



E U R O P E A N
C O M M I S S I O N

The demonstration component of the Joule-Thermie Programme

T H E R M I E



ANTARES
A New Transport
Approach Regarding
Energy Saving

JOULE-THERMIE

The JOULE-THERMIE programme was launched in 1995 as the European Union's first 'integrated' programme, bringing together the resources of the European Commission Directorates-General XII (Science, Research and Development) and XVII (Energy). This programme is funded by the European Union's Fourth Framework Programme for Research and Technological Development, one of the most extensive research funding initiatives available to European companies and research organisations.

The JOULE-THERMIE programme runs until 1998 and has a total budget of 1,030 MECU of which 566 MECU are allocated to the THERMIE demonstration component of the programme for the support of projects and associated measures. THERMIE is focused on the cost-effective, environmentally-friendly and targeted demonstration and promotion of clean and efficient energy technologies. These consist of renewable energy technologies; rational use of energy in industry; buildings and transport; a clean and more efficient use of solid fuels and hydrocarbons. Essentially, THERMIE supports actions which are aimed at proving both the technological and economical viability and validity of energy technologies by highlighting the benefits and by assuring a wider replication and market penetration both in EU and global markets.

Colour Coding

To enable readers to quickly identify those Maxibrochure relating to specific parts of the THERMIE Programme each Maxibrochure is colour coded with a stripe in the lower right hand corner of the front cover, i.e.:

 **RATIONAL USE OF ENERGY - RUE**

 **RENEWABLE ENERGY SOURCES - RES**

 **SOLID FUELS - SF**

 **HYDROCARBONS - HC**

 **GENERAL - GEN**

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ANTARES

**A new transport approach
regarding energy saving**

A great deal of additional information on the European Union is available on the Internet.
It can be accessed through the Europa server (<http://europa.eu.int>)

Cataloguing data can be found at the end of this publication.

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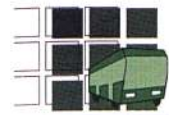
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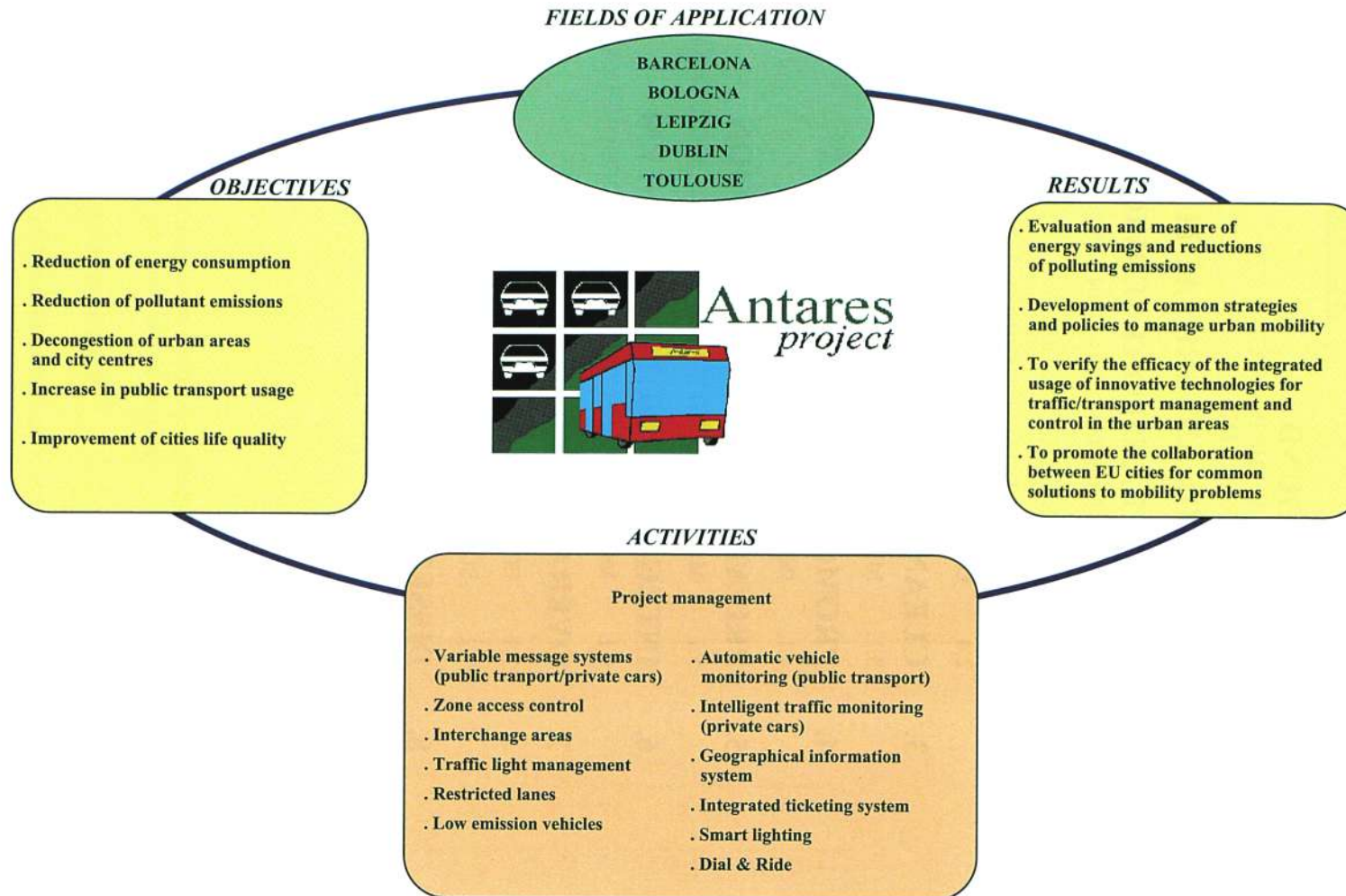
SUMMARY

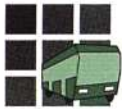
- 0. BACKGROUND**
 - 0.1. AIMS OF THE PROJECT
 - 0.2. ANTARES SITES
- 1. REVIEW OF ANTARES ACTIVITIES**
- 2. PUBLIC TRANSPORT SERVICE IMPROVEMENT**
 - 2.1. REAL-TIME INFORMATION SYSTEM AT BUS STOPS
 - 2.2. BUS PRIORITY SYSTEM
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- 7. OVERALL PROJECT RESULTS**
 - 7.1. ECONOMIC PROFITABILITY
 - 7.2. SUMMARY OF ENERGY AND ENVIRONMENTAL IMPACTS
- 8. DISSEMINATION ACTIVITIES CARRIED OUT**



