

Measure title: **Demand responsive transport system**

City: **Potenza**

Project: **SMILE**

*Measure
number:*

8.7

A Introduction

Demand Responsive Transport Systems (DRTS) are innovative, non conventional, public services applicable in areas of low demand, i.e. municipalities or villages characterised by low population density, population dispersion and low mobility levels.

Starting from these considerations, and given the particular configuration of mobility and population within the municipality of Potenza (creating a disperse mobility demand for links between the historical centre and the suburban zones), it was proposed to implement a “Dial a Ride” public service to serve the Province of Potenza, as part of SMILE, with a demonstration carried out in the peri-urban zone of the municipality.

A1 Objectives

The measure objectives are:

Objective 1: Provide a basic level of mobility to people living in areas not supported by conventional public transport services. This relates to settlements and/or groups of houses distant from the main road network, (bus stops, stations, etc.) with routes not usable by pedestrians or bicycle.

Objective 2: Substitute/integrate conventional service during time periods characterised by low demand.

Objective 3: Strengthen conventional public transport services supporting interchange and integration with other transport modes.

Objective 4: Attract potential mobility demand not satisfied by current public transport system supply.

Objective 5: Favour the connection between the different areas of the territory (peripheral zones and urban centre) in order to create a social link.

Objective 6: Reduce private vehicle movement, emission levels and total accident rate.

A2 Description

At the start of SMILE it was expected that the DRTS public transport service would be implemented in an area called Giuliano, which was to be the subject of a feasibility study carried out by CTP within the AGATA Project. This was to provide results to help the service specification in the demonstration site. However, the site chosen for the AGATA project shifted to another demonstration area, Giarrossa after CTP Group left the LPT management in Potenza and hence took no further part in this measure implementation.

This meant that an additional, fundamental, task – the DRTS service design - had to be performed as part of SMILE, with inevitable delays in the implementation schedule of preparation activities.

The implementation programme for the DRTS system infrastructure included identifying suitable collection points, which covered enough area to satisfy service demand. The service characteristics (many to many or door to door), modality planning and reservation management were defined.

The results expected from the implementation of a DRTS service can be summarised as:

- Making collective transport more efficient with an integration between traditional and potential services (to parameterise in terms of “resource optimisation”).
- Increasing accessibility to collective transport services for customers with restricted mobility and for marginal and poor urban areas (in terms of time, means and trip costs).
- Creating and sustaining social links between the different areas of the territory (in terms of reduction of time to reach a more central urban area).
- Reducing private vehicle movement, emission levels, total accident rate.

B Measure implementation

B1 Innovative aspects

Innovative Aspects:

- New organisational arrangements or relationships

The innovative aspects of the measure are:

- **New organisational arrangements or relationships, regionally** –The service requested from the person's home at an appropriate time has not previously been offered.

B2 Situation before CIVITAS

The administration launched a new mobility plan and thus stressed the need to develop actions for sustainable mobility. These included integrated management of the public transport system, the design of a new and more efficient public transport system, the opening of a limited traffic zone in the historical centre, the realisation of new parking areas at the border of the historical centre

B3 Actual implementation of the measure

The measure was implemented through the following stages:

Stage 1: Acquisition of data from a previous study (*from 05 2006 to 06 2007*) – At the start of the project the partner CTP was responsible of the implementation of the service. Therefore they decided to use the results of the Feasibility Study which CTP carried out within the AGATA Project regarding a DRTS public transport service in a peripheral area of the town which at that stage seemed to be the best site for the trial of the service.

Stage 2: Substitution of measure leader (*06 2007*) – Partner CTP was replaced by an alternative partner Co.TR.A.B, who took over responsibility for providing public transport services in the area. The new measure leader had already implemented DRTS in areas of weak demand in other Italian cities within TWIST, a project of the European Initiative INTERREG III B - CADSES (Central Adriatic Danubian South-Eastern European Space). TWIST was aimed at defining a model useful to the organisation and evaluation of a DRT service that could be transferred to areas sharing the same features.

Stage 3: training of personnel and new service design (*from 06 2007 until the end of the project*) – Co.TR.A.B, using its previous experience, created a team dedicated to the realisation of the measure and carried out the necessary training. Then it procured the software needed to the launch of the service from the previous project TWIST. In the last period of the project, CoTrAB launched a new service design, realised through expert meetings and consultation. The best solutions for the low demand areas of Potenza were defined.

B4 Deviations from the original plan

The deviations from the original plan comprised:

- **Delay due to changes in project consortium** – The original implementation partner left the consortium and was replaced during 2007, which resulted in a change of location and a fresh start to the process of service definition in a new location.
- **Failure of the implementation** – Despite a successful service design, that defined the best solutions for the service implementation, the partner couldn't start the experimentation of the DRTS in time.

B5 Inter-relationships with other measures

The measure is not related to any other measures and will not be evaluated as a cluster.

C Evaluation – methodology and results

C1 Measurement methodology

C1.1 Impacts and Indicators

The table of indicators originally specified to evaluate the DRTS was as follows:

NO.	INDICATOR	DESCRIPTION	DATA /UNITS
1	Operating revenues	Revenues per PT pkm	Euros/pkm, quantitative, derived or measurement
2	Operating costs	Costs per PT pkm	Euros/pkm, quantitative, derived or measurement
13	Awareness level	Degree to which the awareness of the policies/measures has changed	Index, qualitative, collected, survey
14	Acceptance level	Attitude survey of current acceptance with the measure	Index, qualitative, collected, survey
15	Perception of PT accessibility	Attitude survey of perception of physical accessibility of PT network (distance to nearest PT stops)	Index, qualitative, collected, survey
18	Accuracy of PT timekeeping	Percentage of services arriving/departing on time compared to timetables (each city should fix the interval of time considered as a delay compared with timetable)	%, quantitative, collected, measurement
19	Quality of PT service	Perception of quality of PT services	Index, qualitative, collected, survey

Detailed description of the indicator methodologies:

