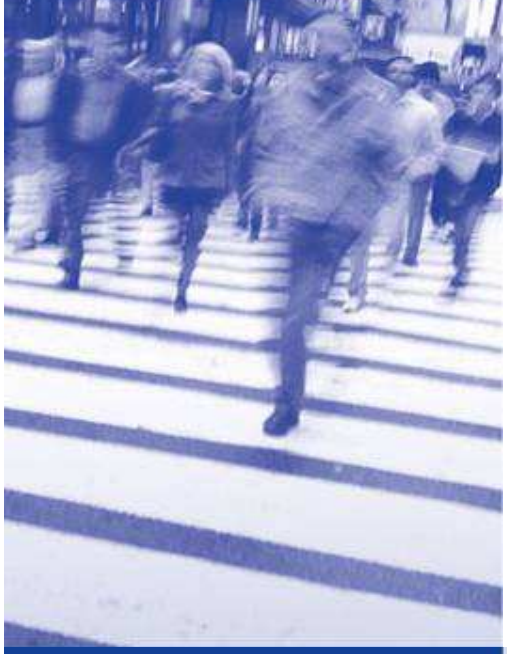

CiViTAS
Cleaner and better transport in cities

ARCHIMEDES
AALBORG • BRIGHTON & HOVE • DONOSTIA - SAN SEBASTIÁN • IAŞI • MONZA • ÚSTÍ NAD LABEM

Monza

R80.1 - Study of Park & Ride Parking Guidance System in Monza

City of Monza

April 2010

THE CIVITAS INITIATIVE
IS CO-FINANCED BY THE
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Project no.	TREN/FP7TR/218940 ARCHIMEDES
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1 Introduction

1.1 Background CIVITAS

CIVITAS - cleaner and better transport in cities - stands for CIty-VITAlity-Sustainability. With the CIVITAS Initiative, the EC aims to generate a decisive breakthrough by supporting and evaluating the implementation of ambitious integrated sustainable urban transport strategies that should make a real difference for the welfare of the European citizen.

CIVITAS I started in early 2002 (within the 5th Framework Research Programme);
CIVITAS II started in early 2005 (within the 6th Framework Research Programme) and
CIVITAS PLUS started in late 2008 (within the 7th Framework Research Programme).

The objective of CIVITAS-Plus is to test and increase the understanding of the frameworks, processes and packaging required to successfully introduce bold, integrated and innovative strategies for clean and sustainable urban transport that address concerns related to energy-efficiency, transport policy and road safety, alternative fuels and the environment.

Within CIVITAS I (2002-2006) there are 19 cities clustered in 4 demonstration projects, within CIVITAS II (2005-2009) 17 cities in 4 demonstration projects, whilst within CIVITAS PLUS (2008-2012) 25 cities in 5 demonstration projects are taking part. These demonstration cities all over Europe will be funded by the European Commission.

Objectives:

- to promote and implement sustainable, clean and (energy) efficient urban transport measures
- to implement integrated packages of technology and policy measures in the field of energy and transport in 8 categories of measures
- to build up critical mass and markets for innovation

Horizontal projects support the CIVITAS demonstration projects & cities by :

- Cross-site evaluation and Europe wide dissemination in co-operation with the demonstration projects
- The organisation of the annual meeting of CIVITAS Forum members
- Providing the Secretariat for the Political Advisory Committee (PAC)
- Development of policy recommendations for a long-term multiplier effect of CIVITAS

Key elements of CIVITAS

- CIVITAS is co-ordinated by cities: it is a programme “of cities for cities”
- Cities are in the heart of local public private partnerships
- Political commitment is a basic requirement
- Cities are living ‘Laboratories' for learning and evaluating

1.2 Background ARCHIMEDES

ARCHIMEDES is an integrating project, bringing together 6 European cities to address problems and opportunities for creating environmentally sustainable, safe and energy efficient transport systems in medium sized urban areas.

The objective of ARCHIMEDES is to introduce innovative, integrated and ambitious strategies for clean, energy-efficient, sustainable urban transport to achieve significant impacts in the policy fields of energy, transport, and environmental sustainability. An ambitious blend of policy tools and measures will increase energy-efficiency in transport, provide safer and more convenient travel for all, using a higher share of clean engine technology and fuels, resulting in an enhanced urban environment (including reduced noise and air pollution). Visible and measurable impacts will result from significantly sized measures in specific innovation areas. Demonstrations of innovative transport technologies, policy measures and partnership working, combined with targeted research, will verify the best frameworks, processes and packaging required to successfully transfer the strategies to other cities.

1.3 Participant Cities

The ARCHIMEDES project focuses on activities in specific innovation areas of each city, known as the CIVITAS corridor or zone (depending on shape and geography). These innovation areas extend to the peri-urban fringe and the administrative boundaries of regional authorities and neighbouring administrations.

The two Learning cities, to which experience and best-practice will be transferred are Monza (Italy) and Ústí nad Labem (Czech Republic). The strategy for the project is to ensure that the tools and measures developed have the widest application throughout Europe, tested via the Learning Cities' activities and interaction with the Lead City partners.

1.3.1 Leading City Innovation Areas

The four Leading cities proposed in the ARCHIMEDES project are:

- Aalborg (Denmark);
- Brighton & Hove (UK);
- Donostia-San Sebastián (Spain); and
- Iasi (Romania).

Together the Lead Cities in ARCHIMEDES cover different geographic parts of Europe. They have the full support of the relevant political representatives for the project, and are well able to implement the innovative range of demonstration activities proposed.

The Lead Cities are joined in their local projects by a small number of key partners that show a high level of commitment to the project objectives of energy-efficient urban transportation. In all cases the public transport company features as a partner in the proposed project.

2 Monza

Monza is a city on the river Lambro, a tributary of the Po, in the Lombardy region of Italy, some 15km north-northeast of Milan. It is the third-largest city of Lombardy and the most important

economic, industrial and administrative centre of the Brianza area, supporting a textile industry and a publishing trade. It is best known for its Grand Prix.

The City of Monza, with approximately 121,000 inhabitants, is located 15 km north of Milan, which is the centre of the Lombardia area. This area is one of the engines of the Italian economy; the number of companies is 58,500, i.e. a company for every 13 inhabitants.

