Measure title: **Traffic visualization system in Burgos**

City: **Burgos** *Project:* **Caravel** *Measure number:* **12.04**

A Introduction

A1 Objectives

The measure outlines to establish the following objectives:

- **Objective 1:** To improve the state of traffic information systems
- **Objective 2:** To facilitate information to the public on the traffic situation

A2 Description

Improvements were badly needed in the traffic information system and prompt facilitation of traffic information to citizens is a challenge that the city now faces. The traffic control panel was out-dated and the city has grown to the extent that it is unable to display real-time traffic flows in new areas of the city. The traffic control room in Burgos intended to implement new visualization tools which greatly assist in the task of controlling and monitoring traffic.

Image 1: Views of the new traffic control room "Centro de Movilidad"

The reform of the hall traffic (centre mobility management) favoured a definitive improvement in the quality and the quantity of the means used to manage traffic. The previous room traffic had undergone a comprehensive refurbishment of the functional level, equipping and integrating the necessary means to improve management, centralization and optimization of the crossings lights, panels route, dynamic information panels (Measure 12.2) , information panels of free parking spaces in the public car parks (Measure 12.2), viewing the traffic cameras (CCTV) and access control in pedestrian areas (Measure 6.2.).

This was expanded the posts of operator room, allowing them to work in parallel with several people at once perfectly controlling all new applications. It was also expanded the capacity of the uninterruptible power supply (UPS) to 5000 VA, which let their work with greater safety in case of failure of electricity supply. I was increased the number of cameras for traffic management, both fixed and mobile installed in the city of Burgos. As a result, it was necessary to extend the videomatriz video (up to 32 inputs and 16 outputs), and installed the VIDEOWALL, which permitted on the basis of need, showed a single image or divided its surface into 16 separate screens. It was chosen lamp technology instead of plasma because the lamp would be the only consumable that would need to change

B Measure implementation

B1 Innovative aspects

Optimum visualization and traffic control systems integrated in real time information systems that allowed data to be compiled in real time.

This includes the following innovative aspects of the measure were:

- **Use of new technology/ITS:** Introduction of new equipment in the traffic room, based on lamp technology.

Image 2: Results of the incorporation plasma technology in the Trafffic Control Room

B2 Situation before CIVITAS

Traffic control was presently performed using an illuminated synoptic panel and various screens in a control room connected to video cameras viewing traffic in strategic streets. Among other features, traffic lights were directly regulated from the control room. This system which had been in use for over 10 years, was unable to deal with current demand due to the rapid growth of new urban developments in peripheral zones of the city. Consequently, traffic control was limited to the urban centre and cannot respond to the current flow of traffic, new avenues and the entry and exit of vehicles on the principal access roads. Moreover, the new ring roads (see WP 6, Measure 6.2) also led to considerable changes in traffic management. The synoptic panel only allowed controlling the traffic semaphores and the integration of other applications (for example, cameras, panels…) wasn´t possible because the operator could not assess all information of new requirements or applications.

Image 3: Old Traffic Control Room

B3 Actual implementation of the measure

The measure was implemented in the following stages:

Stage 1: Technical study *(from April 1st, 2006 – to July 30th, 2006)* – Though the study/technical project of the areas of control and the future growing of the city, the panel were designed with the new characteristic of the plasma technology.

Image 4: "Centro de Gestión de Movilidad" entrance

Stage 2: Integration synoptic panel *(from January 1st, 2006 – to February 30th, 2007)* **–** Integration a synoptic panel that transmits state of traffic information in real time in order to cover the new areas of traffic management and new activities involving road transport in the city.