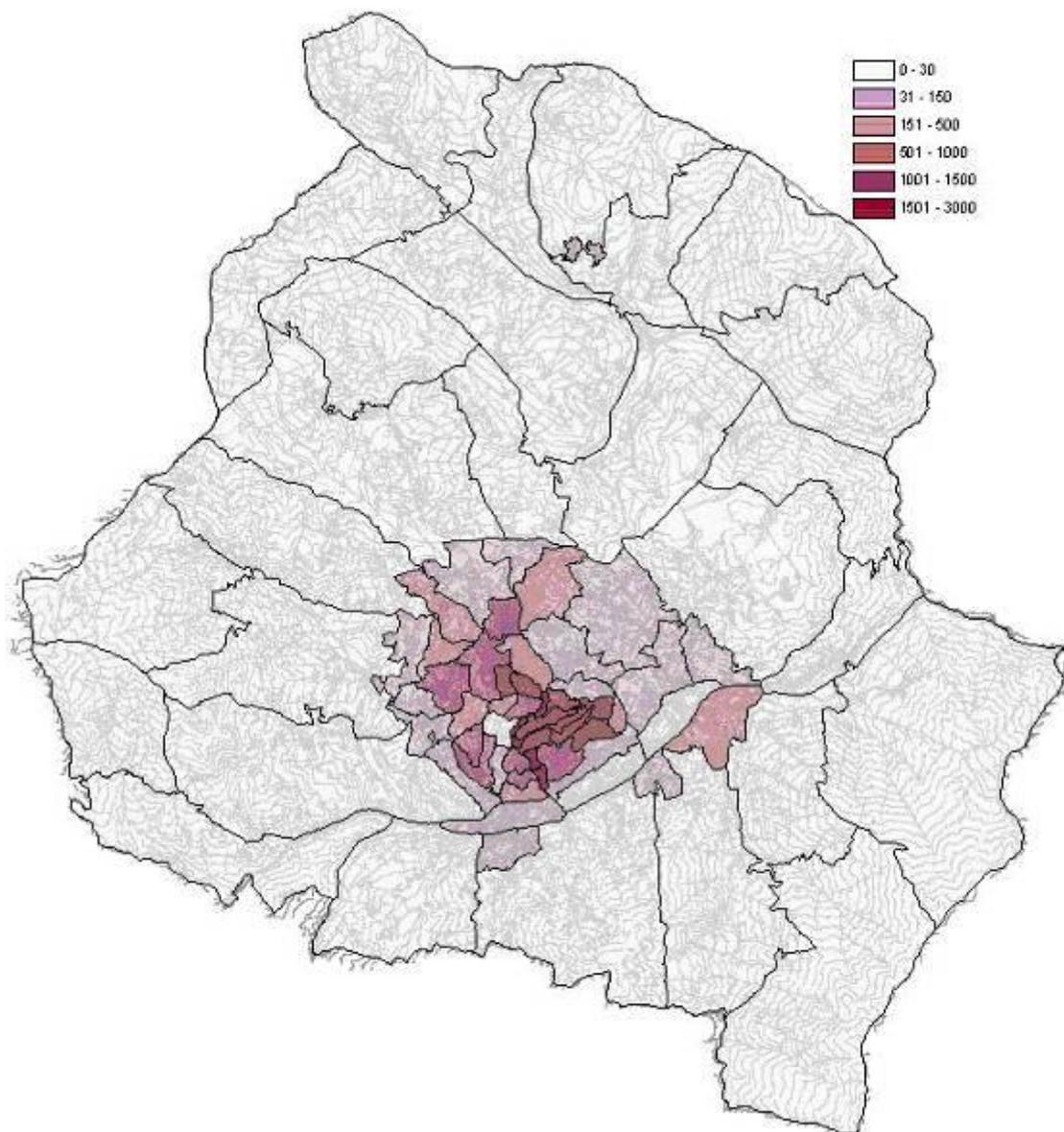
- **Indicator 1** (*Operating revenues*) – Desk modelling of the market to measure the income from the new transport offer via an increase in tickets sold.
- **Indicator 2** (*Operating costs*) – Measures the difference between the actual cost per km and the cost per km hypothesised for the DRTS service.
- **Indicator 13** (*Awareness level*) – Measures the level of information on the service.
- **Indicator 14** (*Acceptance level*) – Measures users' acceptance level
- **Indicator 15** (*Perception of PT accessibility*) – Measures users' perception on DRTS stops.

- **Indicator 18** (*Accuracy of PT timekeeping*) – This measures service quality with reference to punctuality.
- **Indicator 19** (*Quality of PT service*) – This measures the quality of the service using a Customers' Satisfaction survey.