Monza is affected by a huge amount of traffic that crosses the city to reach Milan and the highways nodes located between Monza and Milan. It is also an important node in the Railways network, crossed by routes connecting Milan with Como and Switzerland, Lecco and Sondrio, Bergamo and Brianza. "Regione Lombardia", which in the new devolution framework started in 1998, has full responsibility for establishing the Local Public Transportation System (trains, coaches and buses) and has created a new approach for urban rail routes using an approach similar to the German S-Line or Paris RER.

Monza has recently become the head of the new "Monza and Brianza" province, with approximately 750,000 inhabitants, so will gain the full range of administration functions by 2009. Plan-making responsibilities and an influence over peri-urban areas will require the city to develop new competencies.

In this context, the objective of the City of Monza in participating in CIVITAS as a Learning City is to set up an Urban Mobility System where the impact of private traffic can be reduced, creating a new mobility offer, where alternative modes become increasingly significant, leading to improvements to the urban environment and a reduction in energy consumption (and concurrent pollution).

3 Background to the Deliverable

This deliverable is related to ARCHIMEDES measure number 80 (Park and Ride Parking Guidance System in Monza), which includes 2 subsidiary tasks:

Task 11.8.3 Park & Ride Parking Guidance System (RTD task)
A study will be undertaken by PA and TPM to design a real time parking guidance system.

Task 8.15 P&R Parking Guidance System (DEMO task)
A networked VMS system will be implemented on key routes within the city of Monza. The system will provide real time information on parking availability within the city. The system is ready for implementation at month 25.

3.1 Summary Description of the Task

Within this research task the following actions have been accomplished:

1. meeting with the companies owning the most significant parking areas in the City, aimed at gaining their approval to implement the measure.
2. analysis of the road network and related traffic flows according to data depicted in the General Urban Traffic Plan (GUTP) of the city; it is the official document concerning mobility nowadays under approval by the City Council, as required by Italian law.
3. identification of the precise positions of the signs, both fixed and variable, indicating parkings and parking areas inserted in the system.

Such activities are described in more detail in section paragraph 4.1

4 Parking Guidance System in Monza

4.1 Introduction

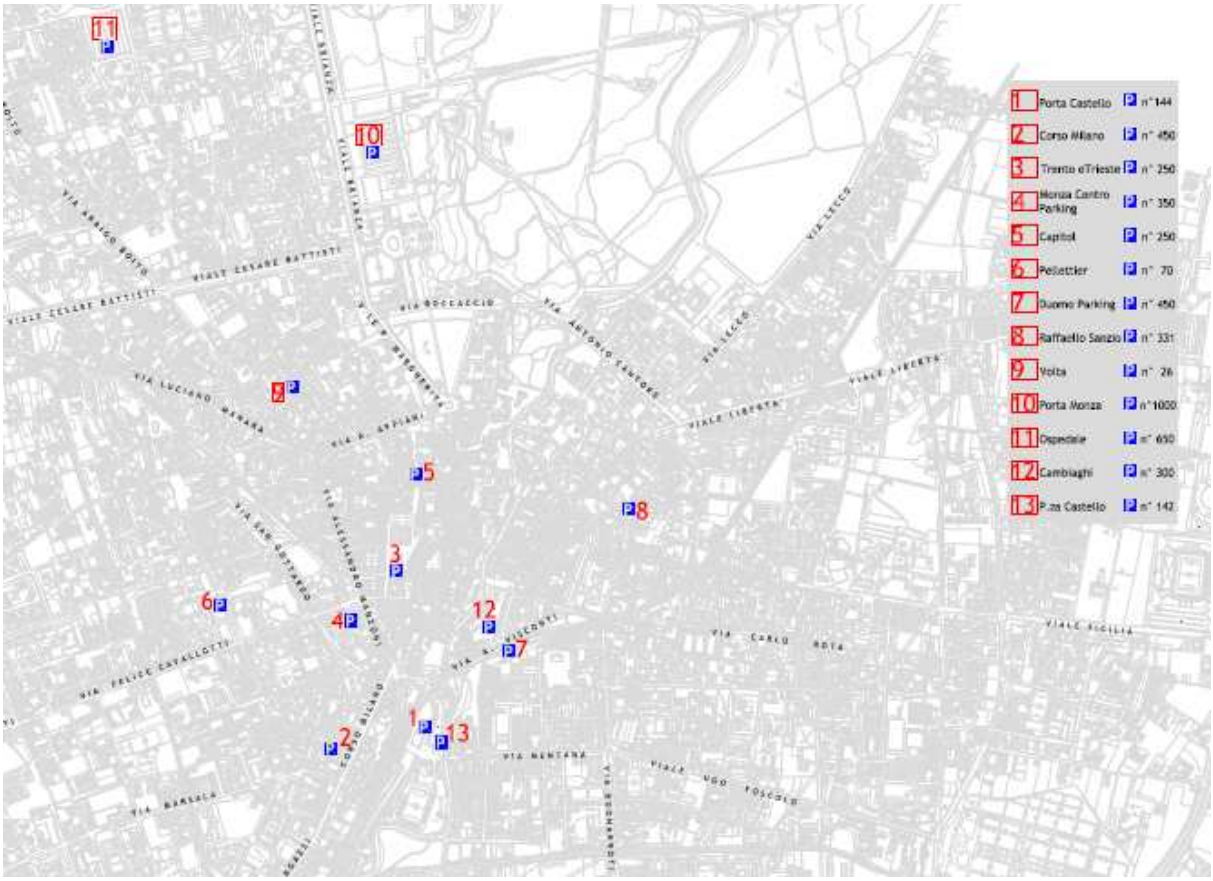
There is no Parking Guidance System in Monza (hereinafter: “InfoPark Monza”) at the moment. Contacts were established in 2007 with the companies owning the most significant parking areas in the City to promote such a system, gaining a substantial approval.

In addition, TPM has been delegated by the Municipality to manage all services related to public parking areas in the City as well as to become the reference partner of the Municipality to set up technological systems for Mobility Management, within the framework if ITS (Intelligent Transportation Systems), supporting it in the execution of public tenders.

