



## Annex 5

### Local Implementation Framework - Rome



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# 1 Rome

## 1.1 Physical Implementation Framework

The Demonstration Area is included in the north eastern central area of Rome inside the so-called Rail-Ring. The Rail Ring includes the central part of Rome, the hearth of the town.

The Demonstration Area has a very clear boundary situation with the presence of:

- North-east: Olimpica and Tangenziale, primary traffic routes and Inner Ring in the town;
- South: Muro Torto primary traffic route to access to the centre of Rome;
- West: the Tevere River with its monitored bridges and the Lungotevere, primary traffic route, the only longitudinal axis of Rome.

The Demonstration Area includes two important green areas: Villa Borghese and Villa Ada, where an environmental monitoring station is located.

In the North side of the Demonstration Area are the most important sport stadiums in Rome (Stadio Olimpico, Stadio Flaminio, etc.), used especially at the weekend.

The south-west side has a regular topography and is easy to model. It represents an important example of mid-central urban district architecture.

Inside the demonstrator area, there are three Consolari (main roads, developed on the basis of already existing roads in the Ancient Roman Period): Nomentana, Salaria and Flaminia three important main roads that provide access to the centre.

The entire Demonstration Area is a bridge between the Historical Centre and the peripheral areas, so the characteristic of the traffic are representative of the whole urban area.

The chosen area exhibits environmental problems, both noise and air pollution, with a high number of people affected, owing to the presence of social institutions (schools, hospitals, kindergarten, etc.) and highly frequented areas (shopping areas, government buildings, movie theatres, etc.).

The Demonstration area has these characteristics:

- 131 km of primary roads (56 km monitored)
- 673 links (213 monitored)

The edge of the area is completely monitored.

The following tables display demographic information about the whole city and demonstration area.

Table 1: Demographic information

		City	Demonstration Area
Total city area (km <sup>2</sup> )		1285	16.35
Population as of 1999		2.750.000	290.000
Population projection 2010		2.600.000	274.000
Household composition			
	1 Person	277.000	29.300
	2 People	587.000	62.200
	3 People	753.000	79.800
	4 People	895.000	94.900
	> 4 People	287.000	30.400

Figure 1: Ring Road map in Rome with the demonstration area



**Figure 2: The demonstration area limited by red boundaries**



As concerns the meteorological description there is a weather station called "Roma Urbe," placed near the demonstration area, which provides data about the highest and the lowest temperatures, rain, wind direction, atmospheric pressure and stability class.

Rome's meteorological conditions generally favour pollutant dispersion.

In winter, the dispersion is favoured by the presence of continental currents and in summer by the sea-breeze.

Also the mean atmospheric stability condition encourages air mixing and the dilution of pollutants.

A different approach is needed to disperse photochemical pollutants such as NO<sub>2</sub> and NO, whose production is related to the high concentration of primary pollutants and strong radiation.

In the following table, mean annual data from the meteorological station is given.

**Table 2: Data from meteorological station – Roma Urbe**

METEOROLOGICAL STATION :	ROMA URBE SEASON:			FALL			
Year	1992	1993	1994	1995	1996	1998	1999
Highest Temperature	31,9		34,6	31,4	27,6	24,9	26,4
Lowest Temperature	4,3		0,2	-4	-0,2	-1,3	-1,3
Mean of the highest Temperature	23,8		23,9	22,4	21,3	16,6	17,5
Mean of the lowest Temperature	13,8		10,8	8,6	10,1	6,4	6,1
Rain (mm)	215,6	174,6	133,4	143,4	219,2	171,8	116,0
Rainy (days)	30	26	27	23	32	31	8
Rainstorms (days)		1	1	1	3	1	3
Snow (days)				1			
Fog (days)		1	4	2	9	7	4
Mean atmospheric pressure (hPa)	1013	1013	1015	1015	1012	1018	1019,1
Wind prevalent direction	N	N	N	N	N	N	N NNW

In the following table, an entire framework on Rome mobility is given.

