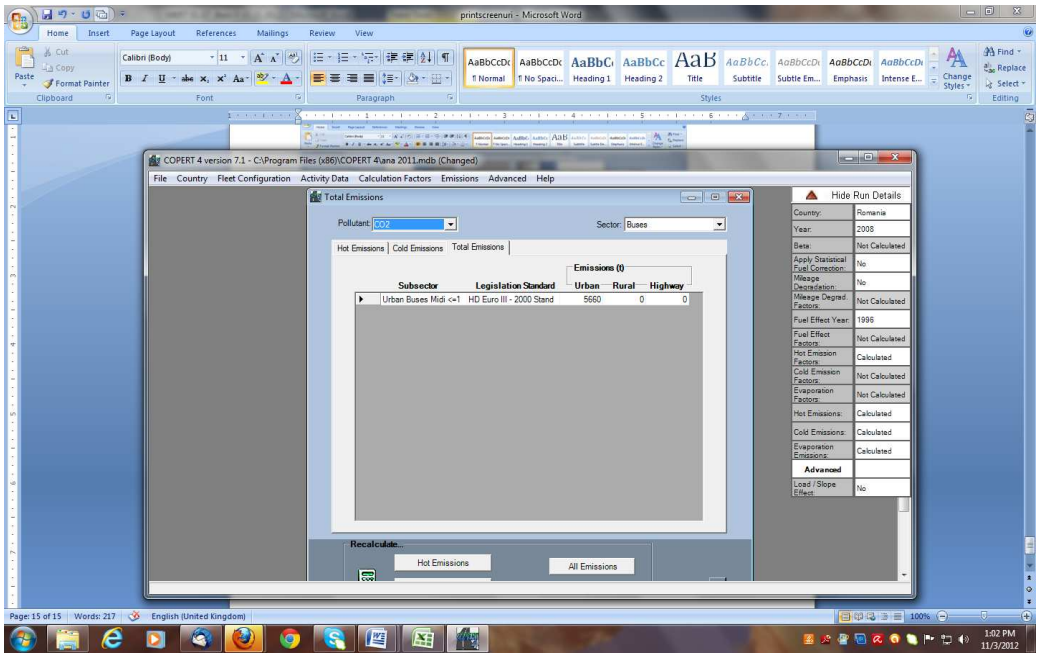
Total emissions Pm- 10 buses Euro III in 2008



Measure title: Transition Towards Clean Fleets

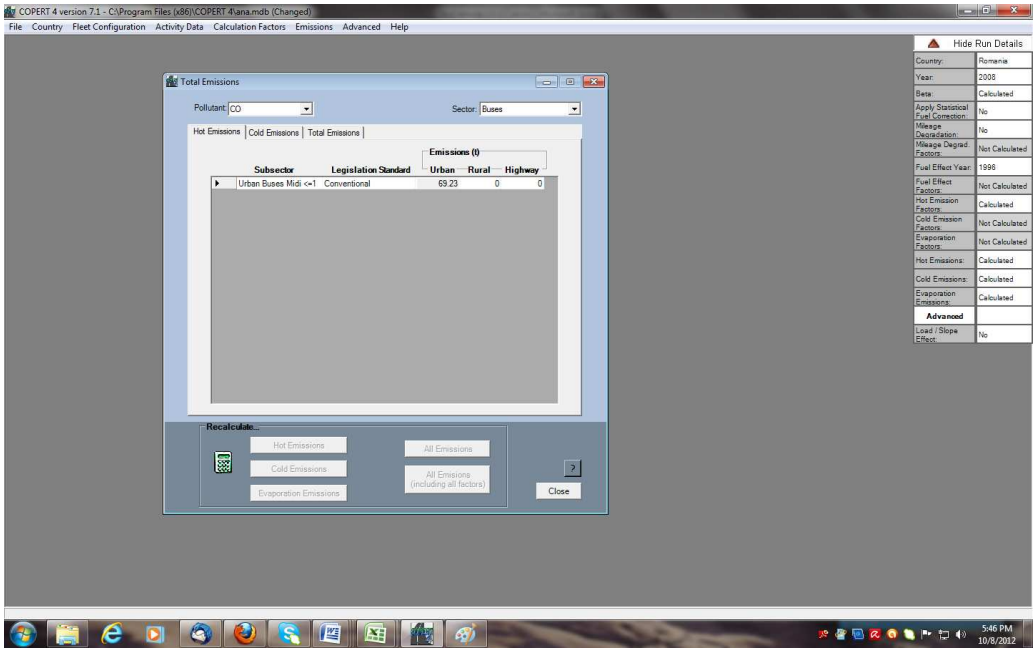
City: Craiova Project: MODERN Measure number: 01.07

Total emissions CO2- 10 buses Euro III in 2008



In order to emphasis the emissions coming from 17 envisaged buses proposed for scrapping we select 17 buses ROMAN UDM type and calculate emissions taking into consideration fuel consumption and respective mileage.

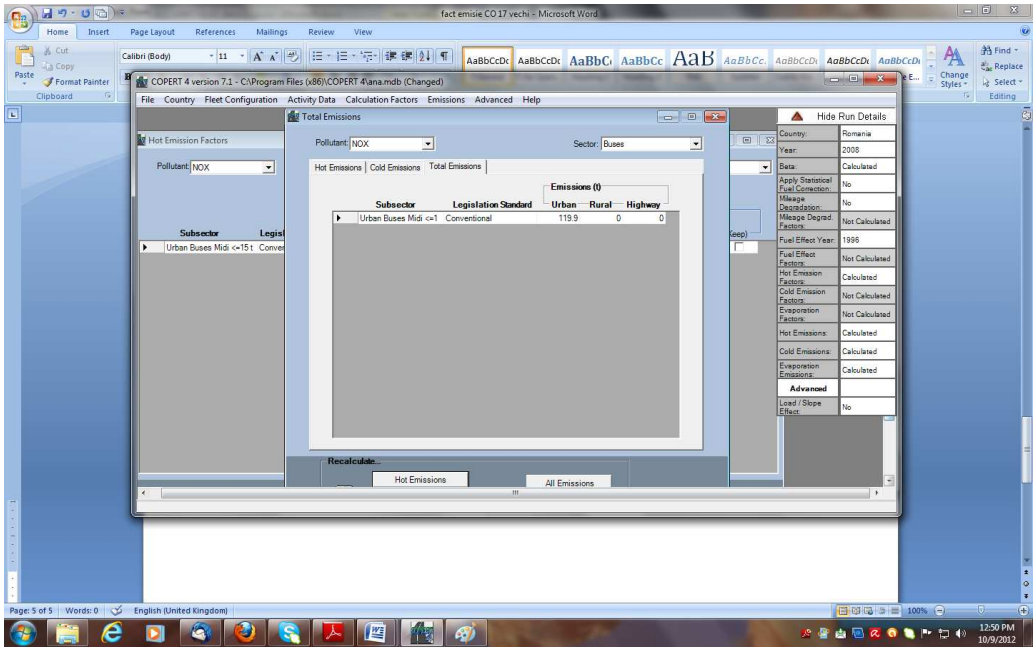
Total emissions CO- 17 buses(NON EURO category) in 2008



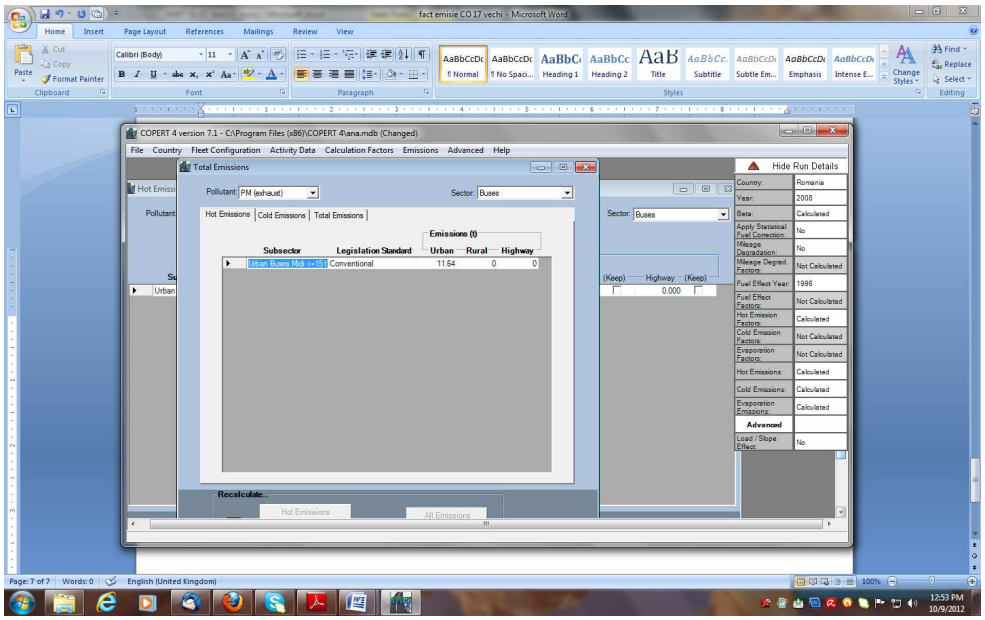
Measure title: Transition Towards Clean Fleets