Image 5: Integration a synoptic panel

Stage 3: Implant cameras *(from January 1st, 2006 – to February 30th, 2007)* - To the control room visualization system new cameras were added which will provide clear images

Stage 4: Promotion *(from January 1st, 2006 – to February 30th, 2007)* – Information to the citizens about the new tools though communication campaigns

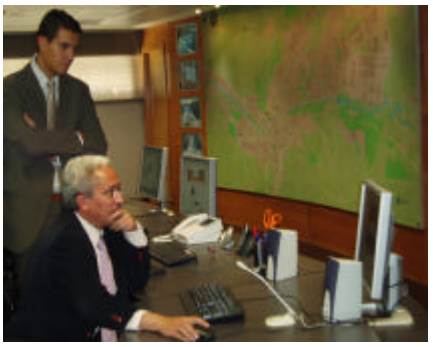


Image 6: Inauguration Day of "Centro de Gestión de Movilidad"

Image 7: Visit of Distribution of goods stakeholder

Image 8: Visit of Transport´ Students of Burgos University

Stage 5: Evaluation of the activities *(from February 1st, 2005 – to September 31st, 2008)* – All the evaluation activities were performed according to the evaluation plan.

B4 Deviations from the original plan

The originally foreseen workplan was carried out without any deviations.

B5 Inter-relationships with other measures

The traffic visualization system is related to the following CARAVEL measures in Burgos:

- **Measure 6.5. - Parking strategy and management in Burgos -** Panels of information of parking. Integration the information of the occupancy of parking in the Control Traffic Room
- **Measure 8.2. - Clean high mobility services in Burgos -** Bus stop with panels of electronic information and inter-modality services
- **Measure 11.2** - **Sustainable mobility marketing in Burgos.** – Several campaigns have been developed to communication the new info-tools introduced.
- **Measure 12.2.- Info mobility tools in Burgos** – Control and visualization of the info-tools. Integration the information of the occupancy of parking in the Control Traffic Room

C Evaluation – methodology and results

C1 Measurement methodology

C1.1 Impacts and Indicators

Data and information concerning the operation level and the use of the traffic visulization system, including trend data, was gathered throughout the CARAVEL project duration. Many quantitative and qualitative parameters (derived from direct market analysis, customer satisfaction reports and surveys) had been analysed to give an exhaustive view of the success of the actions

The evaluation was carried out with a strong interrelation to similar activities developed at the national and international level by Instituto Tecnológico de Castilla y León partner (ITCL – private technological foundation).

12.4. TRAFFIC VISUALIZATION SYSTEM IN BURGOS						
Evaluation Category	**N°**	**Indicator**	**Units**	**Source of data**	**Methodology for indicator construction (survey, modeling, etc)**	**Baseline date**
Transport	19	Quality of PT innovative service	YES/NO	Questionnaires	Measured/ Calculated	-
Transport	GI	Links to parking indicators	-	-	Measured	-
Society	GI (14)	Acceptance/expert statements from operators	YES/NO	Questionnaires	Measured/ Calculated	-
Society	GI (13)	Public use of new information sources	YES/NO	Questionnaires	Measured/ Calculated	July 2007

Detailed description of the indicator methodologies:

Indicator	**Methodology for indicator construction**	
	Definition	**Methods of Measurement**
13. Awareness level	Awareness level is defined as the percentage of the population with knowledge of a measure on account of provided information. Unit: %	Method: Data could be collected by means of surveys (e.g. questionnaires by mail or by face-to-face interviews). Awareness can be at a variety of levels, it depends on the measure. Frequency: Measurements should be made twice during the project Target group: general public
14. Acceptance level	Acceptance level is defined as the percentage of the population who favourably receives or approve of the measure. Unit: %	Method: User acceptance can be assessed through surveys (e.g. questionnaires by mail or by face-to-face interviews Frequency: Measurements should be made twice during the project Target group: Operator
19. Quality of service	Quality of service is defined as the user's perception of the overall quality of the service provided. Unit: index of the "perception" of service quality	Method: The perception of service quality should be measures as yes or no in the survey Frequency: Measurements should be made twice during the project Target group: Operator.
GI. Links to parking indicators.	Links to parking indicators are defined as the signals, panel… that are connected to the parking and that offer information to citizens (number of places).	Method: These data will be obtained by visual system Frequency: Data will be collected on an annual basis. Target group: Council

C1.2 Establishing a baseline

Through an exhaustive analysis of the Civitas core indicators and Guard's information 4 performance indicators were defined for this measure. Further information was gathered from data sources of the Traffic Municipality Services, Traffic Operators and surveys.