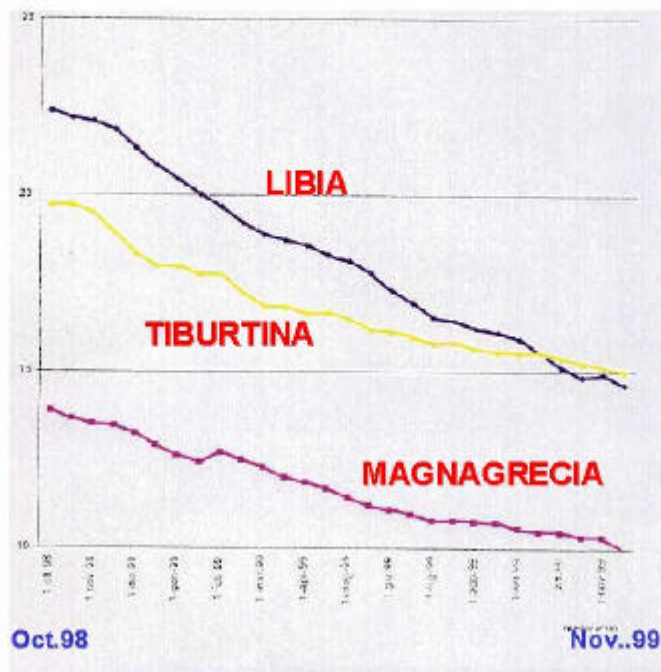
**Table 3: Traffic conditions in Rome**

Number of registered motor vehicles as of 1999		Thousands			
	Motorcycles	650			
	Autos	1750			
	Trucks	119			
	Trucks with trailers				
	Bus	7			
Fleet composition of the motorised vehicle traffic					
	Motorcycles	26%			
	Passenger cars	69%			
	- diesel	7%			
	- with 3-way catalytic converter	33%			
	- without 3-way catalytic converter	28%			
	Light goods vehicles (< 3.5 tonnes)	4.7%			
	Heavy goods vehicles (> 3.5 tonnes)				
	Buses	0.3%			
	Other, e.g. alternative fuels ( <i>specify</i> )	%			
	Methane / LPG cars	1%			
Length of road network		Rome	Rail Ring	Demo area	
	Main road network	750 km	292 km	131 km	
	Monitored main road network		78 km	56 km	
	No monitored main road network		214 km	75 km	
		Rome	Demo area		
	Secondary road network	6000km	201km		
Average traffic volume on the road/ day		Rome			
		16000000 vehicle * km			
Public transit network		Rome		Demo area	
		Length (km)	Traffic volume (vehicle*km)	Length (km)	Traffic volume (vehicle*km)
	Heavy rail	346	2.4		
	Underground railway	36	1.3	1.82	
	Rail rapid transit				
	Tramway	36	1.1	15	
	Bus	2000	21		
Percentage of people are using the following means of transport		Citizens in %			
	Private car	44.1			
	Motorbike	10.8			
	Bicycle	0.3			
	City bus	16.5			
	Regional bus				
	Metro	6.4			
	Railway	1.2			
	Tramway	1.7			
	Trolley - electric vehicles				
	Taxi				
	Other Pedestrian	19			
	<b>TOTAL</b>	<b>100%</b>			

From the analysis of the current air situation, it is apparent that traffic is mainly responsible for high pollutant concentrations. Traffic is mainly responsible for CO and Benzene concentrations; they are high in the vicinity of roads, while the background concentrations are below the legal limit. SO<sub>2</sub> concentrations are below legal limits and quality objectives. Industrial activity has ceased to be a dominant source of air pollution.

Figure 3: Benzene trend in Rome

### ENVIRONMENT SITUATION Benzene trend from oct.98 to nov.99



The ozone concentration has to be monitored due to its photochemical behaviour. The ozone pollution peaks are accompanied by relatively high average concentrations.

The climatic conditions require specific monitoring due to the special effect (canyon) that is created as a result of the breezes on the urban topography.

In order to control critical air pollution events, the Municipality of Rome undertakes several policies to reduce emissions from road transport.

1) »Giornata senza auto« - «Car-free day» on the 22<sup>th</sup> October:

- private vehicles are banned in the historical centre and in eight peripheral districts;
- public transport is free;
- the atmospheric and noise pollution is monitored;
- people can test electric vehicles.