C1.2 Establishing a baseline

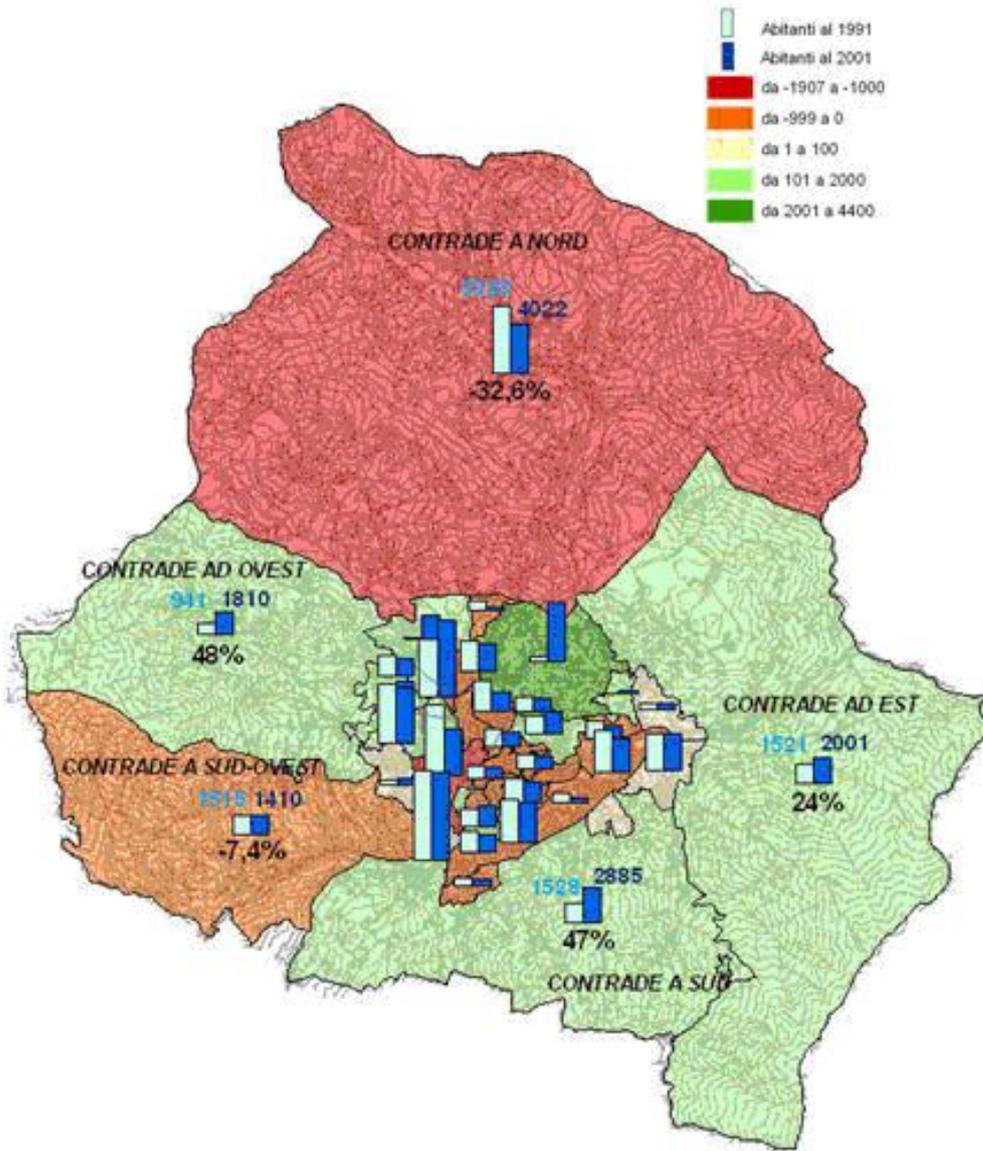
The city of Potenza, situated on a hill at 823 metres above sea level and crossed in the Southern part by Basento river, presents itself as a “closed” town. Due to its particular morphology, the town has not changed for long time and few modifications occurred in the historical centre. Only in 20's it started to develop outside the walls in different directions: southwards, close to the Basento valley, and northwards, in the S. Maria district. The Basentana highway, built between 1959 and 1970, improved the connection to the rest of the region and stressed the need for new services and appealing centres in the town. After the 1980 earthquake many changes occurred in the town, mainly the transfer of important functions and services from the city centre to peripheral areas in order to grant better accessibility from outside the town to regional and provincial services. This decentralisation and the creation of new traffic generators and expanding residential areas was not supported by appropriate accessibility infrastructures, unlike the development that happened in other Italian cities.

The Municipal area is large (174.06 km²) and population is not equally distributed. It is concentrated in central areas where most activities are localised and the accessibility to services is better. The south-western and northern areas are nearly uninhabited.



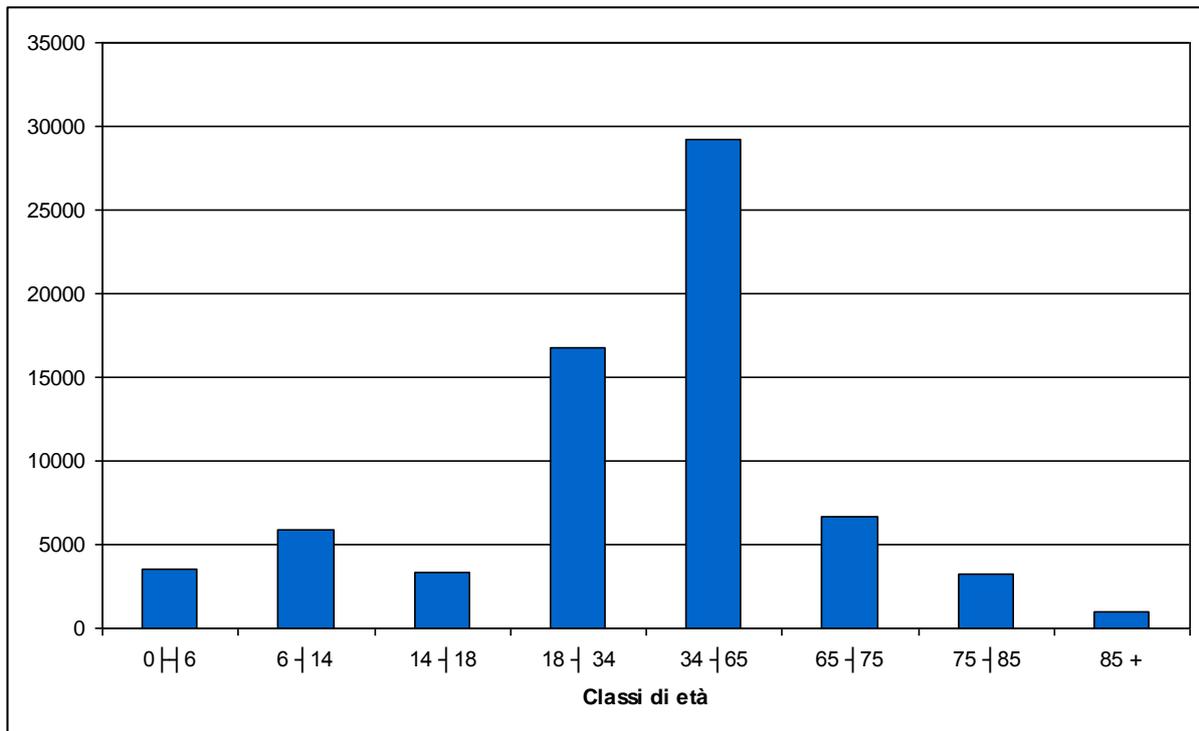
Population density

As regards the demographic dynamics, in the last 10 years we saw: the stability of the city centre, the increase in population of Macchia Romana and other hill residential areas.