The indicators, quality of innovate services, acceptance and awareness, were not possible obtained information of baseline scenario. In the Council had not any survey, questionnaire or data to evaluate similar relevant information about the level of quality and diffusion of the traffic room, despite some figures for the visits are available (visits in 2006: 196, 2007: 590 and 2008 to date: 714)

After this consultation of available data, the work team defined relevant questions to be answered by the **citizens and workers of Traffic Mobility Centre**. By this means it was possible to obtain the data result after the demonstration of the measure.

The survey for **awareness level** to establish the data results of **public/citizens** initiative and the evaluation of traffic control centre took place between July/August of 2007. In this awareness survey, some questionnaires were presented to the general public in different areas of the city, including the Historical Area. The principal aim was understanding and if the traffic room had any influence in the mobility issues of the citizens.

Table 1: Details of the relevant awareness surveys

Name of target group	Date of survey	Sample size	Purpose	Relevant question to assess
Citizens/general public	July/August of 2007	250	Awareness of specific measure	Do you know that there is a new traffic control room?
Citizens/general public	June/July of 2008	250	Awareness of specific measure	Do you know that there is a new traffic control room?

Furthermore, a survey was launched to evaluate the **acceptance and quality level** among the **workers of the Traffic Control Room**. The baseline information was obtained at the end of 2006, before the operation phase of the service in 2007. The sample size is small because only 8 people work in the Traffic Control Room per week.

Table 2: Details of the relevant acceptance and quality of service surveys

Name of target group	Date of survey	Sample size	Purpose	Relevant question to assess
Operator	December of 2006 June of 2008	8 Operator	Acceptance of specific measure	Do you think that the new installations of Traffic control room are adequate?
Operator	December of 2006 June of 2008	8 Operator	Quality of service of specific measure	Has the new traffic control room improved the management of urban traffic?

The indicator '**Links to parking indicators**" was a demonstration project implemented in 2008. Because any similar equipment had been incorporated before to the Civitas project, any baseline data was available in the past. The data results were obtained are the results of the project during 2008.

C1.3 Building the business-as-usual scenario

The do nothing scenario show a clear chaos in the state of the traffic in the city if this project never been implemented. The more of the 14,000 cars circulating everyday have received information concerning the state of the traffic thanks to the traffic control work, the traffic light have changed in to a more adequate timing in order to have a more controlled traffic flow and in a better order. The centre is also in charge of controlling the good work of the access restriction with only three or four incidents in two years perfect working.

C2 Measure results

The performance indicators for the evaluation of Measure 12.4. are broken into 2 sections: transport and society. A full explanation of the indicators and how they were quantified is available in the section C1.1 and C1.2. of this document. The traffic room began to operated at the beginning of 2007.

C2.1 Economy

The figures of the traffic visualization rooms are divided into buildings and two kind of equipment: The cost of the new traffic room was € 126.360 of which € 14.591 was for equipment of the traffic room and € 111.769 was for the visualization system integration in the traffic room.

C2.2 Energy

N/A

C2.3 Environment

N/A

C2.4 Transport

Indicator – Quality of service

Table 3: Results of transport indicators (I)

Indicator	Relevant Question	Data Result 2007	Data Result 2008
(19) **Quality of service**	Has the new traffic control room improved the management of urban traffic?	YES: 90%	YES: 100%

All of the eight operators (5 female, three male, all between the ages of 20-30 years) completed the questionnaires for the analysis on the rate of quality of service in the traffic control room. They unanimously stated that the control room had improved the urban traffic management in Burgos and that in particular the software application (resolution of camera application, data integration, of capacity points and data summaries) represent an improvement.

Additionally, a questionnaire about the training realized to know the exploitation of the systems to manage the urban traffic introduced in the new Traffic Control Room was included in the survey. All but one operator stated that they agree on the fact that the training had been enough and only one considered that a additional language course (English, French) should be included to improve the public attendance to foreign people in relation to access restriction strategy (measure 06.02.) which is controlled in the traffic control room.