Mercoledì pulito» - «Clean Wednesday»

from the 4<sup>th</sup> October 1999 to the 5<sup>th</sup> January 2000, every Wednesday from 3pm to 9 pm non catalytic cars are not allowed in the central area.

3) «Assi verdi» - «Green roads»

In August 1999, the first green road was established. It is a route from the peripheral district of Serpentara to the Termini railway station, which crosses through highly polluted areas. On this route, only public transport is allowed.

4) «Tourist buses' mobility control

Tourist buses are not allowed in the area around the Vatican, they can not cross the GRA without having been checked.

5)»Bollino Blu» - «The blue token»

The blue token is given to vehicles to certify the exhaust emission check. Vehicles without the blue token cannot move in the whole Municipality of Rome.

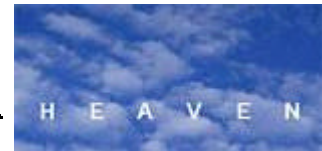
6) «Domenica senza auto» - «Car-free Sunday»

On four established Sundays, vehicles are banned in the historical town and in the district of Esquilino and Appia Antica. Only public transport and electric vehicles are allowed.

Public transport is free.

Table 4. City Descriptor Rome

City			Remarks
Area	1.285	Km <sup>2</sup>	
Population	2.818.021	Pers.	(31/12/2000)
Population density	2.193	Pers./Km <sup>2</sup>	
<b>Road infrastructure</b>			
Total road network	1257	Km	Main network within the external ring road
Urban roads	1092	Km	Intended as subset of Total Road
Highways	165	Km	
Traffic sensors – 1	279	No.	Number of measurement stations; each one contains one or more loops
Traffic sensors – 2	200	No.	Monitored intersections that correspond about 1500 loops
<b>Public transport network</b>			
-Rail	148.8	Km	(It includes link to the hinterland of Rome)
-Tram	50.9	Km	
-Underground	36.6	Km	
-Bus	2.510	Km	
<b>Total Emission/Energy*</b>			
Total amount of emission consists of vehicles emissions and private heating systems.(1999)			
CO	153.625	T/a	
NOx	6.813	T/a	
SO <sub>2</sub>	-	T/a	Rome does not measure this pollutant because it is not representative
VOC	20.779	T/a	
PM	220	T/a	
Energy		Mj/a	



<b>Share of Emissions/ Energy from vehicle traffic</b>			
CO	94	%	Emission in the ring road (1999)
NOx	100	%	Emission in the ring road (1999)
SO <sub>2</sub>	-	%	
HC	100	%	Emission in the ring road (1999)
PM	81	%	Emission in the ring road (1999)
Energy	-	%	
<b>Vehicle fleet composition</b>			1999
Passenger cars, with catalyst	28	%	
Passenger cars, without catalyst	36	%	
Diesel	8	%	
	2	%	
Light duty vehicles	5	%	
Heavy duty vehicles	1	%	
Buses	0.1	%	
Mopeds and motorcycles	21	%	
<b>Air quality monitoring</b>			
Stations	13	No.	
Pollutants measured	CO, O <sub>3</sub> , NOx, NO, NO <sub>2</sub> , PM <sub>10</sub> , benzene		

## 1.2 Legal and Institutional Framework

The main actors relevant to HEAVEN are the administrators and the agencies concerned with environment, health and mobility.

These organisations work at different geographical levels: national, regional and local level.

The organisations are:

### 1) Political and Administrative Organisation:

- Ministero dell’Ambiente - Direzione Generale Inquinamento Atmosferico e Acustico (Italian Ministry of Environment - Atmospheric and Acoustic Pollution Dept.)
- Comune di Roma Dipartimento VII Politiche della Mobilità (Municipality of Rome Dept. VII Mobility Policy);
- Comune di Roma Dipartimento X Politiche Ambientali e Agricole Ufficio Operativo Prevenzione Inquinamento Atmosferico, Acustico e dell’Acqua (Municipality of Rome Dept. X Environmental and Agricultural Policy - Atmospheric, Acoustic, Water Pollution Prevention Office).