In the meantime, after the elections in June 2009, Monza has officially become the capital of the new Province of Monza and Brianza and its administrative offices are starting their activity. This new role will increase the mobility attraction, both for existing institutions (Hospital, University) and local government offices (Province, Police). As a consequence, in order to be ready to accept an increased number of vehicles used to reach the new services, it is very important that the most important parking areas are clearly identified with the real time availability of parking places.

In addition, as well known all over the world, every September Monza hosts Formula 1 Grand Prix, and more that one hundred thousand people approach the city; InfoPark will be very useful also for this purpose.
What’s more, the panels carrying information concerning the occupation rate of car parks will be enriched with messages to be used also for general information about traffic which will be very useful not only during Formula 1 Grand Prix, but also for daily commuters.

Most of the parking areas in Monza are located close to the Historical Centre, as shown in Picture 1 (Annex 1 in pdf file). As known, drivers are attracted to reach the city centre, but parking areas are not always equally used, so the result is traffic congestion due to cars driving round looking for available parking places.



Picture 1 - Location of the parking areas

With this system, people reaching Monza by their private cars will be correctly directed to available parking areas, minimising time spent looking for them and consequently reducing traffic congestion and pollution.

The aim of this measure is to design and implement a real time parking guidance system that will inform drivers about the occupancy rates of the most relevant parking in the city of Monza.

4.2 Description of the Work Done

This paragraph is dedicated to the detailed description of the work carried out in the Research Stage.

4.2.1 Identification of Parking Areas

The first task accomplished is the identification of the parking areas to be considered by the system. There is a distinction among the parking areas in that some are owned by private companies and others are public areas currently assigned by the Municipality to TPM Company, which is a private company 100% owned by the Municipality of Monza.

Meetings have therefore been arranged with the companies owning the most significant parking areas in the City, aimed at gaining the approval to implement the measure. An agreement between parking owners and Comune of Monza about the location of the signs and about reciprocal

obligations concerning the implementation of the measure has been substantially reached and its formal subscription is in progress.

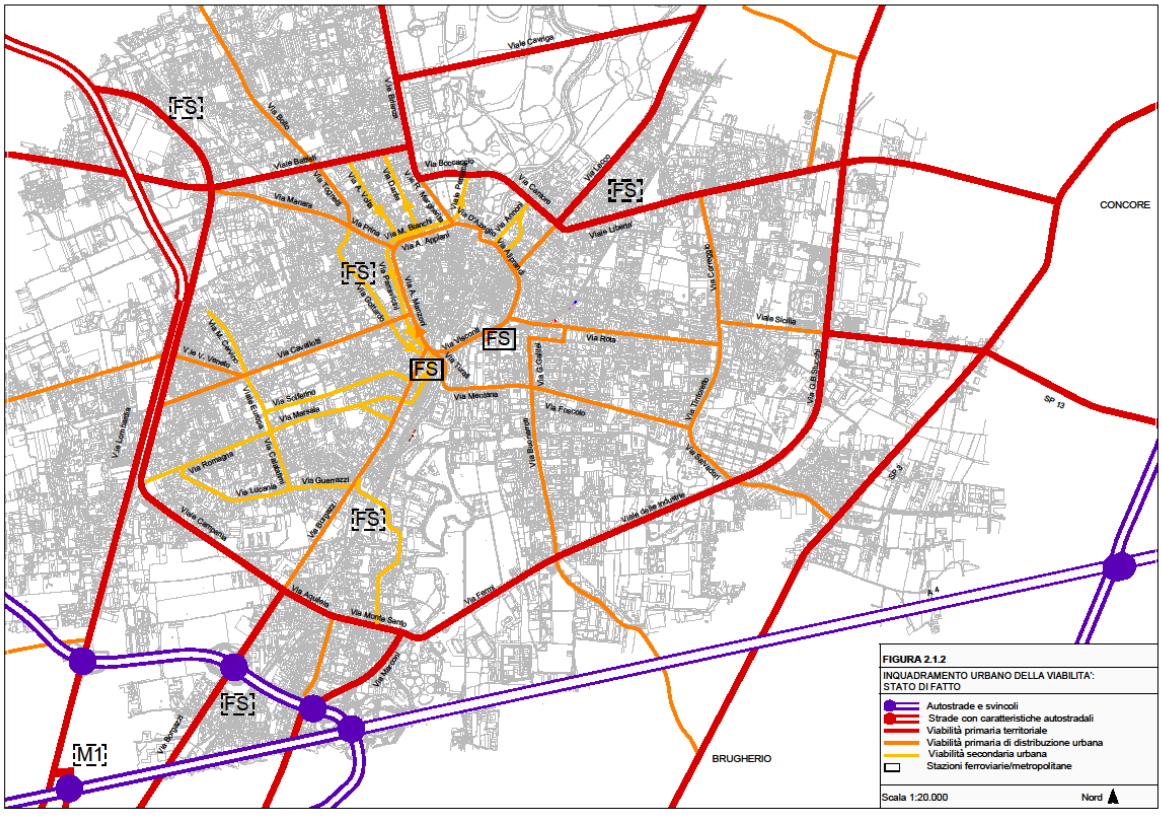
4.2.2 Study of the Road Network and Related Traffic Flows

A study has been conducted on data collected in the draft of the General Urban Traffic Plan, which is going to be adopted by the City government.

More specifically, in the actual hierarchic structure of the city a primary role is assigned to the external ring which surrounds the city and comprises the following streets: Viale Lombardia-Viale Campania-Via Aquileia-Via Monte Santo-Via Fermi-Viale delle Industrie-Viale Stucchi-Viale Libertà-Via Boccaccio-Viale Battisti.

The road network of urban distribution includes the following radial routes: Via Borgazzi - Corso Milano, Via Cavallotti, Via Manara - Via Tognetti - Via Prina, Viale Regina Margherita, Via Lecco, Via Rota, Viale Foscolo- Via Buonarroti -Via Mentana - Via Turati – Via Correggio.

The historical centre of Monza is included in the ring made up by Via Manzoni -Via Appiani - Via D'Azeglio -Via Aliprandi -Via Visconti. The road system is organized to allow accessibility to the various parking areas.



Picture 2 -Monza primary road network (from GUTP)

Analysis of the traffic flows in the peak hours is depicted in the following tables: table 1 shows the traffic flows on the tangential road system, whilst the table 2 shows the traffic flows on the internal ring.

