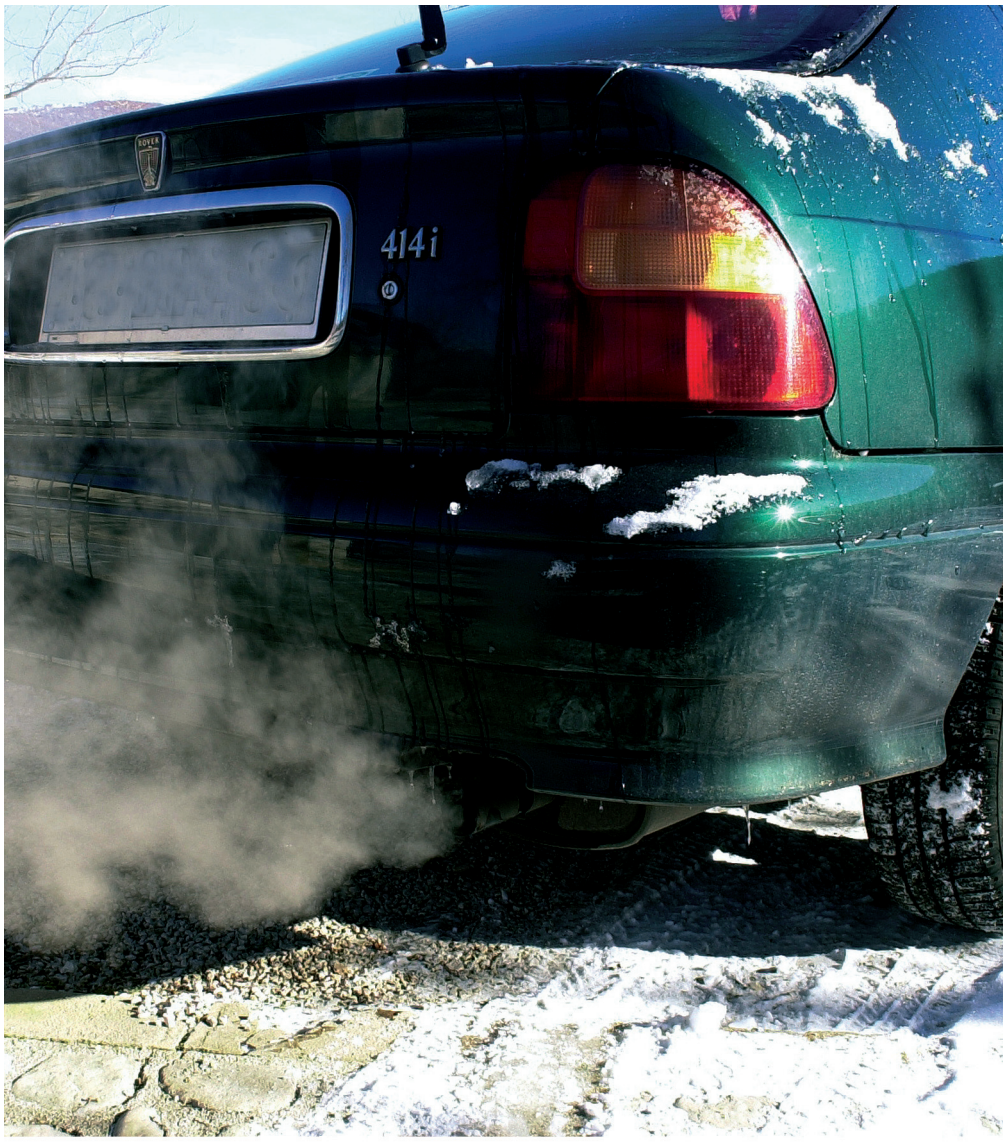
CHAPTER 3



AIR QUALITY

Introduction

Air quality represents one of the environmental emergencies that, together with climate change, to which it is closely connected, as well as the management of waste and water, involves all citizens on a daily basis and is of most concern to administrators of local and central governments. This emergency affects not only Italy, but all the countries of Europe, and especially large urban areas, where the percentage of the population exposed to levels that exceed the limit values set under legislative and regulatory measures is highest. The pollutants most responsible for poor air quality continue to be atmospheric particulate PM_{10}, ozone and nitrogen dioxide.

Air pollution is caused by a variety of factors, such as growing urbanisation, policies of mobility and public transportation, decisions regarding energy sources and heating systems, as well as the localisation of industrial plants. The essential stability of levels of air pollution observed in recent years, despite the reductions registered in Italy and the rest of Europe in emissions of primary particulate materials, nitrogen oxides and other substances responsible for poor air quality, demonstrates the great complexity of the factors at work, together with the need for increasingly integrated, long-term reclamation measures. Our country is making a significant effort, both nationally and regionally, to implement measures of reclamation, especially in the mobility sector, one of the main contributors to the emergency in air quality in urban areas.

Air quality

O_3, PM_{10}, NO_2 are the most critical pollutants.

The most critical pollutants, given the high concentrations in the air, continue to be ozone (O_3) during the summer months, PM_{10} atmospheric particulate (particle material at a size of less than 10 millionths of a meter) in the winter months, and nitrogen dioxide (NO_2), despite the downward trend of emissions in recent years. These key problems, shared by most of the European countries, plus the difficulty of bringing pollutant levels below the regulated limits, were taken into account by the new directive on air quality (Directive 2008/50/EC), which, though it maintains the same limit values as the earlier directive, offers the possibility,

in its art. 22, of requesting, based on reliable data and documentation, extensions or postponements with respect to limit values and deadlines (for nitrogen dioxide, PM_{10} and benzene).

The impact on human health is anything but negligible, considering that the highest concentrations of the pollutants referred to are registered in urban areas, where the population density is also highest: during the period 1997–2004, the European Environmental Agency (EEA) estimated that 20-45% of the urban population in Europe was exposed to levels of PM_{10}, ozone and nitrogen dioxide higher than the limit values[1].

Between 1997 and 2004, 20-45% of the European urban population was exposed to levels higher than the limits.

The EEA has also estimated that in 32 European countries, including the 25 Member States of the European Union, exposure to PM_{10} causes an average loss in life expectancy of nine months, with Italy, and especially the Po Valley zone, ranked among the "worst" areas, together with Benelux, Poland, the Czech Republic and Hungary.

Exposure to PM_{10} in Europe causes an average loss of 9 months in life expectancy.

The following charts on PM_{10}, nitrogen dioxide and ozone show the situation of Italy within the European context, in particular the widely known critical situation in the Po Valley area (Figures 3.1, 3.2, 3.3).

Critical situation in the Po Valley zone.

[1] *Air pollution in Europe* 1990-2004, EEA Report, no. 2/2007.

PM_{10}, 2006. Exceedances were registered in all type of stations, with a greater number of registrations in traffic stations than rural ones.