0. BACKGROUND:

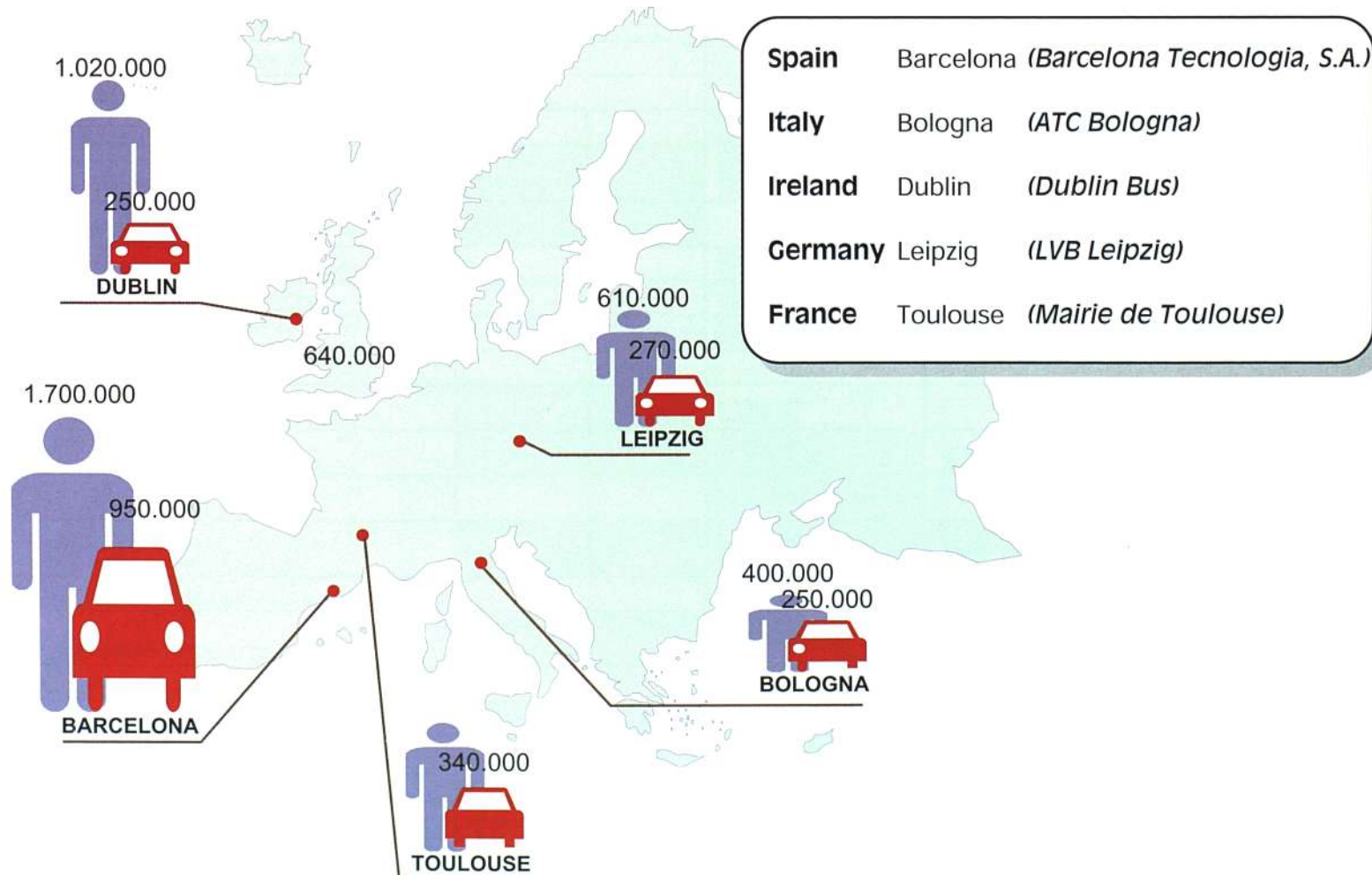
0.1 AIMS OF THE PROJECT





0. BACKGROUND:

0.2 ANTARES SITES



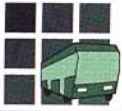


1. REVIEW OF ANTARES ACTIVITIES:

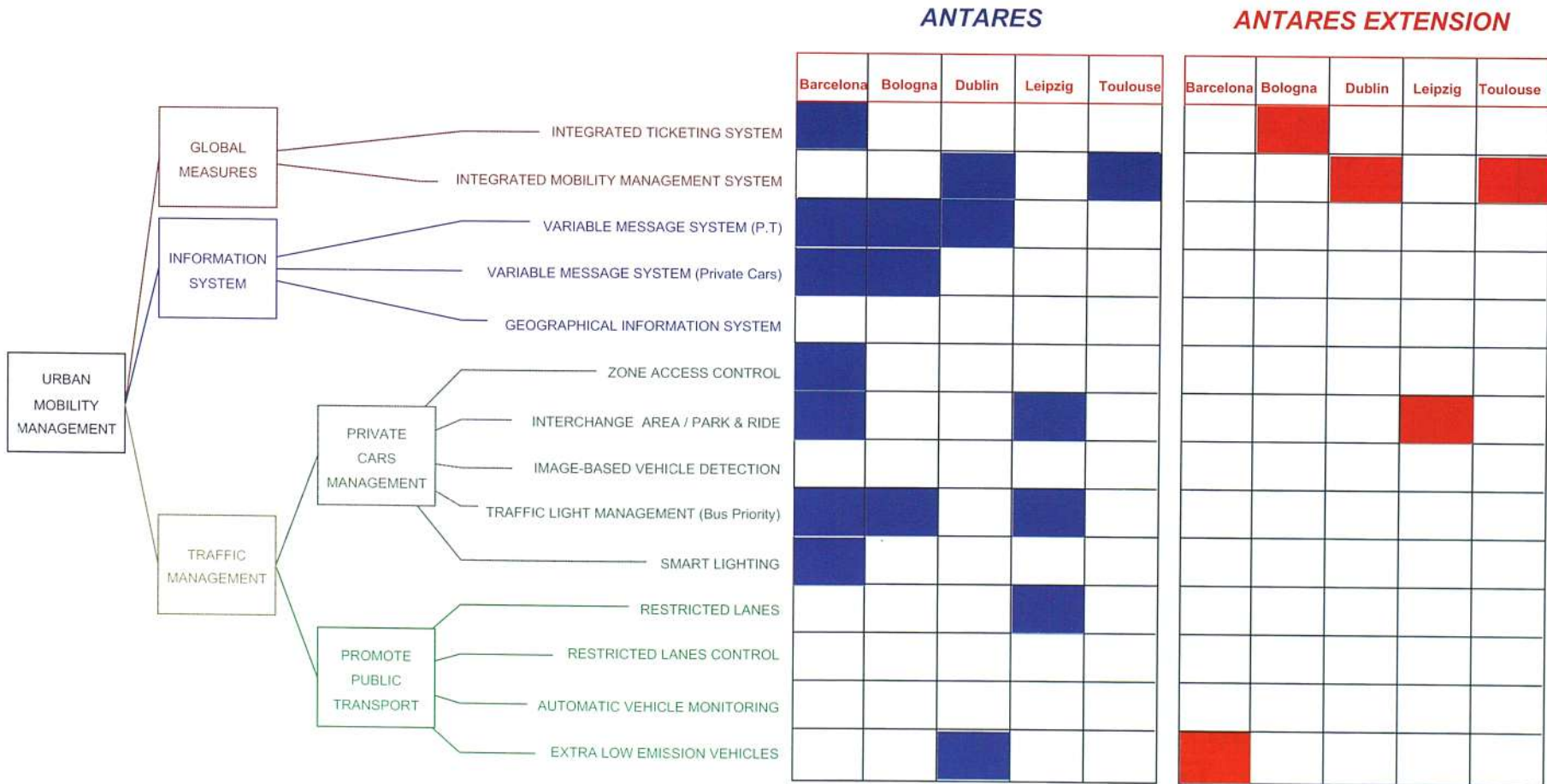
PROJECT PHASE	MEASURES	CITY DEMONSTRATOR				
		BARCELONA	BOLOGNA	DUBLIN	LEIPZIG	TOULOUSE
ANTARES I	ZONE ACCESS CONTROL	✓				
	INTEGRATED MOBILITY MANAGEMENT					✓
	IMAGE-BASED VEHICLE DETECTION	✓ (market research)				
	GEOGRAPHICAL INFORMATION SYSTEM					✓
	VARIABLE MESSAGE SYSTEMS (PUBLIC TRANSPORT)	✓, ✓	✓	✓ (market research)		
	VARIABLE MESSAGE SYSTEMS (PRIVATE CARS)		✓			
	TRAFFIC LIGHT MANAGEMENT (BUS PRIORITY)	✓	✓		✓	
	AUTOMATIC VEHICLE MONITORING	✓				
	RESTRICTED LANES				✓	
	QUALITY CORRIDOR			✓		
	EXTRA-LOW EMISSION VEHICLES			✓		
	INTERCHANGE AREA / PARK & RIDE				✓	
	INTEGRATED TICKETING	✓				
	SMART LIGHTING	✓				
ANTARES II	INTEGRATED TICKETING		✓			
	INTEGRATED MOBILITY MANAGEMENT			NO		✓
	INTERCHANGE AREA / PARK & RIDE				✓, ✓	
	TRAFFIC LIGHT MANAGEMENT (BUS PRIORITY)				(changed by more Interchange Area)	