TABLE 1

COUNTS ON TRAFFIC FLOWS – TANGENTIAL SYSTEM
FLOWS OF PEAK HOURS' SURVEY (7.30-11.30 16.00-20.00)

Clockwise sense

	Vehicles categories											
	Cars	Buses	Vans	Lorries without trailer	Lorries with trailer	Articulated lorries	Other vehicles	**TOTAL**	Bikes	Cycles	General Total	Total of commercial vehicles
Boccaccio	8706	15	558	511	1	25	17	**9833**	577	87	10497	1095
G.B.Stucchi	13384	13	1124	355	52	96	39	**15063**	567	49	15679	1627
Delle Industrie	10303	60	1021	575	270	41	26	**12296**	614	87	12997	1907
Monte Santo	6323	18	560	278	6	3	40	**7228**	386	32	7646	847
Campania	8346	42	758	188	19	80	32	**9465**	674	66	10005	1045
Battisti	9924	10	790	383	29	34	120	**11290**	697	276	12263	1236

Anticlockwise sense

	Vehicles categories											
	Cars	Buses	Vans	Lorries without trailer	Lorries with trailer	Articulated lorries	Other vehicles	**TOTAL**	Bikes	Cycles	General Total	Total of commercial vehicles
Boccaccio	7641	16	586	374	12	39	35	**8703**	712	89	9504	1011
G.B.Stucchi	10632	16	985	362	37	59	50	**12141**	502	55	12698	1443
Delle Industrie	10161	66	1074	649	207	45	22	**12224**	772	89	13085	1975
Monte Santo	8499	106	808	108	28	14	42	**9605**	387	40	10032	958
Campania	7718	50	777	166	11	44	56	**8822**	518	58	9398	998
Battisti	10652	15	959	219	14	74	51	**11984**	869	175	13028	1266

Combined total flow

	Vehicles categories											
	Cars	Buses	Vans	Lorries without trailer	Lorries with trailer	Articulated lorries	Other vehicles	**TOTAL**	Bikes	Cycles	General Total	Total of commercial vehicles
Boccaccio	16347	31	1144	885	13	64	52	**18536**	1289	176	20001	2106
G.B.Stucchi	24016	29	2109	717	89	155	89	**27204**	1069	104	28377	3070
Delle Industrie	20464	126	2095	1224	477	86	48	**24520**	1386	176	26082	3882
Monte Santo	14822	124	1368	386	34	17	82	**16833**	773	72	17678	1805
Campania	16064	92	1535	354	30	124	88	**18087**	1192	124	19403	2043
Battisti	20576	25	1749	602	43	108	171	**23274**	1566	451	25291	2502

TABLE 2

COUNTS ON TRAFFIC FLOWS - INTERNAL RING

FLOWS OF PEAK HOURS' SURVEY (7.30-11.30 16.00-20.00)

Direction towards the Centre of the City

	Vehicles categories											
	Cars	Buses	Vans	Lorries without trailer	Lorries with trailer	Articulated lorries	Other vehicles	**TOTAL**	Bikes	Cycles	General Total	Total of commercial vehicles
Regina Margherita	4961	57	292	32	1	0	7	**5350**	287	169	5806	325
Villa	3364	3	180	3	0	0	15	**3565**	263	119	3947	183
Lecco I	2421	55	220	2	0	0	14	**2712**	171	186	3069	222
Bergamo												
Rota	2976	5	225	28	0	0	14	**3248**	202	111	3561	253
Buonarroti I												
Turati	3608	186	238	39	1	1	5	**4078**	360	169	4607	279
Caduti del lavoro	4015	160	193	11	0	0	2	**4381**	216	80	4677	204
Milano	4015	134	289	91	1	7	30	**4567**	255	203	5025	388
Cavallotti I	3646	61	251	27	0	0	23	**4008**	235	214	4457	278
Prina	2700	105	166	4	2	0	13	**2990**	158	214	3362	172
Volta	3107	3	113	18	0	0	28	**3269**	179	213	3661	131
Dante												
Total	**34813**	**769**	**2167**	**255**	**5**	**8**	**151**	**38168**	**2326**	**1678**	**42172**	**2435**