City: Craiova Project: MODERN Measure number: 01.07

Total emissions NOx-17 buses(NON EURO category) in 2008



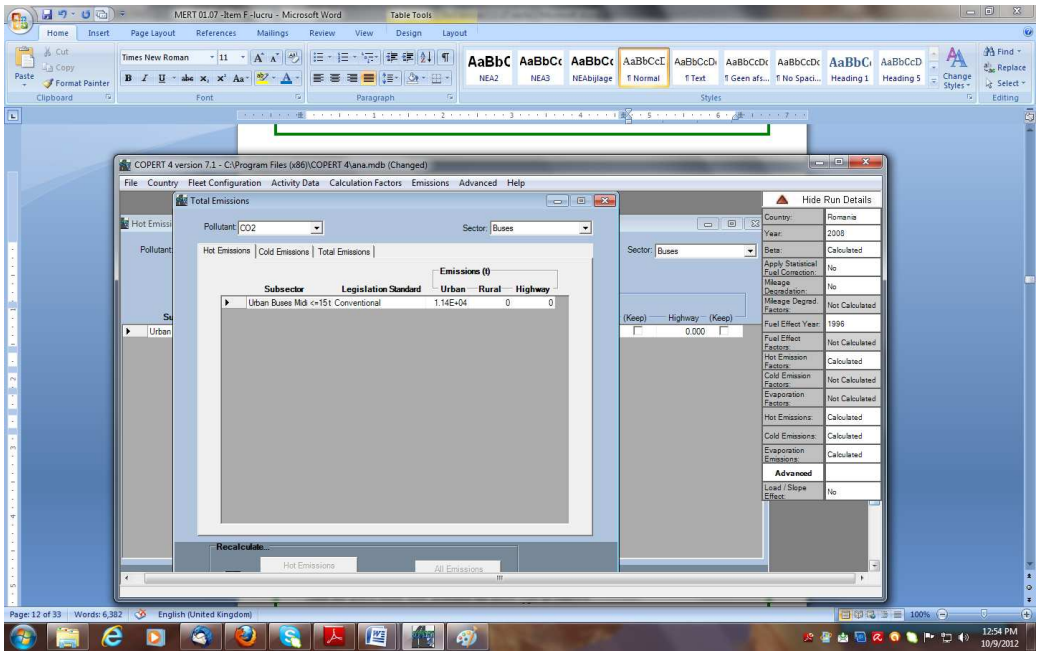
Total emissions Pm-17 buses(NON EURO category) in 2008



Measure title: Transition Towards Clean Fleets

City: Craiova Project: MODERN Measure number: 01.07

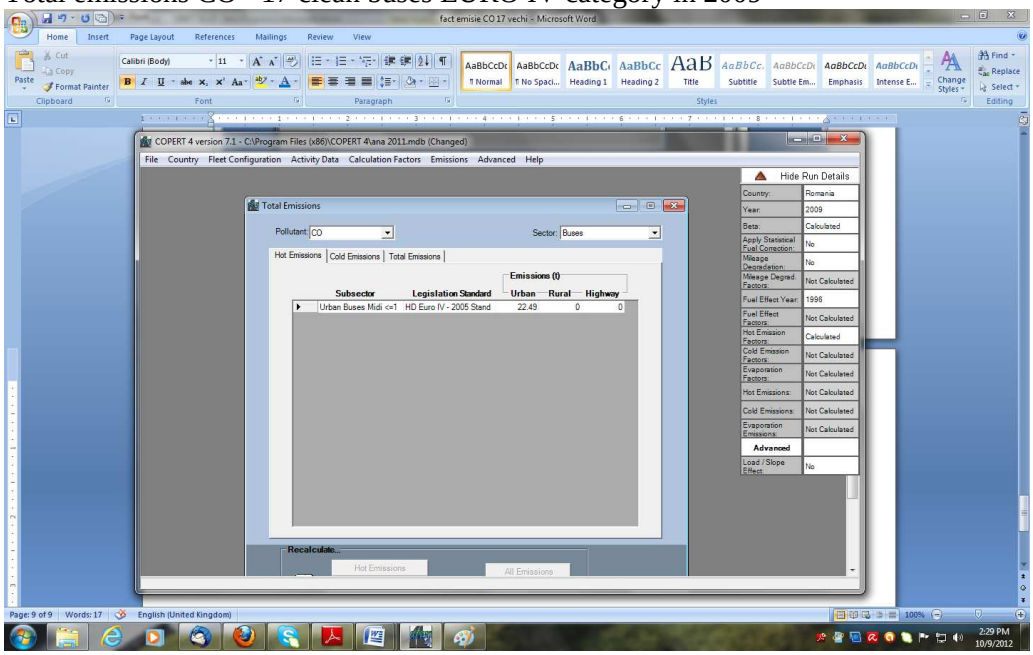
Total emissions CO2-17 buses(NON EURO category) in 2008



Emissions coming from all buses fleet in 2009, consisting in 100 buses :

- 60 buses Euro II
- 13 buses NON Euro(17 NON Euro buses were replaced with clean buses Euro IV- MAN Lions city type)
- 10 buses Euro II
- 17 buses Euro IV- MAN Lions city type

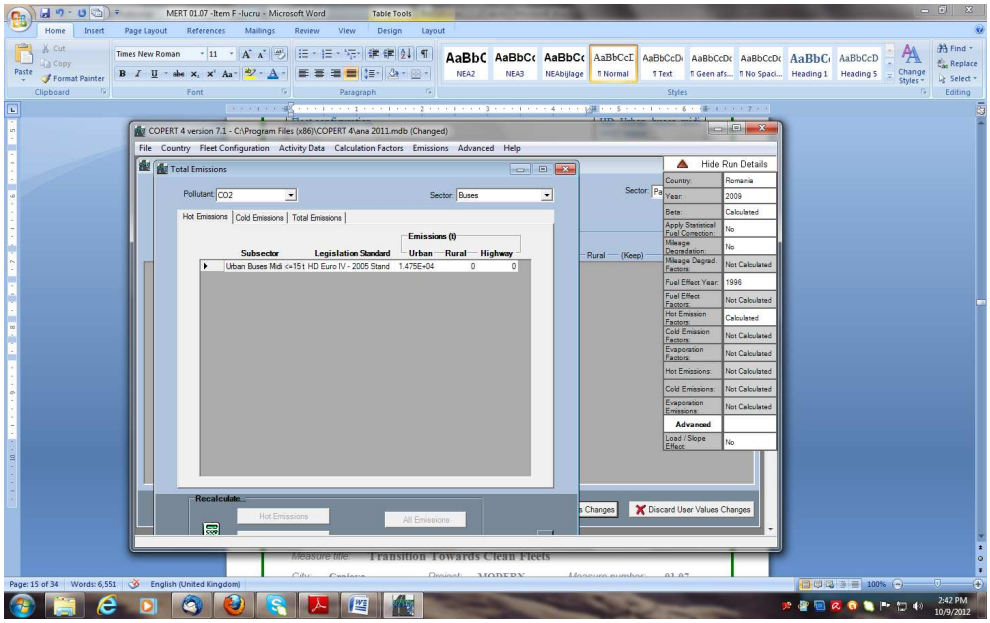
Total emissions CO - 17 clean buses EURO IV category in 2009