	EXTRA-LOW EMISSION VEHICLES	✓				

- Grey: foreseen in technical annex of contract

- Tick: implemented



1. REVIEW OF ANTARES ACTIVITIES:

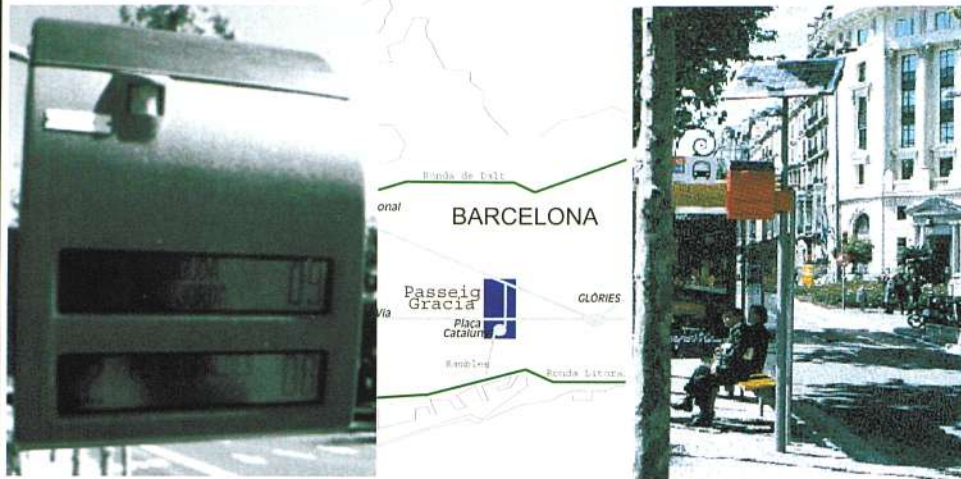




2. PUBLIC TRANSPORT SERVICE IMPROVEMENT

2.1 REAL-TIME INFORMATION SYSTEM AT BUS STOPS

BARCELONA



BOLOGNA

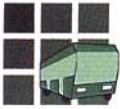


Real-time information system at bus stops

- Pilot test applied in Passeig de Gràcia - commercial zone in city center - and linked with the AVM centre by UHF radio.
- 5 new units specifically developed for Antares are working since July 1995
- The main elements of the new displays are the following:
 - Solar panel for independent energy supply.
 - Graphic display LCD (with two rows of characters).
 - People presence detector.
 - Antenna, UHF radio set, electronic card.

Real-time information system at bus stops

- Infopoints connected to the urban fleet control by radio's reserved frequency channel.
- 3 types and sizes of displays, depending on bus stop's location and bus lines concentration.
- Wide trial over great number of bus stops.