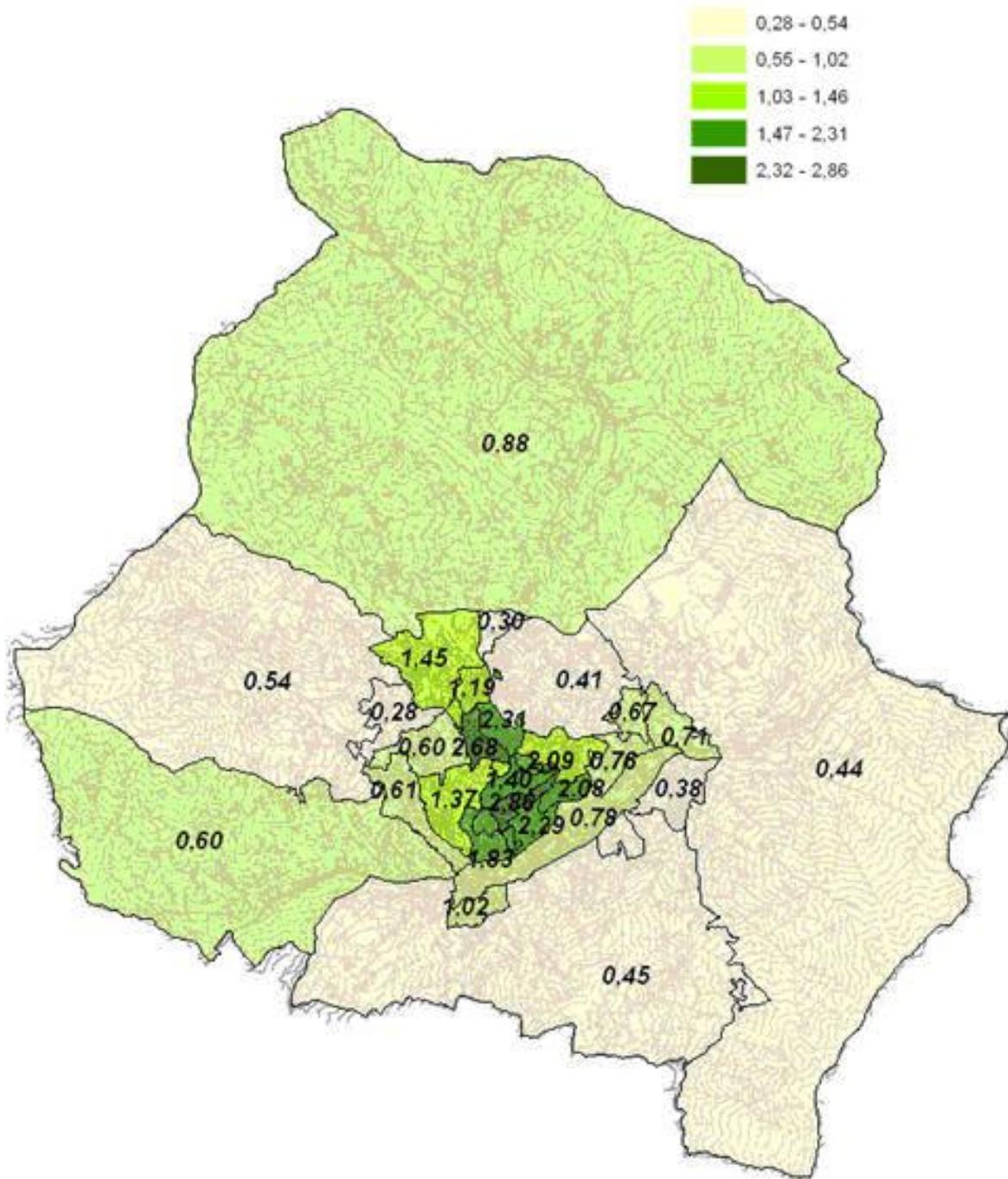
Population variations 1991-2000

The ageing index (ratio between the number of over 65 years persons and under age 14) is equal to 1.4. The two extreme classes are nearly equal. A description of age distribution is presented in the following graph:



Population distribution according to age classes

The disaggregated analysis per area shows values going from a minimum of 0.28 (Poggio Tre Galli quarter) to a maximum of 2.86 (city centre).