Direction towards the edge of the City

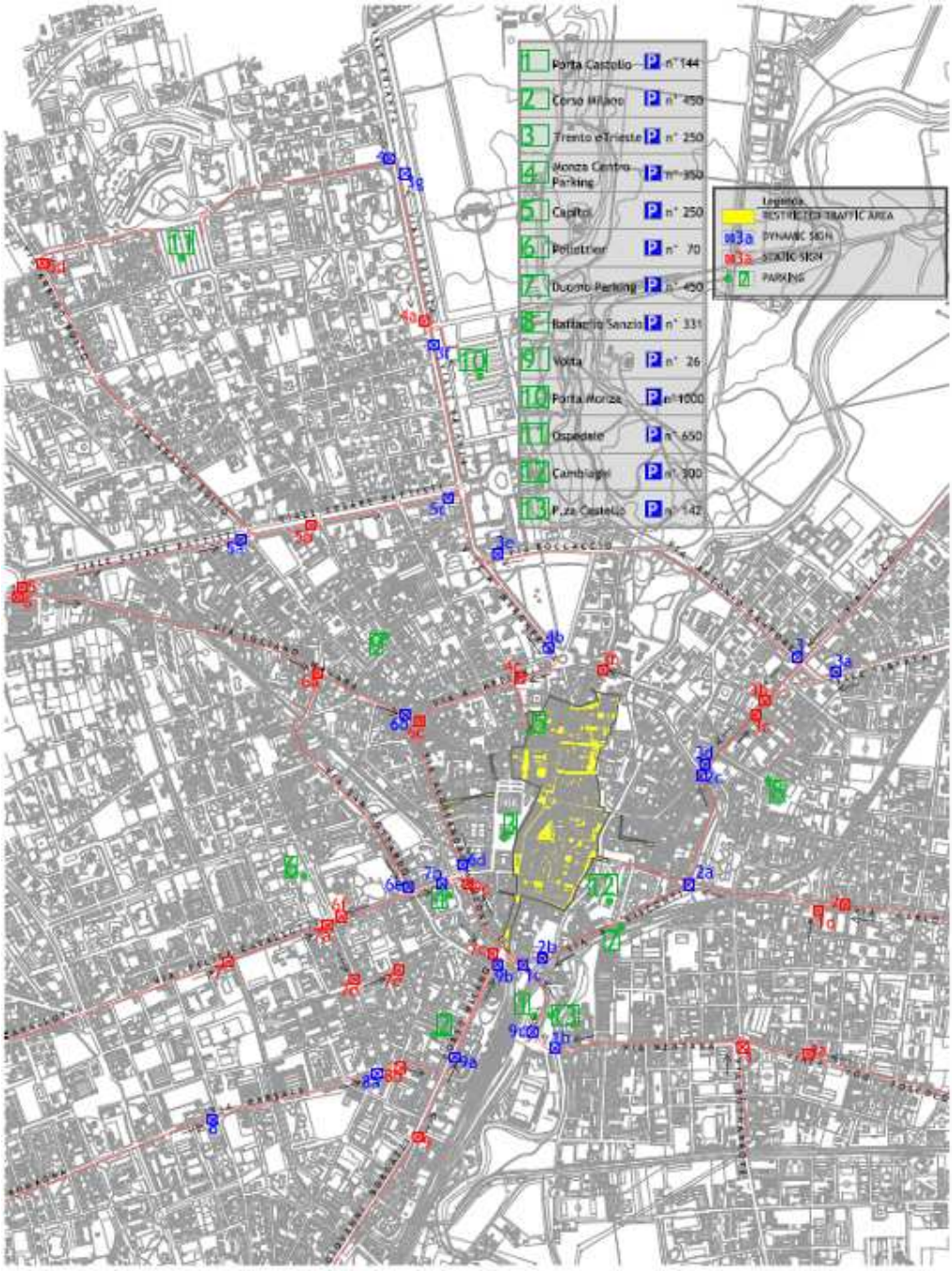
	Vehicles categories											
	Cars	Buses	Vans	Lorries without trailer	Lorries with trailer	Articulated lorries	Other vehicles	**TOTAL**	Bikes	Cycles	General Total	Total of commercial vehicles
Regina Margherita	3145	65	221	11	1	0	5	**3448**	193	129	3770	233
Villa	2645	0	89	2	0	1	10	**2747**	143	72	2962	92
Lecco I	4936	77	318	40	2	0	36	**5409**	330	235	5974	360
Bergamo	1706	1	193	13	0	0	8	**1921**	92	183	2196	206
Rota												
Buonarroti I	6518	46	636	155	11	2	17	**7385**	238	91	7714	804
Turati	4522	158	362	55	2	1	17	**5117**	339	168	5624	420
Caduti del lavoro												
Milano	7618	289	420	80	0	0	11	**8418**	556	413	9387	500
Cavallotti I	4309	89	330	58	0	0	31	**4817**	350	190	5362	388
Prina	3895	103	237	8	0	0	16	**4259**	301	278	4838	245
Volta												
Dante	5073	2	250	13	0	1	21	**5360**	210	120	5690	264
Total	**44367**	**830**	**3056**	**435**	**16**	**5**	**172**	**48881**	**2752**	**1879**	**53517**	**3512**

Combined total flow

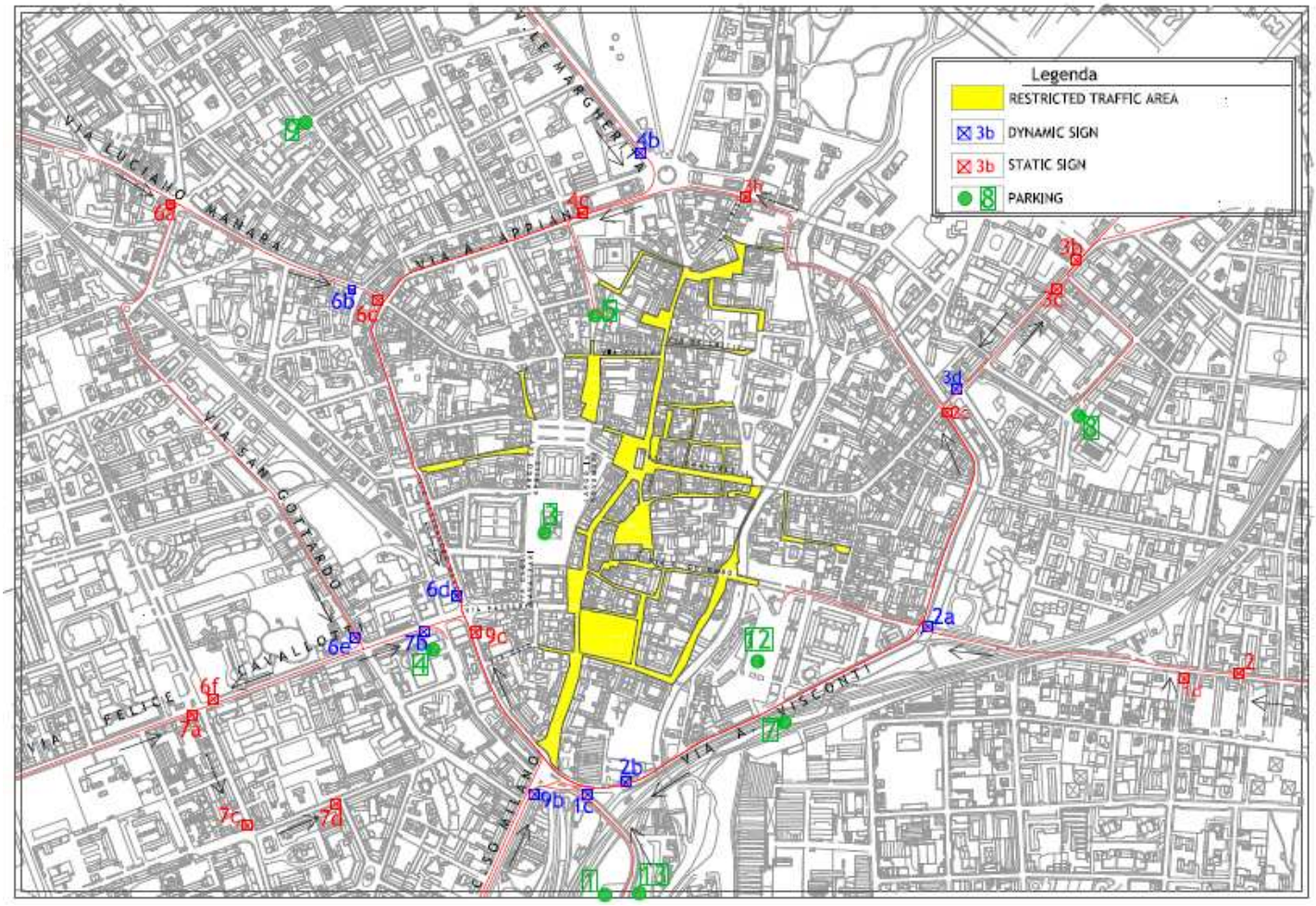
	Vehicles categories											
	Cars	Buses	Vans	Lorries without trailer	Lorries with trailer	Articulated lorries	Other vehicles	**TOTAL**	Bikes	Cycles	General Total	Total of commercial vehicles
Regina Margherita	8106	122	513	43	2	0	12	**8798**	480	298	9576	558
Villa	6009	3	269	5	0	1	25	**6312**	406	191	6909	275
Lecco I	7357	132	538	42	2	0	50	**8121**	501	421	9043	582
Bergamo/Rota	4682	6	418	41	0	0	8	**5169**	294	294	5757	459
Buonarroti I	6518	46	636	155	11	2	17	**7385**	238	91	7714	804
Turati	8130	344	600	94	3	2	22	**9195**	699	337	10231	699
Caduti del lavoro	4015	160	193	11	0	0	2	**4381**	216	80	4677	204
Milano	11633	423	709	171	1	7	41	**12985**	811	616	14412	888
Cavallotti I	7955	150	581	85	0	0	54	**8825**	585	404	9819	666
Prina	6595	208	403	12	2	0	29	**7249**	459	492	8200	417
Volta/Dante	8180	5	363	31	0	1	49	**8629**	389	333	9351	395
Total	**79180**	**1599**	**5223**	**690**	**21**	**13**	**309**	87049	**5078**	**3557**	**95689**	**5947**

