Measure title: **Clean High Mobility Corridors in Genoa**

City: **Genoa** *Project:* **Civitas Caravel** *Measure number:* **08.01**

A Introduction

A1 Objectives

The general aim of the measure is to increase the quality, accessibility and attractiveness of Public Transport by implementing a Clean High Mobility Corridor Network along the whole town (including the already existing corridor in the east side of Genoa managed by line number 17 transformed into a clean high mobility route) that will ensure an improvement of services for PT customers through:

- a higher regularity of buses,
- increased average speed,
- high quality information

A2 Description

AMT and Municipality of Genoa agreed on a joint programme for introducing a high mobility corridors network (including the transformation of the existing corridor on bus route 17 into a clean high mobility route). According to this programme the Municipality of Genoa is in charge of extending Genoa's reserved bus lanes network (from the existing 23 km to 40 km adding about 17 km: 11 Km during 2006 and 7 Km in 2007); and **AMT is in charge of transforming the above reserved bus lanes into a High Mobility Corridor Network.** The transformation of "reserved laneways" into a system of fully integrated quality bus corridors, depends on several activities such as: introduction of new ecologically friendly and comfortable buses; new information services (static and in real time in bus shelters, on bus stops and on board - in both audio and visual format – linked to a new Automatic Vehicle Monitoring System AVM); new monitoring system to avoid the illegal use of the bus lanes; specific information and marketing campaign to promote the right use of bus lanes; extensive bus priority system at traffic lights along the Network, etc.

B Measure implementation

B1 Innovative aspects

The innovative aspects of the measure are:

- **New conceptual approach.** This is based on the High Mobility Corridors Network Concept as a complex of interrelated and integrated *measures* contributing to the success and appeal of the public transport system in Genoa.
  This Concept – never designed before the Caravel Project – deals with the transformation of the reserved bus lanes (the existing and the planned ones) into a quality bus ways implementing several activities and factors:

- *virtual* isolation of the reserved lines from private traffic by a specific bus lane control system based on fixed gates and AMT Ausiliari del Traffico (Traffic Auxiliaries) for a better monitoring and control of the reserved bus lanes and whose goal is fining the illegal uses of them (circulation and parking of not authorized vehicles);
- new *static* travel information devices (such as new ranging rods, totems and other name-plates) in the bus shelters, at the bus stops and in the main intermodal transport nodes interesting the corridors (with information upgrade on bus line table and path, connection with other public transport operators, point of tourist interest,…).
- new *dynamic* travel information: real time information (linked to the new AMT Automatic Vehicle Monitoring System - AVM) at the bus stops in the corridors with new and improved "smart devices" (next bus arrival time and other service information i.e. route change); next stop information and general service information on board
- optimisation of the traffic lights in order to give priority to bus traffic;
- improvement of the bus stops to make the entrance on board easier;
- campaign to promote the right use of the reserved lines to avoid misuse and to fine not authorized circulation or parking along the reserved lines and bus stops;
- introduction of new clean vehicles

- **New technology/ITS** New AMT AVM system based on GPS/GPRS including new smart *devices* at the bus stops; new on board equipment to provide, in real time, information to the passengers (about the next stops and any other information about the services) in both auditable and visual formats. New fixed optical gates and electronic devices for a better control of the reserved bus lanes

- **Targeting specific user groups.** In Italy some categories of drivers/vehicles - such as disabled people, taxis, Police, emergency vehicles, etc. - have, according to the national law, the right to transit on the reserved bus lanes. Always according to the law, some other categories can get special permits to transit on the bus lane thanks to a Mayor act. Accordingly AMT, in its role of concessionaire, defined (by negotiating with the Municipality of Genoa, the Municipal Police and some Municipal Technicians) that the user that are also authorized to travel on the bus corridors will be included in a so called *white list*, where the rules for the use are also specified. Those included in the white list were requested to communicate their plat number; this was informed with a special newspaper campaign. In particular special attention has been dedicated to disabled people. Procedures to avoid fining this user group have been discussed with the relevant organizations formalised and promoted (using different -- as already wrote - information and data transmission channel different channel such as media, mailing, internet, etc.). Moreover, more than 7000 letters have been sending to the disabled people.

- **New economic instrument.** A system of penalties about the extension of the reserved bus lanes (activity in charge on Municipality of Genoa) agreed between AMT and Municipality of Genoa. In accordance with this system, in the event of not creations of the new bus lanes, Genoa Municipality will be paid to AMT a penalty (penalty will be calculated taking into account length of the line not authorized and/or the number of days of delay in comparison to the planned schedule of the new line authorizations and relevant realizations). On the other hand, Genoa Municipality asked to AMT to take care of all the actions and investments to transform the reserved bus lanes network in a real High Mobility Corridor Network (including the development of the bus lane control system). For

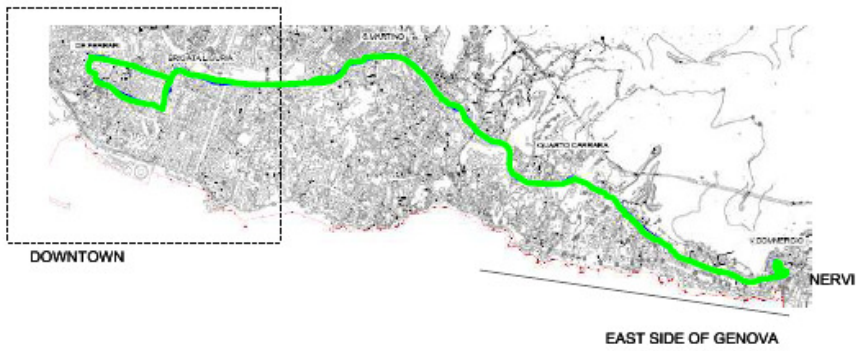
helping AMT in this effort, a new and innovative approach of using financial resources has been developed. In details: according to the agreement between Genoa Municipality and AMT, the revenues from fines made by AMT (using fixed gates and Ausiliari del Traffico) for misuse of the bus lanes (circulation and parking of not authorized vehicles) has been assigned to AMT (normally, in Italy, revenues from these fines, even if imposed by licensed personnel of PT companies, enters in the account of the relevant municipalities) and the 50% of revenues coming from AMT's fines has to invested by AMT in measures to improve the public mobility (including those expected by this measure such as bus stop design that considers improved access for everyone including people with special needs and the elderly).