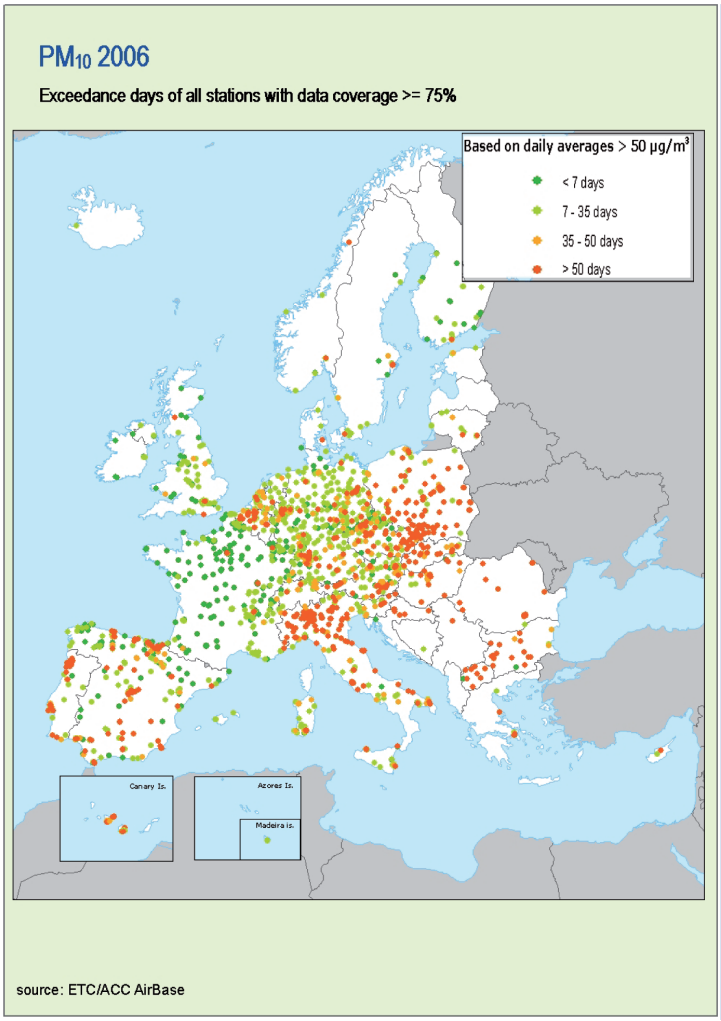


Figure 3.1: PM_{10} – Number of days in exceedance of the daily limit value for the protection of human health (50 µg/m³, not to be exceeded more than 35 times in a calendar year)[2]

[2] Source: http://air-climate.eionet.europa.eu/databases/airbase/eoi_maps/index_html

Nitrogen dioxide, 2006. Stations in urban areas registered the highest levels, plus the greatest number of exceedances.

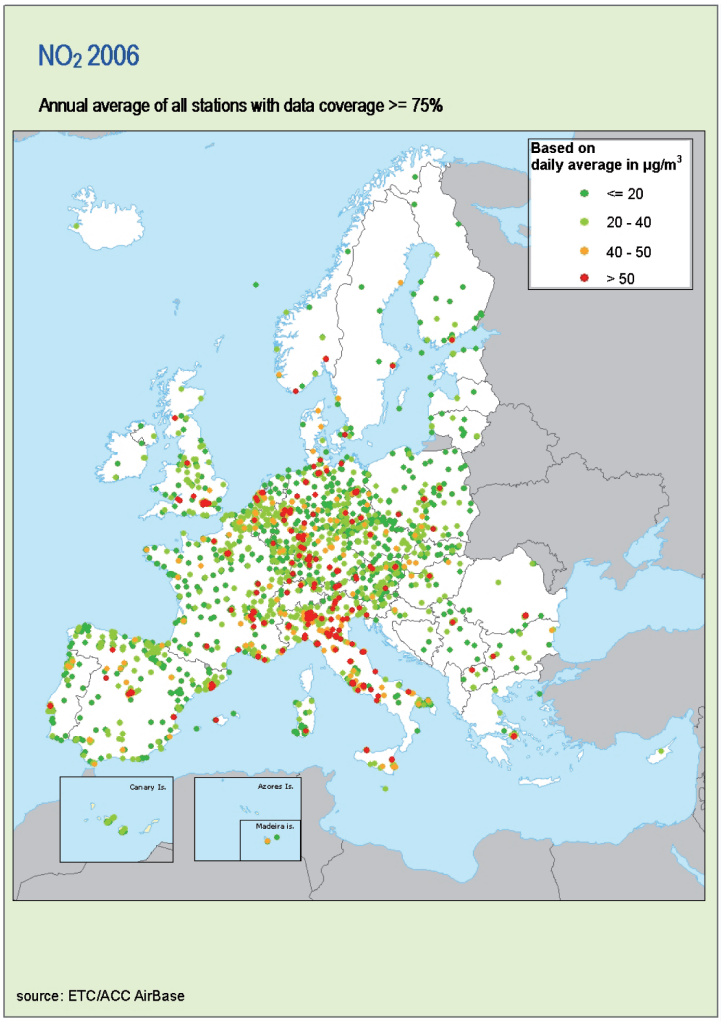


Figure 3.2: NO_2 – Annual average concentration of nitrogen dioxide (limit value 40 µg/m³)[3]

[3] Source: *ibidem*

Ozone, 2006.
Two thirds of the rural stations, and approximately 50% of those found in urban areas, registered exceedances for protection human health.