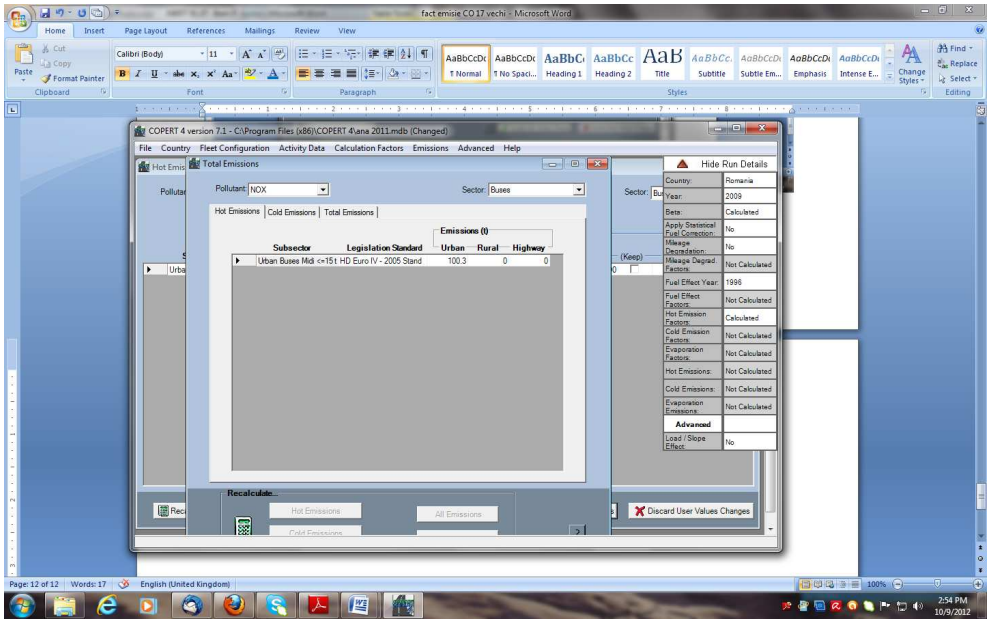
Measure title: Transition Towards Clean Fleets

City: Craiova Project: MODERN Measure number: 01.07

Total emissions CO2- 17 clean buses EURO IV category in 2009



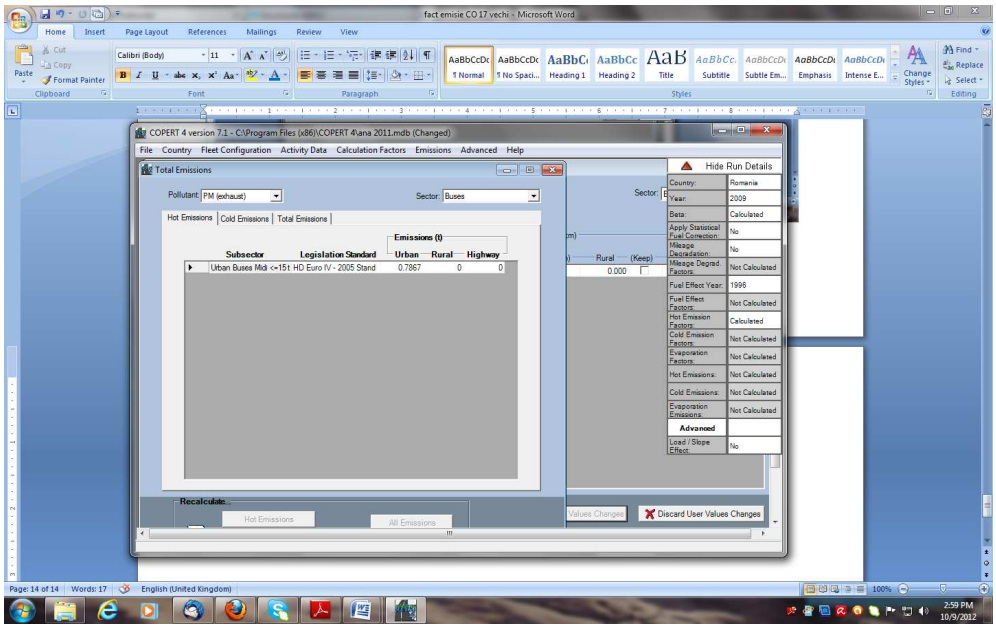
Total emissions NOx- 17 clean buses EURO IV category in 2009



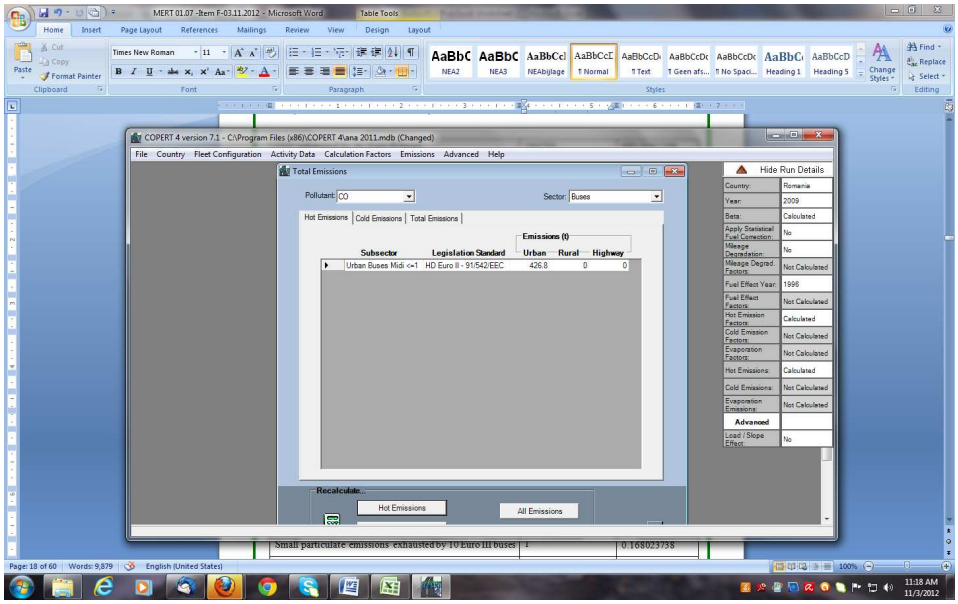
Measure title: Transition Towards Clean Fleets

City: Craiova Project: MODERN Measure number: 01.07

Total emissions Pm- 17 clean buses EURO IV category in 2009



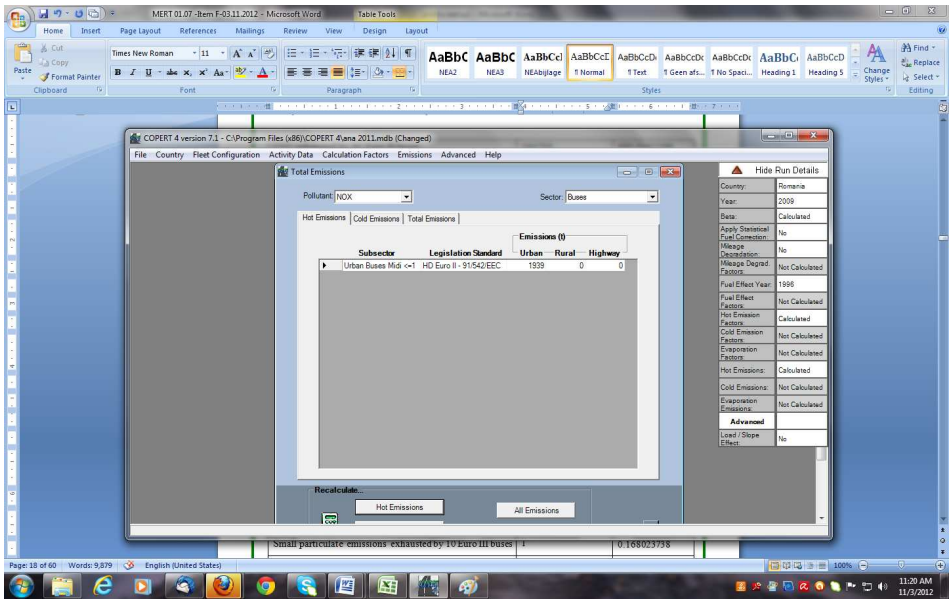
Total emissions CO- 60 buses Euro II in 2009



