

Manual of European Environmental Policy

The following pages are a section from the Manual of European Environmental Policy written by the Institute for European Environmental Policy.

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This section is the text of the Manual as published in 2012. It is therefore important to note the following:

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Air quality framework

Formal references	
2008/50/EC (OJ L152 11.06.2008)	Directive on ambient air quality and cleaner air for Europe
Proposed 21.8.2005 – COM(2005)447	
96/62/EC (OJ L296 21.11.96)	Directive on ambient air quality assessment and management
Proposed 4.7.94 – COM(94)109	
Legal base	Article 192 TFEU (originally Article 175 TEC)
Binding dates 96/62/EC	
Entry into force	21 November 1996
Formal compliance	21 May 1998
Binding dates 2008/50/EC	
Entry into force	11 June 2008
Formal compliance	11 June 2010

Daughter Directives of Directive 96/62/EC are listed in Table 1. Three of the daughter Directives, together with Directive 96/62/EC, were consolidated into Directive 2008/50/EC.

Purpose of the Directives

Directive 96/62/EC was intended to provide a framework for ambient air quality management in the EC. It provided for the establishment of new ambient air quality standards and objectives, the assessment of air quality, the provision of information to the public, and the development and implementation of programmes to maintain air quality or to bring it to the desired levels where necessary. The Directive was subject to review and a revised Directive was adopted in 2008 (Directive 2008/50/EC). This has the same overall framework objectives as the earlier Directive. Limit values and alert thresholds for various ambient air pollutants were to be set through daughter Directives under Directive 96/62/EC, some of which replaced the existing EC air quality standards defined for sulphur dioxide and particulates, nitrogen dioxide and lead. The establishment of air quality standards for ozone were to be based on the information collected under Directive [92/72/EEC](#). Three of these daughter Directives were also amended and incorporated into the revised Directive [92/72/EEC](#).

Summary of the Directive 2008/50/EC

Directive 2008/50/EC repealed the original Air Quality Framework Directive 96/62/EC and the first three daughter Directives with effect from 11 June 2010 (the date by which transposition of Directive 2008/50/EC is required). It does not include the provisions (or repeal) of the fourth daughter Directive ([2004/107/EC](#)). The key elements of the Directive are set out below.

Responsibilities, zones and agglomerations

Member States are required to designate competent authorities, assess air quality, approve measurement systems, ensure accuracy of measurements and coordinate Community-wide assurance programmes on their territory (Article 3). Member States shall also establish zones and agglomerations on their territory where air quality assessment and management will be carried out (Article 4).

Assessment of ambient air quality

The Directive sets out a range of limit values for the pollutants originally addressed in the first two daughter Directives of Directive 96/62/EC. Article 5 establishes upper and lower assessment thresholds for sulphur dioxide, nitrogen oxides, particulates, lead, benzene and carbon monoxide (see Table 7, Table 8, Table 9, Table 10, Table 11), which are to be used to identify zones and agglomerations subject to monitoring and air quality management. This classification should be reviewed every five years. Where air pollution exceeds the thresholds monitoring is required and this can be supplemented by modelling in order to assess air pollutant behaviour and trends. Lower level rural background monitoring is also required (Article 6). Annex III sets out the criteria for the location of sampling points for individual pollutants, such as in relation to roadsides. The exact number and location of sampling points will depend upon the use of supplementary measures, such as modelling (Article 7). Articles 9 and 10 establish the assessment and sampling requirements in relation to ozone.

Ambient air quality management – achieving limit values

Where zones have air quality lower than the limit values, Member States shall endeavour to preserve the best ambient air quality (Article 12). Otherwise, Member States shall ensure that limit values for sulphur dioxide, nitrogen oxides, PM10, lead, benzene and carbon monoxide are met (Articles 13 and 14) (see Table 7, Table 8, Table 9, Table 10, Table 11). For PM2.5 Member States ‘shall take all necessary measures not entailing disproportionate costs’ to reduce exposure with a view to meeting the PM2.5 target value and limit value and to ensure that sampling for PM2.5 reflects population exposure (Articles 15 and 16).

Where a limit value is not met, Member States ‘shall take all necessary measures not entailing disproportionate costs’ to ensure that limit values are attained. Member States must prepare an air quality plan to address the problems identified (Article 17). Where limit values are met, Member States shall preserve best ambient air quality through proportionate measures ‘compatible with sustainable development’ (Article 18). Where alert thresholds are exceeded, Member States must inform the public (Article 19).

Where natural sources contribute to air quality problems, Member States should assess these and communicate the results to the Commission (Article 20). Member States may also designate zones where exceedence of the PM10 limit value is due to winter road salting or sanding. They must take reasonable measures to reduce pollution and communicate information on such zones to the Commission (Article 21).

Where a Member State cannot meet a limit value for nitrogen oxide or benzene, it can postpone the deadline for five years provided an air quality plan is established. If failure to meet a limit value is due to site-specific characteristics, adverse climatic conditions or transboundary contributions, Member States are exempt from meeting the limit value until 11

June 2011 provided appropriate measures are taken. Information on these issues shall be communicated to the Commission (Article 22).

Air quality plans

Air quality plans are required for zones or agglomerations where any target or limit value is exceeded, plus any margin of tolerance in each case (Article 23). The plans shall contain information on at least the following (Annex XV):

- Localization of excess pollution.
- General information.
- Responsible authorities.
- Nature and assessment of pollution.
- Origin of pollution.
- Analysis of the situation.
- Details of measures of projects for improvement which existed prior to 11 June 2008.
- Details of measures or projects adopted following entry into force of the Directive.
- Details of measures or projects planned or being researched for the longer term.
- List of publications and documents, etc., used to supplement information.

Where there is a risk of pollutants exceeding an alert threshold, short-term action plans shall be drawn up (Article 24). Such plans may address issues including traffic measures. Where alert, limit or target values are exceeded due to transboundary pollution Member States shall co-operate and, where appropriate, draw up joint activities, such as joint air quality plans, to address the problem (Article 25). The Commission can assist in this process.

Information and reporting

Member States are required to inform the public and appropriate organizations of air quality information (including annual reports on pollutants), exemptions and air quality plans (Article 26). Requirements are also specified for reporting to the Commission, including on assessment methods and zones and agglomerations where limit values are exceeded (Article 27).