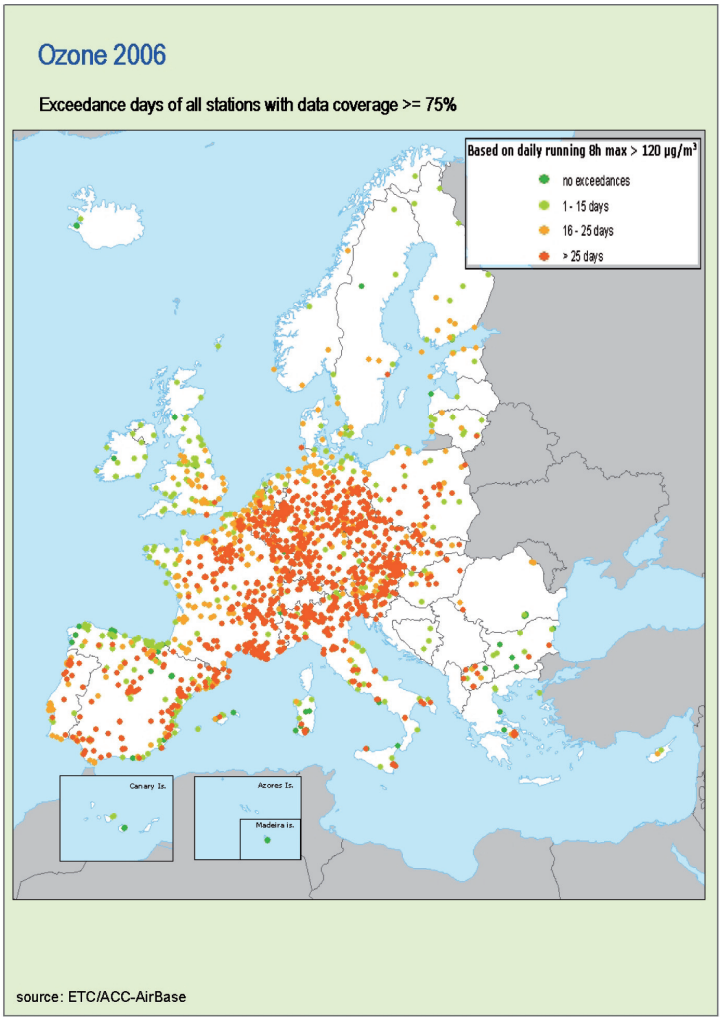


Figure 3.3: O_3 – Number of days in exceedance of the target value for the protection of human health (120 µg/m³ as an average for a maximum of 8 ore daily, not to be exceeded for more than an average of 25 calendar days per year over 3 years)[4]

[4] Source: *ibidem*

The monitoring stations are the main source of information on air quality.

In Italy, the main source of information on air quality, and the most reliable, consists of the measurements of the concentrations of the main pollutants taken at the monitoring stations distributed throughout the national territory, operating as part of regional monitoring networks. The data registered at the monitoring stations are used by the individual Italian regions for the evaluation and management of air quality (Legislative Decree 351/99, Ministerial Decree DM 60/2002 and Legislative Decree 183/2004), as well as for exchanges of information between the member countries of the European Community (Decision 97/101/EC on the Exchange of Information, EoI) and for the dissemination of information to the public on the local level and national levels, in this last case by means of the BRACE database (www.brace.sinanet.apat.it) and the ISPRA Yearbook of Environmental Data.

The emissions reduction of PM_{10}, NO_x and NMVOC registered in recent years has not led to a corresponding improvement in the air quality.

The emission reductions of PM_{10} (30%, and especially marked in the energy and industrial sectors), of nitrogen oxides (NO_x 43%) and of non-methane volatile organic compounds (NMVOC 41%) registered between 1990 and 2006 (*APAT Emissions Inventory*) have not led to a corresponding improvement in air quality, confirming the complexity of the problem of air pollution, which calls not for emergency measures but long-term integrated initiatives. What makes reducing air pollution an especially daunting task is the presence in critical pollutants of a predominant secondary component that forms directly in the atmosphere, starting from other substances referred to as precursors (nitrogen oxides, volatile organic compounds, sulphur dioxide, ammonia).
Unlike the pollutants referred to above, in the case of SO_x, CO, benzene and lead, all pollutants that have no secondary component, reductions in emissions have corresponded to reductions in concentrations in the air, and these substances, on the whole, are no longer a threat to human health, except in certain local settings and specific circumstances[5].

[5] EEA, 2007.

Air pollution, and especially that caused by PM_{10}, is an extremely complex problem that calls for long-term, integrated initiatives.

In the case of PM_{10}, its distinctive characteristics (it is not a single chemical compound, but a complex and variable mix of chemical ingredients that can be of either natural or anthropogenic origin) make understanding how it pollutes, how it should be managed and what measures of reduction should be applied even more difficult than with the other pollutants.
The regulation for PM_{10} sets a daily limit value of 50 μg/m³, which is not to be exceeded more than 35 times a year, plus an annual limit value of 40 μg/m³. These limits are frequently exceeded, especially the daily one, which proves to be stricter than the annual limit.
In 2007, 57% of the stations (Figure 3.4) registered exceedances of the daily limit value on more than 35 days; the 35-day limit is often reached as early as the first half of February (Figure 3.5).

In Italy, in 2007, the daily limit value (50 μg/m³, not to be exceeded more than 35 times a year) was broken by 57% of the monitoring stations. The most critical situation is in Northern Italy.

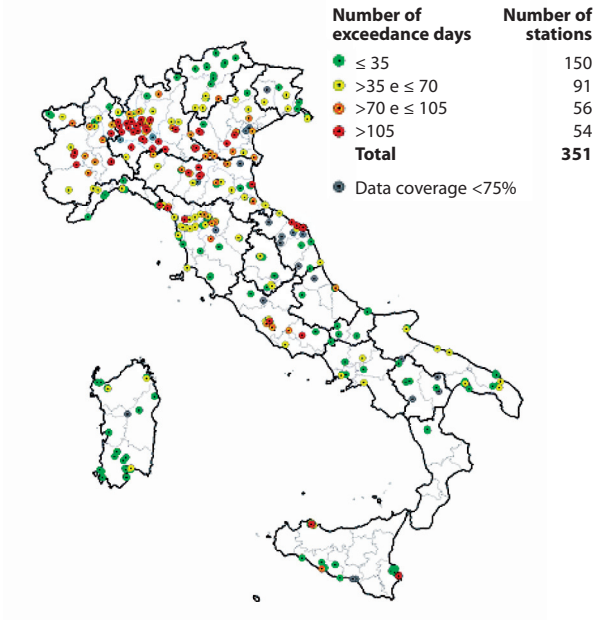


Figure 3.4: PM_{10} – Monitoring stations by categories of days over daily limit value (2007)[6]

[6] Source: EoI data processed by ISPRA (Decision 97/101/EC)

Even accounting for the readily apparent difference in the density of monitoring between Northern and Southern Italy (greater in the North than in the South), the figures confirm the critical state of the Po Valley areas, as already noted. The situation is generally less critical in Central-Southern Italy, though the limits are not respected there either (of the Central-Southern Italian Cities shown in Figure 3.5, Rome presents the highest levels).

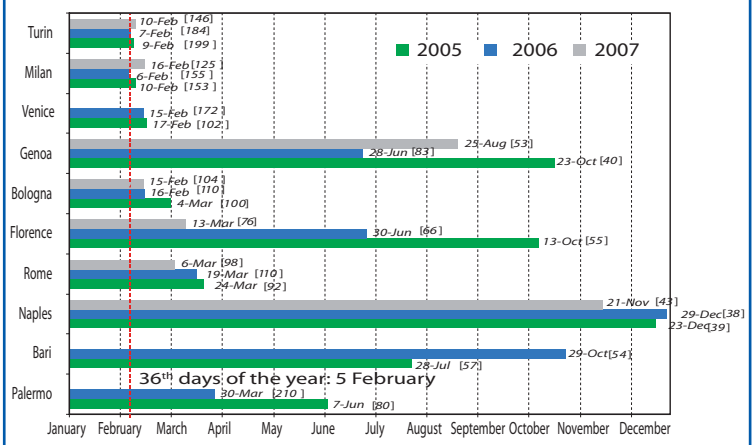


Figure 3.5: PM_{10} – Date on which the daily limit value was exceeded and annual number of exceedances at the monitoring station that first exceeded 35 days (2005-2007)[7]

PM_{10}, daily limit value: the 35 days over 50 μg/m³ are generally reached more "quickly" in the cities of the Po Valley area than in the cities of the rest of Italy.