Indicator – Links to parking indicators

Table 4: Results of transport indicators (II)			
Indicator	**Relevant Question**	**Data Result 2007**	**Data Result 2008**
(GI) **Links to parking indicators**	N/A	N/A	7 panels with 21 elements (7 panels with 3 elements per panel)

The results of the "links to parking" indicator showed that finally the objectives linked to measure 12.02 were achieved because 7 panels with 21 information elements were introduced in the city in connexion among parking, traffic control room and information panels. The software application was included in the new traffic control room and all management activities are controlled by the operator of the centre.

C2.5 Society

Indicator - Awareness Level

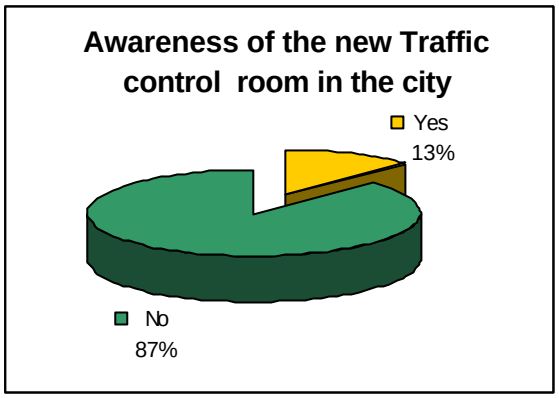
Information about the surveys realized to asses the awareness level:

2007 Data results: 250 citizens/general public completed the survey to know the rate of awareness regarding the new traffic control room. 36,4% of the respondents were male and 63,6% female. The age ranges of the respondents were distributed as 4,8% (<20), 27,6% (20-30), 19,2% (31-40), 38% (41-65) and 10,4% (>65).

2008 Data Results: In the same way, 250 citizens/general public completed the survey to assess the rate of awareness regarding the new traffic control room. In this case, 53,2% of the respondents were male and 46,8% female. The age ranges of the respondents were distributed as 6,3% (<20), 21,6% (20-30), 27,1% (31-40), 27,9% (41-65) and 17,1% (>65).

Table 5: Results of society indicators (I)			
Indicator	**Relevant Question**	**Data Result 2007**	**Data Result 2008**
(13) **Awareness level**	Do you know that there is a new traffic control room?	YES: 13% NO: 87%	YES: 18% NO:82 %

In 2007, the respondents were asked if they were aware that there was a new traffic control room in Burgos. Only 13% stated that they were aware of the news, but 87% didn't have any information about the new project.



Graphic 1: Awareness of the citizens about the new Traffic Control Room. Data Results 2007

In 2008, 18% stated that they were aware of the new traffic control room, but 82% stated didn't have any information about the new traffic control room.

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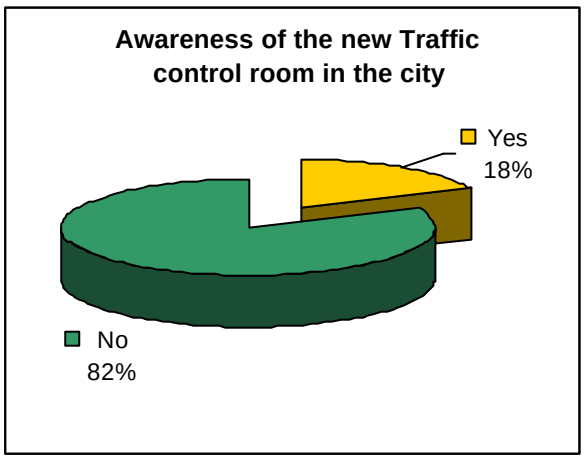
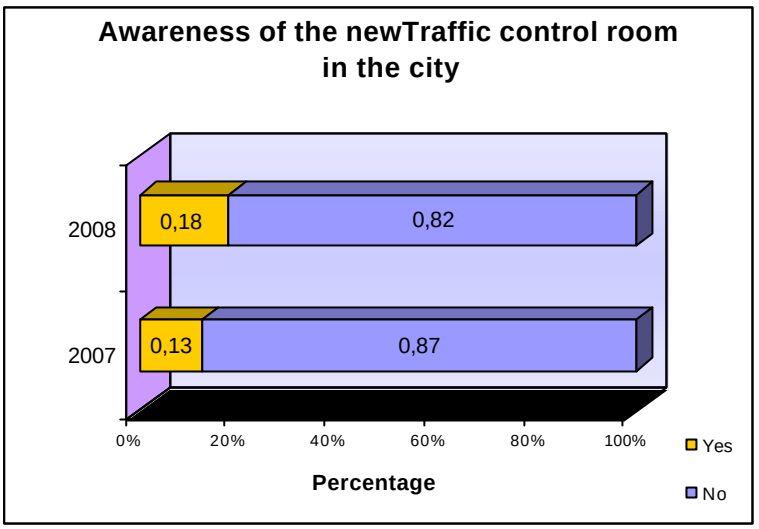