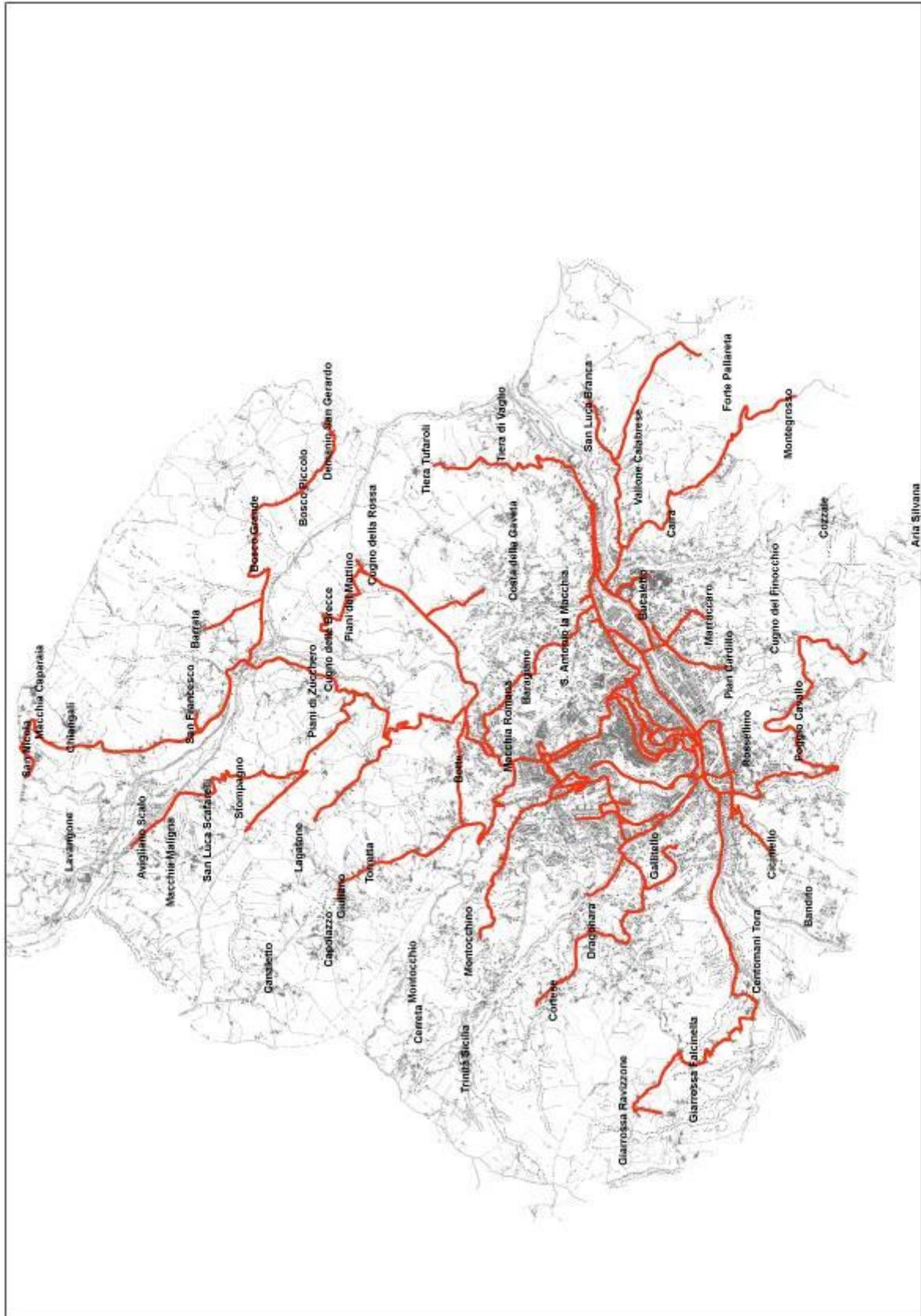
Ageing index distribution

The collective road transportation

The public road transportation is formed of:

- 11 urban routes, operated by CoTrAB and covering the central area;
- 5 rural routes, operated by CoTrAB and connecting some farthest areas to the city centre;
- 5 school routes, operated by CoTrAB;
- 24 rural routes, not operated by CoTrAB, connecting the farthest areas to the city centre.

The network structure and functions are heavily influenced by the town morphology and by the geometrical features of the network. These force vehicles to follow tortuous routes and require the use of minibuses rather than larger vehicles.



Rural routes not operated by CoTrAB

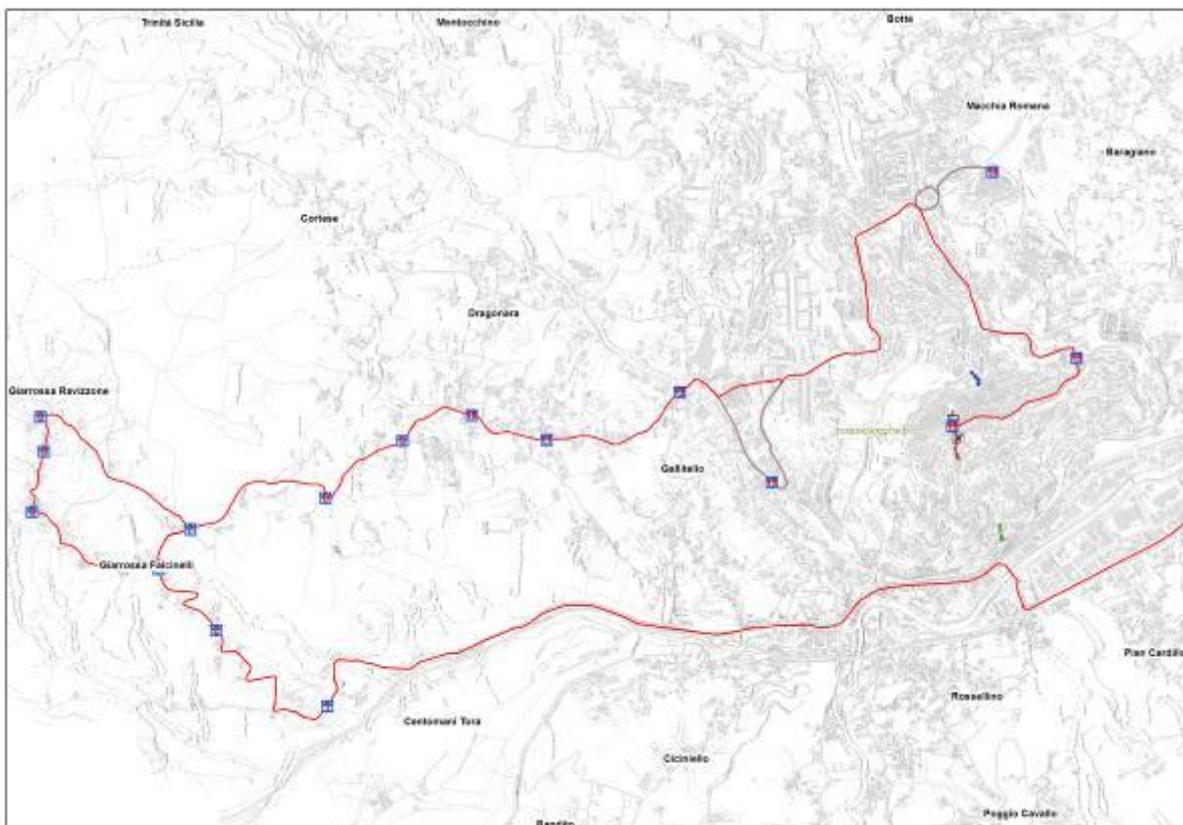
DRTS experimentation

The macro-zones where the service will be trialled are the South-Western districts; two areas in particular have been inspected.

The first one (Malvaccaro and Cerreta districts, Trinità Sicilia and Masseria Monaco) presents an important resident settlement and service users are mainly students. Road conditions are not favourable because somewhere constrictions and landslides are visible. This obliges the use of medium-small sized vehicles.

The second inspection has been carried out in the following districts: Dragonara, Giarrossa Ravizzone and Giarrossa Falcinelli. In these areas numerous houses are present and users are not only students but also people requiring the service on the weekdays. A critical situation could be seen on winter days since, with much of the road network being on steep slopes, snow and ice make difficult for vehicles to reach these districts.

Inspections of the service levels of present public transport system in these areas brought planners to choose to trial the service from Dragonara, Giarrossa Ravizzone and Giarrossa Falcinelli towards the Gallitello commercial area, the historical centre and the Hospital pole. Routes, stops and deviations design is attached in the figure. This area is actually served by two lines operated by CoTrAB (L14 and L15) and by the rural service not operated by CoTrAB, which is the most used since it includes routes for students.



DRTS design

C1.3 Building the business-as-usual scenario

The DRTS measure couldn't be implemented during the period of the SMILE project. Difficulties were met during the first years (due to a variation of local partnership) and the last year of the project (when problems related to the activation of service arose). Differently, the DRTS project was defined in each detail: typology of the service (fixed route with possible deviations) and management software (the one used in the previous project TWIST) were identified and the conditions to implement the measure in the months to come were created. At the moment it is impossible to evaluate the service as it has not yet been implemented. It could be possible instead to conduct an evaluation hypothesising that the service will reduce the gap existing between transport demand on offer in areas of weak demand and improve the system performance.