2. PUBLIC TRANSPORT SERVICE IMPROVEMENT

2.2 BUS PRIORITY SYSTEM

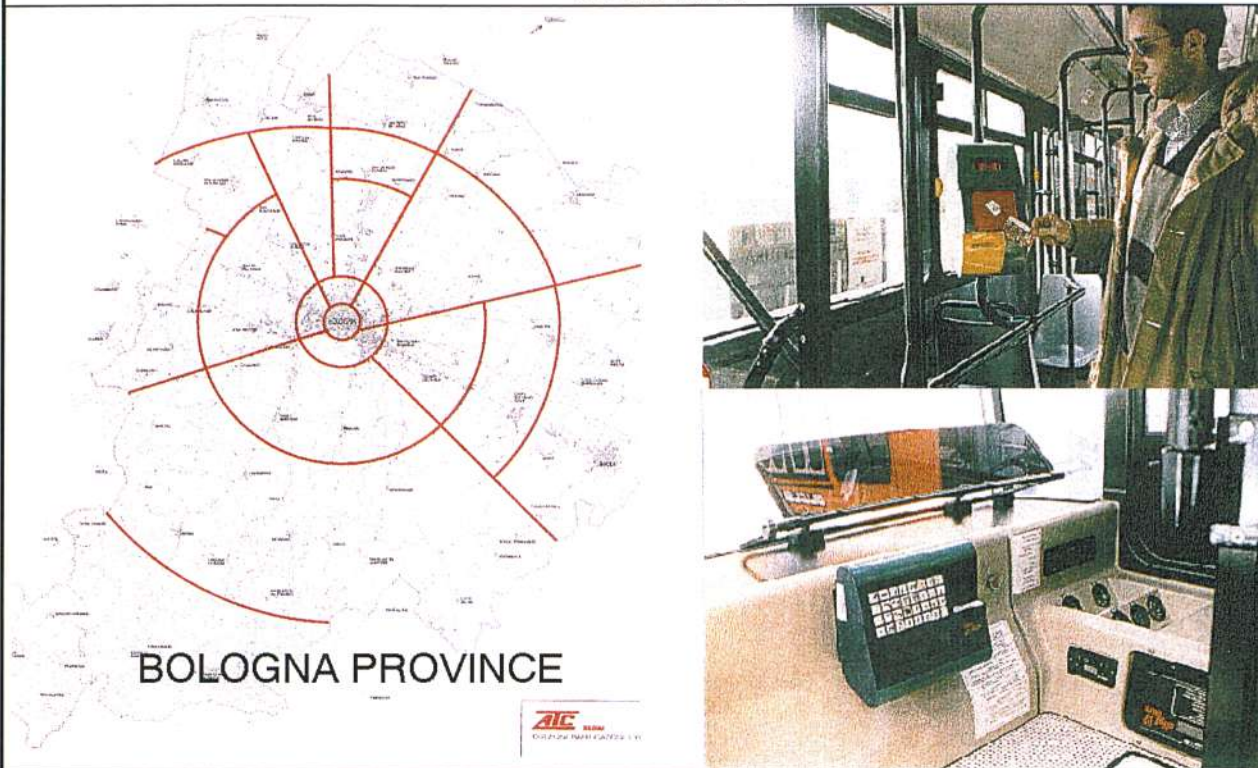
<i>BARCELONA</i>	<i>BOLOGNA</i>	<i>LEIPZIG</i>
<p>Bus priority system with centralised system</p> <ul style="list-style-type: none"> • 4 complex junctions of Passeig de Gràcia • Using information collected by beacons, about bus position, and processing it with priority level tables, the TMB central computer communicates a vehicle priority to the UTCC central computer. • The vehicle priority combined with other inputs like junction traffic demand, order of vehicle arrival,...is sent out to controller that determines the extension. 	<p>Bus priority system with centralised system</p> <ul style="list-style-type: none"> • Actuation along Via Emilia Ponente (32 controlled cross-roads) • Network of multifunctional local units interconnected and linked with control centre. • Using information from magnetic loops and control centre indications, local unit calculates dynamically the traffic light phases. 	<p>Bus priority by local decision</p> <ul style="list-style-type: none"> • 4 junctions of bus line 'A' involved. • Local unit integrated in traffic light. • Using information sent out by radio from bus, about route and foreseen time to pass the junction, local unit determines Green Wave for P.T.



2. PUBLIC TRANSPORT SERVICE IMPROVEMENT

2.3 INTEGRATED TICKETING MANAGEMENT

BOLOGNA



LEIPZIG



Integrated ticketing management

- New integrated fare system applied to the whole Bologna province.
- New ticketing system, a hybrid validator for magnetic/microchip cards.
- General survey to collect data for delimiting geographical area, number of zones and fare levels

On-board new ticketing system

- Quick ticketing system.
- Easier ticketing process for bus driver
- Average saving of delay time at bus stops about 30 seconds.



2. PUBLIC TRANSPORT SERVICE IMPROVEMENT

2.4. OTHER MEASURES

DUBLIN

THE QUALITY BUS CORRIDOR



LEIPZIG



Quality Bus Corridor

- Reappraisal of the role of the buses as a mass transit mode.
- Different important concentric bus lines involved like route 39 and route 25.
- 6 Key attributes of QBC (new alignment, high frequency, 'clean' vehicles, staff, new infrastructure and traffic management)
- Increase of 10% in number of bus passengers, 50% of which come from private transport.

Restricted lanes for trams

- 1,600 m of new installation in Berlin street.
- New public transport lane substitutes private transport lane.
- Trams 'protected' from car congestion.



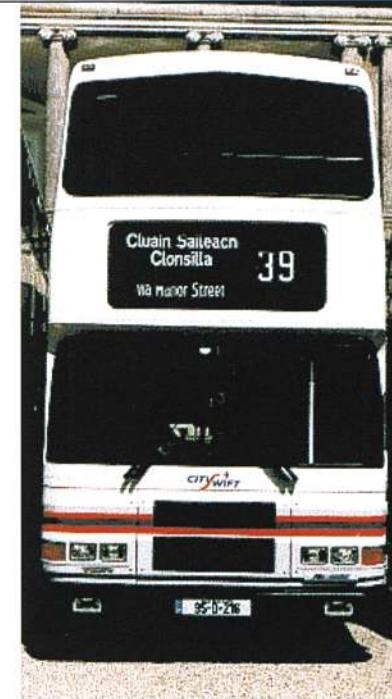
3. CLEAN PUBLIC TRANSPORT VEHICLES

3.1 MEASURES AND TECHNOLOGIES DEMONSTRATED

BARCELONA



DUBLIN

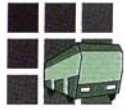


Compressed natural gas vehicles for P.T.

- Pilot trial with the introduction of 2 buses, one standard and one articulated with low floor platform and CNG adapted engine.
- Reduction of pollutant emissions and “clean” fuel use.
- Use of one of the most promising alternative fuels, CNG.
- Vehicles involved run through different conditions and bus lines inside Barcelona, to study possible extension.