Graphic 2: Awareness of the citizens about the new Traffic Control Room. Data Results 2008

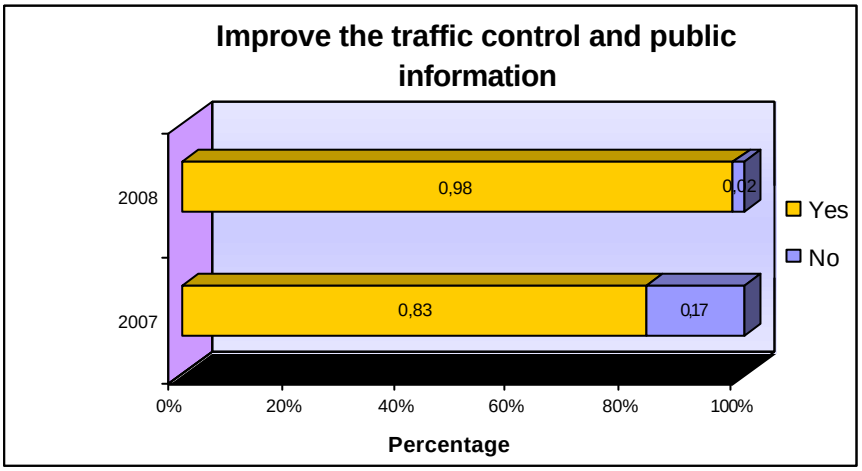
In concrete, the results shown the general public didn't know about the new traffic room in the city, the percentage of citizens that known it was only 18%. The awareness of one year had only been of 5%.

In terms of politic strategy it was a big inauguration as it is seen in the pictures but after that no more information was given to the citizens, apart from the people (mainly students from schools and University, apart from expertises from USA or Japan or the people in the CiViTAS Forum). As a result, people know what has got more visibility: their result in terms of traffic lights, information or access restriction, and no special campaign to promote this new installation was performed.



Graphic 3: Comparatives of Awareness of the citizens about the new Traffic Control Room in 2007 and 2008

An additional question was launched to the citizens in the survey with the aim of assessing the effects of having a new control room in the better traffic control room and better information to the public. The question was the following: Do you think the new traffic control room could improve the traffic control and public information?. Regarding these considerations, 83% in 2007 and 98% in 2008 were positive about this statement and only 17% in 2007 and 2% in 2008 do not believe the new control room could improve the traffic control. The results were increased 15% in one year.