- **New organisational arrangements or relationships**
  - Agreement with AMT and Municipality of Genoa about the bus lanes, their enforcement and the relevant responsibilities. **Municipality of Genoa is in charge to realize the extension of the Genoa reserved bus lane network** (from 23 km existing in 2005 to about 39 Km in 2008). **AMT has the role of concessionaire of the reserved line network. This role includes all the projects, actions and investments to transform the reserved line network in a real High Mobility Corridor Network** and to implement and management the relevant monitoring and enforcement control system based on fixed gates and AMT Ausiliari del Traffico. Please note that AMT is the first PT Company in Italy having the role of concessionaire of the reserved bus lines network. Normally in Italy this role is responsibility of the Municipality.
  - Agreement and procedures with AMT, Municipality of Genoa and Municipal Police to regulate the different phases, activities, the relevant rules and process owners per phase/activities of the complex process for fining (such as the activity and procedures of assessment the made violations by fixed gates or AMT Ausiliari del Traffico, the payments and the not payments of the fines, appeal procedures for fining, the management of the revenues from fines and so on).
  - Agreement with the relevant Disabled People Organizations about the procedures to avoid fining disabled people (in Italy they have the right to use reserved lanes). This procedure has been formalised and promoted (using media, mailing, internet, etc.). ·– Please see also the above relevant point **Targeting specific user groups**

B2 Situation before CIVITAS

Before CIVITAS there were 23 Km of reserved bus lanes spread along the town; the only big corridor, was the East inland corridor (bus route number 17).

Figure 1. Bus line 17



Concerning information services there were 20 smart devices giving only real time information about bus waiting time; the AVM - Automatic Vehicle Monitoring System (also linked with the real time devices at bus stops) installed only on a part of the fleet (about 65%). Moreover this AVM system was based on the radio technology.
The static passengers information at the bus stops showed summary information on the bus number line, path and timetable.
The bus lanes control was only made using human resources - Municipal Police and AMT Ausiliari del Traffico (AMT personnel in charge of fining the illegal use of bus lanes). Few people were dedicated to this activity, in particular for AMT it was a marginal activity, no significant.
The bus fleet (more than 800) was mainly based on Euro 0, Euro 2 and Euro 3 buses

B3 Actual implementation of the measure

The measure was implemented in the following stages:

Stage 1: Design of the High Mobility Corridor on 17 bus line route. Definition of the new strategy about the corridors dedicated to public transport and the relevant control. Preliminary design of the whole network of corridors in Genoa (from the 23 km existing reserved lanes to about 40 km within 2008. Design of the High Mobility Corridor Network concept *(from January 2005 – to February 2006)***:**

From January to November 2005 the activities developed was mainly focused on the design of the High Mobility Corridor for **bus line 17** (it means the transformation of the existing corridor running along Corso Europa links the extreme east of the town – Nervi - with its downtown). According to this focus, analysis of the *state of art* of this corridor has been done as well as the first design of the high mobility route concept (including the IT traveller information services, bus priority traffic lights, new clean buses).

From November 2005 the elaboration of a new AMT strategy about the extensions of thecorridors dedicated to public transport and the relevant control started up. More in details:

- a study has been carried out by AMT for the extension of the current network of the Genoa reserved lanes;
- the study have been negotiated with the Municipality of Genoa;
- accordingly to the negotiation it has been decided to realized 11 km of new reserved lanes during 2006 (**the map is reported in the following - Stage 2**) and another 5 km during 2007 (activity in charge of Municipality of Genoa).[1]

Considering that the Corridor of bus line 17 linking the extreme east of the town (Nervi) with its downtown has been already created and works well, the new priorities arose from the above mentioned study are at first all the Val Bisagno (east side valley) and the Val Polcevera (west side valley). Being priorities the corridors on the two valleys, they have been designed by AMT not only in terms of path but also (and mainly) in terms of way to improve commercial speed and the regularity of the services (bus priority system and control access system for fining not authorised vehicles on the reserved lanes); way to improve travellers' information (by real time

[1] This extension (**in charge of Municipality of Genoa**) was formalised in the *Contratto di servizio* including the system of penalties about the extension of the reserved bus lanes: in the event of not creations of the new bus lanes agreed, Genoa Municipality will be paid to AMT a penalty (penalty will be calculated taking into account length of the line not authorized and/or the number of days of delay in comparison to the planned schedule of the new line authorizations and relevant realizations)

VMS at the bus stops); way to improve the comfort of the passengers (by using new buses); way to promote the use of the corridors (by wide media campaign and door to door marketing activities).

Moreover the High Mobility Concept with reference to the whole bus corridor network (the existing reserved bus lanes and the expected ones) has been elaborated by AMT. The Concept mainly based on:

- new travel information services (and the relevant *static* and *dynamic* information devices);
- new AMT's AVM system called Simon (also linked to the real time information);
- traffic light with bus priority system;
- bus lane control system;
- new buses ecologically friendly (clean fleet renewal program);
- other measures on the reserved bus lanes and areas where buses operated to improve public transport's mobility (bus stops with easy access for every one including people with special needs and the senior citizens; roundabouts instead cross roads, placing limities on parking).

AMT started up the implementation of the High Mobility Corridor Concept with

- the design of the traveller IT and bus priority system (with reference to the whole corridor network);
- chose of the technology to extend the existing AVM system to the whole fleet.

The study for the extension of reserved lanes have been used for defining and sizing the most appropriate solutions (both in terms of technology, performances and cost) for the travellers' real time information services and the bus priority system. Making reference to the whole network (present and expected) of reserved lanes it was possible to design a traveller information services as well as a bus priority system that will fit with the real needs of Genoa (and it has been possible to size the needed funds).
In particular, making reference to the whole network/town, AMT decided to improve the existing AVM system subdividing it into two subsystems:

- the subsystem related to the communication among buses and the control room
- the subsystem related to the communications between VMS equipment and other passengers' information equipment and the control room.

The first one will continue to be based on the radio technology, while the second one will be based on a new GPRS technology. In such a way it will be possible both to extend the AVM to the whole fleet and to install new equipment for passengers' information linked to the AVM.