There are evident signs of a relation between high concentrations of PM_{10} in the air breathed and negative effects on health: the World Health Organisation (WHO) recently estimated[8], based on a study carried out in the years 2002-2004 in Italy's largest cities, that more than 8,000 deaths a year can be attributed to average concentrations of PM_{10} greater than 20 μg/m³.

WHO: 8,000 deaths a year attributable to average PM_{10} concentrations > 20 μg/m³.

[7] Source: ISPRA processing of the air-quality assessment questionnaires for 2005, 2006, 2007 (Decision 2004/461/EC). The data refer only to the monitoring stations in municipal territory

[8] M. Martuzzi, F. Mitis, I. Iavarone, M. Serinelli, *Impatto sanitario di PM_{10} e Ozono in 13 città italiane*, WHO, APAT, 2007.

Negative effects on health are tied primarily to $PM_{2.5}$, the fraction of PM_{10} with the finest granulate size.

Current scientific knowledge shows that the negative effects on health are tied primarily to $PM_{2.5}$, the fraction of PM_{10} with the finest granulate size, accounting for roughly 40-80% of the total mass of PM_{10}. Information on emissions and concentrations in the air of $PM_{2.5}$, currently in short supply in both Italy and the rest of Europe, is sure to increase, give the attention focussed on this pollutant by the recently published Directive 2008/50/EC on air quality, which also contains obligations of monitoring and compliance with limit values on all the member countries.

The highest levels of ozone are registered during the summer season and in urban areas where the impact of traffic is not direct.

Ozone pollution is a problem typical of Summer: the highest concentrations are registered in the hottest months of the year and during the hours of maximum solar radiation, given that the ozone is formed through photochemical reactions starting from precursors that consist of volatile organic compounds and nitrogen oxides. Especially in urban areas, the ozone forms and is transformed extremely rapidly, showing highly complex behaviour that differs from that of other pollutants: unlike PM_{10}, the highest levels of ozone are registered not at sites characterised by high traffic density but at sites where the impact of traffic is not direct.
The long-term objective for the protection of human health (120 $\mu g/m^3$) - which best describe, of all the parameters defined under the legislation, situations of pollution and exposure of the population weighted over time (from the start of April to the end of September) – was exceeded by the vast majority of the stations: during the summer period of 2008, only 11% of the stations (27 stations out of the 245 that supplied information for at least five summer months out of six) did not register exceedances of the long-term objective (Figure 3.6).

Ozone, summer period 2008: 89% of the stations registered exceedances of the long-term objective. The situation was most critical in Northern Italy.

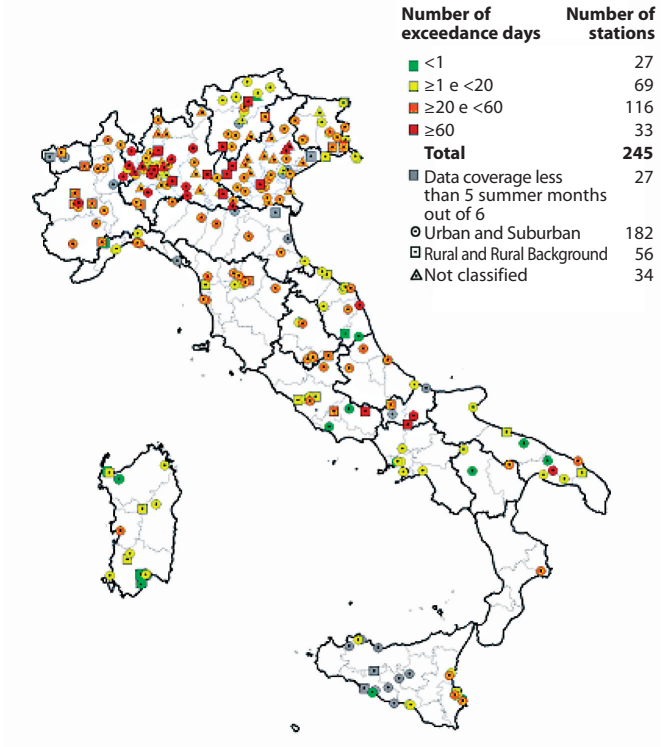


Figure 3.6: Summer O_3 – Monitoring stations by categories of days in exceedance of long-term objectives for the protection of human health (120 μg/m³) (2008)[9]

Even considering the undeniable difference in monitoring density between Northern and Southern Italy, the areas with the most critical ozone situations, as was the case for PM_{10}, are the regions of Northern Italy.

Ozone also has negative effects on human health, though to a lesser extent than PM_{10}; the WHO estimated[10], in the course of

WHO: 500 deaths a year can be blamed on ozone.

[9] Source: Regions data processed by ISPRA (communicated by the in compliance with Legislative Decree 183/2004)

[10] M. Martuzzi, F. Mitis, I. Iavarone, M. Serinelli, *Impatto sanitario di PM_{10} e Ozono in 13 città italiane*, WHO, APAT, 2007.

the study referred to earlier, carried out in 2002-2004 on 13 Italian cities, that approximately 500 deaths a year can be attributed to this pollutant.

In the case of nitrogen dioxide, the annual limit value for the protection of human health (40 µg/m³), which shall go into force in 2010, was met by 65% of the stations in 2007 (Figure 3.7).

Nitrogen dioxide, 2007: at 65% of the stations, the annual limit for the protection of human health was not exceeded (40 µg/m³).