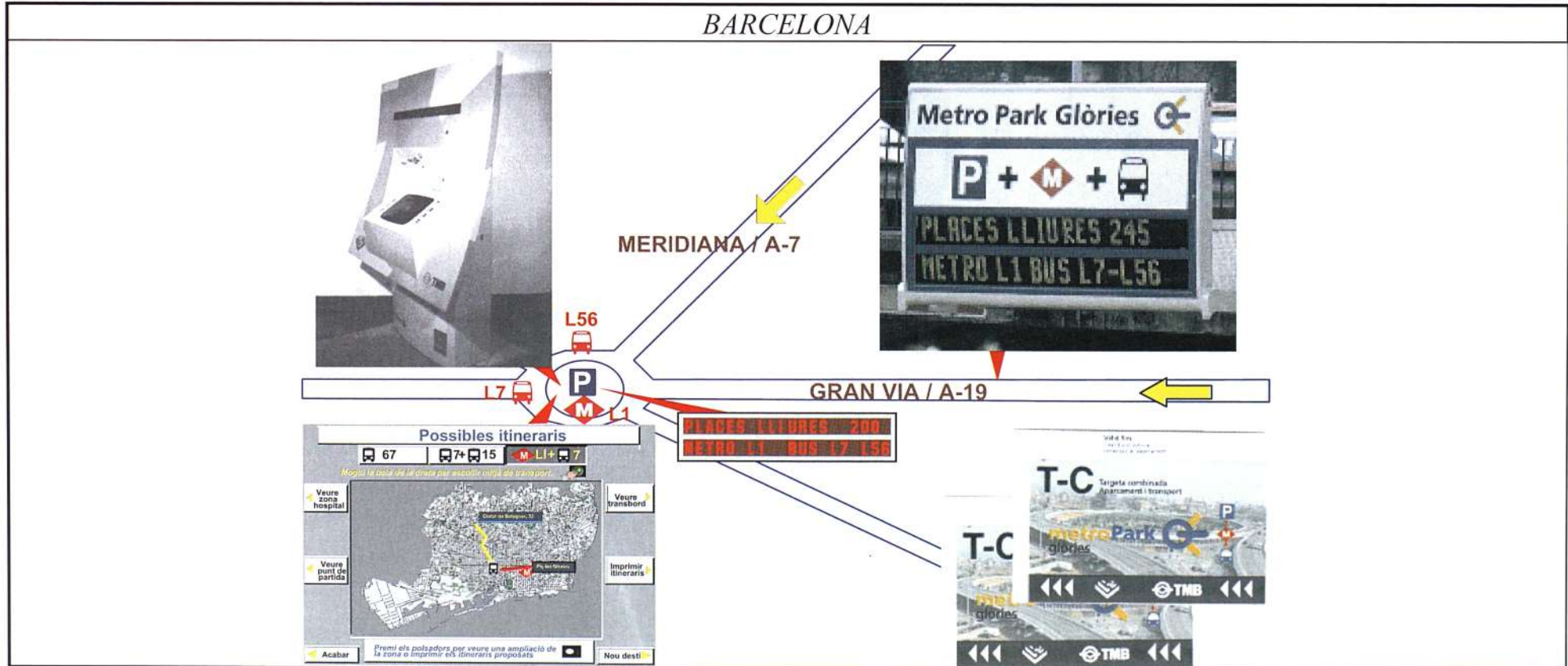
Extra low emission vehicles

- 4 new double deck buses.
- Vehicles to the latest (Euro 1) emission/pollution standard and with the highest quality specifications in terms of passenger comfort.
- 25% energy consumption and emissions savings compared with old double deck buses.
- Integrated within new quality bus corridors.



4. PROMOTION OF MODAL SHIFT

4.1 INTERCHANGE AREAS



- Measures implemented in Park & ride located in Plaça de les Glòries, the junction between the 3 main inner arteries of Barcelona.

Integrated ticketing management

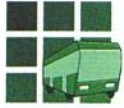
- Combined ticketing for parking and P.T. with an unique fare for parking and for unlimited use of the city public transport network.
- Installation of new adapted ticket dispenser.

Variable message system for cars

- Big variable message panel used.
- Real time information on the occupancy level of the parking and connected public transport lines to the drivers of Gran Via (main access).

Variable message system for P.T.

- Interactive information terminal inside parking.
- Allows to make consultations about the best itinerary combinations between two points using GIS-based bus and metro networks.



4. PROMOTION OF MODAL SHIFT

4.1 INTERCHANGE AREAS

LEIPZIG

Interchanging areas and bike&ride stations

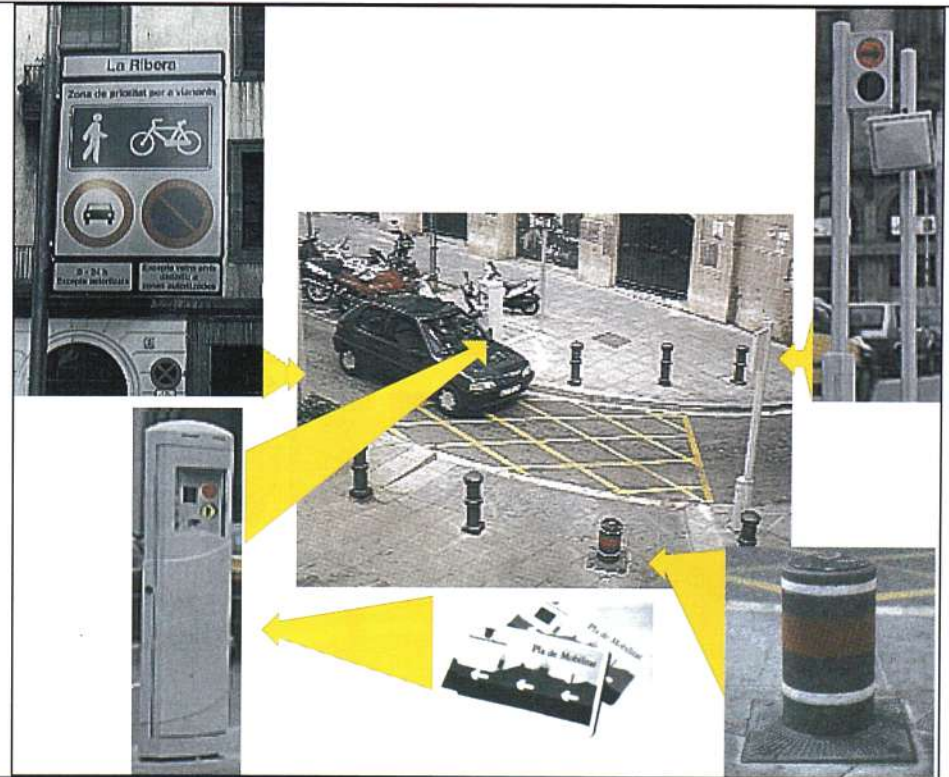
- 18 bike&Ride stations on 15 different places along the city border of LeipzigQuick ticketing system.
- Two different types of bike&ride stations, with roofed and unroofed bike parking areas.
- 2 interchanging areas in City centre and Leipzig-Lindenau allowing the connection between different public transport modes.
- About 350.000 passengers from railway terminal, bus lines and tram lines use interchange area.