About the **bus priority system:**

- started-up the assessment of the existing one (73 traffic lights with bus priority) to optimise its use both in term of performance (capability to increase the commercial speed of the buses) and organizational issues (persons from AMT and from the municipal traffic police, in charge of using the system to better manage the bus and private cars circulation).

About **new clean fleet**

- elaboration of the basic concept of the transition strategy plan and procurement of the first set of Euro IV buses **(Pls. See MERS 5.1)**

Stage 2: Design and implementation of the reserved lanes extension. Design and implementation of the projects and the relevant activities to transform the reserved bus lanes into High Mobility Corridors including a communication campaign to promote the bus lanes *(from February 2006 to January 2007)*

About the **new reserved bus lanes extension**

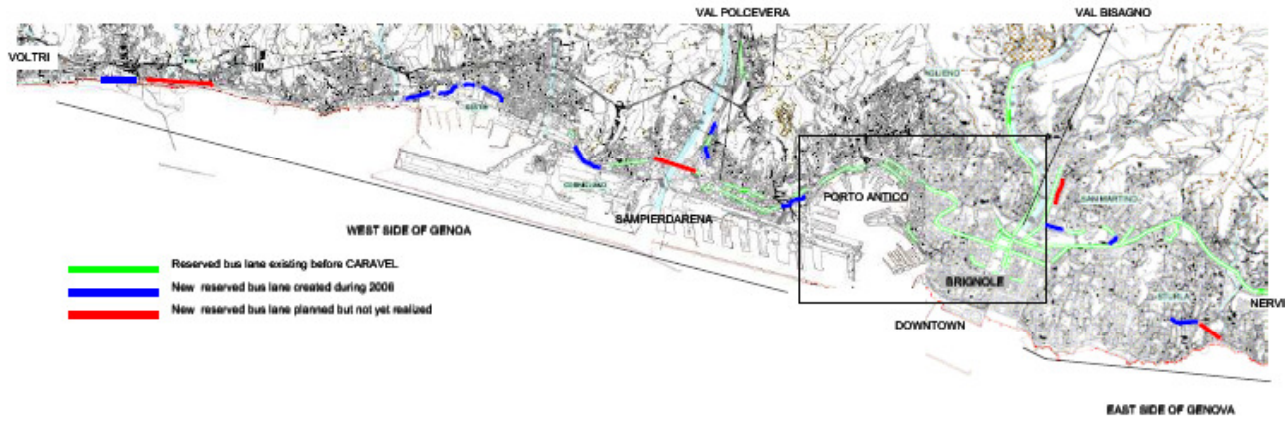
Finalised the design for extending the reserved bus lanes (from 23 Km to about 40 Km) and to create a quality busway network and the planning for the implementation of the new reserved laneways finalised.
In particular, AMT and Genoa Municipality technicians have carried out the detailed design of the 11 km of reversed lines to be realize within 2006 (activity in charge of Municipality of Genoa).

At the end of the second years of the Caravel Project Municipality of Genoa has created 5 km of new reserved bus lanes. Thanks to these reserved lanes new corridors have been created in Val Polcevera (Genoa west side valley), in Val Bisagno (east side valley) and in downtown (beyond the existing corridor interesting the bus line 17). The most part of these new reserved lanes (and the relevant corridors) interesting the bus line 1 and the bus line 18.

Please note that according to the programme agreed between Genoa Municipality and AMT for extending the reserved lane network, 11 km should be created by Municipality of Genoa within 2006 and other 6 km in 2007. Delay is due to the strong opposition arisen from local politicians, private car drivers and shop owners.

The following figure shows the new bus lane created by Municipality of Genoa during 2006 and the new bus lane to realize within 2006 but not created (as well as the existing reserved bus lane before CARAVEL).

Figure 2. Map of reserved bus lane (already existing, planned and realized during 2006, planned and not realized in 2006)



About the **High Mobility Corridor Network** (the transformation of reserved bus lane existing and planned into a system of quality busway in charge of AMT)

Finalised the Concept of Busway Network as well as the relevant projects concerning More in details.

Referencing to the **new information services**

The project about the new information has been elaborated taking into account the results arose from a study conducted by AMT in 2006 on the tools of information and communication to customers.
The study showed that:

- 40% of customers acquire information on their journey at bus stop and need to have more information during their travels (included information on board)
- 85% of customers considered the most beneficial information at the bus stop are those relating to the frequency, the detail of the route, points of interest in the area

According to this **new traveller information service in the bus shelters and at the bus stop designed and implemented**.

Upgrade of **bus shelders'** includes:

- maps of the immediate area,
- route maps,
- intermodality points,
- points of interest and information maps of the immediate area,
- bus line bus paths

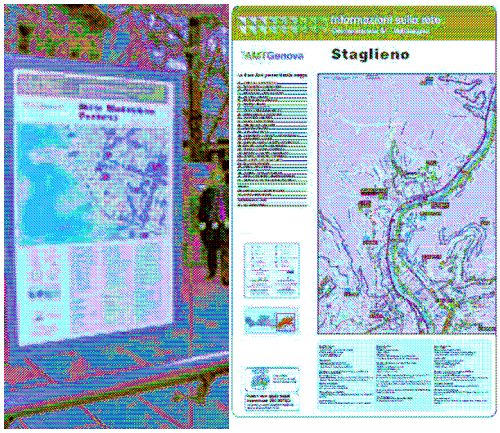


Figure 2
Maps installed in the bus shelters

The **new information at bus stop** includes a new model of totem that provides:

- identification of the stop;
- description of transit lines with full path;
- interchange connections and points of interest of the city,
- different time schedules (weekday, Saturday and holidays) and frequencies;
- passenger information notices to clients;
- mapping the network with maps for both points of interest both for interchanges along the line

Figure 3

The choice of the new structure was though through according to the following criteria:

- integration in the urban landscape aesthetics,
- visibility and accessibility (to make information easily accessible),
- alignment and adjustment to the morphology of the city

Figure 3 - 4
Types of the new passenger information installed at the bus stop

Figure 4

Referencing to **the real time information services and the new AMT's AVM system called Simon GSM/GPRS** based:

- designed the detailed system architecture of the new AVM as well as the relevant programme of the improvement and extension. More in details, after a feasibility study, it was decided that also the sub-system related to the communication among buses and the control room will works with the new GSM/GPRS technology (and not only the subsystem related to the communications between VMS equipment and other passengers' information equipment and the control room as decided in the first draft of the project).
  Accordingly to this the radio technology will be discontinued.
  The new project (elaborated by AMT) including not only the change of the technology communication system (from radio to GSM/GPRS) but also the introduction of 80 devices providing real time information at the bus stops about bus waiting time and other service information (i. e route changes) and the extension to the whole bus fleet of the on board devices providing next stop and general service information in both audible and visual formats.
  A new "smart device" installed on Val Bisagno Corridor

Referencing to the **Traffic light with bus priority system on the Corridors.**

- On progress the assessment of the existing 73 traffic lights with bus priority.