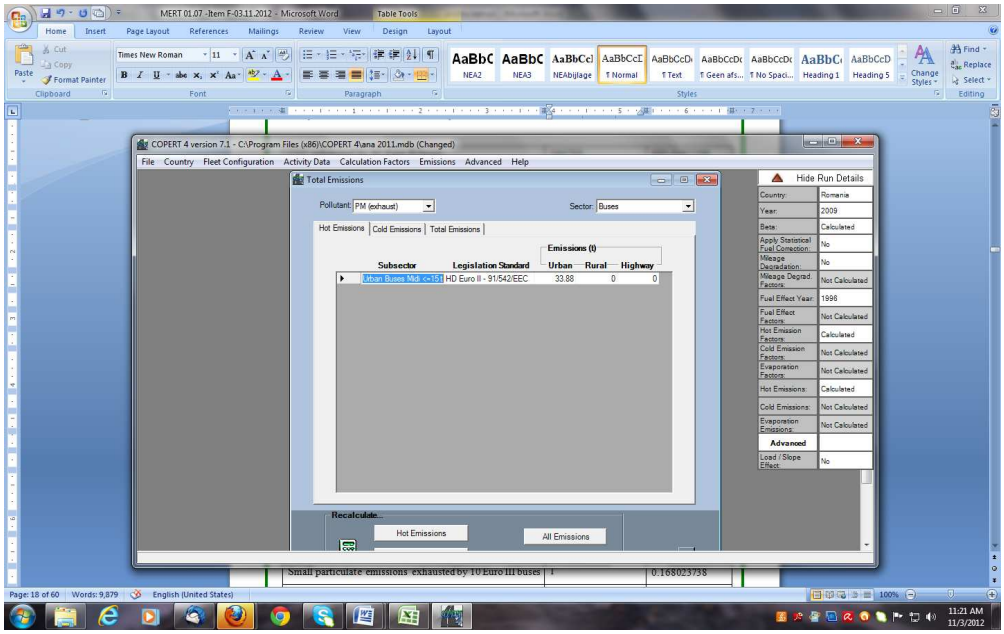
Measure title: Transition Towards Clean Fleets

City: Craiova Project: MODERN Measure number: 01.07

Total emissions NOx- 60 buses Euro II in 2009



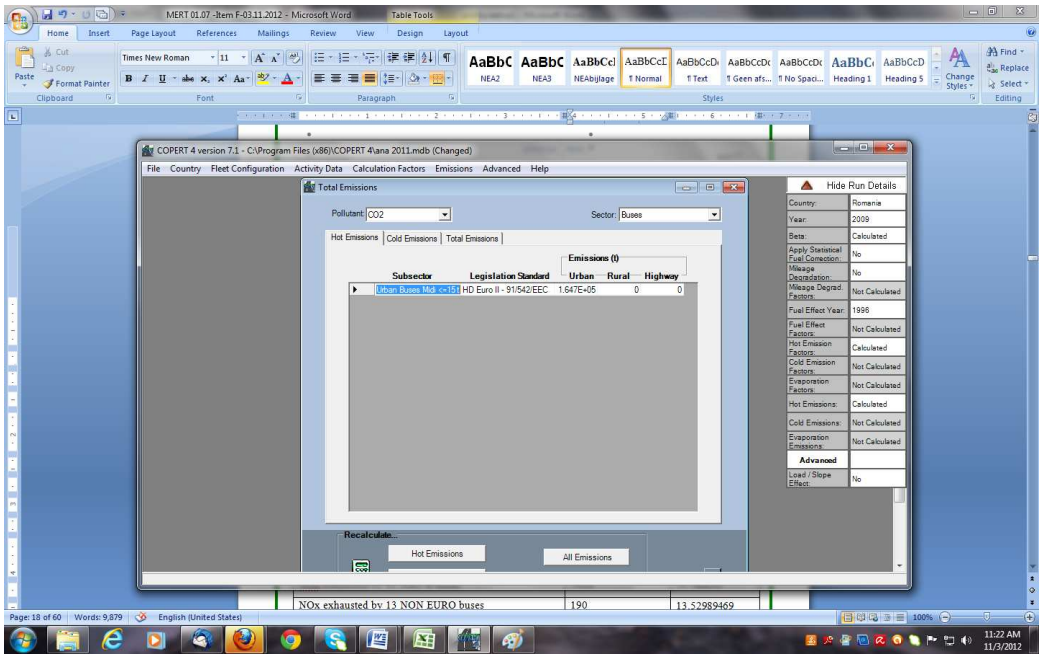
Total emissions Pm- 60 buses Euro II in 2009



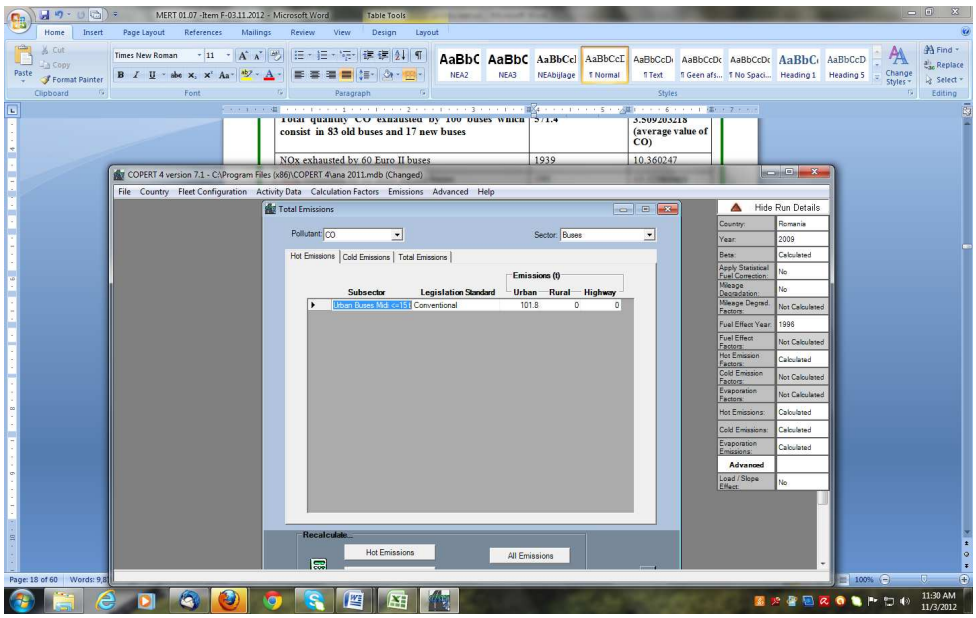
Measure title: Transition Towards Clean Fleets

City: Craiova Project: MODERN Measure number: 01.07

Total emissions CO2- 60 buses Euro II in 2009



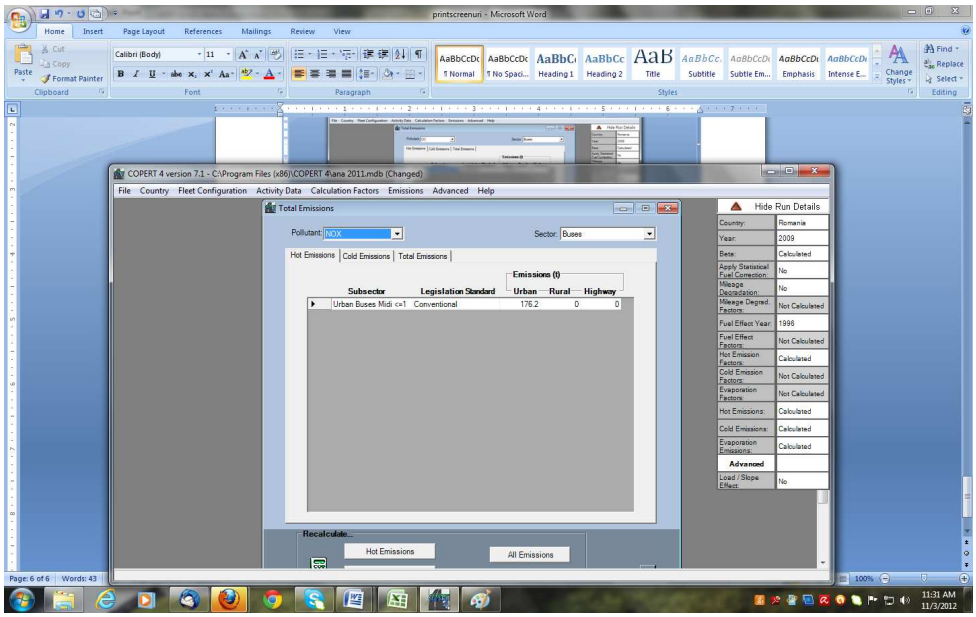
Total emissions CO – 13 buses NON Euro in 2009