In 2001 the Commission published a Decision setting out a questionnaire to be used for annual reporting for ambient air quality assessment under Council Directives 96/62/EC and [1999/30/EC](#) (Decision [2001/839/EC](#)), with a corrigenda on 15.1.2002 ([OJ L 12/70](#)). This was expanded by a Commission Decision ([2004/461/EC](#)) of 29 April 2004 laying down a questionnaire to be used for annual reporting on ambient air quality assessment under Council Directives 96/62/EC and 1999/30/EC and under Directives [2000/69/EC](#) and [2002/3/EC](#) and a corrigendum ([OJ L202](#), 07/06/2004). In February 2004 it issued a Decision [2004/224/EC](#), laying down arrangements for the submission of information on plans or programmes required under Directive 96/62/EC. On 12 December 2011 Commission Implementing Decision [2011/850/EU](#) was adopted which lays down rules for Directives 2004/107/EC and 2008/50/EC on the reciprocal exchange of information and reporting on ambient air quality.

Final provisions

Article 29 establishes a Committee to assist the Commission. Article 30 requires Member States to lay down rules on penalties applicable to infringements of national provisions adopted to implement the Directive.

Time extensions

Article 22 of Directive 2008/50/EC allows Member States to notify the Commission when the conditions are met in a given zone or agglomeration for postponing the attainment deadline for the limit values for nitrogen dioxide and benzene, or for being exempt from the limit values for PM10. Member States have to show:

- For nitrogen dioxide and benzene, the limit values cannot be achieved by 1 January 2010.
- For PM10, all appropriate measures have been taken at national, regional and local level to meet the deadline for the limit values (1 January 2005) and that limit values could not be achieved because of the presence of one or more of the following elements: site-specific dispersion characteristics, adverse climatic conditions or transboundary contributions.
- For PM10, nitrogen dioxide and benzene, compliance with the limit values will be achieved at the expiry of the postponement or exemption period.

If the Commission does not raise objections within nine months of receipt of an official and complete notification, the limit values for nitrogen dioxide and benzene are postponed from January 2010 to January 2015 at the latest. For PM10, the exemption from the limit value applies for a three-year period ending in June 2011. The Commission issued a Communication ([COM\(2008\)403](#)) providing guidance on these issues. On 2 July 2009 the Commission adopted nine decisions addressed to Austria, Belgium, Germany, Denmark, Greece, Spain, France, Hungary and the Slovak Republic concerning temporary derogations from this standard in 94 zones or agglomerations. The Commission decisions approved the time extensions for 19 air quality zones in Austria, Germany and Hungary and raised objections to the requested exemptions in all other zones. The Decisions regarding particular time extensions in individual Member States are set out in Table 1.

Transposition, repeal and transitional provisions

Member States are to transpose the Directive before 11 June 2010. At that time, the original Framework Directive, the first three daughter Directives (Directives 96/62/EC, 1999/30/EC, 2000/69/EC and 2002/3/EC) and much of Decision [97/101/EC](#) will be repealed. However, some of the Committee provisions of these Directives shall be replaced or repealed with immediate effect (from 11 June 2008). Also, key reporting provisions of the Framework and Ozone Directives (96/62/EC and 2002/3/EC) remain in force until 31 December 2010, as does the requirement under Directive 96/62/EC for preliminary assessment of air quality. The transitional arrangements contained in the first daughter Directive addressing NO_x are repealed from 31 December 2009.

The Directive requires that a sufficient number of urban background monitoring stations for PM2.5 are in place by 1 January 2009 in order to calculate the Average Exposure Indicator.

Review

In 2013 the Commission shall review the provisions related to PM2.5 and consider adopting a more ambitious limit value.

Summary of the Directive 96/62/EC

Most of this Directive was repealed on 11 June 2010. The Committee provisions were repealed on 11 June 2008. However, the reporting provisions remain in force until 21 December 2010.

The Directive itself did not create any precise air quality objectives, but rather it set out a framework and basic principles for ambient air quality monitoring and management. These were to be given effect once daughter Directives for specific pollutants were adopted (see below).

Air quality standards

Air quality standards were to be established through daughter Directives which were to be proposed according to the following timetable:

- No later than 31 December 1996 for sulphur dioxide, nitrogen dioxide, fine particulate matter such as soot, suspended particulate matter and lead (this date was missed by nine months).
- No later than 31 December 1997 for benzene and carbon monoxide lead (this date was missed by 11 months).
- As soon as possible, and no later than 31 December 1999 for poly-aromatic hydrocarbons, cadmium, arsenic, nickel and mercury lead (this date was missed by three and a half years).

For the substances listed above, proposed daughter Directives were to include both limit values and higher 'alert thresholds'. In addition, proposals for ozone were to be tabled by 1 March 1998 in accordance with the older Ozone Directive [92/72/EEC](#) (this date was missed by four and half years). These would make provision for target and/or limit values, but in contrast with the other pollutants the Directive did not create an obligation for a legally binding air quality standard for ozone to be proposed.

The Directive also provided a basis for establishment of standards for pollutants not explicitly identified, where necessary to protect the environment and/or human health. An annex set out guidelines for the determination of other pollutants for which EC standards may be considered necessary.

In fixing limit values and alert thresholds, account was to be taken of a number of factors. These were listed in an annex, and included the degree of exposure of sectors of the population and sensitive sub-groups, sensitivity of flora, fauna and habitats, exposure of historic heritage and economic and technical feasibility.

Monitoring requirements

At the same time as ambient standards were set, criteria were to be established for the assessment of air pollution. These were to include details of the location, number and type of sampling sites, as well as the use of other techniques such as modelling. Once daughter Directives were adopted, Member States would have to assess ambient air quality in accordance with the provisions specified. Measurement would be mandatory in so-called ‘agglomerations’ – zones where the population concentration exceeds 250,000 inhabitants – and in zones where pollution exceeded some proportion of the limit values, to be established in the daughter Directives. Where pollution concentrations were below certain levels, again to be defined in daughter Directives, greater or even exclusive use of modelling techniques would be allowed. The Commission issued guidance on the assessment of air quality under the framework Directive and its daughter Directives (available at: <http://ec.europa.eu/environment/air/pdf/guidanceunderairquality.pdf>).

Compliance with limit values

The Directive placed a general obligation upon Member States to take the necessary measures to comply with the limit values established. Provisions were specified for three situations: those where there was a risk of exceedances occurring from time-to-time; those where pollution levels generally were higher than limit values; and those where levels were lower than limit values.

Where there was a risk of limit values and/or alert thresholds being exceeded, action plans were to be drawn up. These plans were to indicate short-term measures to be taken to reduce the risk and limit the duration of such occurrences. The plans could provide for the control or suspension of motor vehicle traffic, but this was not mandatory.