5. PRIVATE TRAFFIC RESTRICTION

5.1 MEASURES AND TECHNOLOGIES DEMONSTRATED

BARCELONA



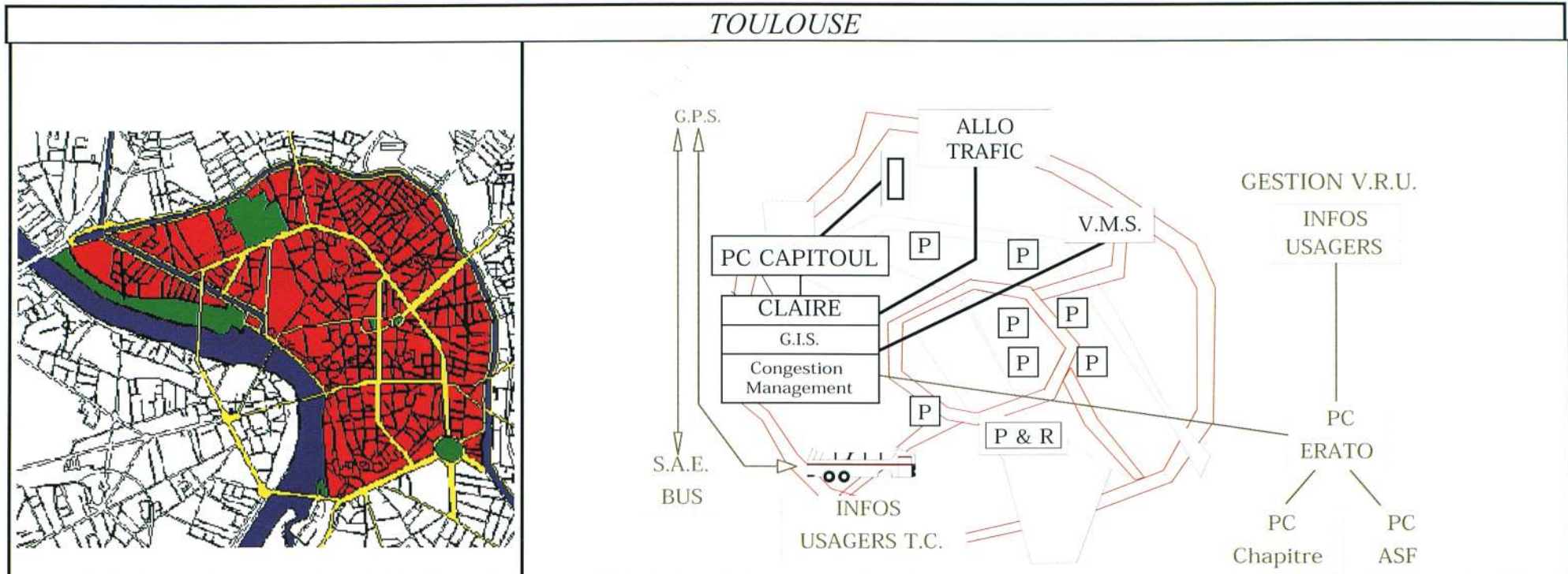
Intelligent access control for private cars

- Selected area called La Ribera is located in Ciutat Vella, historical centre of the city.
- Pilot trial to reduce traffic volumes and to place pedestrians at the top of area mobility.
- 4 entry gates, 2 main entries, with card reading system, without time restrictions, and 2 secondary entries with pre-defined timetables.
- Integrated system with traffic detectors, retractable bollards, identification terminal connected with control centre, light signal and teletag.
- Reduction about 80% of daily traffic with high level of satisfaction of residents and users.



6. INTEGRATED MOBILITY SYSTEM

6.1 MEASURES AND TECHNOLOGIES DEMONSTRATED



Integrated mobility management system

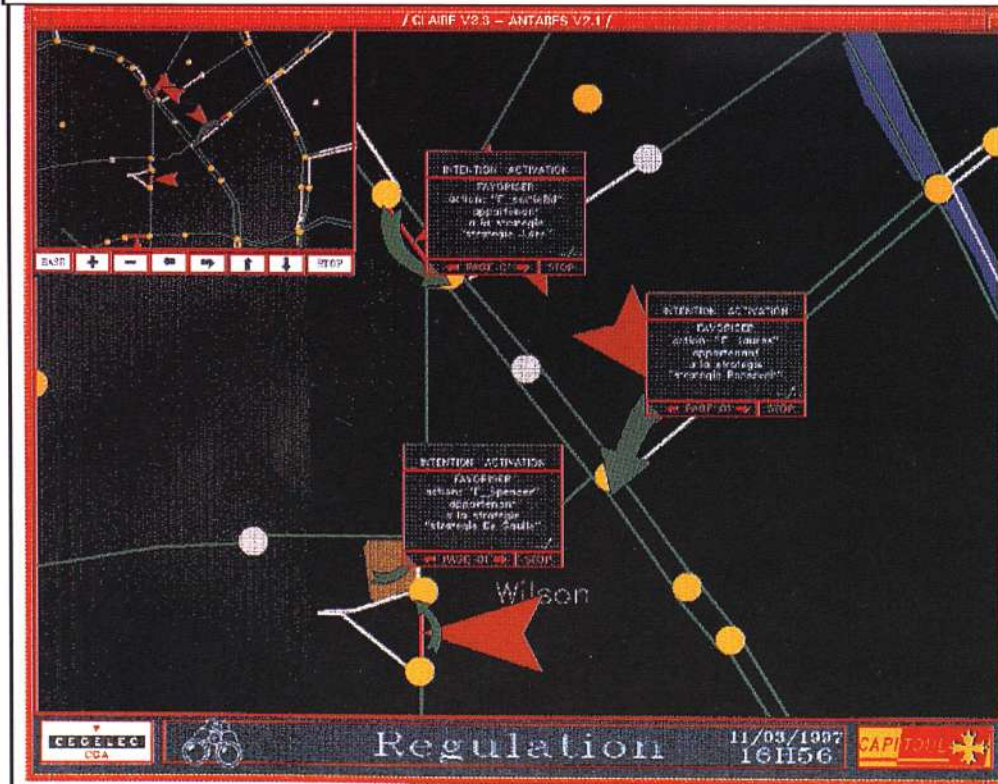
- Pilot trial in the centre of the city, about 75 crossings equipped with traffic lights and sensors scattered in the road.
- Implementation of new mobility management software tool called CLAIRE.
- CLAIRE is a system for monitoring and regulation of congestion.
- Inputs collected from several sensors network, integrated within a Geographical Information System
- CLAIRE gives information through variable message system and “ALLO TRAFIC”, phone service with automatic voice messaging.



6. INTEGRATED MOBILITY SYSTEM

6.1 MEASURES AND TECHNOLOGIES DEMONSTRATED

TOULOUSE



Integrated mobility management system

- Traffic in the city centre has decreased by about 5%.
- Increase of average vehicle speed about 5%.