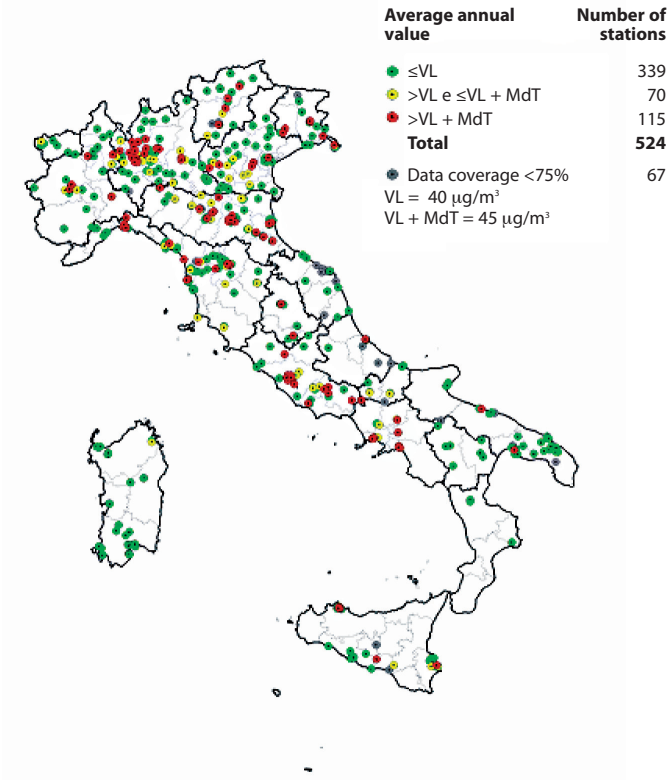


Figure 3.7: NO_2 – Monitoring stations by categories of average annual value (2007)[11]

[11] Source: EoI data processed by ISPRA (Decision 97/101/EC)

The main causes of air quality deterioration

The economic sectors contribute in different ways to emissions in the air of the main pollutants.

The information provided by APAT in the National Emissions Inventory for 2006, in the case of PM_{10}, with regard only to its primary component, shows that transport is the main source of pollution, accounting for 41% of the total, of which approximately 27% is attributable to roadway transport; next come industry (25%), the residential sector (13%) and agriculture (10%).

In 2006, 41% of PM_{10}, 65% of NO_x and 39% of NMVOC were caused by the transport sector.

In terms of tropospheric ozone, meaning that found in the lower layers of the atmosphere, there are no direct sources of ozone, seeing that it is a secondary pollutant. In terms of its precursors, the main source of nitrogen oxide emissions (NO_x) is transport, which accounts for 65%, with roadway transport representing approximately 45%; industry is responsible for 15%, the production of energy for 11% and the residential sector for 9%.

As for volatile organic compounds, but solely with regard to the non-methane ones (NMVOC), transport is responsible for 39%, while 42% come from the use of solvents, and the rest from the industrial sector, the residential sector and other minor sectors.

The national trends in emission reductions have also been observed on the European level. As noted in EEA report n. 7/2008, emissions of NO_x in the countries of the EU27 fell, between 1990 and 2006, by 35%, emissions of NMVOC by 44% and those of SO_x by approximately 70%. Emissions of PM_{10}, on the other hand, showed a 10% decrease between 2000 and 2006.

Between 1990 and 2006, in the countries of the EU27, emissions of NOx dropped by 35%, of NMVOC by 44% and of SOx by 70%. Between 2000 and 2006, emissions of PM_{10} dropped by 10%.

Roadway transport was the main source of emissions in 2006, responsible for 40% of emissions of NO_x and 18% of NMVOC. The other main sources of NO_x emissions are electricity production (19%), industrial combustion (14%) and the residential sector (14%). The main sources of NMVOC, apart from roadway transport, are domestic and industrial uses of solvents (16%), the use of solvents in paints (16%) and domestic heating (10%).

Emissions of both tropospheric ozone precursors and PM_{10} have fallen considerably in all the regions, with the size of the magnitude of the decrease depending on the presence of large-scale industrial plants, for which stringent limits were introduced in the 90's on smokestack emissions of SO_x, NO_x and PM_{10}. In fact, emis-

Emissions of PM_{10}, SO_x and NOx fell in all the regions, and especially those where large-scale combustion plants are found.

sions of these substances from plants of industrial combustion and energy production have dropped significantly between 1990 and the present. The regional emissions for the substances indicated above are illustrated for the years 1990, 1995, 2000 and 2005 (Figures 3.8, 3.9, 3.10).

Reductions in SO_x were registered by all the regions between 1990 and 2005, in a range of 60% to 90%.

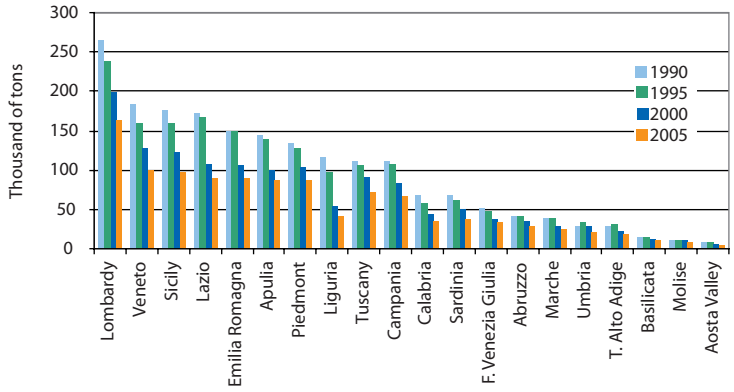


Figure 3.8: Regional emissions of SO_x[12]

Reductions in NO_x were registered by all the regions between 1990 and 2005, in a range of 30% to 60%, with the exception of Molise, where emissions remained stable.

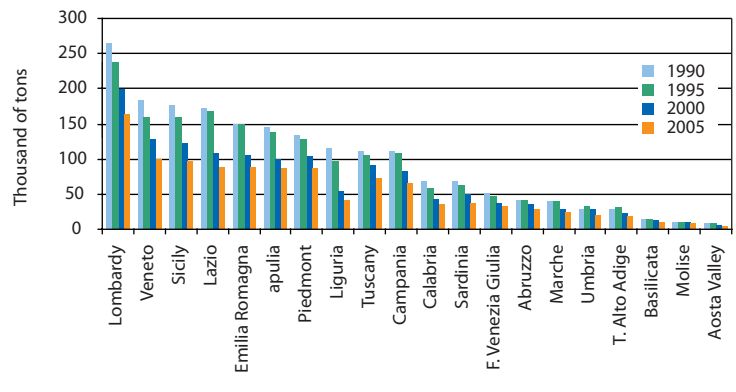


Figure 3.9: Regional emissions of NO_x[13]

[12] Source: APAT
[13] Source: APAT

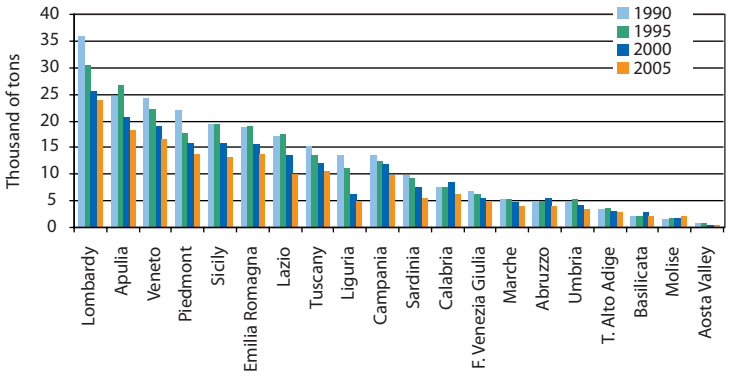


Figure 3.10: Regional emissions of PM_{10} [14]

Reductions in PM_{10} were registered by all the regions between 1990 and 2005, in a range of 15% to 45%, with the exception of Molise, where emissions rose slightly, and Basilicata, where they remained stable.