Zones where limit values were exceeded, taking account of any ‘margins of tolerance’ which could be specified, were to be identified on lists drawn up by Member States. Member States would then have to prepare plans to attain the limit values within the time periods specified in the daughter Directives. An annex set out the type of information to be included in improvement plans, the main elements were as follows:

- Localization of excess pollution.
- General information.
- Responsible authorities.
- Nature and assessment of pollution.
- Origin of pollution.
- Analysis of the situation.
- Details of pre-existing measures or projects for improvement.
- Details of measures or projects adopted following implementation of the Directive.
- Details of measures or projects planned or being researched for the long term.

Plans had to be available to the public, and were to be subject to scrutiny by the Commission during implementation. In areas where the levels of two or more pollutants exceed their limit values, the Directive required preparation of integrated plans covering all of the pollutants concerned.

Zones where levels of pollution were lower than limit values were also to be listed by Member States. Member States were placed under an obligation to maintain the levels of pollutants in these zones below the limit values and to ‘endeavour to preserve the best ambient air quality, compatible with sustainable development’.

Alert thresholds

In the case of an ‘alert threshold’ being exceeded, steps had to be taken to inform the public, such as through radio reports. Member States had also to provide details of such exceedances to the Commission.

Information and reporting

Member States were to provide a variety of data to the Commission to demonstrate the extent of their compliance with the Directive. The data to be submitted included: details of the occurrence of pollution exceeding limit values, and the reasons for each recorded instance, in the nine-month period after the end of each year; improvement plans for zones where limits are exceeded, within two years of the end of the year when the exceedance was noted; and reports on the progress of improvement plans, every three years. In addition, certain details on the implementation of the Directive were to be included in the reports prepared in accordance with the Standardized Reporting Directive (see section on [implementation and enforcement of legislation](#)). The Commission was to publish annually a list of areas where limit values were exceeded, and was also to produce a report every three years on ambient air quality in the EC.

Committee

The Directive provided for the establishment of a Committee, comprising representatives from the Commission and Member States, to assist the Commission in defining detailed arrangements for information reporting. The Committee was also to be involved in adapting to scientific and technical progress the criteria and techniques used to determine limit values and measurement requirements.

Competent authorities

Member States were required to designate competent authorities for implementation of the Directive, including through assessment of air quality, approval of measuring devices, ensuring accuracy of measurement, analysis of assessment methods and coordination within their territory of the operation of EC-wide quality assurance programmes.

Summary and development of the ‘daughter’ Directives and limit values under Directive 2008/50/EC

Daughter Directives adopted under the Air Quality Framework 96/62/EC are listed in Table 2

First daughter Directive: sulphur dioxide, nitrogen oxides, particulate matter and lead

The first daughter Directive (1999/30/EC) was adopted in April 1999, and amended by Commission Decision [2001/744/EC](#) of 17 October 2001. It provided limit and alert values for sulphur dioxide, nitrogen oxides, particulate matter and lead. The selection of these pollutants in the first daughter Directive was undertaken in order to update the limit values already existing in EU legislation, that is the earlier Directives [80/779/EEC](#) (smoke and sulphur dioxide), [82/884/EEC](#) (lead) and [85/203/EEC](#) (nitrogen dioxide). The revised limit values adopted (Table 3) took account of developments in the understanding of health risks posed by each pollutant, which indicated that stricter limits and new averaging periods were required. In particular, the Directive introduced standards for fine particulates (PM10), the health impacts of which had only recently become apparent. These standards superseded the less precise smoke standards of Directive 80/779/EEC. The Directive also introduced the first air quality standards for ecosystem protection.

Although there was some discussion over the limit values proposed, the values finally adopted were those of the original proposal. However, the degree to which limit values for sulphur dioxide, nitrogen dioxide and PM10 might be exceeded was increased due to pressure from Environment Ministers. The ecosystem standards also proved controversial. The European Parliament argued for a stricter sulphur dioxide value of 10 µg/m³ as this followed the UNECE critical level for sensitive species. The Council rejected this and also added restrictions on the requirement to meet ecosystem standards close to agglomerations and motorways.

The Directive established a range of monitoring requirements, not only to assess compliance with the limit values, but also to assist the Commission in reviewing air quality objectives (Articles 3 and 5). Thus Member States were required to provide information, from selected monitoring stations, on 10 minute mean concentrations of sulphur dioxide and on concentrations of PM2.5.

The Directive set out a number of public information requirements (Article 8). Those for alert threshold information referred to the requirements of the Framework Directive 96/62/EC. More routine information requirements not only specified information provision to the public in general, but also to a range of listed interested groups. Information on ambient concentrations of sulphur dioxide, nitrogen dioxide and particulates had to be available on a daily basis and, where practicable, on an hourly basis, while that for lead had to be available on a three-monthly basis.

The Directive also resulted in the repeal of the previous air quality Directives, as the compliance timetable for 1999/30/EC came into effect.

Directive 1999/30/EC was repealed by Directive 2008/50/EC on 11 June 2010.

Second daughter Directive: benzene and carbon monoxide

The second daughter Directive 2000/69/EC covered benzene and carbon monoxide. The proposal was developed following consultation with a range of interest groups, so that its adoption proved relatively straightforward. The Directive was the first to set a limit value for air pollution for a carcinogen (benzene). The setting of such limits was particularly problematic given the lack of a threshold for effects. The Directive required the European Commission to review progress and current knowledge by the end of 2004, at which point it could consider a revision of the limit values. Limit values are set out in Table 4. On 25 March 2004 the Commission issued guidance ([2004/279/EC](#)) for the implementation of the Directive.

Directive 2000/69/EC was repealed by Directive 2008/50/EC on 11 June 2010.

Third daughter Directive: ozone

The third daughter Directive 2002/3/EC addressed ozone. The Directive built on the earlier Ozone Directive [92/72/EEC](#) and took forward requirements for monitoring, plans and programmes. However, it also established target values for ozone (Table 5) and improved methods of information for the public. On 19 March 2004 the Commission published Decision 2004/279/EC on the implementation of the Directive. It set out guidance for the drawing up of short-term action plans in accordance with Article 7 of Directive 2002/3/EC; examples of such measures that had been introduced in Member States, in accordance with Article 7(3) of the Directive; and guidelines on the development of a strategy to measure ozone precursors, in accordance with Article 9(3).