C2 Measure results

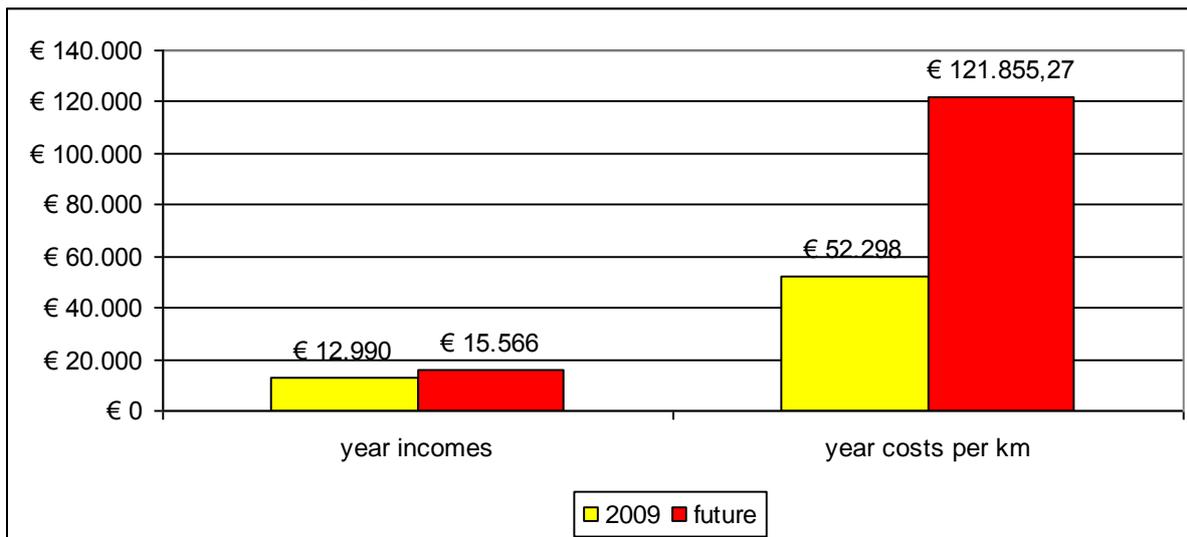
In the following sections indicators and predicted results are described. Since the service trial wasn't active during the project period, the evaluation of most indicators is a desk-based evaluation, while other indicators are assessed by hypothesising how they can be measured if the trial is launched. In particular, for section C2.1 Economy indicators (Operating revenues and Operating costs) a future scenario has been outlined since it is possible to draw different projections on the basis of some elements. The indicator "Accuracy of PT timekeeping" can be measured only after the trial. Other indicators (quality of PT service, awareness level, acceptance level, perception of PT accessibility) can be measured after a survey. Data about the present situation exists for some of them but it is not possible to draw an hypothesis, on the basis of future survey results and expressed in numerical terms, since in Potenza examples of trials of non-conventional transport to be used as a benchmark don't exist.

C2.1 Economy

Operating revenues: desk modelling of the income from the new service offer has been calculated to be an increase in tickets sold equal to 18%.

Most of present PT users are students using the rural transport services (see section C1.2). In the trial area, the number of monthly tickets sold is equal to 45 while the data referred to single ticket sales of 185. The aim of the Municipality of Potenza, through the implementation of this measure, is to improve the existing service network, adjusting the offer to demand and to gain user-share in order to better connect the rural areas to the city centre. The hypothesis drawn is the following: In a 2 year trial there would be an increase of 18% in tickets sales, which is estimated on the basis of statistical considerations linked to the demographics of the region. To place this in context, most present bus users are students between 6 and 18-years old, a group that represents 12% of the total population. Considering that one of DRTS objectives is to increase and diversify users' classes of 18 to 65 years people, an increase of 18% (equal to 1.5 times the weight of young people class), does not seem unreasonable, but can only truly be tested in operation. The variation in incomes and costs per year is represented in the following figure (the service will be offered at the standard cost of a single ticket, € 0.50, and of monthly tickets, € 22.00).

Operating costs: This measures the difference between the present cost of PT per km and the same cost hypothesised for the DRT service. The cost of rural services actually paid by the Municipality of Potenza to operators is € 1.00 per km. The feasibility study related to the DRTS in the rural areas of the city of Potenza, realised within AGATA project, estimates a cost per km equal to € 2.33. It is important to consider that the cost per km in DRT services is not directly comparable to data referring to conventional services. Within the DRT service, an indicator such as the cost per km must be carefully interpreted. On the contrary, the cost per hour seems to give better information; in this case this value is equal to € 45.94 (the non-conventional public transport hour cost is nearly € 35.00). The parameters for the evaluation of such costs derive from a benchmarking of major LPT companies operating the extra-urban service in areas sharing the same features with the town of Potenza.



C2.2 Energy

n.a.

C2.3 Environment

n.a.

C2.4 Transport

Accuracy of PT timekeeping: This indicator measures the service quality in terms of punctuality. One of the most important features of DRTS is the punctuality of the service, granted by the planning of routes on the basis of previous users’ calls. Exceptions are made in case of force majeure. In the following table is shown, as an example, an hypothesis of a DRTS morning timetable, verified by covering the route with the same bus that will be used in the trial.

bus stop	departure time
1	10.12
3	10.16
4	10.18
6	10.20
7	10.23
8	10.26
9	10.27
10	10.28
11	10.30
12	10.31
13	10.33
14	10.45
15	10.49

Quality of PT service: This measures the DRTS quality using Customer Satisfaction. In a preliminary phase a survey was carried out with the objective of contributing to the analysis of the problems and needs of LPT service users. A SERVQUAL model has been used through a distribution of a questionnaire to a sample of interviewees. The questionnaire, easy to use and schematic, with answers codified on a numeric scale from 1 to 5, makes the SERVQUAL a precious instrument to assess Customer Satisfaction. SERVQUAL is innovative thanks to its structure based on a double series of questions enabling separate evaluation of the user's expectations and perceptions. In fact, service quality is not an absolute value but comes from the comparative judgment expressed upon expectation and perception of the service. The SERVQUAL model uses a questionnaire made up of 22 questions aimed at separately measuring users' expectations and perceptions. Service quality, in this case, is evaluated comparing expectations and real performances. The objective is to stress the gap existing between the expected and perceived service.

