

**Proposal for a Directive of the European Parliament and of the Council relating to ozone in ambient air**

(2000/C 56 E/11)

(Text with EEA relevance)

COM(1999) 125 final — 1999/0068(COD)

*(Submitted by the Commission on 14 July 1999)*

THE EUROPEAN PARLIAMENT AND THE COUNCIL OF THE EUROPEAN UNION,

advances in metrology with a view to re-examining the elements on which such thresholds are based.

Having regard to the Treaty establishing the European Community, and in particular Article 175(1) thereof,

(5) Directive 96/62/EC requires limit and/or target values to be set for ozone. In view of the transboundary nature of ozone, target values should be set for the protection of human health and for the protection of vegetation. Those target values should relate to the interim objectives derived from the Community strategy to combat tropospheric ozone.

Having regard to the proposal from the Commission,

Having regard to the opinion of the Economic and Social Committee,

(6) Directive 96/62/EC requires action to be taken in respect of zones and agglomerations within which ozone concentrations exceed target values in order to ensure that target values are met as far as possible by the date specified. Such action will to a large extent refer to control measures to be implemented in accordance with relevant Community legislation.

Having regard to the opinion of the Committee of the Regions,

Acting in accordance with the procedure laid down in Article 251 of the Treaty,

Whereas:

(7) Specific local circumstances will in some cases require additional local measures to be implemented if the target values are to be met. Local measures should not be required where examination of benefits and costs shows them to be disproportionate.

(1) On the basis of principles enshrined in Article 174 of the Treaty, the Fifth Environmental Action Programme approved by the Resolution of the Council and the Representatives of the Governments of the Member States meeting within the Council of 1 February 1993 on a European Community programme of policy and action in relation to the environment and sustainable development <sup>(1)</sup> envisages in particular amendments to existing legislation on air pollutants. The said programme recommends the establishment of long-term air quality objectives.

(8) Long-term objectives should be set with the aim of providing effective protection of human health and the environment. Long-term objectives should relate to the ozone strategy and its aim of closing the gap between current ozone levels and the long-term objective as far as possible.

(2) Pursuant to Article 4(5) of Council Directive 96/62/EC of 27 September 1996 on ambient air quality assessment and management <sup>(2)</sup>, the Council is to adopt the legislation provided for in paragraph 1 and the provisions laid down in paragraphs 3 and 4 of the same Article.

(9) Measurements should be mandatory in zones with exceedances of the long-term objectives. Supplementary means of assessment and collocated measurements of nitrogen dioxide may reduce the required number of sampling points.

(3) It is important to ensure effective protection against effects on human health from exposure to ozone. The adverse effects of ozone on vegetation, ecosystems and the environment as a whole should be reduced, as far as possible. The transboundary nature of ozone requires action to be taken at Community level.

(10) An alert threshold for ozone should be set for the protection of the general population. An information threshold should be set as an alert threshold to protect sensitive sectors of the population. Up-to-date information on concentrations of ozone in ambient air should be readily available to the public.

(4) Directive 96/62/EC provides that numerical thresholds are to be based on the findings of work carried out by international scientific groups active in the field. The Commission is to take account of the most recent scientific research data in the epidemiological and environmental fields concerned and of the most recent

(11) Short-term action plans should be drawn up where the risk of exceedances of the alert threshold can be reduced significantly. The potential for reducing the number, duration and severity of exceedances should be investigated and assessed.

<sup>(1)</sup> OJ C 318, 17.5.1993, p. 1.

<sup>(2)</sup> OJ L 296, 21.11.1996, p. 55.

- (12) The transboundary nature of ozone pollution may require certain coordination between neighbouring Member States in drawing up and implementing action plans and in informing the public.
- (13) As a basis for regular reports, information on measured concentrations should be submitted to the Commission.
- (14) The Commission should review the provisions of this Directive in the light of the most recent scientific research concerning in particular the effects of ozone on human health and the environment. Such review should be part of an integrated air quality strategy designed to review and if necessary revise Community air quality objectives, including those for acidification and eutrophication. That strategy should include measures to reduce emissions across all sources, taking into account technical feasibility and cost-effectiveness, in order to ensure achievement of those objectives. For ozone, the review should aim if possible at achieving the long-term objectives within a foreseeable time period.
- (15) Member States should lay down rules on penalties applicable to infringements of the provisions of this Directive and ensure that they are implemented. Those penalties must be effective, proportionate and dissuasive.
- (16) In accordance with the principles of subsidiarity and proportionality as set out in Article 5 of the Treaty, the objectives of the proposed measure, ensuring effective protection against effects on human health from ozone measure, ensuring effective protection against effects on human health from ozone and reducing the adverse effect of ozone on vegetation, ecosystems and the environment as a whole, cannot be sufficiently achieved by the Member States because of the transboundary nature of ozone and can therefore be better achieved by the Community; this Directive confines itself to the minimum required in order to achieve those objectives and does not go beyond what is necessary for that purpose.
- (17) Council Directive 92/72/EEC of 21 September 1992 on air pollution by ozone <sup>(1)</sup> should therefore be repealed.
- (b) to ensure that common methods and criteria are used to assess concentrations of ozone and, as appropriate, ozone precursors (oxides of nitrogen and volatile organic compounds) in ambient air in the Member States;
- (c) to ensure that adequate information is obtained on ambient levels of ozone and that it is made available to the public;
- (d) to ensure that, with respect to ozone, ambient air quality is maintained where it is good, and improved in other cases.