Directive 2002/3/EC was repealed by Directive 2008/50/EC on 11 June 2010, except for some reporting obligations which remain in force until 31 December 2010.

Fourth daughter Directive: arsenic, cadmium, nickel, mercury and PAHs

The fourth daughter Directive covers arsenic, cadmium, nickel, mercury and PAHs. The Directive set out ‘target values’ (Table 6) and Member States must take all necessary measures ‘not entailing disproportionate costs’ to meet these by 2012. The air quality levels of the four pollutants for which the Directive sets target values are to be assessed throughout the territory of each Member State, and their measurement is mandatory in zones and agglomerations where the lower threshold levels – which is 40 per cent of the target value for all except nickel which is 50 per cent – are exceeded. Measurement can be taken continuously at fixed sites or by random sampling. The installation of a certain density of background sampling points is required, irrespective of concentrations, to measure air concentration and deposition of all four heavy metals, including mercury, as well as benzo(a)pyrene and other selected PAHs. Member States are to communicate information annually to the Commission covering where exceedances occur, the reasons for these and the population exposed. The Commission is to report on the experience with the Directive by the end of 2010.

Revision of limit values under Directive 2008/50/EC

Directive 2008/50/EC (as stated above) incorporated and repealed the first three daughter Directives and amended some of the limit values. The resulting limit values are set out in Table 7, Table 8, Table 9, Table 10, Table 11.

Development of Directives 96/62/EC and 2008/50/EC

Directive 96/62/EC

Until the early 1990s, Community policy regarding air pollution was fragmented, with Directives setting out air quality standards for a few individual pollutants, but no coherent approach to managing air quality. This changed with the adoption in 1992 of the Fifth Environmental Action Programme, which contained proposals for long-term environmental objectives for air quality. It stated that ‘all people should be effectively protected against recognized health risks from air pollution’, and that ‘permitted concentration levels of air pollutants should take into account the protection of the environment’.

In 1994 the Commission published its proposal for a Directive on ambient air quality assessment and management (COM(94)109). The proposal was well received, as it set out a generalized management framework for air quality, with little controversy that could surround proposals for individual limit values. In its report on the implementation of older air Directives, the Commission ([COM\(95\)372](#)) stated that there was a need for harmonization in a variety of areas ranging from the implementation of legislation to the siting of monitoring stations to help deliver air quality benefits. It noted that use of limit values had proved effective, but guide values less so. It also stressed the value of information to the public (such as through alert thresholds), a point highlighted in the Fifth Environmental Action Programme. The proposal for a new framework Directive would also be only one part of a strategy to improve air quality, as this would be supplemented by controls on emissions (such as through the Integrated Pollution Prevention and Control Directive [2008/1/EC](#), which was also originally adopted in the same year as Directive 96/62/EC). The European Parliament attempted to introduce (Second Reading 22 May 1996) several amendments concerning public information, the general use of target values, the introduction of the critical load concept and a threshold of 100,000 inhabitants in place of 250,000 for air quality management. The Commission (24 June 1996) accepted ([COM\(96\)311](#)) certain Parliament amendments aimed, in particular, at making available to the public information collected under the Directive, and speeding up the timetable for future proposals concerning benzene and carbon monoxide.

Directive 2008/50/EC

In 2005 the Commission published a Communication on a Thematic Strategy on air pollution ([COM\(2005\)446](#)) under the [Sixth Environmental Action Programme](#). Accompanying the Strategy was a proposal for a Directive, which proposed that Directive 96/62/EC be merged with its first three daughter Directives and the Decision on the exchange of air quality information into one piece of legislation (that is Directives 1999/30/EC, 2000/69/EC, 2002/3/EC and Decision 97/101/EC, respectively). The fourth daughter Directive 2004/107/EC would be merged later. The proposal had some new elements, as it would require Member States to monitor PM_{2.5} concentrations for the first time. It also included a

‘concentration cap’ on PM2.5 for 2010, and sets an indicative reduction target between 2010 and 2020. The action on PM2.5 was based on new scientific evidence, which suggested that the smaller particles are more dangerous for human health. To take account of this change of emphasis, the indicative limit value for PM10 for 2010 was to be repealed. The proposal also included the possibility for derogations from the existing limit values in specific urban areas where limits on NO_x, benzene or particulates are currently being exceeded, provided that plans and appropriate measures are put in place to ensure compliance within five years. This was to accommodate the difficulties that a number of Member States are currently experiencing in meeting the limit values in some areas. The Strategy also set out the Commission's proposals to ‘modernise’ monitoring and reporting by setting up a system of electronic reporting based on a shared information system, in collaboration with the [European Environment Agency](#).

There was considerable disagreement between the Council and the European Parliament over the text of the proposed revision to Directive 96/62/EC, particularly on the limit values to be applied to fine particulates. Indeed, the Parliament's Environment Committee was divided on the proposed limit value for PM2.5 and on how flexible the law should be. However, attempts to impose stricter obligations on the Member States were not successful.

Implementation of the Directives

National transposition

Details of national measures taken to transpose Directive 2008/50/EC can be found in the Member States’ national [execution measures](#).

Details of national measures taken to transpose Directive 96/62/EC can be found in the Member States’ national [execution measures](#).

Details of national measures taken to transpose Directive 1999/30/EC can be found in the Member States’ national [execution measures](#).

Details of national measures taken to transpose Directive 2000/69/EC can be found in the Member States’ national [execution measures](#).

Details of national measures taken to transpose Directive 2002/3/EC can be found in the Member States’ national [execution measures](#).

Details of national measures taken to transpose Directive 2004/107/EC can be found in the Member States’ national [execution measures](#).

Guidance and reference measurement methods

The European Commission has produced a range of guidance documents to support the implementation of the Directives:

- In January 2003 a Decision concerning guidance on a provisional reference method for the sampling and measurement of PM2.5 ([2003/37/EC](#)).