The questionnaire used in Potenza surveys using the following classification of a service quality dimensions is shown in the appendix:

1. Aspects related to time (service speed, punctuality, regularity)
2. Aspect related to easiness of use (in fruition, instructions for use, post-sale assistance, warrantee)
3. Aspects related to information (if the service is understandable, clear, complete)
4. Aspects related to guidance and welcoming (signage, suggestions, pre-sale consultancy)
5. Aspects related to physical structures (attention to the environment, comfort, cleaning, materials and equipment quality, systems efficiency, localization, transport, logistics)
6. Aspects related to social and human relationships (courtesy, reliability, readiness, personnel competence, personalisation of treatment).

The statistical analysis of interview results takes into consideration some statistical indexes defined for both:

- Total results of the two questionnaires blocks;
- Results related to single items couples sharing the same number in the two sections of the questionnaire.

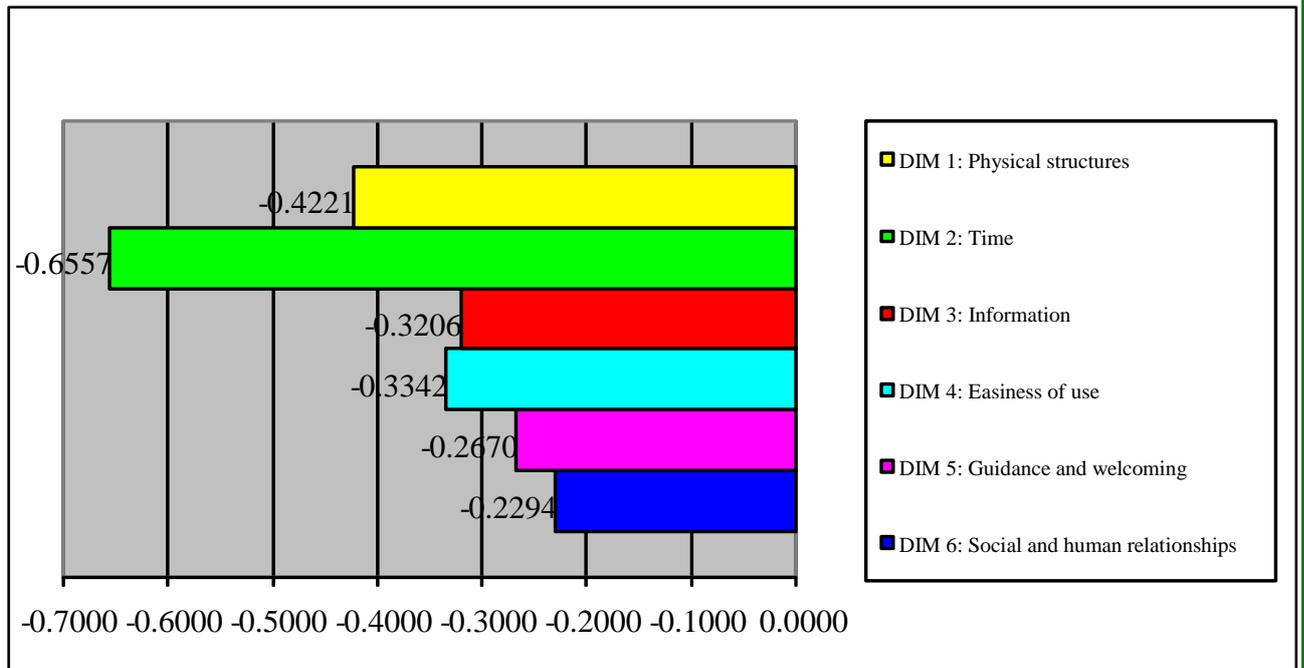
The difference between the average total result of sections and the result of each single item related to quality perception and expectations will constitute the result of users' satisfaction.

The questionnaire was distributed to a sample of 205 local public transport users.

The total Customer Satisfaction Index (CSI) scored was equal to -2.2293%. The negative sign means that the perceived quality is inferior to what is expected. This result was clearly predictable in the light of the crisis affecting the whole public transport sector and the specifically the city of Potenza. It will be interesting to use the same survey methodology again when the new local public transport system is active in the town: new routes, opening of new mechanised systems, the surface railway, enlargement of LTZ in the historical centre.

Single interviews results have been calculated obtaining the average SERVQUAL (CSI) scores related to each dimension.

The following graph shows, in percentage terms, the CSI of each user with reference to the six dimensions considered.



CSI related to six dimensions

The results clearly show that, for each dimension, users’ perception of service is inferior to expectations. The dimension which shows the highest gap existing between expectations and perceptions is dimension 2 “time”, meaning that present waiting time, and the passage of vehicles along bus stops according to the fixed time, is too high and this causes, as a consequence, the loss of a great number of users.

At the moment, other applications of the SERVQUAL model for the measurement of Customer Satisfaction related to public transport were not found; therefore it is impossible to compare our survey values with other similar experiences.

C2.5 Society

Awareness level: This measures the level of information about the service. At the moment the services offered by CoTrAB (with routes L14 and L15) and by other operators are the ones existing in the whole territory. In the new DRTS design a wide informative campaign directed to all residents of interested areas, to be realised through local TV, leaflets, brochures, has been planned. It is expected this will create an increased and constant users’ information level.

Acceptance level: This measures users’ acceptance level. Also in this case, due to the failed implementation of the measure, it is only reasonable to hypothesise that the acceptance level is high. The hypothesis matured during the phase of service definition: in fact, the whole project (bus stops included) has been planned taking as a starting point the on site inspections and users’ requests to operators: All this justifies the expected high acceptance level.