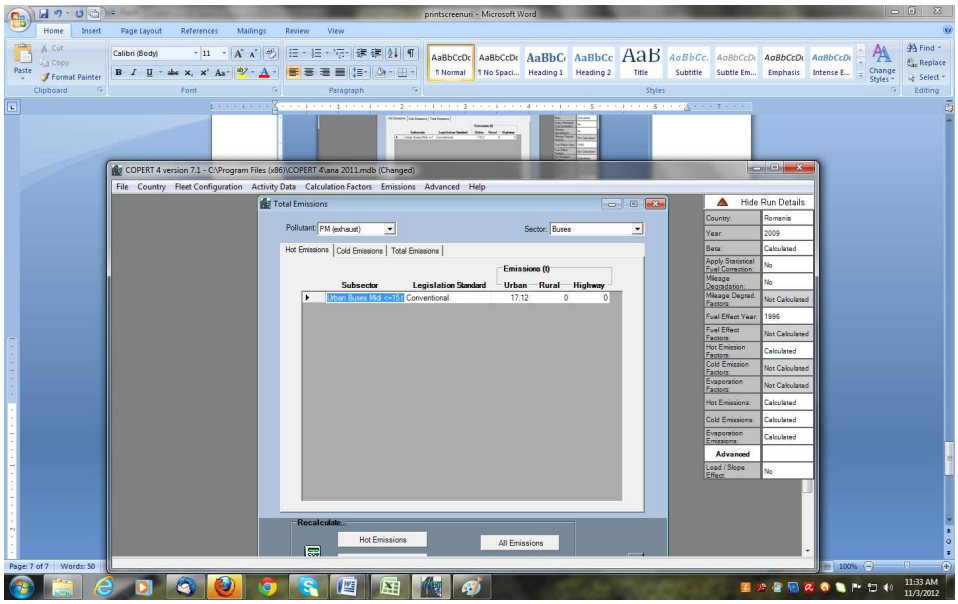
Measure title: Transition Towards Clean Fleets

City: Craiova Project: MODERN Measure number: 01.07

Total emissions NOx – 13 buses NON Euro in 2009



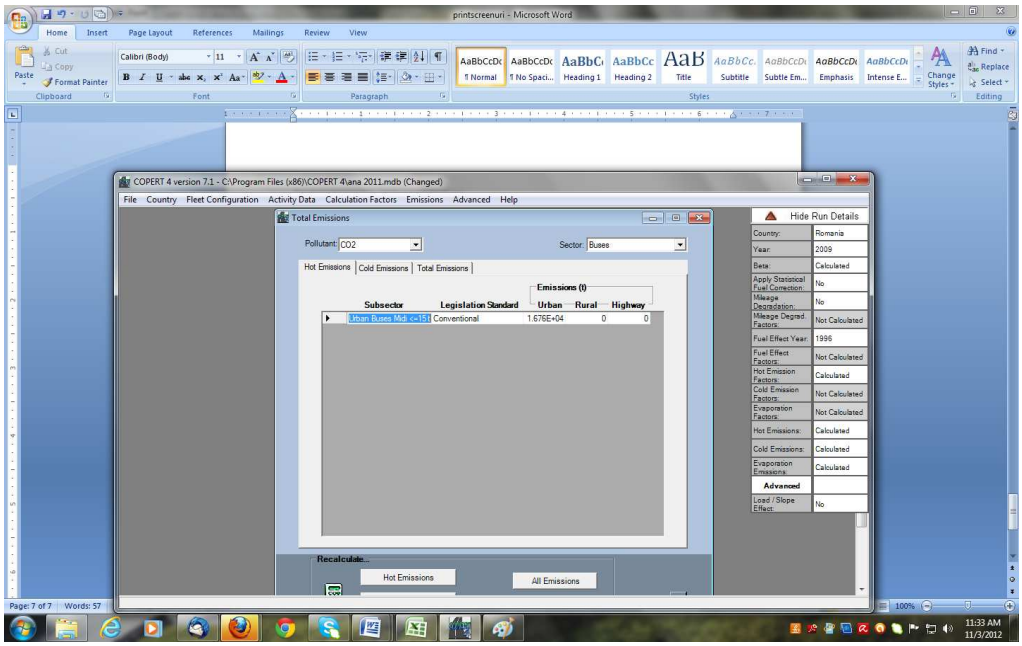
Total emissions Pm- 13 buses NON Euro in 2009



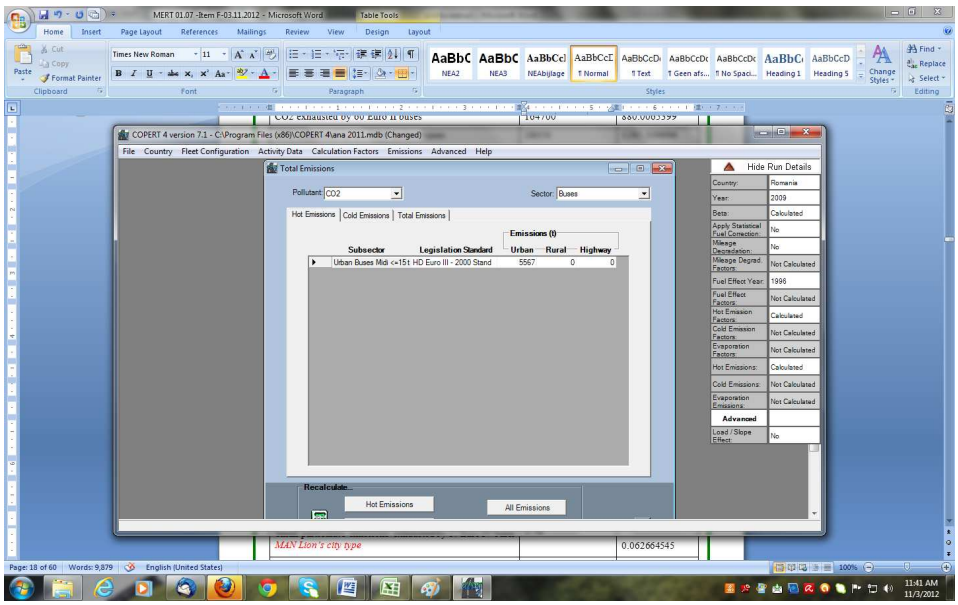
Measure title: Transition Towards Clean Fleets