7. OVERALL PROJECT RESULTS

7.1 ECONOMIC PROFITABILITY

**THE ANTARES PROJECT PRODUCES
ANNUAL SAVINGS OF:**



**1,403,376
litres of Gasoline**



**543,205
litres of Diesel**



**864,000
Kw/hour**



**IN ECONOMIC TERMS:
1,720,316
ECU**



7. OVERALL PROJECT RESULTS

7.1 ECONOMIC PROFITABILITY

EQUIPMENT INVESTMENT OF:

5,119,512 ecu

MAINTENANCE COST OF:

469,402 ecu per year

ECONOMIC SAVINGS OF:

1,720,316 ecu per year

THE PAYBACK PERIOD CORRESPONDS TO :

4.1 years

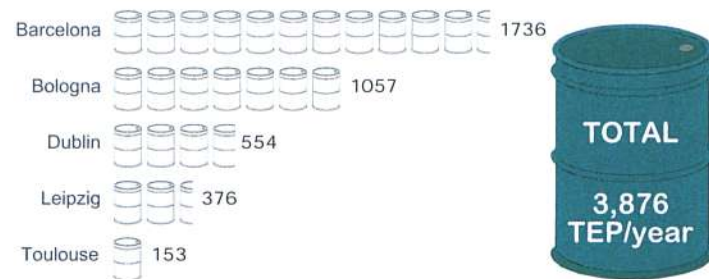


7. OVERALL PROJECT RESULTS

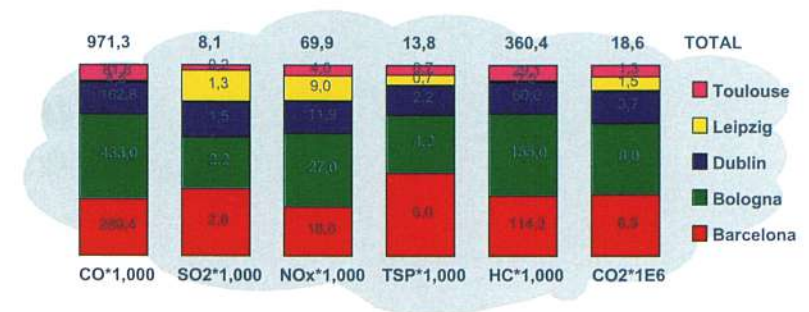
7.2 SUMMARY OF ENERGY AND ENVIRONMENTAL IMPACTS

EVALUATION METHODOLOGY

ENERGY SAVINGS (TEP/year)



ENVIRONMENTAL IMPACTS (Kg/year)



- BEFORE/AFTER DATA HAVE BEEN COLLECTED USING SURVEYS, COUNTINGS AND ON-STREET MEASUREMENT:
 - Cities stock matrix data and specific invariable data
 - Selection of application areas for each measure or group of measures
 - Before/after traffic conditions in each mode in the areas (speed and v/km)
- THE ANTARES METHODOLOGY FOR CALCULATION AND ANALYSIS OF THE ENERGY CONSUMPTION AND POLLUTANT EMISSIONS HAVE BEEN DEVELOPED WITHIN THE TYPE B ACTION (T 131) TOGETHER WITH JUPITER AND ENTRANCE PROJECTS



7. OVERALL PROJECT RESULTS

7.2 SUMMARY OF ENERGY AND ENVIRONMENTAL IMPACTS EVALUATION METHODOLOGY

COLLABORATION WITH OTHER THERMIE TARGETED PROJECTS: JUPITER AND ENTRANCE (THERMIE TYPE B ACTION – T131)

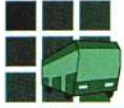
**DEVELOPMENT OF A COMMON METHODOLOGY FOR
CROSS-CITY EVALUATION OF URBAN TRANSPORT MEASURES**

AIMS:

TO CURRENT AND FUTURE PROJECTS

***COMPREHENSIVE AND ACCURATE TOOL, FOR
FUTURE USE AS A STANDARD FOR EVALUATING
THE ENERGY AND ENVIRONMENTAL BENEFITS OF***

BASIS AT A CITY LEVEL



7. OVERALL PROJECT RESULTS

7.2 SUMMARY OF ENERGY AND ENVIRONMENTAL IMPACTS

ANTARES total annual savings

ANNUAL ENERGY & ENVIRONMENTAL SAVINGS INDICATORS						
Energy in GJ	CO ₂ in Kg	CO in Kg	HC in Kg	NO _x in Kg	SO _x in Kg	PM in Kg
96,081	5,266,954	433,036	54,494	21,028	3,226	2,705
SAVINGS per km² Total area = 3,303 km ²						
 29.08	 1594.59 CO ₂	 131.1 CO	 16.49 HC	 6.36 NO _x	 0.97 SO _x	 0.81 PM
SAVINGS per 1000 inhabitants Total population = 4,296,658 inhabitants						
 22.36	 1225.82 CO ₂	 100.78 CO	 12.68 HC	 4.89 NO _x	 0.75 SO _x	 0.62 PM
SAVINGS per MECU Total investment = 5.5 MECU						
1 MECU 17,469.27 GJ 	1 MECU 957,628 Kg CO ₂	1 MECU 78,734 Kg CO	1 MECU 9,908 Kg HC	1 MECU 3,823.27 Kg NO _x	1 MECU 586.54 Kg SO _x	1 MECU 492 Kg PM



7. OVERALL PROJECT RESULTS

7.2 SUMMARY OF ENERGY AND ENVIRONMENTAL IMPACTS

Annual savings per 1000 inhabitants by city

	Energy	CO ₂	CO	HC	NO _x	SO _x	PM
BARCELONA	1000 inhab 630.99 GJ 	1000 inhab 41284.25 Kg 	1000 inhab 1853.14 Kg 	1000 inhab 256.25 Kg 	1000 inhab 211.41 Kg 	1000 inhab 18.57 Kg 	1000 inhab 12.42 Kg
BOLOGNA	1000 inhab 393.41 GJ 	1000 inhab 21006.67 Kg 	1000 inhab 2920 Kg 	1000 inhab 304.29 Kg 	1000 inhab -26.69 Kg 	1000 inhab 13.49 Kg 	1000 inhab 12.86 Kg
DUBLIN	1000 inhab 445.96 GJ 	1000 inhab 27160.8 Kg 	1000 inhab 1519.71 Kg 	1000 inhab 200.75 Kg 	1000 inhab 219.52 Kg 	1000 inhab 19.83 Kg 	1000 inhab 14.61 Kg
LEIPZIG	1000 inhab 114.52 GJ 	1000 inhab 9402.13 Kg 	1000 inhab 35.06 Kg 	1000 inhab 7.55 Kg 	1000 inhab 10.32 Kg 	1000 inhab 2.68 Kg 	1000 inhab -
TOULOUSE	1000 inhab 89.76 GJ 	1000 inhab 5210.89 Kg 	1000 inhab 435,40 Kg 	1000 inhab 51.38 Kg 	1000 inhab 19.08 Kg 	1000 inhab 2.92 Kg 	1000 inhab 2.78 Kg