The emissions of industrial plants, as well as those of other production sectors, including agriculture, and those due to heating in the residential sector, affect urban air quality in different ways, depending on the characteristics of diffusion and concentration of the pollutants in the atmosphere and the conditions of weather and climate. In the Po basin regions, for example, levels of air quality are highly influenced by total emissions, and by the specific conditions of weather and climate in force, especially during the winter period.

Levels of PM_{10} in excess of the limits in urban settings depend not only on emissions, but also on the prevalent conditions of weather and climate.

Within this scenario, emissions of PM_{10} caused by the combustion of wood in fireplaces and stoves for house heating, an emissions source concentrated in the winter months, become equally as relevant as emissions due to roadway transport in terms of exceedances of the limit value established by the legislation. In the case of large urban centres, on the other hand, the main sources of urban emissions, such as those tied to roadway transport, are the primary cause for the registration of exceedances of the legal limits.

The points briefly illustrated indicate that transport, and especially by roadway, is one of the main causes of the high concentrations of PM_{10} and ozone in the air. This critical problem is especially

The transport sector is responsible for the high concentrations of PM_{10} and ozone registered in the air.

[14] Source: APAT

acute in cities where the levels of population and transport density are highest. In urban settings, emissions from roadway transport account for more than 70% of overall emissions of PM_{10}, NO_x and NMVOC.

As is plainly evident, the transport sector is the main source of the emission of harmful substances in the air. This situation is common to the majority of European countries, obliging the European Environmental Agency to draw up an annual set of indicators entitled TERM (*Transport and Environment Reporting Mechanism*), covering the main elements of the transport – environment system.

Harmful gas emissions during the period 1990-2006 were the result of two contrasting trends: emissions tend to increase, because of the continuous growth in the vehicle fleet and the paths covered, though, in reality, they decrease, thanks to the renewal of the vehicle fleet.

Since 1995, there have been significant reductions in NO_x, COV, Pb and C_6H_6, as well as PM_{10}, though to a lesser extent, on account of the renewal of the vehicle pool and the quality of the fuels.

In the years since 1995, NO_x, VOC and benzene have fallen at significant rates, thanks primarily to the renewal of the vehicle fleet.

As for the other harmful compounds, concentrations of PM_{10}, whose main source, at present, are freight vehicles, both light and heavy duty, have fallen to a limited extent, while concentrations of benzene and lead have fallen significantly, thanks primarily to the reduction of their content in gasoline, with the use of catalytic converters also contributing to the drop in benzene.

The demand for passenger transport increased by 34.1% between 1990 and 2007.

Demand for mobility, and especially the portion consisting of roadway transport, has grown constantly during the period under examination.

During the years 1990-2007, the demand for passenger transport increased by 34.1%, at a rate often higher than the increase in the GDP.

Private transport covers 81.5%.

Tranport demand has been satisfied to an increasing extent by private transport, which now accounts for approximately 81.5%.

Air transport shows extremely rapid growth.

During the same period, passenger transport by rail increased by 8.1% and bus transport by 24.1%, while air transport was the mode that grew most rapidly: the number of landings and take-offs rose by 217%.

Between 1990 and 2007 there was a noteworthy increase in freight traffic (27.2%), especially that travelling on roadways.

Freight transport growth for the period 1990-2007 is closely tied to economic growth. Changes in the structure of production processes ("just in time" and delocalisation of production among the EU-27 countries), as well as in consumption patterns, have resulted in a dizzying increase in freight traffic: +27.2% (total freight traffic for distances of more than 50 km) between 1990 and 2007, with an increasing percentage travelling on the road. This trend is forecast to continue over the next few years. In 2007 roadway transport absorbed 64.9% of the demand, railway 10.9% and short-haul shipping 19.2%.

Initiatives designed to improve air quality

Directive 96/62/EC[15], transposed into Italian law under Legislative Decree 351/1999[16], sets the criteria for the assessment and management of the ambient air quality. These criteria are based of a series of steps that range from assessing air quality to formulating plans or programs, whose contents are to address, among other considerations, measures designed to safeguard the air quality and comply with the maximum values set for pollutants, taking into account the characteristics of the territory and of the emission sources.
In cases where the levels of one or more air pollutants regulated under Ministerial Decree 60/2002[17] are greater than the limit values (LV), plus the margin of tolerance (LV+MOT), the regions

[15] Directive 1996/62/EC, issued by the Council on 27 September 1996, with regard to the assessment and management of environmental air quality – Official Gazette, issue L 296 of 21 November 1996.
[16] Implementation of Directive 96/62/EC on the assessment and management of environmental air quality – Official Gazette, issue no. 241 of 13 October 1999.
[17] Transposition into Italian law of Directive 1999/30/EC, issued by the Council on 22 April 1999, regarding the environmental air-quality limit values for sulphur dioxide, nitrogen dioxide, particulate and lead, plus Directive 2000/69/EC on the environmental air-quality limit values for benzene and carbon monoxide – Official Gazette, issue no. 87 of 13 April 2002 – Ordinary Supplement no. 77.

and the autonomous provinces are required to implement a plan or program (art. 8 of Legislative Decree 351/1999), in order to bring the levels under the limits within the deadlines set in the above decree.
In the same way, when concentrations of ozone in the air exceed the long-term objective (LTO) and/or the target value (TV) set under Legislative Decree 183/2004[18] for the protection of health, the regions and the autonomous provinces are required to implement a plan or program.

Plans for upgrading: investigative phase (local inventories), assessment phase (data on air quality), proposal phase (reclamation measures, emission and air-quality scenarios).

The starting point for drawing up a plan is the *investigative* phase, which includes an analysis of the regulatory framework and of the characteristics of the territory, including the typical climatic and meteorological conditions and pressures (*local inventories*).
There follows an *assessment* phase, involving an *air quality assessment* whose purpose is to describe the state of the atmospheric environment, identifying critical problems. This assessment must cover the entire territory being examined, and it must draw on both the precise data provided by a meteorological monitoring network and the "techniques in spatial data analysis", to analyse the distribution of the pollutants, in order to identify the portions of the territory (zones) inside of which initiatives of maintenance or upgrading must be undertaken. As a rule, these areas, within the Italian context, correspond to the administrative borders of one or more municipalities.
The characterisation of the territory and the assessment of the air pollution should lead, through a modelling system able to forecast air quality, to a subsequent *trend assessment* that simulates the concentrations of air pollutants over time, under certain meteorological conditions and in the presence of certain emissions input.