4.2.3 Identification of position for signs

Once the parking areas to be included in the system had been identified, as depicted in Picture 1 and road network and traffic flows had been analysed, experts from the Municipality proposed the location of the signs, both static and dynamic as depicted in Pictures 3 and 4, also attached to the present study in pdf files (annexes 2 and 3).



Picture 3 - Monza general plan : identification of position for signs



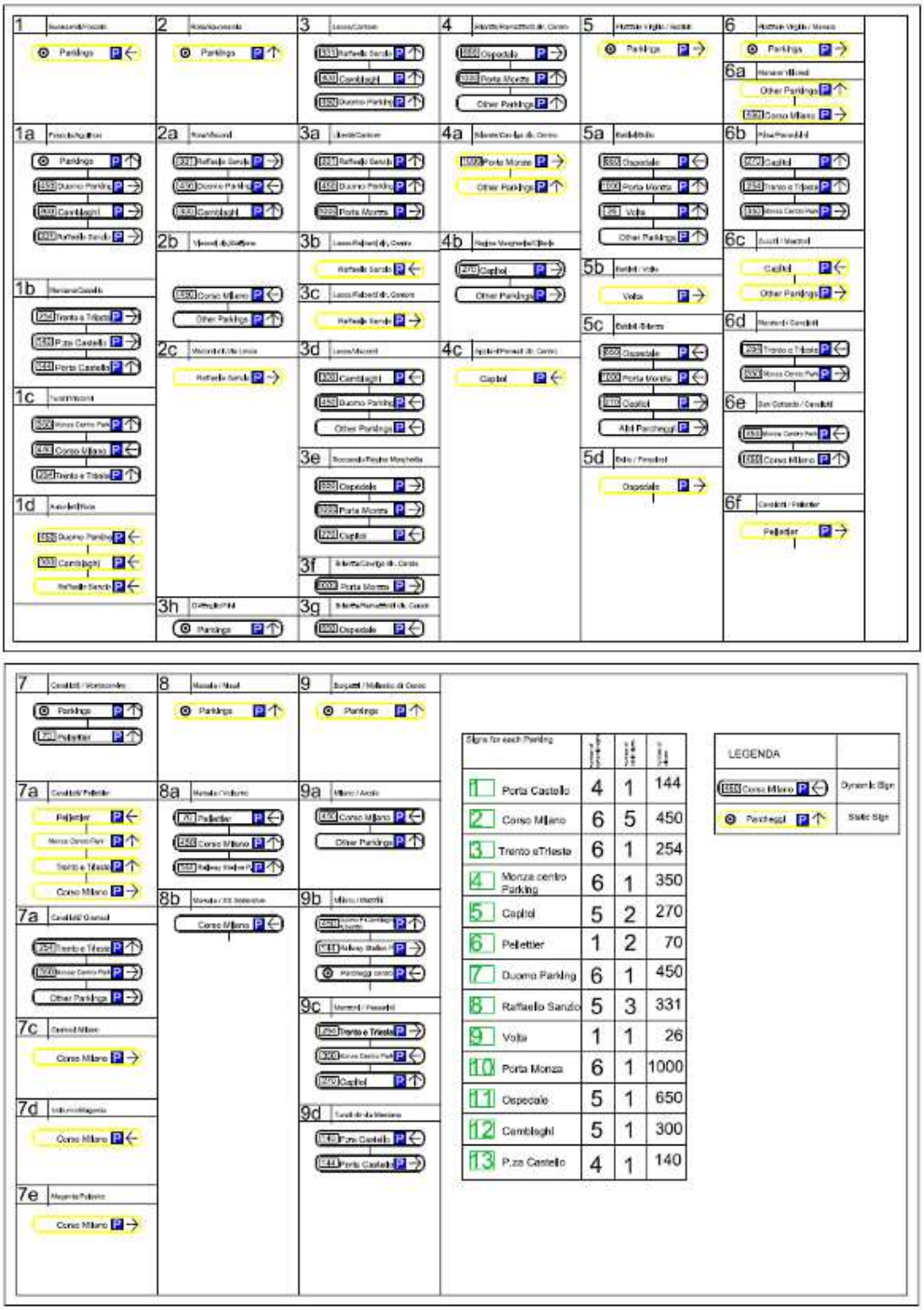
Picture 4 - Monza historical centre : identification of position for signs

The following scheme (Annex no. 4) is the basic source of information to establish the quantity of Message Signs to be installed across the city. Each sign is graphically represented with the information needed in that location.