### 2) Technical Agencies:

- ANPA - Agenzia Nazionale per la Protezione dell’Ambiente (Italian Environmental Protection Agency)
- ARPA - Agenzia Regionale per la Protezione dell’Ambiente del Lazio (Regional Environmental Protection Agency - Lazio)
- ISS - Istituto Superiore di Sanità (Advanced Health Institute)  
S.T.A. S.p.A. / Centrale del Traffico (Mobility Agency for the Municipality of Rome / Traffic Control Center)
- CNR - Consiglio Nazionale delle Ricerche (National Research Council)
- ENEA Ente Nazionale Energia e Ambiente (National Energy and Environment Association)
- Commissione Ambiente ( Environmental Commission)

These Organisations cover the conceptual matrix:

	<b>ENVIRONMENT</b>	<b>MOBILITY</b>	<b>HEALTH</b>
<b>NATIONAL</b>	Italian Ministry of Environment Italian Environmental Protection Agency	Italian Ministry of Transport	Italian Ministry of Health Advanced Health Institute
<b>REGIONAL</b>	Lazio Regional Administration	Lazio Regional Administration	-
<b>LOCAL</b>	Municipality of Rome Dept. X - Environmental and Agricultural Policy	Municipality of Rome Dept. VII Mobility Policy	-

In fact:

- Mobility: Comune di Roma Dipartimento VII Politiche della Mobilità deliberates mobility policy over the urban area, accomplishes mobility policy and takes routine decisions regarding mobility.
- Health: Istituto Superiore di Sanità is the technical organ of the Italian Health Ministry for hygienic sanitary questions

All these Organisations are dealing with questions of traffic related pollution every day.

Depending on the different characteristics of Organisations, their roles in traffic / environment policies are:

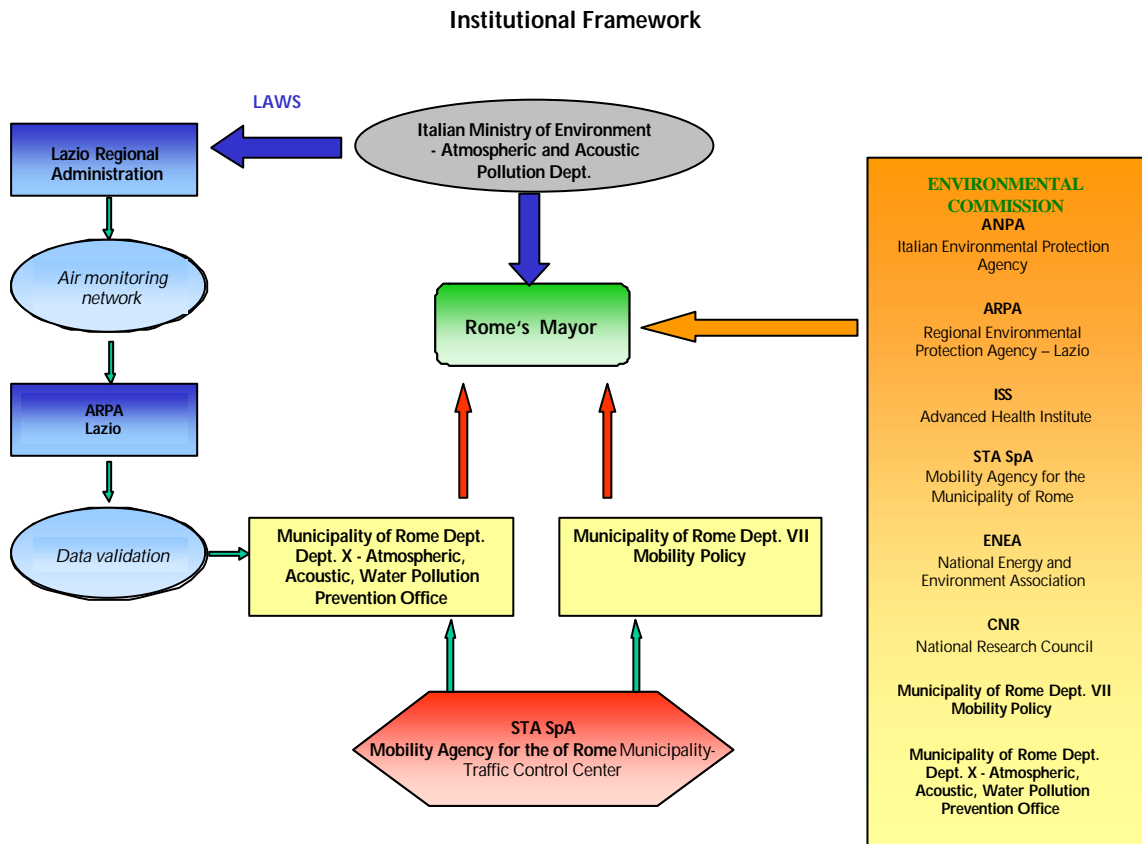
- Informing and Advising the decision makers (the Agencies System)
- Making the final decision (Administrative Organisations)