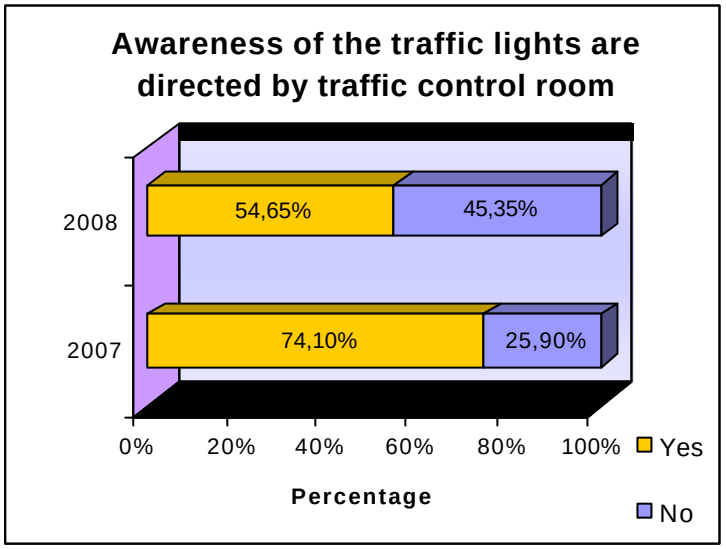
Graphic 4: Comparatives of Awareness of the citizens about the new Traffic Control Room improve the traffic control and public information in 2007 and 2008

So the people answered this question after declaring that they know this room exits, is clear that in a high percentage they really think they do a good work. The reason is that very probably they have been visiting the centre or know someone has visited and they explain “in situ” all the activities. The majority of the citizens after the visits they think it is a fantastic centre plenty of good technology and they think they perform a very good work.

Other people perhaps they never visited the traffic room but as said before the results have visibility, so they can see the traffic lights working, the information provided or the good work of the access restriction system.

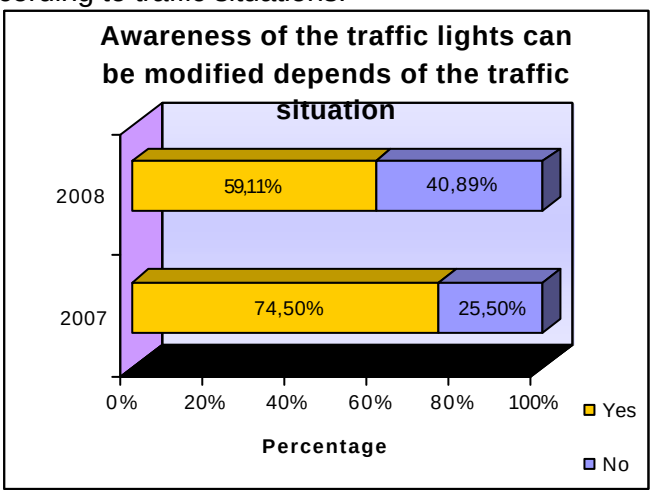
Additionally other questionnaires were considered in the same survey proposed to the citizens. The principal aim was to know if the people knew the operation level of the Traffic Control Room. The questions launched were the following: Do you know that the traffic lights are controlled and directed and can also be modified from the traffic centre?

Regarding the traffic lights were directed controlled in the traffic control room, in 2007, 74% stated "yes" and 26% "no" when they were asked if they know that the traffic lights were directed by the Traffic Control Room. In 2008, the situation was that 54% stated that "yes" and 45% "no".
Then, there was a difference of 20% in one year about the knowledge of the citizens of the modifications of traffic lights by the traffic room. However, data results showed that more than 50% of the respondent knew as the functioned of the traffic room and his applications.



Graphic 5: Awareness of the fact that traffic lights are directed from the traffic control centre

In the same way, the respondents were asked if they knew that traffic lights could be modified depending on traffic situation. In 2007, 75% of the sample stated that they knew that the traffic lights were modified depending on the real traffic situation while only 25% stated that they were not aware of this mechanism. In 2008, 59% stated they were aware while 40% stated that no.
The difference in one year was 15% about the perception that the citizens had about the functioning of traffic lights. In any case, more than 50% of the respondents knew as the traffic lights could modify according to traffic situations.



Graphic 6: Comparative of the awareness of the traffic lights could be modified depends on of the traffic situation in 2007 and 2008

In conclusion, a comparison of these results shows that the general public was aware of the existence of the traffic lights, the traffic control room and the effects in the traffic but they were not aware of the existence of a new project aiming at improving the activities and the technological capacity of the Traffic Control Room. The reasons of these results could be that the awareness campaigns of the project did not concentrate on the knowledge of the traffic room for the general public (only through some articles in the local newspapers). The survey on awareness of traffic control room were directed to special target groups (university students, distributors and transport stakeholders and other visitants) which showed their interest to know the new equipment and the activities of traffic control room.