Starting from data collected in the draft of the General Urban Traffic Plan, nine principal routes (numbered from 1 to 9) approaching the historical centre have been identified. It has been decided to direct traffic flows towards the nearest parking area along the route, in order to distribute flows in a homogeneous way in the city and to avoid traffic congestion in the historical centre.

The first signs along each route are static indications since they indicate parking areas near the historical centre, without giving the number of available places which could change before reaching the area. Dynamic indications have been located in proximity of important crossroads, in order to direct drivers to the chosen parking area, giving in that moment the information about available places.

It has been decided to equally distribute the number of dynamic signs between the different parking areas in order to consequently obtain an equal distribution of traffic flows in the city.



Picture 5 - List for signs' positioning

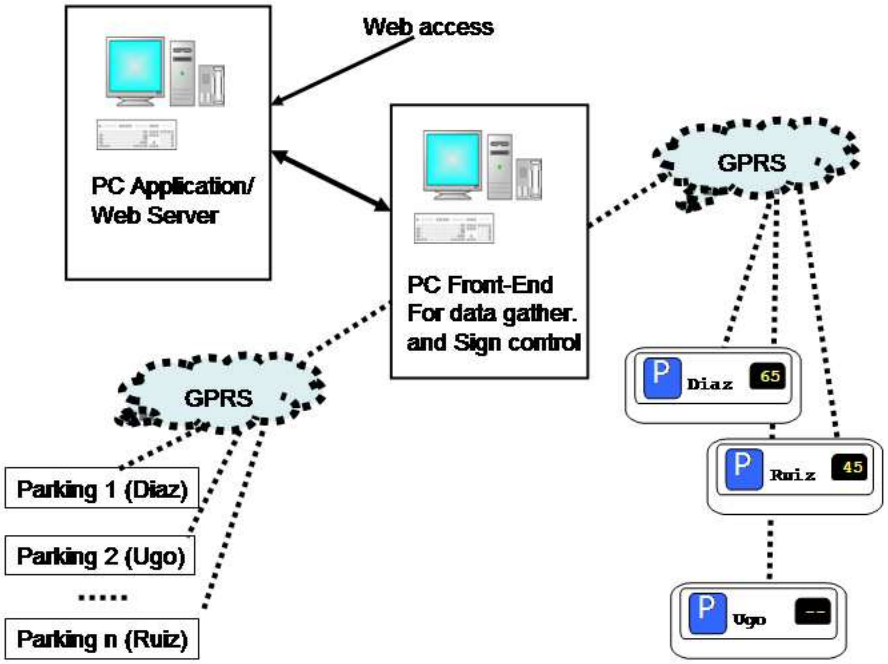
4.3 Main Outcomes

This section presents the main functional and non-functional requirements that have been identified as well as the conceptual architecture of the system. At the end of the paragraph, a time plan is proposed concerning the further stages of the measure.

InfoPark Monza is constituted of the following functional interrelated components:

- *Data Collection component*: this is aimed at gathering data concerning the availability of free places in the parkings included in the system.
- *Data Management component*: all data collected are kept in databases (relational or object oriented) for their processing; in addition, a specific software application must be provided to manage the system;
- *Data Communication component*: this is aimed at ensuring the communication between the Control Centre, the parkings which generate data and the VMS spread across the city;
- *Data Processing component*: information collected are checked before their use;
- *Data Presentation component*: data concerning the status of the parkings and the number of free places will be communicated through Variable Message Signs (VMS) spread across the city and through a specific Web Server that can be accessed by standard PCs as well as mobile devices (e.g. simple mobile phones, Smartphones,…);

InfoPark Monza is designed to be encapsulated in a wider ITS that will encompass all the technological systems concerning Mobility management in the city; some of them are already installed (e.g. video surveillance), others will become available within the ARCHIMEDES project lifetime, whilst others are expected in the future.



A breakdown of the components is the following:

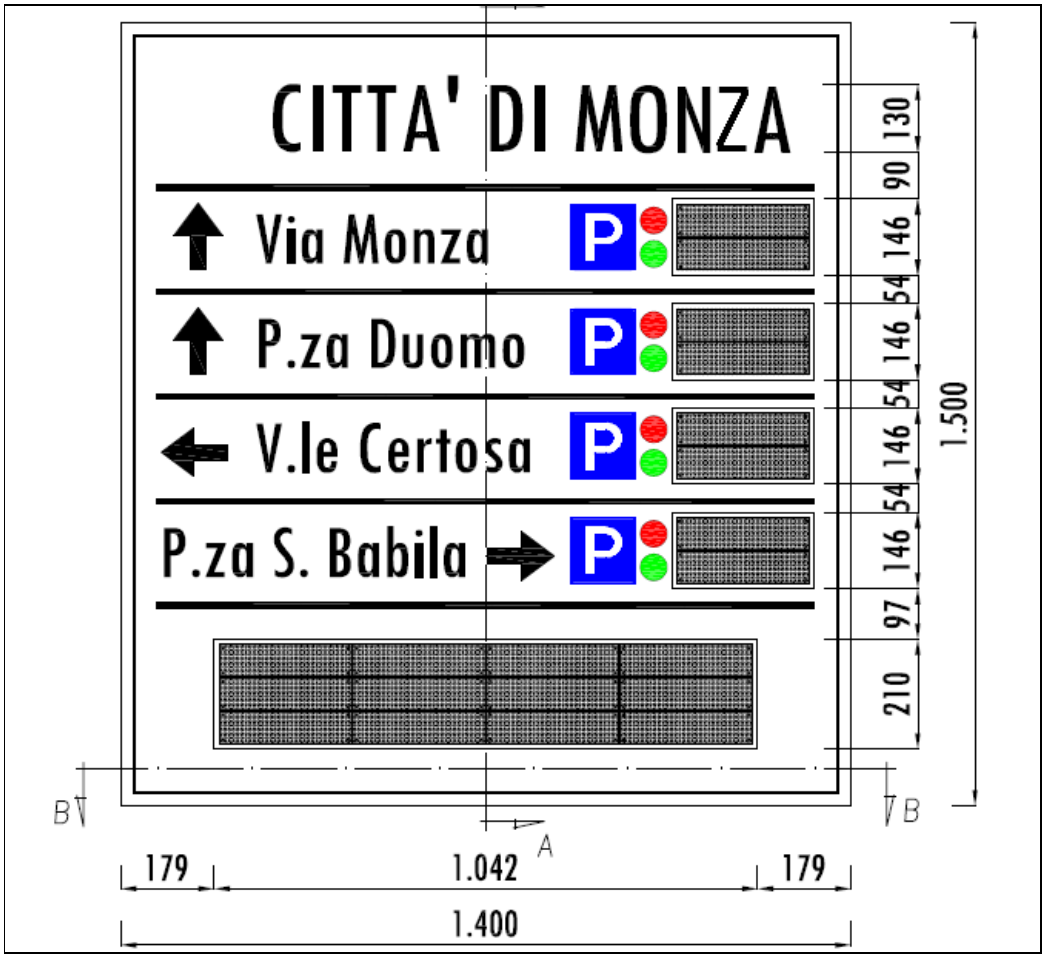
- Data collection component: it is aimed at gathering data concerning the availability of free places in the parkings included in the system and it is constituted of two sub-modules depending on the way parkings are interfaced.
  - D-COLL-1: this module is used for those parking areas for which information will be gathered by the technological system already in place to manage the basic functionality of the parking itself, such as issuing tickets at the entrance to the parking area, updating the parking ticket when payment is made, checking that the correct payment has been made on exit from the parking area. The parking owners will ensure that their technological system will be enabled to make such information available to allow specific software device drivers to access them through agreed application program interfaces (API);
  - D-COLL-2: this module is used for those parking areas where the information are not gathered by a technological system, either because such a system does not exist or because it is not accessible through a software interface; this is the case for example of parking areas managed with parking meters the suggested approach for these situations is to equip a counting system which is independent of the parking management system; therefore, an ad-hoc detection system needs to be designed and installed to know how many cars enter the parking as well how many vehicles leave it. The number of vehicles in the parking is simply the difference between the number of vehicles that have entered and the number of vehicle that have exited in a specified time, typically every day. Some extra features need to be added in this case to allow manual re-alignments, if offsets between the number of vehicles actually present in the parking is different to the number reported as well as to fix a reference value at opening time if, for example, the parking allows free overnight parking.
- Data management component: it is constituted of two sub-modules:
  - D-MGMT-1: This first module is aimed at designing and implementing a repository to store the status of the system and the number of places available gathered through the Data Collection component; the role of this component is twofold: the first use is for on-line purposes, to be diffused by the Data Presentation component; the second use is for planning and transportation purposes, enabling traffic experts to evaluate trends and correlation with other traffic data, analysing historical data.
  - D-MGMT-2: The second module consists of the software functionality to allow system management by authorised operators, such as diagnostic features, the capability to set reference values, to set as out-of-order specific parking areas, to ask collection systems the actual value of free places,…
- Data Processing component (D-PROC): this is aimed to pursue elaboration on data collected, for example to identify outliers, i.e. data which are biased for unpredictable reasons, and to apply forecast models when needed: for example, if the data collected concerning the number of places free is presented on VMSs quite far from the destination parking, it might happen that in the travel time needed to reach the parking, the parking itself becomes full. In this case, data collected and stored in the repository must be processed to generate a forecast which can then be shown on the VMSs. Forecasts must depends on the day of the week and the seasonal period.
- Data Communication component (D-COMM): it is aimed to ensure the communication between the Control Centre and the parking areas which generate data and between the Control Centre and the VMS spread across the city; GSM/GPRS connections will be preferred, unless other

connections are available (Wi-Fi hotspot, optical fibre in the neighbourhood); anyway, the quantity of data to be exchanged is very limited (hundreds of bytes every minutes) so GSM/GPRS connections are appropriate and cheap.

- Data Presentation component: it is constituted of two sub-modules:
  - D-PRES1: data concerning the status of the parking areas and the number of free places will be communicated to the drivers through Variable Message Signs (VMS) spread across the city;
  - D-PRES2: data concerning the status of the parking areas and the number of free places will be communicated also through a specific Web Server that can be accessed by standard PCs as well as mobile devices (e.g. simple mobile phones, Smartphones,…);

As far as the supply is concerned, the entities to be procured and installed are the following:

- Variable Message Signs to be installed on a pole adjacent to the roads in the locations identified by the experts of the Municipality; each VMS has a dimension of about 140 x 150 cm and allows the presentation of the status of up to four parking areas. Each VMS is completed by relevant hardware, software and communication devices (e.g. access router GSM/GPRS) as well as civil works to connect power supply.
- Printed Message Signs (PMS) to be used when only the direction to reach parking areas has to be indicated, instead of the number of places available.
- civil works to install the VMSs and PMSs;
- power supply connection for the VMSs;
- software licences for the interface modules on the parking areas management systems to make available data on occupancy, free places and status of the parking (operational, closed);
- development of the software interface to access such data;
- software protocols to communicate with VMSs;
- software licences of the Software system which manage the entire system;
- software licences for the Web Portal which shows the status of the parking areas;
- software licences for mobile devices (e.g. simple mobile phones, Smartphones,…).



Picture 6 - Example of VMS

4.4 Problems Identified

No functional issues have as yet been identified as problems.

4.5 Mitigating Activities

Not applicable.

4.6 Future Plans

The implementation of the system will be carried out during the demonstration phase according to the following stages:

Stage 1: Definition of tender documents for the system *InfoPark Monza*

Stage 2: Once bid procedures are completed, Detailed Design of the system *InfoPark Monza* will be carried out; at this stage the exact position of the VMSs and PMSs will be defined, as well the specific interfaces with the parking areas (D-COLL-1 or D-COLL-2).

Stage 3: Implementation of the system