Depending on the different territorial characteristics of Organisations, their roles in short term decisions are:

- Informing and Advising the decision makers (the Local and Regional Agencies System, Istituto Superiore di Sanità)
- Making the final decision (Municipal Administrative Organisations)
- No Role (Italian Ministry of Environment and National Environmental Agency)

All these relationships are better explained in the following organigramme.

Figure 4: Organigramme of institutional framework



never (Ministero dell'Ambiente).

The public can receive information through channels such as:

- Radio data system - traffic message channel (RDS - TMC)
- Variable message sign (VMS)
- Data collected from computer controlled operation system
- Radio broadcast

The public consider air quality to be an important issue. There is a major environmental problem related to air quality and noise in Rome: this is the traffic.

The DSS can be used to optimise transport flows, to model the environmental effects of long term transport policies, to model the environmental effects of temporary measures to reduce traffic.

The final issue is a reduction of air pollution and traffic fluidification.

### **1.3 Technical Framework**

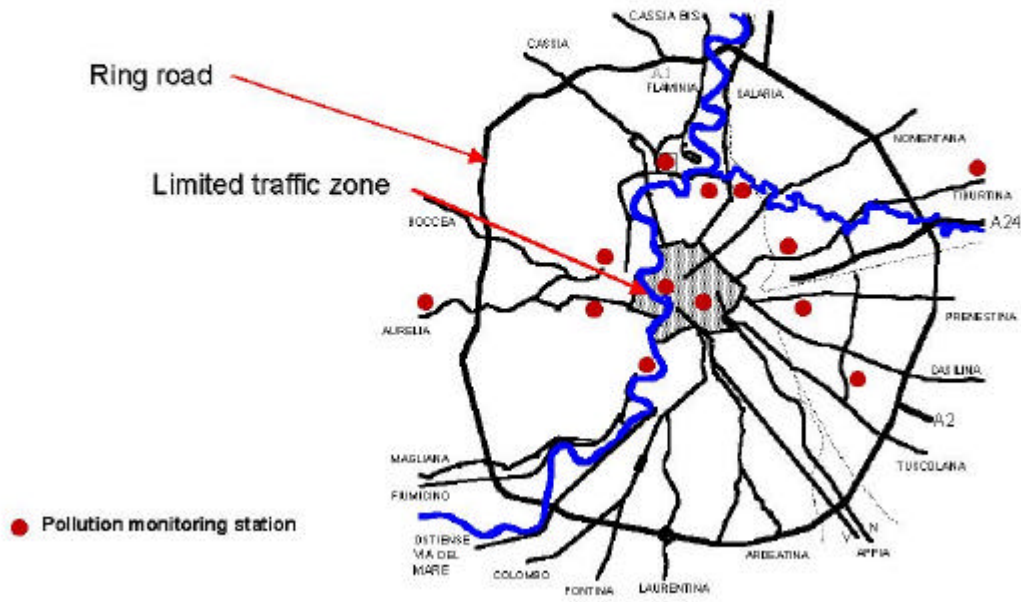
The basis for the Rome HEAVEN system is the traffic management centre established in 1999. The traffic management centre collects real time traffic data from measurement points in the city. With traffic modelling tools the traffic in the Demonstration Area will be modelled on the basis of the measured traffic data.