In any case, the perception in 2008 is lower perhaps because the big inauguration was in September 2006, and the press articles were more recent for the citizens in 2007 than in 2008. As already said, no special marketing campaign was launched, but the Council can exploit the good results and the good work developed in the centre, despite the citizens can see the results of this good work as good information, adequate traffic lights timing or access restriction system working in a very good way.

Indicator - Acceptance level

In the same way for the quality of service indicator, 8 workers completed the survey to know the acceptance of the traffic control room.

Table 6: Results of society indicators (II)

Indicator	Relevant Question	Data Result 2007	Data Result 2008
(14) **Acceptance level**	Do you think that the new installations of Traffic control room are adequate?	YES: 100%	YES: 100%

The operator acceptance of this measure was very positive. All of them considered that the new installations were adequate for developing an optimum control of the traffic situation in Burgos.

Moreover, respondents were asked if the traffic control with cameras is more efficient that the old system through the intensities in the traffic capacity points. Also in this regard, all operators agreed that the control was more efficient and that it real-time visualisation which allows to automatically modify the traffic equipment, including traffic lights was more adequate than in the past only seeing lights meaning the intensity of the traffic flows.

This high acceptance level by the operators was obtained thanks to the new plasma technology and software application installed in the traffic control room which favoured to control the traffic situation on real time.

C3 Achievement of quantifiable targets

No.	Target	Rating
1	To improve the state of traffic information systems	★★★
2	To facilitate information to the public on the traffic situation	★★★

NA = Not Assessed ★ = Not achieved ★★= Achieved in full ★★★= Exceeded

C4 Up-scaling of results

N/A

C5 Appraisal of evaluation approach

After the evaluation of the measure, some considerations were done aiming at improving the evaluations of similar actions in the city. Some appraisals are the following:

- Better coordination among Traffic department and operators (subcontracting company) of the Traffic Control Room to realize evaluation before and after of the implementation and obtain right data for the progress of the results.
- Big effort of the measure was condensed in the implementation phase. The evaluation activities to obtain the data were delayed until that the all Traffic Room was completed.
- Evaluation of quality service should be carried out periodically, with the aim to assure that the service offered to information and management of traffic data is adequate and it can reach the target groups or citizens in general.
- The information obtained through the surveys among workers of the traffic control room will facilitate new actions that can be planned in the time for the Council.

C6 Summary of evaluation results

The key results are as follows:

- **Traffic information for the public –** Thanks to the new equipment included in the traffic room and through the telematic panels (joint Measure 12.2.), one important goal has been achieved by increasing the level of the information of traffic in real time for citizens. The Traffic Control Room received all information of cameras and other traffic systems, the data is processed and sent to the panels situated in different places of the city. All process of traffic information (state of traffic, data treated and public communication) was completed within the Caravel project.
- **High acceptance among operators** – The quality of service and acceptance level referred by the operators in the Traffic Control Room was very positive which was due to the last available technology for traffic visualization system which allows the operators to know on real time the traffic situation in different points of the city and modify it thanks to new applications of the software.
- **Proposals for additional improvements / active involvement of operators** – The continued monitoring of the service by the operators showed some proposals to improve the control of the traffic system, as new software application and introduction of new additional cameras.
- **Traffic room addressed to information to the public –** The new application introduced allowed that other information systems could be included to inform the state of traffic in the city and to improve the better the traffic conditions for the citizens.