Referencing to the **Bus lane control system**.

- Designed the project based on fixed gates and AMT Ausiliari del traffico (supported by optical pens).
- Obtained the relevant authorizations to use the fixed gates on the reserved bus lanes (by the Minister of Transport) and to management the data and the complex activities of fining as well as the revenues providing for AMT'fines (by Municipality Genoa).
- Installed -and under testing phase - 4 prototype fixed gates on the corridors.
- **(Pls. See MERS 12.5).**

Referencing to **Clean fleet.**

- 31 Euro IV vehicles have been acquired. **(Pls. See MERS 5.1)**

Stage 3: Design of a new *policy* and programme (the AMT White Paper) *to resolve* the bus lanes' creation delay (in charge of Municipality of Genoa) – Design and implementation of the projects and the relevant activities to transform the reserved buslanes into High Mobility Corridors *(from February 2007 to January 2008)*

About **<u>the new reserved bus lanes extension</u>**

At the end of the third years of the Caravel Project the only new reserved buslanes are the 5 Km realized by Municipality of Genoa during 2006 (in December).
As already wrote, according to the programme agreed between Genoa Municipality and AMT for extending the reserved lane network 11 km should be created within 2006 and other 5 km in 2007. Delay is due not only to the strong opposition arose from local politicians, private car drivers and shop owners (during 2006), but also for the election of a new Mayor (May 2007).

Accordingly to this delay, **AMT elaborated** (and submitted to the *new* Municipality of Genoa in September) **a new policy and programme study - named *White Paper* -** identifying the principal problems and critical points in Genoa for the public transport's mobility (such as traffic jam, tailback,…) with reference to road sections with and without reserved bus lanes including a conceptual design activities for improving

actions. The special commission (decided and nominated by the *new* Municipality and composed by AMT and Municipality of Genoa to finalise the design and improving the relevant actions) began works doing priority to the Val Bisagno valley. A detailed design of public mobility in this valley has been carried out.

About the **High Mobility corridor network**

On going the transformation (in charge of AMT) of the reserved laneways dedicated to buses into a system of quality bus ways (high mobility corridor network) providing the following activities. More in details

Referencing to the **New Travel information services:**

- achieved the *first step* of the project concerning the upgrading of travel information and relevant ranging rods. More in details: 40 new "ranging rods", totems and other nameplates (with information upgrade on bus line time table and path, connection with other public transport operators, points of tourist interest, etc.) installed and launched at the bus stops and in the main intermodal transport nodes (railway-bus) interesting the corridors.
- stated up the second step of the project - concerning the upgrading of the travel information and relevant ranging rods for the **bus route 17** (and its relevant high corridor) More in details:
  - realized the first audit;
  - prepared; decided, published and assigned the international tender to purchased 600 new static information devices (acquired thanks to an international tender);
  - installed the first 25 prototypes of these new devices.
- *Real time information* with new and improved "smart device" called "paline intelligenti" (linked to the new AMT AVM system called Simon): till-up today installed 39 of the new 80 "smart devices"; 33 of them has been switched on and works in GSM/GPRS. **For achieved this result the following activities has been done**:
  - designed of the feasibility study for the installation of the new 80 smart devices;
  - designed the roll out of strategy for the installation of the first set of new smart devices;
  - requested and obtained the relevant authorizations for the laying of the installations;
  - extending of GSM/GPRS communication system on the smart device prototype. Moreover, considering the performances obtained by the new smart devices, AMT decided and acquired another set of 20 new smart devices. On progress the design about their locations. *See also the following relevant point dedicated to AVM system*.

Referencing to the **New AMT's AVM system called Simon GSM/GPRS based** (the project includes: the supply of the new 80 smart devices+ further 20 ones providing real time information at the bus stops about bus waiting time and other service information i. e. route changes; the extension to the whole bus fleet of the on board devices providing next stop and general service information in both audible and visual formats).

- On progress the new AVM software development.
- Designed and approved further technical upgrades of the system (for a better management during the delivery of the services and for the ex-post data analysis).
- Designed and approved the Risk Management Plan and the relevant Contingency Plan. Ready some prototype-buses with the new AVM system.

Referencing to **the Traffic light with bus priority system on the Corridors.**

- The new traffic light with bus priority system installed in the Val Bisagno corridor is under operation. .
- According to the results of White Paper, traffic light with bus priority has to be improved; consequently on going the meetings with the Municipality of Genoa and the traffic light with bus priority system operator have been to discuss the action plan for improving the traffic light with bus priority system.

Referencing to the **Bus lane control system**.

- From February two gates are providing fines, tender to buy the other gates (10+ further 8 optional gates) have been issued and assigned. Decide to install 15 ITS gates. Ready - in cooperation with the bid winner - the final and executive design and the documents for the relevant authorizations for the laying of the new 15 ITS gates. The project is now under evaluation of Municipality of Genoa and Municipal Policy **(pls. see MERS 12.5)**

Referencing to the **Clean fleet renewal programs**.

- All 14 new large clean Euro IV buses (18 m long) are under operation in the high mobility corridor network. A very innovative PT services (never managed before) entered in operation: the Navebus. **(Pls. see MERS 5.1.)**

Referencing to the **other measures on the reserved bus lanes and areas where buses operated to improve public transport's mobility** (*such as bus stops with easy access for every one including people with special needs and the senior citizens; round about instead cross roads, placing limits on parking*)

- Realized, and launched with a public opening ceremony, three experimental bus stops in Val Bisagno Valley with easy access for everyone including people with special needs and the senior citizens.
- **Works and activities to convert these bus stops into easy access bus stops** included:
  - elaboration of the feasibility study;
  - design of the technical and functional specification,
  - chose of the supplier,
  - activities and documents to the relevant authorisations.