Based on this traffic data two models will be used to calculate emissions resulting from the existing or estimated traffic situation and pollutant dispersion.

The model Copert II/III will be used to calculate the vehicle emission factors. The results of Copert, together with other information such as mean speed and meteorological condition will be used as inputs for the dispersion model.

The combination of the data from the traffic management centre and the existing models will allow for the modelling of pollution levels in near real time and on street level for each major street in the Demonstration Area in Rome. The calculated levels can be compared to the different environmental information measurements in Rome, coming from the monitoring network, shown in the next figure, especially from the air quality stations inside or nearby the Demonstration Area.

Figure 5: The existing air quality monitoring network in Rome



## 1.4 Appraisal Groups

Table 5: Names and institutions of HEAVEN users in Rome

HEAVEN User Category	Names of User Organisations	Names of Key Individuals in Organisations
<b>Authorities as Direct HEAVEN Users</b>		
<b>Traffic/ Transport Departments</b>		
	Municipality of Rome Dept. VII Mobility Policy -	<i>Maurizio Fagioli</i>
	STA S.p.A Mobility Agency for the Municipality of Rome Traffic control centre	<i>Maurizio Tomassini Emilio Cera</i>
<b>Environmental Departments</b>		
	ANPA Air Monitoring and Integrate Control	<i>Franco Desiato</i>
	ARPA Regional Environmental Protection Agency - Lazio)	<i>Gianfranco Pallotti Francesco Troiano</i>
	Municipality of Rome Dept. X Environmental and Agricultural Policy - Atmospheric, Acoustic, Water Pollution Prevention Office	<i>Mirella di Giovine Annamaria Calofani</i>
<b>Health Departments</b>		
	Advanced Health Institute	<i>Giuseppe Viviano</i>
<b>Urban Planning Departments</b>		
	Municipality of Rome Dept. VII - Planning Department	<i>Gianfranco Taccari</i>
<b>Decision Makers (directly or via administration) as Indirect HEAVEN Users</b>		
<b>Urban Development</b>		
	Municipality of Rome - Mobility department	<i>Walter Tocci</i>
	STA S.p.A Mobility Agency for the Municipality of Rome - Planning Department	<i>Stefano Giovenali</i>
<b>Traffic/ Transport</b>	Italian Ministry of Transport	<i>Pier Luigi Bersani</i>
	Municipality of Rome	<i>Walter Tocci</i>
<b>Environment</b>		
	Italian Ministry of Environment Noise&Air Pollution Department	<i>Gianni Silvestrini</i>
	Lazio region Administration	<i>Marco Verzaschi (Political) Manlio Mondino (Technician)</i>
	Municipality of Rome	<i>Loredana De Petris</i>
<b>Health</b>		
	Italian Health Ministry	<i>Umberto Veronesi</i>

HEAVEN User Category	Names of User Organisations	Names of Key Individuals in Organisations
<b>Public &amp; Interest Groups as Other Stakeholders</b>		
<b>NGOs</b>		
	Legambiente- Italian environmentalist association	
	ITALIA NOSTRA Italian environmentalist association i	
	WWF - Italia Italian environmentalist association i	
<b>Research Institutions</b>		
	ENEA - Environment Air pollution Department	<i>Carlo Marzi</i>
	ENEA - Energy Transport Department	<i>Emanuele Negrenti</i>
	CNR - ( National Research Council) Environmental pollution Department	<i>Ivo Allegrini</i>
	DITS Department of Hydraulic, Transport and Roads - University of Rome	<i>Francesco Filippi</i>
<b>Public Transport Operators</b>		
	ATAC / COTRAL Rome public transport	
	FFSS National Railway Transport	Name

## 1.5 Institutions Responsible for HEAVEN Implementation

The DSS to be developed in HEAVEN will integrate real time traffic flow information into emission models in order to analyse the contribution of mobile sources to the ambient air quality for district and city level. The combination of the data from the traffic management centre and the existing models will allow the modelling of pollution levels in near real time and on the streets in the Demonstration Area in Rome. The calculated levels can be compared to the different environmental information measurements in Rome coming from the monitoring network, shown in the previous figure, especially for the air quality stations inside or nearby the Demonstration Area.