City: Craiova Project: MODERN Measure number: 01.07

Total emissions CO2- 13 buses NON Euro in 2009



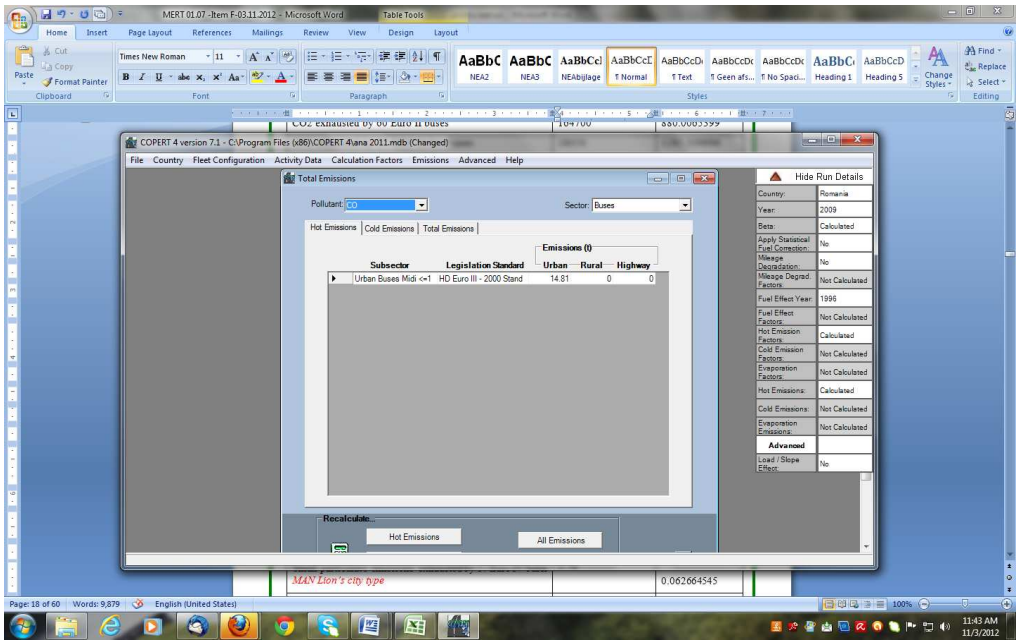
Total emissions CO2- 10 buses Euro III - 2009



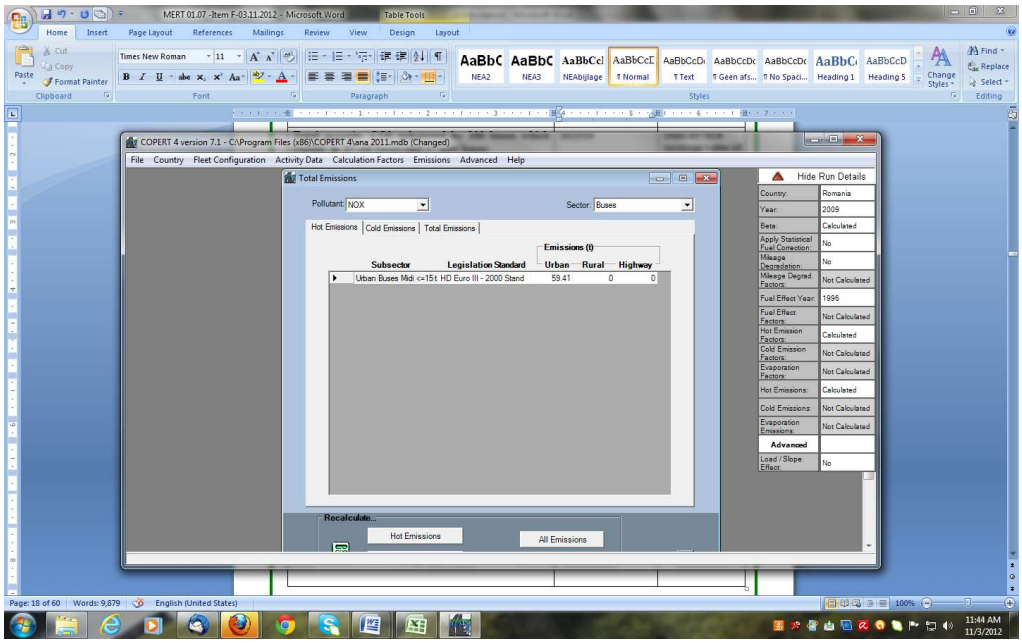
Measure title: Transition Towards Clean Fleets

City: Craiova Project: MODERN Measure number: 01.07

Total emissions CO- 10 buses Euro III in 2009



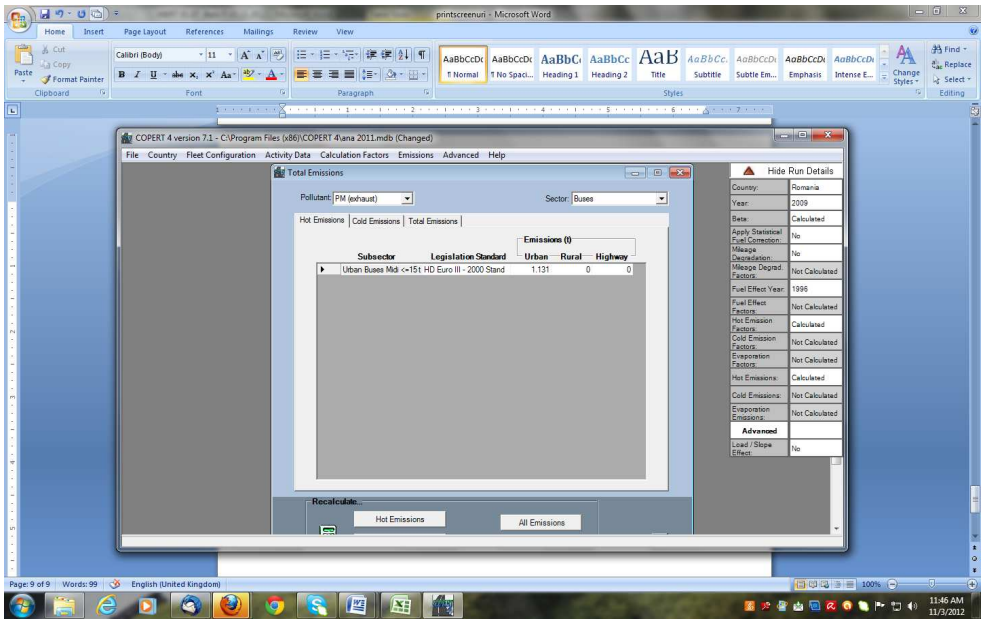
Total emissions NOx- 10 buses Euro III in 2009



Measure title: Transition Towards Clean Fleets

City: Craiova Project: MODERN Measure number: 01.07

Total emissions Pm- 10 buses Euro III in 2009



Ex-ante emissions calculation

Name of indicators calculated automatically	**Values of indicators calculated automatically by the software(t/year)**	**grams /year**	**No of buses**	**Product of the number of vehicles and Km travelled by the vehicles**	**Values of indicators (g/vKm)**	**Km travelled by the vehicles in 2008**
1	2	3 Data from column 2 multiplied by 10^6	4	5 Data from column 4 multiplied by data from column 7	6 Data from column 3 divided by data from column 5	7
CO2 exhausted by 60 EII buses	232400	2.324E+11	60	264054420	880.1216052	4,400,907
CO2 exhausted by 30 NON EURO buses	42430	42430000000	30	35556870	1193.299635	1,185,229
CO2 exhausted by10 EIII buses	5660	5660000000	10	6051430	935.3161154	605,143
Total quantity CO2 exhausted by 100 old	280490	2.8049E+11	100			

Name of indicators calculated automatically	Values of indicators calculated automatically by the software(t/year)	grams /year	No of buses	Product of the number of vehicles and Km travelled by the vehicles	Values of indicators (g/vKm)	Km travelled by the vehicles in 2008
buses						
CO exhausted by 60 EII buses	602	602000000	60	264054420	2.279833074	4,400,907
CO exhausted by 30 NON EURO buses	258	258000000	30	35556870	7.255981755	1,185,229
CO exhausted by10 EIII buses	15	15000000	10	6051430	2.478752956	605,143
Total quantity CO exhausted by 100 old buses	875	875000000	100			
NOx exhausted by 60 EII buses	2736	2736000000	60	264054420	10.36150048	4,400,907
NOx exhausted by 30 NON EURO buses	446	446000000	30	35556870	12.54328629	1,185,229
NOx exhausted by10 EIII buses	60	60000000	10	6051430	9.915011824	605,143
Total quantity NOx exhausted by 100 old buses	3242	3242000000	100			
Small particulate emissions exhausted by 60 EII buses	48	48000000	60	264054420	0.18178071	4,400,907
Small particulate emissions exhausted by 30 NON EURO buses	43	43000000	30	35556870	1.209330293	1,185,229
Small particulate emissions exhausted by10 EIII buses	1.15	1150000	10	6051430	0.190037727	605,143
Total quantity Small	92.15	92150000	100			

Measure title: Transition Towards Clean Fleets

City: Craiova Project: MODERN Measure number: 01.07

Name of indicators calculated automatically	Values of indicators calculated automatically by the software(t/year)	grams /year	No of buses	Product of the number of vehicles and Km travelled by the vehicles	Values of indicators (g/vKm)	Km travelled by the vehicles in 2008
particulate emissions exhausted by 100 old buses						