## Article 2

### Definitions

For the purposes of this Directive:

1. 'ambient air' means outdoor air in the troposphere, excluding work places;
2. 'pollutant' means any substance introduced directly or indirectly by man into the ambient air and likely to have harmful effects on human health and/or the environment as a whole;
3. 'level' means the concentration of a pollutant in ambient air or the deposition thereof on surfaces in a given time;
4. 'assessment' means any method used to measure, calculate, predict or estimate the level of a pollutant in the ambient air;
5. 'fixed measurements' means measurements taken in accordance with Article 6(5) of Directive 96/62/EC;
6. 'zone' means part of their territory delimited by the Member States;
7. 'agglomeration' means a zone with a population concentration in excess of 250 000 inhabitants or, where the population concentration is 250 000 inhabitants or less, a population density per km<sup>2</sup> which for the Member State justifies the need for ambient air quality to be assessed and managed;
8. 'target value' means a level fixed with the aim in the long term of avoiding harmful effects on human health and/or the environment as a whole, to be attained as far as possible within a given period;
9. 'long-term objective' means an ozone concentration in the atmosphere below which, according to current scientific knowledge, direct adverse effects on human health and/or the environment as a whole are unlikely, to be attained as far as possible in the long term with the aim of providing effective protection of human health and the environment;
10. 'alert threshold' means a level beyond which there is a risk to human health in the general population from brief exposure and at which immediate steps must be taken by the Member States as laid down in this Directive;

HAVE ADOPTED THIS DIRECTIVE:

### Article 1

#### Objectives

The purpose of this Directive is:

- (a) to establish long-term objectives, target values, an alert threshold and an information threshold for concentrations of ozone in ambient air in the Community, designed to avoid, prevent or reduce harmful effects on human health and the environment as a whole;

<sup>(1)</sup> OJ L 297, 13.10.1992, p. 1.

11. 'information threshold' means an alert threshold for sensitive sections of the population;
12. 'Volatile organic compounds' (VOC) means all organic compounds capable of producing photochemical oxidants by reaction with nitrogen oxides in the presence of sunlight.

#### Article 3

##### Target values

1. The target values to be achieved by 2010 in respect of ozone concentrations in ambient air are those set out in Section II of Annex I.
2. Member States shall draw up a list of zones and agglomerations in which the levels of ozone in ambient air, as assessed in accordance with Article 9, are higher than the target values referred to in paragraph 1.
3. In the zones and agglomerations referred to in paragraph 2, Member States shall take steps to ensure that a plan or programme is prepared and implemented for attaining as far as possible the target value as from the date specified in Section II of Annex I.

Where, in accordance with Article 8(3) of Directive 96/62/EC, plans or programmes must be prepared or implemented in respect of other pollutants, Member States shall prepare and implement integrated plans or programmes covering all the pollutants concerned. Those plans or programmes shall incorporate at least the information listed in Annex IV to Directive 96/62/EC and shall be made available to the public and to appropriate organisations such as environmental organisations, consumer organisations, organisations representing the interests of sensitive population groups and other relevant health care bodies.

#### Article 4

##### Long-term objectives

1. The long-term objectives for ozone concentrations in ambient air are those set out in Section III of Annex I.
2. Member States shall draw up a list of the zones and agglomerations in which the levels of ozone in ambient air, as assessed in accordance with Article 9, are higher than the long-term objectives referred to in paragraph 1 but below or equal to the target values set out in Section II of Annex I. Within such zones and agglomerations Member States shall implement measures with the aim of achieving the long-term objectives as far as possible.

#### Article 5

##### Requirements in zones and agglomerations where ozone levels meet the long-term objectives

Member States shall draw up a list of zones and agglomerations in which ozone levels meet the long-term objectives. They shall maintain the levels of ozone in those zones and agglomerations below the long-term objectives and shall endeavour to preserve the best ambient air quality compatible with sustainable development.