- In July 2003 guidance was published relating to the development of plans and programmes under Directive 96/62/EC. This is supported by further guidance¹.
- In March 2004 a Decision concerning guidance for implementation of Directive 2002/3/EC on ozone (2004/279/EC).
- Guidance in April 2004 on a provisional reference method for the sampling and measurement of PM_{2.5} ([2004/470/EC](#) – with a corrigendum ([OJ L212](#), 12/06/2004)).
- Detailed Guidance on assessment under the EU Air Quality Directives².
- A report on guidance to Member States on PM₁₀ monitoring and intercomparisons with the reference method³.
- Guidance issued in January 2010 for the demonstration of equivalence of ambient air monitoring methods⁴.
- Guidelines issued in January 2011 for the agreements on setting up common measuring stations for PM 2.5. ([SEC\(2011\)77](#))
- Guidelines established in February 2011 for measurement of exceedances attributable to natural sources ([SEC\(2011\)208](#))
- Guidelines to support the adaptation of measurement to winter sanding and salting of roads ([SEC\(2011\)207](#))
- Guidance issued in March 2011 on preparing a notification of a postponement of the deadline for attaining the limit values of NO₂ ([SEC\(2011\)300](#))

Further supporting information, such as position papers to help understand sources of individual pollutants, has been developed by the Commission and its working groups and can be found at this [link](#).

The European Committee for Standardization has developed reference measurement methods for many of the pollutants addressed by Directive 2008/50/EC and Directive 2004/107/EC. The reference to these methods is given in Table 12.

Implementation reports

Regular reports on the implementation of the Directives are produced for the European Commission, examining the status of air quality in the EU with respect to the obligations under the Directives. The European Environment Agency maintains [AirBase](#), which contains air quality monitoring data and information submitted by participating countries throughout Europe. This contains more recent data than are available in formal implementation reports.

The report⁵ for 2001–2003 covered the EU15. The total number of zones reported ranged between 377 and 560 depending on the pollutant. Limit values and margins of tolerance were exceeded in 38 per cent of zones (particularly for PM₁₀ and NO₂).

The report⁶ for 2004 was the first to cover the EU25. The total number of zones reported ranged between 759 and 971 depending on the pollutant. Limit values and margins of tolerance were exceeded in 27 per cent of zones (particularly for PM₁₀ and NO₂). For O₃ (health) exceedances were reported in 30 per cent of zones and for O₃ (vegetation) exceedance was reported in 22 per cent of zones.

In January 2005 the Commission published a short report on experience in implementing Directives 96/62/EC and 1999/30/EC ([COM\(2004\)845](#)). Reporting from the Member States had been poor (only three had reported on plans and programmes to manage air quality). Specific points from the experience of implementation include:

- The limit value approach was viewed as a good system for improving air quality.
- The major problems arose with PM10 and NO₂, rather than SO₂.
- Member States had adopted different approaches in setting up air quality assessment zones, often corresponding to administrative boundaries rather than patterns of air quality. The Commission recognized the utility of this approach and was not planning to interfere with the way Member States are working.
- Stakeholders had asked for greater clarification on population exposure and on protection of ecosystems and the Commission was taking this forward.
- The margins of tolerance and special provisions in the Directive seemed to be set about right and would not be changed.
- The Directive required the use of short-term measures if limit values were exceeded, but Member States questioned their effectiveness and the Commission was examining this issue.
- While monitoring networks generally worked well, the Commission intended to adopt adaptations on rural background monitoring, different urban station types, random sampling, etc.
- No change in the use of modelling was proposed, but the Commission was also examining this issue.

The report⁷ for 2005 found that the total number of zones reported ranged between 777 and 978 depending on the pollutant. The percentage of zones exceeding limit value, margin of tolerance or target value for lead, CO, benzene, SO₂ (annual), SO₂ (daily) and SO₂ (hourly) was low (4 per cent). 6 per cent of zones exceeded the values for SO₂ (winter), NO_x and NO₂ (hourly). The largest problems were with PM10 (annual) (18 per cent), NO₂ (annual) (26 per cent), O₃ (vegetation) (24 per cent), O₃ (health) (34 per cent) and PM10 (daily) (44 per cent).

The report⁸ for 2006 covered 1056 zones for the EU27, although there was incomplete coverage from Italy. The pollutants that most exceeded the limit value and target were PM10 daily (45 per cent of zones) and O₃ (health) (39 per cent of zones).

The report⁹ for 2007 found a decline in the number of reporting zones from 1056 in 2006 to 909 in 2007. This was due to a significant reduction in reporting zones in Poland. Reports from Italy were incomplete. The pollutants that most frequently exceeded the limit value and target values were PM10 (daily), in 42 per cent of zones, and O₃, in 46 per cent of zones. The report concluded that:

- 74 per cent of the EU27 population lived in zones exceeding the PM10 limit value (the same as 2006).
- 50 per cent of the EU27 population lived in zones exceeding the NO₂ annual limit value (a decrease from 2006).
- 46 per cent of the EU27 population lived in zones exceeding the O₃ health target value (an increase from 2006).

The report¹⁰ for 2008 covered much of the EU27, although reports from Malta and from several regions within Italy were missing. The report concluded that the designation of zones was still incomplete in a number of Member States. 20 Member States had a complete or nearly complete coverage for the pollutants of the first three daughter Directives having a health related limit or target value. Coverage was best for sulphur dioxide, nitrogen dioxide, PM10 and ozone, but lower for benzene and carbon monoxide and even lower for lead and the pollutants from the fourth daughter Directive. Exceedances of the daily limit value for

PM10 occurred in 36 per cent of the zones in 2008. Exceedences of the annual limit value plus margin of tolerance for NO₂ were reported by 19 Member States and exceedence of the hourly limit value for NO₂ was reported by nine Member States. Exceedences of the target values of ozone were reported by 17 Member States, although the long-term objective was met in most cases. The target value of benzo(a)pyrene was widely exceeded in 22 per cent of the zones covering 21 per cent of the population in the EU27. Exceedences of the limit values of SO₂ were reported in total in nine (hourly limit value) and 11 (daily limit value) zones.

In 2011 the EEA published a report¹¹ examining air quality in 2009 and recent trends. Key findings were:

- Particulates: 20 per cent of the EU urban population lives in areas where the air quality 24-hour limit value for PM₁₀ was exceeded in 2009. The EEA concluded that “this situation does not seem to be improving”.
- Ozone: Ozone levels did not fall significantly between 1999 and 2009 and about 17 per cent of European citizens live in areas where the EU target for ozone concentration was exceeded in 2009.
- Sulphur dioxide: Very few EU urban citizens are exposed to levels of SO₂ above the limit value.
- Nitrogen dioxide: Concentrations of NO₂ have declined slightly in recent years. 12 per cent of the European urban population lives in areas with urban background (non-traffic) concentrations of NO₂ exceeding limit values.
- Heavy metals: Atmospheric levels of arsenic, cadmium, lead and nickel are generally low in Europe. However, “despite considerable cuts in emissions of heavy metals since 1990 in the EU, a significant proportion of European ecosystems are still at risk of heavy metal contamination”.