BAU emissions calculation

Name of indicator calculated automatically	Values of indicators calculated automatically by the software(t/year)	grams /year	No of buses	Product of the number of vehicles and Km travelled by the vehicles	Values of indicators (g/vKm)	Km travelled in 2009 by euro type
1	2	3 Data from column 2 multiplied by 10^6	4	5 Data from column 4 multiplied by data from column 7	6 Data from column 3 divided by data from column 5	7
CO2 exhausted by 60 EII buses	164700	1.647E+11	60	187157700	880.0065399	3119295
CO2 exhausted by 13 NON EURO buses	16760	167600 00000	13	14042977	1193.479132	1080229
CO2 exhausted by 10 EIII buses	5567	556700 0000	10	5951540	935.3881516	595154
CO2 exhausted by 17 EIV	14750	147500 00000	17	12447230	1185.002607	732190

Name of indicator calculated automatically	Values of indicators calculated automatically by the software(t/year)	grams /year	No of buses	Product of the number of vehicles and Km travelled by the vehicles	Values of indicators (g/vKm)	Km travelled in 2009 by euro type
buses						
Total quantity CO2 exhausted by 100 buses which consist in 83 old buses and 17 new buses	201777	2.01777E+11	100			5526868
CO exhausted by 60 EII buses	426.8	426800000	60	187157700	2.280429819	3119295
CO exhausted by 13 NON EURO buses	101.8	101800000	13	14042977	7.249175157	1080229
CO exhausted by 10 EIII buses	14.81	14810000	10	5951540	2.488431566	595154
CO exhausted by 17 EIV buses	22	22000000	17	12447230	1.767461516	732190
Total quantity CO exhausted by 100 buses which consist in 83 old buses and 17 new buses	565.41	565410000	100			5526868

Name of indicator calculated automatically	Values of indicators calculated automatically by the software(t/year)	grams /year	No of buses	Product of the number of vehicles and Km travelled by the vehicles	Values of indicators (g/vKm)	Km travelled in 2009 by euro type
NOx exhausted by 60 EII buses	1939	1939000000	60	187157700	10.360247	3119295
NOx exhausted by 13 NON EURO buses	176.2	176200000	13	14042977	12.54719708	1080229
NOx exhausted by 10 EIII buses	59.41	59410000	10	5951540	9.982290298	595154
NOx exhausted by 17 EIV buses	100	100000000	17	12447230	8.03391598	732190
Total quantity NOx exhausted by 100 buses which consist in 83 old buses and 17 new buses	2274.61	2274610000	100			5526868
Small particulate emissions exhausted by 60 EII buses	33.88	33880000	60	187157700	0.18102381	3119295
Small particulate emissions exhausted by 13 NON EURO buses	17.12	17120000	13	14042977	1.219114722	1080229

Name of indicator calculated automatically	Values of indicators calculated automatically by the software(t/year)	grams /year	No of buses	Product of the number of vehicles and Km travelled by the vehicles	Values of indicators (g/vKm)	Km travelled in 2009 by euro type
Small particulate emissions exhausted by 10 EIII buses	1	1000000	10	5951540	0.168023738	595154
Small particulate emissions exhausted by 17 EIV buses	0.78	780000	17	12447230	0.062664545	732190
Total quantity Small particulate emissions exhausted by 100 buses which consist in 83 old buses and 17 clean buses(Euro IV category)	52.78	52780000	100			5526868

Ex-post emissions calculation

Name of indicators calculated automatically	Values of indicators calculated automatically by the software(t/year)	grams /year	No of buses	Product of the number of vehicles and Km travelled by the vehicles	Values of indicators (g/vKm)	Km travelled in 2009
1	2	3 Data from column	4	5 Data from column 4 multiplied by data from column	6 Data from column 3 divided by	7

Name of indicators calculated automatically	Values of indicators calculated automatically by the software(t/year)	grams /year	No of buses	Product of the number of vehicles and Km travelled by the vehicles	Values of indicators (g/vKm)	Km travelled in 2009
		2 multiplied by 10^6		7	data from column 5	
CO2 exhausted by 60 Euro IV LC buses	153800	1.538E+11	60 Euro IV LC buses	187157700	821.7668843	3119295
CO2 exhausted by 13 Euro IV LC buses	11540	11540000000	13 Euro IV LC buses	14042977	821.7630777	1080229
CO2 exhausted by 10 Euro IV LC buses	4891	4891000000	10 Euro IV LC buses	5951540	821.8041045	595154
CO2 exhausted by 17 Euro IV LC buses	14750	14750000000	17 Euro IV LC buses	12447230	1185.002607	732190
Total quantity CO2 exhausted by 100 Euro IV LC buses	184981	1.84981E+11	100	552686800	334.6940799	5526868
CO exhausted by 60 Euro IV LC buses	234.6	234600000	60 Euro IV LC buses	187157700	1.253488368	3119295
CO exhausted by 13 Euro IV LC buses	17.6	17600000	13 Euro IV LC buses	14042977	1.253295508	1080229
CO exhausted by 10	7.46	7460000	10 Euro IV LC buses	5951540	1.253457088	595154

Name of indicators calculated automatically	Values of indicators calculated automatically by the software(t/year)	grams /year	No of buses	Product of the number of vehicles and Km travelled by the vehicles	Values of indicators (g/vKm)	Km travelled in 2009
Euro IV LC buses						
CO exhausted by 17 EIV buses	22	22000000	17 Euro IV LC buses	12447230	1.767461516	732190
Total quantity CO exhausted by 100 Euro IV LC buses	281.66	281660000	100	552686800	0.509619553	5526868
NOx exhausted by 60 Euro IV LC buses	1046	1046000000	60 Euro IV LC buses	187157700	5.588869707	3119295
NOx exhausted by 13 Euro IV LC buses	78.47	78470000	13 Euro IV LC buses	14042977	5.587846509	1080229
NOx exhausted by 10 Euro IV LC buses	33.26	33260000	10 Euro IV LC buses	5951540	5.588469539	595154
NOx exhausted by 17 Euro IV LC buses	100	100000000	17 Euro IV LC buses	12447230	8.03391598	732190
Total quantity NOx exhausted by 100 Euro IV LC buses	1257.73	1257730000	100	552686800	2.275664988	5526868
Small particula	8.206	8206000	60 Euro IV LC buses	187157700	0.043845377	3119295

Name of indicators calculated automatically	Values of indicators calculated automatically by the software(t/year)	grams /year	No of buses	Product of the number of vehicles and Km travelled by the vehicles	Values of indicators (g/vKm)	Km travelled in 2009
te emissions exhausted by 60 Euro IV LC buses						
Small particulate emissions exhausted by 13 Euro IV LC buses	0.61	610000	13 Euro IV LC buses	14042977	0.043438083	1080229
Small particulate emissions exhausted by 10 Euro IV LC buses	0.26	260000	10 Euro IV LC buses	5951540	0.043686172	595154
Small particulate emissions exhausted by 17 Euro IV LC buses	0.78	780000	17 Euro IV LC buses	12447230	0.062664545	732190
Total quantity Small particulate emissions exhausted by 100	9.856	9856000	100	552686800	0.017832885	5526868

Name of indicators calculated automatically	Values of indicators calculated automatically by the software(t/year)	grams /year	No of buses	Product of the number of vehicles and Km travelled by the vehicles	Values of indicators (g/vKm)	Km travelled in 2009
Euro IV LC buses						

Measure title: Transition Towards Clean Fleets

City: Craiova Project: MODERN Measure number: 01.07

Annex 2

Instructions

This survey is part of a FP7 European project- called MODERN (Mobility, Development and Energy Reduction) and aims to collect your experiences in traveling by bus. The objectives of the measure are:

- To identify the typology of buses suitable for decreasing the emissions
- To identify a proper granting program for eco-buses acquisition

Your answers will be treated confidentially.

Thank you for your participation!