This experimental project should be extended on the main bus stops on Corridor of bus line 17; in particular completed the project for converting 16 bus stops into easy access bus stops on Corridor of bus line 17. This project is now at the study of the Municipality of Genoa

Stage 4: New projects for new "long and continuous" reserved bus lanes to be transformed into Busway (*last Caravel Project Year)*

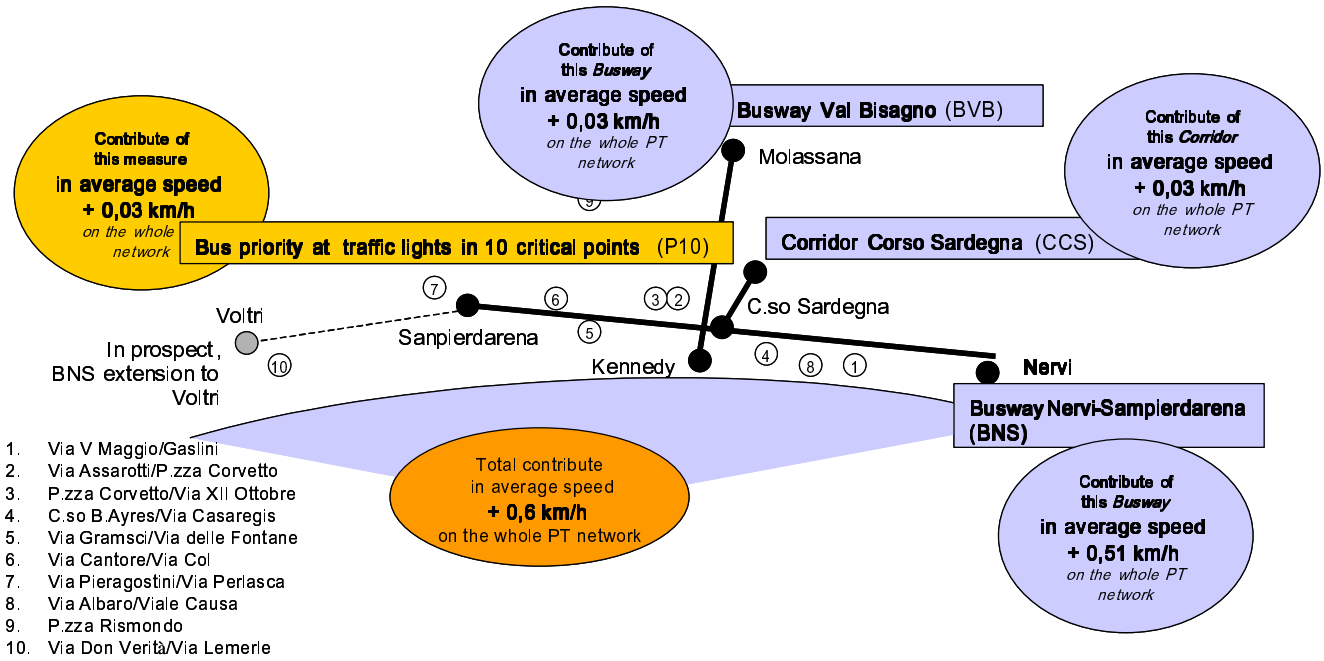
Redefined and completed the study of public mobility in Val Bisagno (carried out by the special commission composed by AMT and Municipality of Genoa [2]). It has been decided to realize a Busway. The two Local Municipalities, whose area are interested by the new project, evaluated positively the design. Accordingly, in Val Bisagno new long and continuous reserved bus lanes will be done and will be transformed into Busway. Started the detailed project of the Busway in Val Bisagno.
At the same time, it has been decided that the existing Corridor of bus line 17 will be extended till Sampierdarena. Also this new section will be equipped like a Busway

[2] As already wrote the special commission is in charge to finalise and improvement the relevant actions stated in the White Paper.

Amt is in charge to elaborated these relevant projects

The following Figure 4 shows the first draft of the project

Figure 4. Draft of the project for the new "long and continuous reserved buslanes" called Busways



B4 Deviations from the original plan

In origin (IR 2005) the Measure was designed making reference to the only high mobility corridor existing in Genoa at that time (run by buses of route 17). The Measure object has been enlarged (Amendment 2007) making reference to the new whole High Mobility Corridor Network.

The reason of **enlargement** of the scope of the measure:

- at the end of 2005 (November)[3] a new private partner, the French group Transdev, entered in AMT; so that now AMT is owned by Transdev (41%) and Genoa Municipality (59%). The two partners agreed on a joint programme for introducing other high mobility corridors in addition to the existing one on route 17, this has been done in order to increase bus speed and service punctuality and

[3] Context in short:
On December 2004 AMT (Public Transport operator in Genoa – 100% property of Municipality of Genoa) was subdivided into two companies: the new AMT- Azienda Mobilità e Trasporto S.p.A. (transport operator in charge of all transport services) and AMI – Azienda Mobilità e Infrastrutture S.p.A. (Public Mobility and Infrastructure Agency and company in charge of the maintenance of AMT's buses and other activities such as real estate and parking management). Both the companies were 100% owned by Genoa Municipality. During 2005 an international tender has been issued by the Municipality of Genoa to sell the 41% of AMT share to a private partner. The winner was the French Group Transdev. At the end of 2005 the new private partner Transdev entered in AMT; therefore now AMT is 59% property of Municipality of Genoa and 41% property of Transdev. Accordingly with the agreement between the two partners, the responsibility to manage AMT has been given to Transdev. Relationship between AMT and the Municipality concerning the PT service to be operated is now managed by a contract named Contratto di Servizio. Relationship between AMI and AMT first of all for bus maintenance is managed by three a contracts named Contratti Intercompany.

regularity and therefore to get the following results: less personnel costs, less fuel costs, less environmental impact, less accidents and relevant assurance costs, better quality service.

- During 2006, the 2006-2011 Business Plan (accordingly to the agreement between the two AMT's stakeholders Genoa Municipality and Transdev) has been prepared and approved by the Board of AMT and Municipality of Genoa. The Business Plan includes the agreement with the Municipality, the actions and relevant investments to create the High Mobility Corridor network in Genoa that is the subject relevant to this Measure. Accordingly to this programme **Genoa Municipality is in charge to extend the Genoa reserved lane network** (from the 23 km existing when the programme was decided to about 40 km); **AMT is in charge to transform the reserved lane network in a high mobility corridor network and to monitor and enforce the network** (pls. see MERS 12.5).