Enforcement and court cases

There have been a number of cases concluded in the European Court of Justice (ECJ) concerning the Air Quality Framework. The following judgements concern Directive 96/62/EC:

- [C-417/99](#) 13/09/2001. This was a judgement against Spain for failure to designate the competent authorities and bodies referred to in the first paragraph of Article 3 of Directive 96/62/EC.
- [C-237/07](#) 25/07/2008. This case was brought by an individual from Germany against Freistaat Bayern. Air quality measurements in the municipality had demonstrated exceedences of air limit values for particulates. However, no action plan had been developed to tackle this problem. The Court ruled in July 2008 that where there was a risk that the alert thresholds or limit values may be exceeded, persons directly concerned must be in a position to require the competent national authorities to draw up an action plan, even though, under national law, those persons may have other courses of action available to them to require competent authorities to address air pollution. However, with regard to the content of the action plans, the ECJ noted that Member States are not obliged to take measures to ensure that the limit values or alert thresholds are never exceeded. They are obliged, subject to judicial review by the national courts, only to take such measures in the short term as are capable of reducing to a minimum the risk that the limit values or alert thresholds may be

exceeded and of ensuring a gradual return to a level below those values, taking into account the factual circumstances and all opposing interests.

The following judgements concern Directives 96/62/EC and 1999/30/EC:

- [C-320/03](#) 15.11.2005. This case was brought against Austria following the adoption of a Regulation by the First Minister of the Tyrol limiting transport on the A 12 motorway in the Inn valley (sectoral prohibition on road transport) for lorries of over 7.5 tonnes carrying certain goods. The Court stated that this prohibition was implemented in order to satisfy the requirements of the Directives 96/62/EC and 1999/30/EC. Furthermore this policy failed to fulfil its obligations under Articles 1 and 3 of Council Regulation (EEC) No [881/92](#) of 26 March 1992, and that it was discriminatory to non-resident carriers of goods. Austria subsequently planned new measures including further traffic prohibitions for heavy lorries. In Case [C-28/09](#), 21.12.2011, Austria was again found to have breached its obligations regarding free movement under the TFEU.
- [C-139/04](#) 12.01.2006. This was a judgement against Italy for failure to forward information on ambient air quality and limit values as required by Directives 96/62/EC and 1999/30/EC.
- [C-365/10](#) 24.03.2011. In this case, Slovenia was found to be in breach of the obligations of the Directive 1999/30/EC for failure to meet the annual and daily limit values for PM10 between 2005 and 2007.
- [C-479/10](#) 10.05.2011. In this case, Sweden was found to be in breach of the obligations of the Directive 1999/30/EC for failure to meet the limit values for PM10 in three zones between 2005 and 2007.

The following judgement concerns Directive 2000/69/EC:

- [C-146/04](#) 14.04.2005 In this case, the Netherlands was found to be in breach of its obligations under Directive 2000/69/EC by failing to adopt the necessary laws, regulations and administrative measures necessary to comply with it.

Further developments

In 2001 the Commission initiated a review of EU air quality policy, involving studies and public consultation. Further information is provided in [SEC\(2011\)342](#).

Related legislation

The Air Quality Framework Directive 2008/50/EC has repealed the earlier legislation setting out ambient air quality standards:

- Directive [80/779/EEC](#) on air quality limit values and guide values for sulphur dioxide and suspended particulates.
- Directive [82/884/EEC](#) on limit value for lead in the air.
- Directive [85/203/EEC](#) on air quality standards for nitrogen dioxide.
- Directive [92/72/EEC](#) on air pollution by ozone.

- Decision [97/101/EC](#) establishing a reciprocal exchange of information and data from networks and individual stations measuring ambient air pollution within the Member States.

The Directive sets ambitious goals relating to a range of air pollutants. There is a range of EU law which either seeks to set general goals for the control of emissions of these pollutants or regulates their emissions from specific sources. Key legislation in this regard is as follows:

- National Emission Ceilings Directive [2001/81/EC](#).
- The Integrated Pollution Prevention and Control Directive [2008/1/EC](#).
- Large Combustion Plant Directive [2001/80/EC](#).
- Waste Incineration Directive [2000/76/EC](#).
- Solvents Emissions Directive [1999/13/EC](#).
- Directive [94/63/EC](#) on volatile organic compounds from petrol.
- Directive [93/12/EEC](#) relating to the sulphur content of certain liquid fuels.
- The large body of legislation addressing [emissions from vehicles](#).

In January 2011 the European Environment Agency published a report on the impact of selected policies on Europe's air quality¹². It examined the impact of the Euro emission standards for road vehicles and the Integrated Pollution Prevention and Control (IPPC) Directive and the Large Combustion Plant Directive. It concluded that both vehicle emissions policies and industrial pollution control policies had “significantly improved air quality and reduced air pollution induced health effects that would otherwise have occurred”. It also concluded that with the implementation of the latest emission standards for vehicles and application of emission limits associated with best available techniques under IPPC, “there is significant scope to reduce emissions further and hence improve air quality in most regions”.

References

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11 European Environment Agency 2011. *Air quality in Europe — 2011 report*. Technical report No 12/2011. [\[link\]](#)

12 Impact of selected policy measures on Europe's air quality. Technical Report No 8/2010. European Environment Agency, Copenhagen. <http://www.eea.europa.eu/publications/impact-of-selected-policy-measures>

Table 1. Decisions concerning the notifications for time extensions under Directive 2008/50/EC

Member State	Decision reference	Pollutants covered
Austria	Draft 1 Draft 2	PM10
Belgium	Draft	PM10
Bulgaria	Draft	PM10
Cyprus	Draft	PM10
Czech Republic	Draft	PM10
Denmark	Draft	PM10
France	Draft 1 Draft 2 Draft 3	PM10
Germany	Draft 1 Draft 2 Draft 3 Draft 4	PM10
Greece	Draft	PM10
Hungary	Draft	PM10
Italy	Draft 1 Draft 2	PM10
Latvia	Draft	PM10
Malta	Draft not yet available	PM10
Netherlands	Draft	PM10
Poland	Draft 1 Draft 2 Draft 3	PM10 and NO ₂
Portugal	Draft	PM10
Slovakia	Draft 1 Draft 2	PM10 and NO ₂
Spain	Draft 1 Draft 2	PM10
United Kingdom	Draft 1 Draft 2	PM10