BAU questionnaire- disseminated to people to see their opinion on buses fleet which includes 17 new buses

MEASURE 01.07: Transition Towards Clean Fleets

45% 55%

1. Gender: F ☐ M ☐

2. Age:

Up to 15	15-24	25-45	45-54	55-65	over 65
5%	5%	26%	31%	23%	10%

3. Background (last graduate institution):

· faculty	· secondary school	· primary school
35%	60%	5%

4. **Labour market status**:

employed	unemployed	students
60%	25%	15%

5. Public transport user

80 % ☐ daily

20% ☐ occasionally

Quality of service

6. How would you rate the quality of public transport service in Craiova, currently, before implementing measure**?**

dissatisfied	Somewhat dissatisfied	Satisfied	Don't know
22%	39%	38%	1%

7. How do you perceive buses journey now**?**

uncomfortable	Somewhat Comfortable	Comfortable	Don't know
24%	40%	35%	1%

8. Have you ever responded to questionnaires on MODERN project**?**

☐1	Yes 60%
☐2	No 40%

Measure title: Transition Towards Clean Fleets

City: Craiova Project: MODERN Measure number: 01.07

Instructions

This survey is part of a FP7 European project- called MODERN (Mobility, Development and Energy Reduction) and aims to collect your experiences in traveling by bus. The objectives of the measure are:

- To identify the typology of buses suitable for decreasing the emissions
- To identify a proper granting program for eco-buses acquisition

Your answers will be treated confidentially.

Thank you for your participation!

Ex-post questionnaire

MEASURE 01.07: Transition Towards Clean Fleets

38% 62%

1. Gender: F ☐ M ☐

2. Age:

Up to 15	15-24	25-45	45-54	55-65	over 65
3%	7%	26%	31%	20%	13%

Measure title: Transition Towards Clean Fleets

City: Craiova Project: MODERN Measure number: 01.07

3. Background (last graduate institution):

· faculty	· secondary school	· primary school
38%	60%	2%

4. **Labour market status**:

employed	unemployed	student
55	20	25

5. Public transport user

daily 82 occasionally 18%

Quality of service

6. H**ow would you assess the quality of service if all the buses would be new**?

dissatisfied	Somewhat dissatisfied	Satisfied	Don't know
10%	19%	70%	1%

7. **How would you perceive buses journey if all the buses would be new**?

uncomfortable	Somewhat Comfortable	Comfortable	Don't know
11%	46%	42%	1%

8. Have you ever responded to questionnaires on MODERN project?

☐1	Yes 100%
☐2	no

Annex 3 – Estimation of sample size

Variables name and explanations		Variables values
		01.07
n	The sample size	119
t	z-score: the abscissa of the Normal distribution for probability α (consisted of 1.5+0.03 from the table-standard normal probabilities)	1.53
α	**confidence level**, is a percentage and represents how often the true percentage of the population who would pick an answer lies within the **confidence interval** (margin of error).	87.50%
P	percentage of your sample that picks a particular answer. We considered that majority of people will be satisfied if the buses fleet will be replaced with new one	0.85
Q	(1-P)	0.15
d	**confidence interval** (also called margin of error)	0.05
N	population total (if N is enough large the term in the denominator tends to 1 and the formula is reduced to the numerator)	300000

Sample size

$n = [t^2PQ/d^2] / [1 + (t^2PQ/d^2 - 1)/N]$ (1)

where: t = the abscissa of the Normal distribution for probability α

P = expected population value of the proportion

Q = (1-P)

d = margin of error

N = population total

α - in mod obisnuit se foloseste 95%

A preliminary estimate of P (called p) is made from prior information or as an informed guess; so then q = 1-p.

If N is large, a first approximation of *n* is given by:

$n_0 = t^2pq/d^2$ (2)

or $n_0 = pq/V$ (3)

where $V = d^2/t^2$ is the desired variance of the sample proportion

In practice, n_0 is calculated first and so long as n_0/N is quite small, n_0 provides a satisfactory estimate of *n*. If not, then from equations (1) and (2) above:

$n = n_0 / [1 + (n_0 - 1)/N]$

Standard Normal Probabilities

Source: http://people.richland.edu/james/lecture/m170/tbl-norm.html

z	0.00	0.01	0.02	0.03	0.04	0.05	0.06	0.07	0.08	0.09
0.0	0.0000	0.0040	0.0080	0.0120	0.0160	0.0199	0.0239	0.0279	0.0319	0.0359
0.1	0.0398	0.0438	0.0478	0.0517	0.0557	0.0596	0.0636	0.0675	0.0714	0.0753
0.2	0.0793	0.0832	0.0871	0.0910	0.0948	0.0987	0.1026	0.1064	0.1103	0.1141
0.3	0.1179	0.1217	0.1255	0.1293	0.1331	0.1368	0.1406	0.1443	0.1480	0.1517
0.4	0.1554	0.1591	0.1628	0.1664	0.1700	0.1736	0.1772	0.1808	0.1844	0.1879
0.5	0.1915	0.1950	0.1985	0.2019	0.2054	0.2088	0.2123	0.2157	0.2190	0.2224
0.6	0.2257	0.2291	0.2324	0.2357	0.2389	0.2422	0.2454	0.2486	0.2517	0.2549
0.7	0.2580	0.2611	0.2642	0.2673	0.2704	0.2734	0.2764	0.2794	0.2823	0.2852
0.8	0.2881	0.2910	0.2939	0.2967	0.2995	0.3023	0.3051	0.3078	0.3106	0.3133
0.9	0.3159	0.3186	0.3212	0.3238	0.3264	0.3289	0.3315	0.3340	0.3365	0.3389
1.0	0.3413	0.3438	0.3461	0.3485	0.3508	0.3531	0.3554	0.3577	0.3599	0.3621
1.1	0.3643	0.3665	0.3686	0.3708	0.3729	0.3749	0.3770	0.3790	0.3810	0.3830
1.2	0.3849	0.3869	0.3888	0.3907	0.3925	0.3944	0.3962	0.3980	0.3997	0.4015
1.3	0.4032	0.4049	0.4066	0.4082	0.4099	0.4115	0.4131	0.4147	0.4162	0.4177
1.4	0.4192	0.4207	0.4222	0.4236	0.4251	0.4265	0.4279	0.4292	0.4306	0.4319
1.5	0.4332	0.4345	0.4357	0.4370	0.4382	0.4394	0.4406	0.4418	0.4429	0.4441
1.6	0.4452	0.4463	0.4474	0.4484	0.4495	0.4505	0.4515	0.4525	0.4535	0.4545
1.7	0.4554	0.4564	0.4573	0.4582	0.4591	0.4599	0.4608	0.4616	0.4625	0.4633
1.8	0.4641	0.4649	0.4656	0.4664	0.4671	0.4678	0.4686	0.4693	0.4699	0.4706
1.9	0.4713	0.4719	0.4726	0.4732	0.4738	0.4744	0.4750	0.4756	0.4761	0.4767
2.0	0.4772	0.4778	0.4783	0.4788	0.4793	0.4798	0.4803	0.4808	0.4812	0.4817
2.1	0.4821	0.4826	0.4830	0.4834	0.4838	0.4842	0.4846	0.4850	0.4854	0.4857
2.2	0.4861	0.4864	0.4868	0.4871	0.4875	0.4878	0.4881	0.4884	0.4887	0.4890
2.3	0.4893	0.4896	0.4898	0.4901	0.4904	0.4906	0.4909	0.4911	0.4913	0.4916
2.4	0.4918	0.4920	0.4922	0.4925	0.4927	0.4929	0.4931	0.4932	0.4934	0.4936
2.5	0.4938	0.4940	0.4941	0.4943	0.4945	0.4946	0.4948	0.4949	0.4951	0.4952
2.6	0.4953	0.4955	0.4956	0.4957	0.4959	0.4960	0.4961	0.4962	0.4963	0.4964
2.7	0.4965	0.4966	0.4967	0.4968	0.4969	0.4970	0.4971	0.4972	0.4973	0.4974
2.8	0.4974	0.4975	0.4976	0.4977	0.4977	0.4978	0.4979	0.4979	0.4980	0.4981
2.9	0.4981	0.4982	0.4982	0.4983	0.4984	0.4984	0.4985	0.4985	0.4986	0.4986
3.0	0.4987	0.4987	0.4987	0.4988	0.4988	0.4989	0.4989	0.4989	0.4990	0.4990