Annual savings per 1000 inhab. in area involved for groups of measures

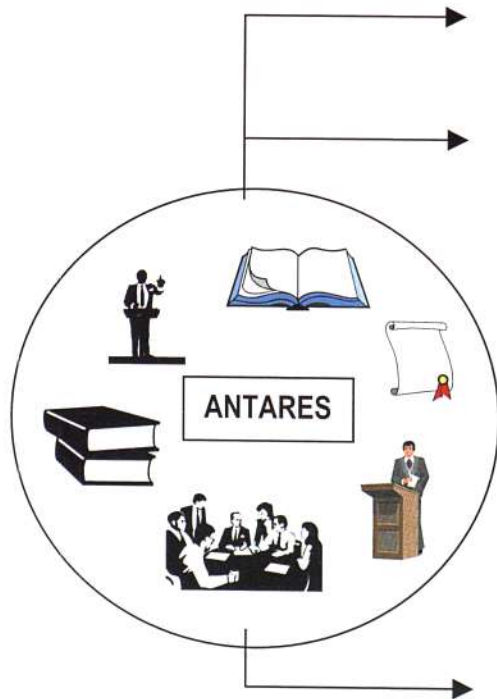
BARCELONA	Energy	CO₂	CO	HC	NOx	SOx	PM
Private Traffic Restriction and Integrated Mobility Manag.: * Zone access control	1000 inhab 637.75 GJ 	1000 inhab 41604.9 Kg 	1000 inhab 1928.16 Kg 	1000 inhab 262.32 Kg 	1000 inhab 215.23 Kg 	1000 inhab 18.78 Kg 	1000 inhab 12.66 Kg
Public Transport Improvement: * Real time info * Bus priority with macroreg. * CNG vehicles	1000 inhab -7.02 GJ 	1000 inhab -336.64 Kg 	1000 inhab -75.83 Kg 	1000 inhab -6.18 Kg 	1000 inhab -3.90 Kg 	1000 inhab -0.22 Kg 	1000 inhab -0.24 Kg
Modal Shift: * Park&Ride system with: - Integrated ticketing - VMS traffic vehicles - VMS public transport	1000 inhab 0.26 GJ 	1000 inhab 15.99 Kg 	1000 inhab 0.81 Kg 	1000 inhab 0.11 Kg 	1000 inhab 0.08 Kg 	1000 inhab 0.01 Kg 	1000 inhab 0.00 Kg
BOLOGNA	Energy	CO₂	CO	HC	NOx	SOx	PM
Traffic Light Management System and the VMS for pri.t.: * Bus priority * Real time info	1000 inhab 393.41 GJ 	1000 inhab 21006.67 Kg 	1000 inhab 2920 Kg 	1000 inhab 304.29 Kg 	1000 inhab -26.69 Kg 	1000 inhab 13.49 Kg 	1000 inhab 12.86 Kg
DUBLIN	Energy	CO₂	CO	HC	NOx	SOx	PM
Public Transport Improvement: * Quality bus corridor * Low diesel emission vehicles	1000 inhab 445.96 GJ 	1000 inhab 27160.8 Kg 	1000 inhab 1519.71 Kg 	1000 inhab 200.75 Kg 	1000 inhab 219.52 Kg 	1000 inhab 19.83 Kg 	1000 inhab 14.61 Kg
LEIPZIG	Energy	CO₂	CO	HC	NOx	SOx	PM
Pub.Transp. Improvement: * Bus priority local decision * On board ticketing * Restricted lanes	1000 inhab 109.17 GJ 	1000 inhab 8917.85 Kg 	1000 inhab 8.64 Kg 	1000 inhab 3.15 Kg 	1000 inhab 8.28 Kg 	1000 inhab 2.68 Kg 	1000 inhab -
Modal Shift: * Bike & ride	1000 inhab 5.35 GJ 	1000 inhab 484.28 Kg 	1000 inhab 26.42 Kg 	1000 inhab 4.40 Kg 	1000 inhab 2.04 Kg 	1000 inhab - 	1000 inhab -
TOULOUSE	Energy	CO₂	CO	HC	NOx	SOx	PM
Priv.Traffic Restriction and Integrated Mobility Manag.: * Congestion manag. system and users info	1000 inhab 89.76 GJ 	1000 inhab 5210.89 Kg 	1000 inhab 435.40 Kg 	1000 inhab 51.38 Kg 	1000 inhab 19.08 Kg 	1000 inhab 2.92 Kg 	1000 inhab 2.78 Kg



8. DISSEMINATION ACTIVITIES CARRIED OUT

⇒ Many dissemination activities have been carried out, among them we can highlight:

- More than 30 publications have been issued at city and European level
- ANTARES partners have participated in Fairs and Exhibitions



Partner	Fair/Exhibition	Place and Dates
MT	SITEF	Toulouse, October 1995
MT	FAUST 96	Toulouse, October 1996
BTSA	TEM/96 (Salón Internacional de Técnicas y Equipamientos Municipales)	Madrid, 19-22 November 1996
ATC	THERMIE Exhibition	Berlin, 19-24 September 1994
ATC	The Convegno Europolis	Bologna, 22-25 February 1996
LVB	Stadtverwaltung Leipzig Die Industriestadt Leipzig: gestern-heute-morgen	Leipzig, 1994

- Important events at political level have been organised by ANTARES partners.

Partner	Event	Place and Date
LVB	“Signature of Antares Protocol”	Leipzig, March 10, 1994
BTSA	“Barcelona Resolution Signature”	Barcelona, November 18, 1994
MT	“Séminaire Télématique des déplacements urbains”	Toulouse, 28-29 March 1996

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European Commission

ANTARES — A new transport approach regarding energy saving

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Within each Member State there are a number of organisations recognized by the European Commission as an Organisation for the Promotion of Energy Technology (OPET). It is the role of these organisations to help to coordinate specific promotional activities within Member States. These include staging of promotional events such as conferences, seminars, workshops or exhibitions as well as production of publications associated with the THERMIE programme.

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ORGANISATIONS FOR THE PROMOTION OF ENERGY TECHNOLOGY

Within each Member State there are a number of organisations recognized by the European Commission as an Organisation for the Promotion of Energy Technology (OPET). It is the role of these organisations to help to coordinate specific promotional activities within Member States. These include staging of promotional events such as conferences, seminars, workshops or exhibitions as well as production of publications associated with the THERMIE programme.

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'The overall objective of the Community's energy policy is to help ensure security of energy supplies for European citizens and businesses at competitive prices and in an environmental compatible way. DG XVII initiates, coordinates and manages electricity, nuclear energy, renewable energy sources and the rational use of energy.

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