D Lessons learned

D1 Barriers and drivers

D1.1 Barriers

- **Barrier 1** - Substantial cost increases for major components and budget modifications that might modify the project and any remaining measures. To prevent financial problems, strict control systems would be put in place right from the start of the project. Moreover, the local committee prepared a contingency plan for such an eventuality. Thanks to agreetments with companies, the technology can be introduced due to some of work correspondy directly with the operator of the traffic room.
- **Barrier 2** - Failure to keep to the implementation deadlines and to satisfy quality conditions in technological systems, which might delay other measures. To plan the purchase and installation of the traffic system in a timely manner to facilitate its implementation. The installation were delayed in one ocasion due to the components should obtain since other countries. It could solve thanks to the effort of the team work for that all components can integrate togetherly, about all software and applications with the new equipment.

D1.2 Drivers

- **Driver 1** – Political support in the development of the measure

D2 Participation of stakeholders

- **Stakeholder 1 -** General public**:** The system implanted controls the mobility of the citizens through cameras and inform of the state of traffic via panels
- **Stakeholder 2 -** Local/regional businesses: Control the movement of the commuters in the peak points in the different strategic roads of the city and users by the businesses
- **Stakeholder 3 –** Business association: Interest of the association in the new tools introduce in the city to control and manage the traffic.

The participation of these stakeholders was specifically to consulted and to inform about the technology and traffic information carried out.

D3 Recommendations

- **Transfer of results –** It is important to transfer the results to other local authorities to exchanges experiences and to update the information systems incorporated in other Traffic Control Rooms. So that, the Burgos City Council has been providing information to other Spanish, European and international local authorities to help them in the initiative and operation of similar Traffic Control Room facilities. In concrete, the particular experience of this measure would be interesting for municipalities with no previous local traffic operation experience and other cities which had grown fast in few years and need to reformulate the traffic regulation and control systems. Moreover, Burgos is studying to introduce some ideas obtained in the technical visit to Traffic Rooms of Madrid, Barcelona, Salamanca and Stuttgart in relation to arrangement methods, technologies in the cameras and the software application.

- **Information and awareness raising** – It is essential to inform citizens on the results of the CIVITAS – CARAVEL project and as the traffic situation is controlling in a Traffic Room through the regulating of the traffic flow, traffic lights and the traffic information through tools as panels, web… In this way, Burgos City Council has organized several open days to show the relevant stakeholders (goods distributors, resident associations, commercial representatives, university students, …) the new Traffic Control Room.
- **Remain informed about the state-of-the-art** – It is necessary to analyze the state of art in the technological tools to introduce in the Traffic Control Room. Many applications are available in the market. To pre-define in a technical project the aim and the capacities of each tool, application or software is indispensable for an adequate exploitation of the Traffic Control Room
- **Local Inter-department cooperation** – It is essential to define the model of operation for the Traffic Control Room. Burgos had a strong debate about how the system should be managed (Police, operators or representatives of different departments with interest to control the images of cameras). Moreover, another element to decide is the level of management of this centre, in the same way as other Traffic Rooms are done, the integration the Traffic activities with Safety and Police Departments.
- **Budget for the installation, equipment and additional applications** – It is essential to establish a strong budget for launching this measure although the benefits for the city and traffic control would be important. Moreover, as other applications tools would be needed, the final budget will increase proportionally to the equipment and applications introduced.

D4 Future activities relating to the measure

Future activities of this measure can be foreseen due to its continued success, Burgos City Council is studying to provide a new complementary information tools on traffic level in coordination with the Control Traffic Room. The City Hall assumed that providing good and accurate information to drivers should favour the traffic flow in the city. New expansion areas and the connection roads with new ring roads of the city will be essential areas for providing traffic information for users to cross the city. The Traffic Control Room will be the place where all different info-tools will be controlled, regulated and managed.

The introduction of new cameras and panels will allow to control the traffic in the city in real time through the Traffic Control Room, but also in critical zones where the traffic flow is varied in peak/peak off hours, and about all in season periods when the foreign drivers cross the city while going to other cities due to the city's important traffic connection with the north of Spain.

Burgos City Council is studying to introduce new formulas for the management of this Centre, as the integration of other municipality departments with interest to control the available information by the cameras. Moreover, other functions could be added to the actual traffic regulation as the information for the local safety and security of the city. New arrangement protocols should be defined to establish a level of functions and coordination among departments.