Table 2. Daughter Directives of the Air Quality Framework Directive

Pollutants		Details of Directive		Dates
	Number	OJ Reference	Title	
Sulphur dioxide, nitrogen oxides, particulate matter and lead	1999/30/EC	L 163/41 29.6.1999	Directive relating to limit values for sulphur dioxide, nitrogen dioxide and oxides of nitrogen, particulate matter and lead in ambient air	Proposed: 08.10.97 – COM(97)500 Notification: 22.04.99 Formal compliance: 19.07.2001 Standards to be met: 19.7.2001, 1.1.2005 and 1.1.2010.
Benzene and carbon monoxide	2000/69/EC	L 313/12 16.11.2000	Directive relating to limit values for benzene and carbon monoxide in ambient air	Proposed: 1.12.98 – COM(1998)591 Notification: 16.11.2000 Formal compliance: 13.12.2002 Standards to be met: 1.1.2005 and 1.1.2010
Ozone	2002/3/EC	L67/14 9.3.2002	Directive relating to ozone in ambient air	Proposed: 2.10.2002 – COM(2000)613 Notification: 12.2.2002 Formal compliance: 9.9.2003 Standards to be met: 2010
Arsenic, cadmium, mercury, nickel and polycyclic aromatic hydrocarbons.	2004/107/EC	L 23/3 26.1.2005	Directive relating to arsenic, cadmium, mercury, nickel and polycyclic aromatic hydrocarbons in ambient air.	Proposed 16.7.2003 – COM(2003)423 Notification: 26.1.2005 Formal Compliance: 15.02.2007 Date to aim to achieve targets: 31.12.2012

Table 3. Limit values, alert values and compliance timetable for compliance for Directive 1999/30/EC.

	Averaging period	Value	Margin of tolerance	Date by which limit value is to be met
Sulphur dioxide				
Hourly limit value for the protection of human health	One hour	350 µg/m ³ , not to be exceeded more than 24 times a calendar year	150 µg/m ³ (43 per cent) on entry into force of the Directive, reducing on 01.01.2001 and every 12 months thereafter by equal percentages to reach 0 per cent by 01.01.2005.	1 January 2005
Daily limit value for the protection of human health	24 hours	125 µg/m ³ , not to be exceeded more than three times a calendar year	None	1 January 2005
Limit value for the protection of ecosystems	Calendar year and winter (1 October to 31 March)	20 µg/m ³	None	19 July 2001
Alert threshold	Three consecutive hours over an area of 100 km ² or an entire agglomeration	500 µg/m ³	—	—
Nitrogen dioxide (NO₂) and oxides of nitrogen (NO_x)				
Hourly limit value for the protection of human health	One hour	200 µg/m ³ NO ₂ , not to be exceeded more than 18 times a calendar year	50 per cent on entry into force of the Directive, reducing on 01.01.2001 and every 12 months thereafter by equal percentages to reach 0 per cent by 01.01.2010.	1 January 2010

Annual limit value for the protection of human health	Calendar year	40 µg/m ³ NO ₂	50 per cent on entry into force of the Directive, reducing on 01.01.2001 and every 12 months thereafter by equal percentages to reach 0 per cent by 01.01.2010.	1 January 2010
Limit value for the protection of vegetation	Calendar year	30 µg/m ³ NO _x	None	19 July 2001
Alert threshold	Three consecutive hours over an area of 100 km ² or an entire agglomeration	400 µg/m ³	—	—
Particulate matter PM₁₀				
Stage 1				
24 hour limit value for the protection of human health	24 hours	50 µg/m ³ PM ₁₀ , not to be exceeded more than 35 times a calendar year	50 per cent on entry into force of the Directive, reducing on 01.01.2001 and every 12 months thereafter by equal percentages to reach 0 per cent by 01.01.2005.	1 January 2005
Annual limit value for the protection of human health	Calendar year	40 µg/m ³ PM ₁₀	20 per cent on entry into force of the Directive, reducing on 01.01.2001 and every 12 months thereafter by equal percentages to reach 0 per cent by 01.01.2005.	1 January 2005
Stage 2				
24 hour limit value for the protection of human health	24 hours	50 µg/m ³ PM ₁₀ , not to be exceeded more than seven times a calendar	To be derived from data and to be equivalent to the Stage 1 limit value	1 January 2010

		year		
Annual limit value for the protection of human health	Calendar year	20 µg/m ³ PM10	50 per cent on 01.01.2005 reducing every 12 months thereafter by equal percentages to reach 0 per cent by 01.01.2010.	1 January 2010
Lead				
Annual limit value for the protection of human health	Calendar year	0.5 µg/m ³	100 per cent on entry into force of the Directive, reducing on 01.01.2001 and every 12 months thereafter by equal percentages to reach 0 per cent by 01.01.2005, or by 01.01.2010 in the immediate vicinity of specific point sources, of which the Commission must be notified.	1 January 2005, or 1 January 2010 in the vicinity of specific industrial sources situated on sites contaminated by decades of industrial activities. The Commission must be notified of those sources by 19.07.2001. In such cases, the limit value as from 01.01.2005 will be 1.0 µg/m ³ Note: Stage 2 limit values for PM10 are indicative and will be reviewed in the light of further information on health and environment effects, technical feasibility and experience in the application of stage 1 limit values in the Member States.

Table 4. Limit values and compliance timetable for Directive 2000/69/EC.

Pollutants	Average period	Limit value	Margin of tolerance	Date by which limit value must be met
Benzene	Calendar year	5 µg/m ³	100 per cent on 13 December 2000, reducing every 12 months by 10 per cent	1 January 2010
Carbon monoxide	Maximum daily eight-hour mean	10mg/m ³	6 mg/m ³ on 13 December, reducing on 1 January 2003 and every 12 months thereafter by 2 mg/m ³ to reach 0 per cent by 1 January 2005	1 January 2005

Table 5. Limit values and long-term objectives for ozone as required in Directive 2002/3/EC.

Objective	Period	Target value for 2010
Target value for protection of human health	Maximum daily eight-hour mean	120 µg/m ³ not to be exceeded on more than 25 days per calendar year average over three years
Target value for the protection of vegetation	AOT40, calculated from one hour values from May to July	18,000 µg/m ³ h averaged over five years
Long-term objective for the protection of human health	Maximum daily eight-hour mean within a calendar year	120 µg/m ³
Long-term objective for the protection of vegetation	AOT40, calculated from one hour values from May to July	6,000 µg/m ³ h

Table 6. Target values for pollutants in Directive 2004/107/EC. Concentrations are assessed according to the total content in the PM10 fraction averaged over a calendar year.