#### Article 6

##### Dissemination of up-date information, information thresholds and alert thresholds

1. Member States shall take appropriate steps to disseminate up-to-date information on ambient concentrations of ozone to the public as well as to appropriate organisations representing the interests of sensitive population groups and other relevant health care bodies, by means, for example, of the broadcasting media, the press, information screens or computer network services. This shall include information on relevant precursor substances in so far as these are not covered by existing Community legislation.

This information shall be updated on at least a daily basis and, wherever appropriate and practicable, on an hourly basis.

Such information shall at least indicate all exceedances of concentrations in the long-term objectives, target values and information and alert thresholds and, where appropriate, the reference levels given in Section III of Annex II, for the relevant averaging period. It shall also provide a short assessment in relation to the long-term objectives and the information and alert thresholds, and appropriate information regarding effects on health.

2. The information threshold and the alert threshold for concentrations of ozone in ambient air are given in Section I of Annex II. Details supplied to the public in accordance with Article 10 of Directive 96/62/EC when either threshold is exceeded shall include as a minimum the items listed in Section II of Annex II. Member States shall where practicable also take steps to supply such information when an exceedance of the information threshold or alert threshold is predicted.

3. Information supplied under paragraphs 1 and 2 shall be clear, comprehensible and accessible.

#### Article 7

##### Short-term action plans

In accordance with Article 7(3) of Directive 96/62/EC, Member States shall draw up action plans indicating measures to be taken in the short term where there is a risk of exceedances of the alert threshold and where there is likely to be significant potential for reducing that risk or for reducing the duration and severity of any exceedance.

For this purpose, Member States shall investigate and assess the reduction potential of those short-term measures, taking into account the criteria specified in the guidance referred to in Article 12.

Member States shall also have regard to that guidance when developing and implementing the short-term action plans.

*Article 8***Transboundary pollution**

1. Where ozone concentrations exceeding target values or long-term objectives are due largely to precursor emissions in other Member States, the Member States concerned shall cooperate, where appropriate, in drawing up joint plans and programmes in order to attain the target values or long-term objectives as far as possible. The Commission may assist in those efforts. In carrying out its obligations under Article 11, the Commission shall consider whether further action should be taken at Community level in order to reduce precursor emissions responsible for such transboundary ozone pollution.

2. Member States shall, if appropriate, prepare and implement joint short-term action plans under Article 7 covering neighbouring zones in different Member States. Member States shall ensure that neighbouring zones in different Member States which have developed short-term action plans receive all appropriate information.

3. Where exceedances of the information threshold or alert threshold occur in zones close to national borders, information should be provided as soon as possible to the competent authorities in the neighbouring Member States concerned in order to facilitate the provision of information to the public in those States.

*Article 9***Assessment of concentrations of ozone and precursor substances in ambient air**

1. Measurements are mandatory in zones where exceedance of a long-term objective for ozone has occurred during the previous five years of measurements. Where fewer than five years' data are available Member States may, to determine exceedances, combine measurement campaigns of short duration at times and locations likely to be typical of the highest pollution levels with results obtained from emission inventories and modelling.

2. Annex IV sets out criteria for determining the location of sampling points for the measurement of ozone and relevant precursor substances.

3. Section I of Annex V sets out the minimum number of fixed sampling points for continuous measurement of ozone in each zone or agglomeration within which measurement mandatory, if measurement is the sole source of information for assessing air quality.

4. In zones and agglomerations within which measurements of ozone are mandatory, continuous measurements of nitrogen dioxide shall also be made at a minimum of 50 % of the ozone sampling points to be located in each zone or agglomeration in accordance with Section I of Annex V.

5. For zones and agglomerations within which information from fixed measurement stations is supplemented by information from other sources such as objective estimation,

modelling, random sampling and indicative measurement, the total number of sampling points specified in Section I of Annex V may be reduced by one-third. The number of stations remaining shall be sufficient to enable assessment within the accuracy limits specified in Annex VII, and at least one sampling point must be retained in each zone or agglomeration. In this case nitrogen dioxide shall be measured at all such remaining sampling points except at rural background stations.

6. Measurements shall also be made in zones where concentrations are below the long-term objectives. In this case the number of continuous measurement stations shall be determined in accordance with Section II of Annex V.

7. Each Member State shall ensure that at least one measuring station to supply data on concentrations of the ozone precursor substances listed in Annex VI is installed and operated in its territory. Each Member State shall choose the number and siting of the stations at which ozone precursor substances are to be measured, taking into account the objectives, methods and recommendations laid down in the said Annex.