[18] Implementation of Directive 2002/3/EC on ozone in the air – Official Gazette, issue no. 171 of 23 July 2004 – Ordinary Supplement.

The trend analysis, carried out through the modelling evaluation of the scenario, represents the third, or *proposal* stage. It must contain the elements necessary for:

- determining the objectives for reducing air-pollution emissions necessary to obtain compliance with the air-quality limits. Action should be focussed on emissions in the sectors that contribute significantly to exceedances of the levels set by law (essentially transport, plus industry and commercial, and domestic activities);
- indicating the *"additional" measures* through which the region/autonomous province intends to achieve these objectives. The measures can involve economic/tax initiatives (tax reductions, incentives), technical considerations (use of lower-impact technologies) or even information (awareness campaigns);
- quantifying the air-quality benefits to result from application of the additional measures, as well as the estimated time needed to obtain them.

Under Legislative Decree 351/1999 (art. 12, paragraph 3), the regions and the autonomous provinces must transmit to the Ministry of the Environment, Land and Sea, and to the Ministry of Health, doing so through the ISPRA (formerly the APAT), information on their plans and/or programs (by means of questionnaires), no later than eighteen months after the end of the year during which the exceedances were observed; the Ministry of the Environment, Land and Sea, in turn, transmits the information on the plans or programs to the European Commission within two years after the end of the year during which the exceedances were observed (in 2008 the plans for 2006 are transmitted).
The current situation of the transmission of the plans is indicated on Table 3.1.

Roughly a third of the regions/autonomous provinces have not sent in the information for 2006. They are almost all located in the South.

Table 3.1: Information on plans and programs set by the regions/autonomous provinces, as per the legislation currently in force[19]

Year to which the plan refers	**2001**	**2002**	**2003**	**2004**	**2005**	**2006[a]**
Year information sent in	***2003***	***2004***	***2005***	***2006***	***2007***	***2008***
Piedmont	YES	YES	YES	YES	YES	YES
Aosta Valley	*	*	*	*	YES	YES
Lombardy	YES	YES	YES	YES	YES	YES
Bolzano	*	*	*	YES	YES	YES
Trento	*	*	*	YES	YES	YES
Veneto	YES	YES	YES	YES	YES	**NO**
Friuli Venezia Giulia	*	YES	YES	YES	YES	YES
Liguria	YES	YES	YES	YES	YES	YES
Emilia Romagna	YES	YES	YES	YES	YES	YES
Tuscany	YES	YES	YES	YES	YES	YES
Umbria	YES	YES	YES	YES	YES	YES
Marche	YES	YES	YES	YES	YES	YES
Lazio	YES	YES	YES	YES	YES	YES
Abruzzo	YES	YES	YES	YES	YES	YES
Molise	*	*	**NO**	**	**	**
Campania	YES	YES	YES	YES	YES	**NO**
Apulia	YES	YES	YES	YES	YES	YES
Basilicata	*	*	*	*	**NO**	**
Calabria[b]	*	*	*	**NO**	**NO**	*
Sicily	YES	YES	**NO**	**NO**	**NO**	**
Sardinia	YES	YES	YES	YES	YES	**NO**

Legend:

[a] Temporary figures: the regions are still sending in the questionnaires

[b] In the years 2005 and 2006, only exceedances of the ozone TV were recorded

* Absence of exceedances, no plan required

** No air quality questionnaires sent in

There were noteworthy delays in the sending of information for 2006: even though the deadline set was 30 June 2008, the majority of the questionnaires were sent in the months of October, November and December.

[19] Source: Regions/autonomous provinces data processed by ISPRA

As for the contents of the documents, those analysed show critical problems with regard to the "proposal" section; as a rule, the information is incomplete, especially in the portions regarding:

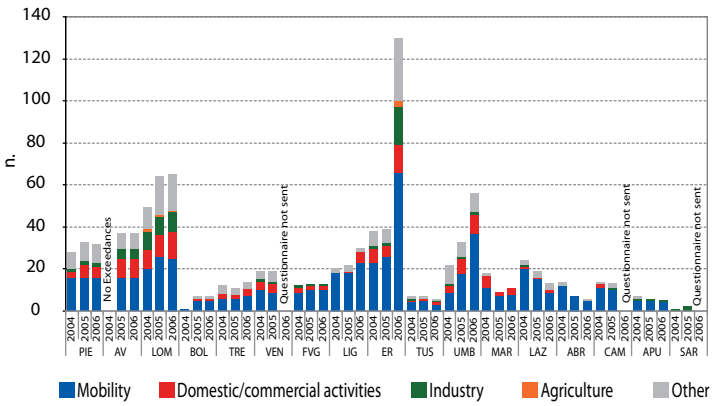
- assessment of the actual effectiveness of the additional measures identified;
- quantification of the time required for these measures to be effective.

The primary critical problems regard assessment of the efficiency of the proposed additional measures and quantification of their effectiveness over time.

The main sectors of intervention in which the additional measures identified by the regions fall are: mobility, domestic/commercial activities, industry, agriculture, other[20].

Sectors of intervention.

Figure 3.11 shows the number of measures implemented by the regions in the three-year period 2004 – 2006, classified.



The regions that did not send in the questionnaire, or that did not register exceedances, are not shown (see table 3.1)

Legend:

* Provisional data

Figure 3.11: Measures taken to restore air quality, detailed by region (2004-2006)[21]

Between 2004 and 2006 there was a significant increase in the measures taken to restore the air quality in the Emilia Romagna and Umbria Regions, while the number of measures in the Lazio and Abruzzo Regions decreased. The sector most frequently involved was mobility.

[20] The category "Other" includes: accessory measures in urban centres; studies and projects; initiatives for restructuring or expansion of air quality monitoring networks.

[21] Source: Regions and the autonomous provinces data processed by ISPRA

More than 400 measures are forecast for 2006, as compared to 284 in 2004.

As shown by Figure 3.11, the number of measures undertaken by the regions to restore air quality increased during the three-year period 2004-2006. In 2004, there were 284 measures throughout the national territory, with the number rising to 341 in 2005 and, based on the information currently available, to 398 (provisional data) in 2006. It can further be observed that mobility is the sector most frequently involved.

In 2006, the regions that undertook the most measures were: Emilia Romagna and Lombardy.

For 2006, to date, the regions that have undertaken the most measures are Emilia Romagna, at 130, and Lombardy, at 65 measures.

Measures for sustainable mobility.