B5 Inter-relationships with other measures

The measure is related to other measures as follows:

- **Measure 5.1 -Transition strategy towards clean fleets in Genoa:** the High Mobility Corridor Network will be operated also by the clean vehicles expected within this Measure
- **Measure 12.5 - Bus lane control system in Genoa** The monitoring system of the High Mobility Corridor Network will be realised within this Measure

Measure title: **Clean High Mobility Corridors in Genoa**

City: **Genoa** *Project:* **Civitas Caravel** *Measure number:* **08.01**

C Evaluation – methodology and results

C1 Measurement methodology

C1.1 Impacts and Indicators

Table of Indicators

Evaluation Category	N°	Indicator	Units	Source of data	Methodology for indicator construction (survey, modelling, etc)	Baseline date
Environment	5	CO levels (San Martino)	mg/mc	AMT/ ARPAL Provincia di Genova/ SIRA	Measurement	2005
	6	NOX levels (San Martino)	ppb		Measurement	2005
	7	Particulate levels	microg/mc		Measurement	2005
Transport	18	Accuracy of PT time keeping	%	AMT	Survey with AMT's AVM System	**2006 (*)**
	23 24	Average bus speed peak/off peak	Km/h	AMT	Survey with AMT's AVM System	**2006 (*)**
	///	Passenger load	passenger load year n/ passenger load year n-1	AMT	Survey	2005

(*) Clarifications respect to the Evaluation Report:
Changed the baseline date (from 2005 to 2006) because the data of the Bus Line 17/ in 2005 concerning the accuracy of PT time keeping and the average speed peak/off peak are not comparable with the other years data, because during 2005 the journey of the bus line 17 was modified (and reduced about - 1 Km) for road works in Nervi

Detailed description of the indicator methodologies:

Indicator	Methodology for indicator construction	
Co levels Nox levels Particulate levels	**ARPAL**	**AMT can give to Arpal for these indicators the following data on annual basis**: • the average operated buses in the year for each type of buses and vehicles (i.e EURO 2; Euro 3, trolleybus) • the average Km done during the year for each type of buses and vehicles • the average age for each type of buses and vehicles **Methodology described by Arpal for the indicators CO, NOX and particulate levels** The annual average value of the hourly CO and NOX concentration and the annual average value of the daily PM10 concentration measured by the Corso Europa monitoring station are calculated

Accuracy of PT time keeping	• **Definition of accuracy of PT time keeping and unit**: number and % of the total **departure times** per year that are within the range – 2::+ 3 minutes around the time shown in the timetables • **Method of measurement and frequency**: AMT's AVM system (called Simon). The system surveys the data every day. Data is collected on monthly basis: Data is delivered for *evaluation* on annual basis • **Target group and domain**: PT services for the following bus lanes - **For year 2006:** data are collected for the bus- line 17 (the first high mobility corridor existing in Genoa) - **From 2007**: data are collected for the - Bus Line 17 - Bus Line 18 (because the new bus lane created during 2006 has impact on this bus line) - Bus Line 1 (because the new bus lane created during 2006 has impact of this bus line)
Average bus speed peak/off peak	• **Peak hours:** from 7.00 to 9.00 b. pm and from 17,00 to 19,00 a. pm • **Off peak hours**: from 6,00 to 7,00; from 9,00 to 17,00; from 19 to 21,00 • **Period of survey:** from the above half month of September to the above half month of June of each year • **Methods of measurement and frequency:** AMT's AVM system (called Simon) Data is collected for the period survey already detailed (from September to June) on monthly basis. The data is delivered for *evaluation* on annual basis • **Target group and domain**: PT services for some bus lanes - **For year 2006:** data is collected for the bus- line 17 (the first high mobility corridor existing in Genoa) - **From 2007**: data is collected for the: - Bus Line 17 - Bus Line 18 (because the new bus lane created during 2006 has impact on this bus line) - Bus Line 1 (because the new bus lane created during 2006 has impact of this bus line)
Passenger load	• **Definition of the passenger load:** number of passengers on the buses, running from 6.30 a.m to 9.00 a.m. during the winter services, of lines 17, 18, 1 surveyed in the relevant line section with max load. • **Methods of measurement and frequency:** survey, once a year • **Period of survey:** two days per year during the called winter bus transport services; output for each line is the average on the measurements done during the two days • **Target group and domain:** passenger load in the line section with max load of lines 17,18,1 - **For years 2005-2006:** data is collected for the bus- line 17'(the first high mobility corridor existing in Genoa) - **From 2007**: data is collected for the passenger load of - Bus Line 17 - Bus Line 18 (because the new bus lane created during 2006 has impact on this bus line) - Bus Line 1 (because the new bus lane created during 2006 has impact of this bus line)

C1.2 Establishing a baseline

This information for the baseline date is contained in the tables below for each indicator.

C1.3 Building the business-as-usual scenario

None of the results would have been obtained without to the implementation of this measure. The results are detailed in the following **paragraph C6. Summary of evaluation results**

C2 Measure results

C2.3 Environment

Indicators: CO levels, NOX levels, Particulate levels

Table 1: CO, NOX and particulate levels per each year measured in S.Martino area (by the Corso Europa monitoring station)

Indicator	Unit	2005	2006	2007	2008 partial data (not comparable)
CO levels (in S. Martino)	mg/mc	2,41	2,22	1,68	1,69
NOX levels (in S.Martino)	ppb	102,19	108,96	127,76	79,95
Particulate levels (in S. Martino)	microg/mc	35,43	42,42	33,50	37,39

Data reported in the Table for 2008 are not comparables with those of the other years because they consider only the period between 1/1/2008 and 31/10/2008. Instead the data of this indicator (as defined in the previous paragraph C.1.1.) refers to the entire year.

Generally speaking, the value of the CO levels decreased. CO pollution is strictly related to traffic emissions and it is particularly high in case of congested traffic (stop and go). The decrease of CO levels shows that the traffic in Corso Europa has been less congested and that the number of vehicles in the area has decreased. This may be due to the improvement of public transport services in Corso Europa and to the consequent increase in the use of bus instead of private vehicles.