Perception of PT accessibility: This measures users’ perception of the bus stops. The drts service was defined on the basis of an analysis of population distribution in the trial area and transport needs. Therefore bus stops have been located in positions where accessibility is high (see the following table). Only the bad state of some roads produced in some causes an inferior accessibility level; this is due to the particular morphology of the land, which creates difficulties for the passage of buses, even the small sized ones, in the roads chosen for the service. In the following table distances among bus stops are identified:

departure	arrival	length (Km)
Depot	1	10.5
1	3	1.5
3	4	1
4	6	1
6	7	1
7	8	1.3
8	9	0.7
9	10	0.5
10	11	0.8
11	12	0.9
12	13	1
13	14	4.4
14	15	2.4
15	16	1.3

Total**28.3**

C3 Achievement of quantifiable targets

No.	Target	Rating
1	Operating revenues	0
2	Operating costs	0
13	Awareness level	0
14	Acceptance level	0
15	Perception of PT accessibility	0
18	Accuracy of PT timekeeping	0
19	Quality of PT service	0

NA = Not Assessed 0 = Not achieved * = Substantially achieved (> 50%)
 ** = Achieved in full *** = Exceeded

C4 Up-scaling of results

Potenza has a wide land surface and, over the years, an urban core and widespread residential settlements developed with areas of low public transport demand. Public transport in these areas is affected by a fragmentary management of the system. In such a scenario, a transport model like DRT greatly improves the present poor performances. The new Public Transport Schedule, that will be in force when a new operator of the integrated system is identified, is aimed at improving present performances by intensifying buses frequencies and promoting a definitive (that is not only experimental) demand responsive transport service.

C5 Appraisal of evaluation approach

The overall delays in the implementation of the measure compromised the whole process of evaluation, both in the sense of:

- Getting useful data to the standard required for evaluation, and
- Introducing innovative elements in the assessment of an initiative already registered in the past years thanks to spontaneous agreements.

C6 Summary of evaluation results

The key results are as follows:

- **Key result 1** – Demand Responsive services, in Italy at least, are far from economical in terms of the balance between service costs and revenues received. Although the modelled results are still to be tested in practice, the local authority fully expects to subsidise the service to the tune of €100,000 per year, which is normal for local authorities in Italy as a contribution to basic mobility provision to peripheral and low population density areas.

D Lessons learned

D1 Barriers and drivers

D1.1 Barriers

- **Barrier 1** – Difficulties in implementing the service in the first years and local partnership variation.
- **Barrier 2** – Brief implementing time available.

D1.2 Drivers

- **Driver 1** – Measure leader know how: the partner in charge of the implementation of the service is skilled in the service offer having participated in a past European project related to the experimentation of a DRT service in an Italian city.
- **Driver 2** – A customer satisfaction survey helped the institutions to understand how much people living in peripheral and weak demand areas are unsatisfied about the actual public transport offer and how necessary innovative services are to satisfy their demand.

D2 Participation of stakeholders

Stakeholder 1 - Potential public transport users, public transport users living in weak demand areas and potential users of an experimental dial-a-ride system have been interviewed through the distribution of a "customer satisfaction" questionnaire.

D3 Recommendations

- **Recommendation 1** - The partner/s in charge of the implementation of a DRTS service must necessarily be a local actor in public transport in the town. The partner must have full awareness of the context the partner will act in, of its features and its needs, in order to achieve maximum efficiency in the service offer.
- **Recommendation 2** – It is very important to involve in the preparation phase (design of the service) the target and potential users in different ways and methodologies (e.g. through a customer satisfaction survey)
- **Recommendation 3** – A DRTS service, that can be considered a strategic action within the management of a mobility system, must be pursued despite any barrier or difficulty

D4 Future activities relating to the measure

The implementation of the Demand Responsive Transport Systems (DRTS) has been one of the most interesting actions in the CIVITAS-SMILE project in POTENZA.

From the beginning, this initiative has represented an important step for the implementation of the whole reinforcement and re-organisation of the local public transport, all geared towards the macro-aim that is the reduction of the private car use. The achievement of this aim made, during recent years, the attention of the Local Municipality was towards the transport economical-financial sustainability above all for the rural areas in which there is a wide transport demand (done by an improvement of the services versus the decreasing financial resources).

In this context, for Potenza Municipality (as for all the Italian Municipalities with an important decrease of the available financial resources), the Demand Responsive Transport System has been almost obligatory because it is necessary in order to achieve two different aims:

- 1- To guarantee, in public transport, better and more services.
- 2- To be in line with the financial budget bonds.

Therefore, during the whole CIVITAS project, this service trial has been immediately set as a new opportunity in order to check the impact of it on the Potenza local territory. This CIVITAS phase has coincided with a wider phase related to public transport re-planning by the local government, throughout a continual comparison between the municipality and the manager, CoTrAB (that is the local manager of the transport in Potenza, until the complete development of the local ongoing tender, in accordance with new national and regional law).

This situation has certainly impacted on the implementation of the measure; first of all due to the delay of the planning and final approval of the new local public transport schedule; then for the execution of the demo. In fact, even if CoTrAB started from a previous experimented and realised experience in Puglia Region, the local manager had some difficulties in taking the software necessary to the trial start step.

The aim of maximising CIVITAS impact, in a synergic way with a wider increasing action in local public transport sustainability, had some delays due to integration of the local activities, becoming incompatible with the CIVITAS-SMILE realisation times.

Nevertheless this situation, even underlining a partial ineffectiveness of the measure, has not limited the positive impacts of an action that will be implemented, even though temporary realisation of CIVITAS-SMILE.

Starting from the formative and planning phases, the strategic value of the service implementation is confirmed in a wider activity for the local transport implementation that Potenza Municipality is carrying out.

In these days and in the scenario of the mobility initiatives, Potenza Municipality is approving a new urban plan able to re-design the town-planning and the whole Potenza area in accordance with the new regional urban law and, above all, is working on Strategic Plan which will re-plan the Potenza metropolitan area and the ten municipalities of the hinterland.

Starting from the project of a new sustainable mobility that fulfils the accessibility demand, this strategic project is involving some public and private stakeholders, in connection with the city of Potenza, and is increasing the competitiveness by reinforcing its ability to be the crux of the services offered.

The most important implementation field of this service is represented by the rural and hinterland areas, e.g. only 10,000 inhabitants for Potenza Municipality. In fact, considering the specific area of the urban settlements of the Potenza area (in which there is a high sprawl of residential areas, services supply and working/studying areas), this re-planning of the public transport has to be able to guarantee a good alternative to private means of transport (the car!).

Starting from the demo-phases (that are scheduled in the coming months), the Local Municipality would like to re-articulate the entire system of the rural areas connection to the City, in this context, by choosing the areas in which the Demand Responsive Transport Systems have to be, it will be possible to re-distribute the service users in the best way.

CoTrAB is working on this possibility and will find its implementation with the complete development of the local ongoing tender because it will take over the temporary entrustment of the transport service.