The specific mobility initiatives include the following types of measures:

1. Promotion and dissemination of clean vehicles in public transport[22]
2. Reinforcement of local public transport (LPT)
3. Promotion and dissemination of clean vehicles in private transport
4. Testing of exhaust emissions from motor vehicles
5. Traffic restriction measures
6. Regulation of urban freight distribution
7. Drafting of urban plans (Traffic, mobility, transport)
8. Structural initiatives regarding mobility
9. Initiatives for alternative mobility[23]
10. Promotion and dissemination of clean vehicles in freight transport
11. Technological support for sustainable mobility

In order to provide a complete overview of the information received on the measures implemented in the mobility sector, the figures for 2005 have been examined. The number of measures enacted by each region are shown below, broken down by type.

Figure 3.12 shows that the measures most frequently taken were:

The measures most often adopted regard alternative mobility (17%).

- initiatives in favour of alternative mobility (17%);
- measures regarding the public vehicle pool (16%);
- measures regarding the private vehicle pool (15%);
- structural measures involving mobility (15%).

[22] Low Environmental Impact.

[23] Examples of initiatives in favour of alternative mobility: initiatives favouring two-wheeled mobility, systems of collective transport, car-sharing, car-pooling, on-call services, collective taxis.

Roughly 50% of all the measures on mobility were concentrated in 5 regions: Piedmont, Lombardy, Liguria, Emilia Romagna and Lazio.

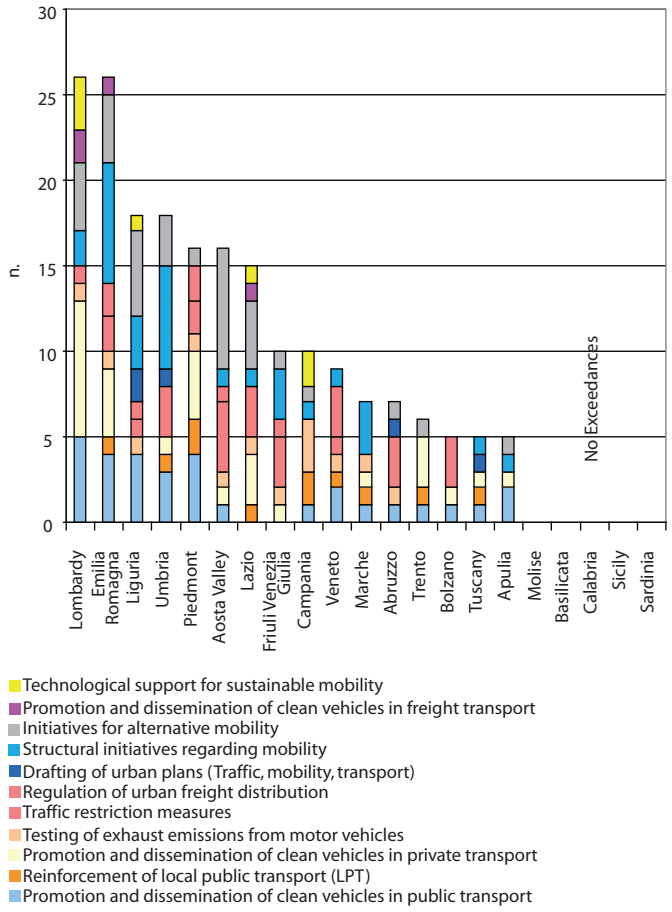


Figure 3.12: Regional restoration measures in the mobility sector (2005)[24]

In terms of actions for the restoration of air quality, investigative initiatives, an area in which the ISPRA plays a major role, should not be neglected. At present, the prevalent and most reliable

[24] Source: Regions and the autonomous provinces data processed by ISPRA

The new directive on air quality calls for a single, telematic information flow.

source of information on air in Italy consists of the monitoring stations distributed throughout the national territory, operating as part of the regional monitoring networks. Communication of information on the local, national and European levels is currently complicated by the fact that two distinct flows of information exist: one whose purpose is primarily informative (Decision 97/101/EC on the Exchange of Information, EoI); the other specifically designed to verify compliance with air quality limits (Legislative Decree 351/99, Ministerial Decree 60/2002 and Decision 2004/461/EC, plus Legislative Decree 183/2004).
The inconsistencies registered between the two flows, essentially stemming from the fact that the air quality data produced by a given monitoring station are not always present in both flows, were almost completely resolved in 2007 - 2008, and the problem will be solved completely by the implementation of a new directive on air quality, calling for a single flow of information carried exclusively by telematic means.

The regional monitoring networks are currently being updated and revised, in order to make available information that proves more uniform and suitable for comparison, throughout Italian territory and with the rest of Europe.

In terms of monitoring network quality and compliance with regulatory criteria, a process of updating and revision is currently underway, based on standards that call for, among other innovations, subdivision of the territory into zones, in order to assess and manage air quality, in addition to integrating the monitoring data with other techniques (spatial surveying, modelling, satellite procedures and others). This process of revising the monitoring networks, which involves the regions and the Agency System on the local level, together with the ISPRA and the Ministry of the Environment, Land and Sea on the central level, though it currently makes for complications when comparing data in terms of time and space, shall ultimately lead to more uniform, easier to compare information for the entire national and European territories.

There are clear signs of improvement in the activities of monitoring and the communication of information, on both the local and national levels.

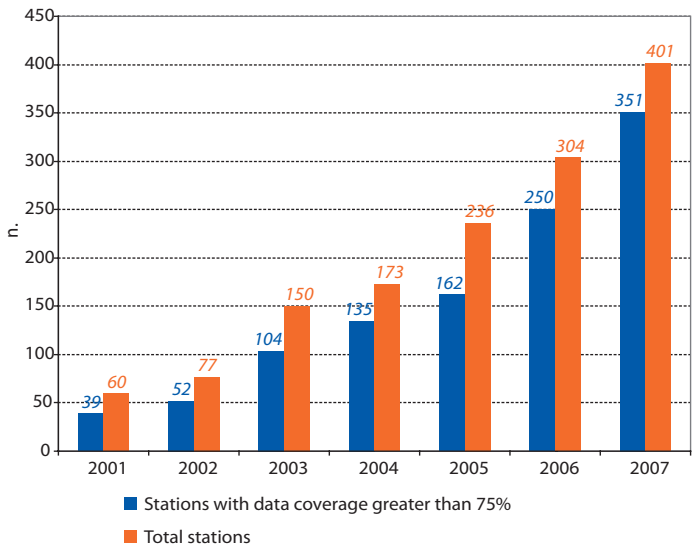


Figure 3.13: PM_{10} – Number of monitoring stations with time coverage of more than 75% and total number of stations[25]

In terms of monitoring network rationalisation, what stands out is that the number of stations utilised under the EoI continues to grow. Together with the number of stations, the number of data sets whose time coverage is in compliance has also increased, as shown in Figure 3.13 for PM_{10}: all these developments point to an improvement in monitoring activities and communication of information on the local and national levels.

[25] Source: EoI data processed by ISPRA (Decision 97/101/EC)