NOx and PM10 levels haven't been clearly influenced by the traffic reduction; this is probably due to the fact that NOx and PM10 levels are influenced also by heating emissions and by other factors like sea salt events for PM10.

C2.4 Transport

Indicator: Accuracy of PT time keeping (% of buses departed within – 2 : + 3 min).

Table 2. % of buses departed within –2:+3 m per bus lines and per each year

	2006	2007	2008 Partial data (not comparable)
Bus Line 1	///	86,3%	90,1%
Bus Line17/	90,8%	93,8%	94,8%
Bus Line 18	///	86,9%	86,3%

Data reported in the Table for 2008 are not comparables with those of the other years because they consider only the period: from January to September 2008. Instead the data of this indicator (as defined in the previous paragraph C.1.1.) refers to the entire year.

Therefore **data will be comparables and significant only at the end of 2008** .

Moreover, in May 2008 , the Bus line 18 has partially changed the path.

Indicator: Average bus speed peak/off peak

Table 3. Average bus speed peak/off peak per bus lines and per each year

	2006		2007		2008 Partial data (not comparable)	
	Average speed peak	Average speed off peak	Average speed peak	Average speed off peak	Average speed peak	Average speed off peak
Bus Line 1	///	///	15,2 Km/h	16,8 Km/h	15,1Km/h	18,1 Km/h
Bus Line 17/	16,5 Km/h	17,6 Km/h	16,7 Km/h	17,7 Km/h	16,6 Km/h	17,7 Km/h
Bus Line 18	///	///	14,6 Km/h	15,8 Km/h	12,3 Km/h	14,1 Km/h

Data reported in the Table 3 **for 2008 are not comparables** with those of the other years because they considered only the first part of the "*winter services*" (January – June 2008).
The period of survey of this indicator, as defined in the previous paragraph C.1.1, is*: from the above half month of September to the above half month of June* **of each year**.
To clarify "each year" is referred to the calendar year. It means, in terms of calendar year, so the period of survey is: January - half June **+** half September - December **of the same year**.

Therefore **data will be comparables and significant only at the end of 2008**.

Moreover, in May 2008, the Bus line 18 has partially changed the path.

Indicator: Passenger load

Table 3 shows the **number of passengers** on the buses of lines 17, 18, 1 **surveyed in the relevant line section with max load**

Table 3. Number of Passenger load per Bus Line in the relevant section with max load and year and the relevant indicator

Bus line	Line section with max load	N. of passengers on the buses surveyed in the line section with max load (average data of two days of measurements)				Indicator Passenger load year n /passenger load year n-1			
		2005	2006	2007	2008	2006 vs 2005	2007 vs 2006	2008 vs 2007	2008 vs 2005
17/	Corso Gastaldi	2.124	2.423	2.273	2.863	1,15	0,93(*)	1,26	**1,35**
18	Piazza Nunziata	///	///	2.600	2.604	///	///	1,00 (*)	
1	Piazza Massena	///	///	1.615	1.607	///	///	1,00 (*)	

(*) Due to the limited sample, the delta between one year and another one is in the frame of statistical error

C3 Achievement of quantifiable targets

No.	Target	Rating
1	Increasing of accuracy PT time keeping (+ 1,5% at the end of the Caravel project)	**
2	Increasing of average bus speed (+ 0,1 Km/h at the end of the Caravel Project)	**
3	Increasing of passengers load (+ 0,5% at the end of the Caravel Project)	***

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

C4 Up-scaling of results

The new about 17 km of reserved bus lanes planned is already the maximum number that it is reasonable to create in a city like Genoa.

The complete fulfilling of the extension program of the quality corridors network (that foresees the construction of aprox. 17 km of new reserved lanes for PT) **would lead to a saving in terms of travel time for passengers** using the lines that transit these planned new reserved lanes **of about 3.200 hours a day**.

Methodology used for the calculation
For every new part of lane to carried out, the average trip duration for every time slot of every bus line using that sector without the reserved lane has been calculated (info obtained from AVM). The average travelling time in the time slot 13.00- 14.00 (generally being the fastest slot due to a lower density of traffic) it has been assumed as the average standard time that might occur in case the reserved lane is introduced.

For every time slot the expected benefit has been calculated (in terms of potential time saving) as the difference between the measured time without the reserved lane and the average standard time.

Calculated in this way Delta has been multiplied by the number of programmed transits for every time slot (the estimated passengers have been calculated multiplying the number of programmed transits for the average capacity of every bus and for the filling coefficient); the result is the time saving per passenger for each time slot. Details are reported in the following Table

Table 4. The estimated time saving for the all passengers load per each new lanes to carried out

New lanes to carried out location and their relevant track direction	Passengers load per day (estimated data)	Time saving per passengers per day (estimated data)
Corridor Via Prà – towards east	5.757	137 hours
Corridor Via Prà – towards downtown	8.584	113 hours
Corridor Via Merano-Multedo-Ronchi - towards east	19.289	191 hours
Corridor Via Ronchi-Multedo-Merano - towards downtown	19.741	108 hours
Corridor Via Siffredi-Giotto - towards east	22.028	10 hours
Corridor Via Manara - Siffredi - towards east	22.706	241 hours
Corridor Via Cornigliano - towards east	23.666	61 hours
Corridor Via Cornigliano - towards downtown	24.020	147 hours
Corridor Via Pieragostini - towards east	26.896	35 hours
Corridor Via Pieragostini - towards downtown	26.584	110 hours
Corridor Via Cantore - towards east	7.156	266 hours
Corridor Via Cantore - towards downtown	39.652	400 hours
Corridor Via di Francia - towards downtown	3.568	19 hours
Corridor Via Bobbio – Canevari - towards east	15.971	328 hours
Corridor Corso Sardegna - towards mountain	19.724	73 hours
Corridor Via Giacometti - towards east	25.047	98 hours
Corridor Via Casoni – towards west	22.595	149 hours
Corridor Via Torti- Barrili - towards east	9.986	94 hours
CorridorVia dei Mille- Caprera - towards west	13.281	140 hours
Corridor Via S. Martino - towards west	12.291	79 hours
Corridor Via Bensa - towards east	42.822	204 hours
Corridor Via Assarotti -towards downtown	17.898	172 hours
Total estimated time saving		**3.175 hours per day**

C5 Appraisal of evaluation approach

Referencing to the **indicators chosen** for the evaluation category **Environment**,