Pollutant	Target value (ng/m³)
Arsenic	6
Cadmium	5
Nickel	20
Benzo(a)pyrene	1

Table 7. Sulphur dioxide limit values, alert values and compliance timetable for compliance for Directive 2008/50/EC

	Averaging period	Value	Margin of tolerance	Date by which limit period value is to be met
Hourly limit value for the protection of human health	One hour	350 µg/m ³ , not to be exceeded more than 24 times a calendar year	150 µg/m ³ (43 per cent)	Already in force
Daily limit value for the protection of human health	24 hours	125 µg/m ³ , not to be exceeded more than 3 times a calendar year	None	Already in force
Critical level for the protection of vegetation	Calendar year	20 µg/m ³	None	N/a
Alert threshold	Three consecutive hours over an area of 100 km ² or an entire agglomeration	500 µg/m ³	N/a	N/a

Table 8. Nitrogen dioxide and nitrogen oxide limit values, alert values and compliance timetable for compliance for Directive 2008/50/EC

	Averaging period	Value	Margin of tolerance	Date by which limit period value is to be met
Hourly limit value for the protection of human health	One hour	200 µg/m ³ , not to be exceeded more than 18 times a calendar year	50 per cent on 19 July 1999, decreasing on 01.01.2001 and every 12 months thereafter by equal percentages to reach 0 per cent by 01.01.2010	1 January 2010
Annual limit value for the protection of human health	Calendar year	40 µg/m ³ NO ₂	50 per cent on 19 July 1999, decreasing on 01.01.2001 and every 12 months thereafter by equal percentages to reach 0 per cent by 01.01.2010	1 January 2010
Critical level for the protection of vegetation	Calendar year	30 µg/m ³ NO _x	None	N/a
Alert threshold	Three consecutive hours over an area of 100 km ² or an entire agglomeration	500 µg/m ³	N/a	N/a

Table 9. Obligations relating to PM2.5: national exposure reduction target, target value and limit value for compliance with Directive 2008/50/EC.

<p>Average exposure indicator</p> <p>The Average Exposure Indicator expressed in µg/m³ (AEI) shall be based upon measurements in urban background locations in zones and agglomerations throughout the territory of a Member State. It should be assessed as a three-calendar year running annual mean concentration averaged over all sampling points established pursuant to Section B of Annex V. The AEI for the reference year 2010 shall be the mean concentration of the years 2008, 2009 and 2010. However, where data are not available for 2008, Member States may use the mean concentration of the years 2009 and 2010 or the mean concentration of the years 2009, 2010 and 2011. The AEI for the year 2020 shall be the three-year running mean concentration averaged over all those sampling points for the years 2018, 2019 and 2020. The AEI is used for the examination whether the national exposure reduction target is met. The</p>
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AEI for the year 2015 shall be the three-year running mean concentration averaged over all those sampling points for the years 2013, 2014 and 2015. The AEI is used for the examination whether the exposure concentration obligation is met.

National exposure reduction target

Exposure reduction target relative to the AEI in 2010

Year by which the exposure reduction target should be met: 2020

Initial concentration in $\mu\text{g}/\text{m}^3$	Reduction target in percent
<8.5 = 8.5	0
>8.5–< 13	10
=13–< 18	15
=18–< 22	20
>22	All appropriate measures to achieve 18 $\mu\text{g}/\text{m}^3$

Where the AEI in the reference year is 8.5 $\mu\text{g}/\text{m}^3$ or less the exposure reduction target shall be zero. The reduction target shall be zero also in cases where the AEI reaches the level of 8.5 $\mu\text{g}/\text{m}^3$ at any point of time during the period from 2010 to 2020 and is maintained at or below that level.

Exposure concentration obligation

Exposure concentration obligation	Year by which the obligation value is to be met
20 $\mu\text{g}/\text{m}^3$	2015

Target value

Averaging period	Target value	Date by which target value should be met
Calendar year	25 $\mu\text{g}/\text{m}^3$	1 January 2010

Limit value

	Averaging period	Limit value	Margin of tolerance	Date by which limit value should be met
Stage 1	Calendar year	25 $\mu\text{g}/\text{m}^3$	20 per cent on 11 June 2008, decreasing on the next 1 January and every 12 months thereafter by equal annual percentages to reach 0 per cent by 1 January 2015	1 January 2015
Stage 2	Calendar year	20 $\mu\text{g}/\text{m}^3$		1 January 2020 Stage 2 — indicative limit value to be reviewed by the Commission in 2013 in the light of further information on health and environmental effects, technical feasibility and experience of the target value in Member States.

Table 10. Lead, benzene and carbon monoxide limit values, alert values and compliance timetable for compliance for Directive 2008/50/EC.

	Averaging period	Value	Margin of tolerance	Date by which limit period value is to be met
Lead	Calendar year	0.5 $\mu\text{g}/\text{m}^3$	100 per cent	In force
Benzene	Calendar year	5 $\mu\text{g}/\text{m}^3$	100 per cent on 13 December 2000, reducing from 1.1.06 and every 12 months by 1 $\mu\text{g}/\text{m}^3$ to reach 0 per cent by 1.1.2010	1 January 2010
Carbon monoxide	Maximum daily eight-hour mean	10 mg/m^3	60 per cent	In force

Table 11. Target values and long-term objectives for ozone as required in Directive 2008/50/EC.

	Parameter	Target value for 1 January 2010
Target value for protection of human health	Maximum daily eight-hour mean	120 $\mu\text{g}/\text{m}^3$ not to be exceeded on more than 25 days per calendar year average over three years
Target value for protection of vegetation	AOT40, calculated from one hour values from May to July	18,000 $\mu\text{g}/\text{m}^3\text{h}$ averaged over five years
Long-term objective for protection of human health	Maximum daily eight-hour mean within a calendar year	120 $\mu\text{g}/\text{m}^3$
Long-term objective for protection of vegetation	AOT40, calculated from one hour values from May to July	6,000 $\mu\text{g}/\text{m}^3\text{h}$

Table 12. Reference measurement methods

Pollutant(s)	CEN Reference
Sulphur dioxide	EN 14212:2005
Nitrogen dioxide and nitrogen oxides	EN 14211:2005
Lead, cadmium, arsenic, nickel	EN 14902: 2005
PM10	EN 12341:1999
PM2.5	EN 14907:2005
Benzene	EN 14662:2005
Carbon monoxide	EN 14626:2005