- the CO indicator, as already wrote above, is strictly related to traffic: so even small changes in traffic can produced reductions in CO level.
- NOX and PM10 are also influenced by a high number of other sources (i.e. heating homes) and by the weather situation and the general climate; so they are not as sensitive in traffic conditions as the CO.
- In any case, as the data reported above showed, the trend of Nox and PM10 is not in a drastic deterioration; this means that the traffic measures beginning to have some effect on these pollutants

About the **indicators** *Accuracy of PT time keeping* and *Average bus speed peak/off peak* and Passenger load (defined as number of passengers on the buses surveyed in the relevant line section with max load) referred to the bus lines 17, 18 and 1 chosen for the evaluation category **Traffic:**

- **Bus line 18 and Bus line 1** were chosen because those were biggest interested for the creation of new sections of reserved bus lanes and are those that would benefit the most. Having been only partially implemented the project of extension of new sections of reserved lanes, the data reported concerning the two lines are not significant;
- moreover in May 2008, the **Bus line 18 was partially changed**. The route is longer and with less sections of reserved bus lanes. Accordingly the data of 2008 is not comparable with that of 2007.
- In any case, the creation of new sections of reserved lanes even if very limited and the additional control on the bus lanes, have produced small improvements **in the overall bus transport network**

Indicator	2006	2007	2008 partial data (not comparable)
Accuracy of PT time keeping	**88,9%**	**89,3%**	**89,8%**
Average bus speed peak	**14,7**	**14,8**	**14,8**
Average bus speed off peek	**16,3**	**16,3**	**16,4**
Passenger load (considering the whole PT network managed by AMT)	**155,7 million**	**157,6 million**	**133,98 million**

- Moreover the data show that to achieve significant improvements the reserved bus lanes need to be long and continuous. The length of the reserved bus lane should be equal to the 80% of the bus line path **at least** (ideally 100%).

C6 Summary of evaluation results

To be completed and upgrated

The key results are as follows:

- Reducing in CO pollution
- Increased of accuracy of Pt time keeping
- Increased of Average bus speed

- Over 100 new passenger information stops, way finding signages and new totems installed along the corridors and in the main transport interchanges (railway–bus).
- 400 maps installed in bus shelters including detailed information about bus lines, streets, points of interest of the immediate area
- On progress the upgrade and further develop of the new AMT's AVM system - called SIMON (GSM/GPRS based) to better manage the delivery of services across the network and also to improve the interface with customers in terms of providing real time information at more stops and also on board the buses
- 60 new real time information displays (linked to the new SIMON) providing service information (real time) installed at the bus stop about bus waiting time and other service information.
- 3 bus stops converted into easy access bus stops for everyone (including people with special needs and senior citizens).
- 46 new clean buses (meeting Euro IV standards) in operation on the corridors.
- 57 new buses EEV (Enhanced Environmentally Friendly Vehicle) will be under in operation within 2009.
- 15 fixed gates (cameras) monitoring the use of reserved bus lanes in operation

D Lessons learned

D1 Barriers and drivers

D1.1 Barriers

- **Public opposition.** Strong opposition arose and are still arising from
- **Motorcycle drivers**, **shop owners local politicians**. Moreover positions of these people have been "enlarged" and promoted by local media (newspapers and televisions) this mainly for getting visibility by supporting the share of population more aggressive (while the other share, the bus users, are silent). In particular shop owners are afraid that new bus reserved lanes as well as the fining of bus lane misuse can reduce the number of their clients; car and motorcycle drivers fear the reduction of street width due to the bus lanes (this is particularly significant in a city like Genoa characterized by narrow streets). Moreover motorcycle drivers in the past had been rarely fined for bus lane misuse while now this tolerance approach (at least for penalties arising from the automatic fixed gates) has been abandoned by AMT. Therefore, even if it could seem that in presence of rules people should respect them, in the reality it is needed a wide changing in the people mentality.

D1.2 Drivers

- **AMT, local administration and politicians (Municipality of Genoa and Local Police).** In addition to AMT the other driver of this project is mainly the Municipality (and in particular the Local Police as well as politicians and their managers working in the mobility sectors). Even if the project is foreseen in the Contratto di Servizio (the contract between AMT and Municipality of Genoa to manage PT services) the Municipality has to face the wishes both of bus clients and private vehicle users. therefore the path from the designing phase of the

project to the implementation phase is not easy (it has to be noted that after having had the general project approval several specific authorizations should be provided by the Municipality to install each fixed gate and political reasons can stop these authorizations even if, in theory, these are linked only to technical issues
Moreover there are other issues that have to be managed together with the Municipality such as the white list (including the relevant roles) and the penalties process (including the relevant share of responsibilities and procedure between AMT and the Municipality).

- **Media**. Other drivers are local media, as already underlined, usually prefer to share the position of private vehicle drivers (being the cluster with more visibility) therefore AMT is working with the media in order to make visible also the voice of the bus clients (the other more silent cluster).

D2 Participation of stakeholders

- **Associations of disable people**. These associations have been contacted to discuss and agree about the procedure for permitting to authorized people, such as the disable one, to use the bus lanes.
- **Motorcycle drivers and their association.** An association among some motorcycle drivers has been created to fight against the fining and to push the Municipality and AMT to authorize the motorcycle circulation into the bus reserved lanes. This association has arranged some demonstrations even if not a lot motorcycle drivers attended these road events.
- **Shop owner, local politicians, and Media (Please see above)**

D3 Recommendations

- To study in deep the law and the relevant roles concerning private and public traffic in order to understand if solutions such as those implemented in this project (in Genoa/Italy) can be adopted also in other countries
- A strong endorsement of the Municipality and the Local Police is needed.
- Where and if it is possible ("where" according to the size and shape of the street and "if" according to safety roles) it could be better to install physical devices to separate the reserved lanes from the other lanes than to install the gates (virtual separation).
- If it is possible ("if" according to the law and economic resources) it be better used coloured asphalt in the reserved bus lanes for an immediately identification of them
- To implement the monitoring and control of the reserved bus lanes and fining the not authorized transits to establish that the PT spaces has to be respected.

D4 Future activities relating to the measure

On going the activities to transform the reserved bus lanes into a High Mobility Corridor Network with particular referencing to information services. On going the new project concerning the new "long and continuous reserved bus lane"