As part of the guidance developed under Article 12, guidelines for an appropriate strategy to measure ozone precursor substances shall be developed, taking into account existing requirements in Community legislation and the EMEP<sup>(1)</sup> programme.

8. Reference methods for analysis of ozone are set out in Section I of Annex VIII. Section II of Annex VIII sets out reference techniques for air quality modelling and objective estimation.

9. Any amendments necessary to adapt this Article and Annexes IV to VIII to scientific and technical progress shall be adopted in accordance with the procedure set out in Article 12 of Directive 96/62/EC.

*Article 10***Transmission of information and reports**

1. When forwarding information to the Commission under Article 11 of Directive 96/62/EC, Member States shall also:

(a) send to the Commission annually and no later than nine months following the end of each calendar year the lists of zones and agglomerations referred to in Article 3(2), Article 4(2) and Article 5 of this Directive;

(b) send to the Commission the plans or programmes referred to in Article 3(3) of this Directive no later than two years after the end of the year during which exceedances of the target values for ozone were observed;

(c) inform the Commission every three years of the progress of any such plan or programme.

<sup>(1)</sup> The cooperative programme for monitoring and evaluation of the long-range transmission of air pollution in Europe.

2. Member States shall also:
- (a) for each month from April to September each year, send to the Commission, on a provisional basis, by no later than the end of the following month, the information specified in Annex III to this Directive;
  - (b) for each year, send to the Commission by no later than 1 July of the following calendar year the validated information specified in Annex III;
  - (c) within nine months of the end of each year, send the Commission the annual average concentration for that year of the ozone precursor substances specified in Annex VI;
  - (d) forward to the Commission every three years within the framework of the sectoral report referred to in Article 4 of Council Directive 91/692/EEC <sup>(1)</sup> and no later than 9 months after the end of each three-year period:
    - (i) information reviewing the levels of ozone observed or assessed, as appropriate, in the zones and agglomerations referred to in Article 3(2), Article 4(2) and Article 5 of this Directive;
    - (ii) information on any measures taken or planned under Article 4(2) of this Directive;
    - (iii) information regarding decisions on short-term action plans and concerning the design of any such plans prepared in accordance with Article 7 of this Directive.
3. The Commission shall:
- (a) publish annually a list of the zones and agglomerations submitted pursuant to paragraph 1(a) and, by the end of October each year, a report on the ozone situation during the current summer and the preceding calendar year;
  - (b) check the implementation of the plans or programmes submitted pursuant to paragraph 1(b) by examining their progress and the trends in air pollution;
  - (c) take into account the information provided under paragraph 1 and 2 in preparing three-yearly reports on ambient air quality in accordance with Article 11(2) of Directive 96/62/EC;
  - (d) arrange appropriate exchange of information and experience forwarded in accordance with paragraph 2(d)(iii) regarding the design and implementation of short-term action plans.
4. The Commission will, as necessary, call upon the expertise available in the European Environment Agency in drafting the reports referred to in paragraph 3(a) and (c).
5. The date by which Member States shall inform the Commission of the methods used for the preliminary assessment of air quality under Article 11(1)(d) of Directive

96/62/EC shall be 18 months after the entry into force of this Directive.

#### Article 11

#### Review and reporting

1. The Commission shall submit to the European Parliament and the Council by 31 December 2004 at the latest a report based on experience of the application of this Directive, and in particular on the findings of the most recent scientific research into the effects on human health and the environment of exposure to ozone, and on technological developments, including progress achieved in methods of measuring and otherwise assessing concentrations.
2. The report shall include a review of the provisions of this Directive in the light of the most recent scientific research concerning in particular the effects of ozone on human health and the environment.
3. The report shall be presented as an integral part of an air quality strategy designed to review and propose Community air quality objectives and develop implementing strategies to ensure achievement of those objectives.

The strategy shall take into account:

- (a) the implementation of existing requirements relating to air quality, acidification and eutrophication, including progress in implementing limit values and target values established in accordance with Article 4 of Directive 96/62/EC, in particular the information received from Member States regarding plans and programmes developed and implemented in accordance with Articles 3 and 4 of this Directive, experience in implementing short-term action plans under Article 7 of this Directive and the conditions under which air quality measurement has been carried out;
- (b) transport of pollution across national boundaries;
- (c) the need for new or revised objectives relating to air quality, acidification and eutrophication;
- (d) current air quality, and trends up to and beyond the year 2010;
- (e) the broad scope for making further reductions in polluting emissions across all relevant sources, taking account of technical feasibility and cost-effectiveness;
- (f) relationships between pollutants, and opportunities for combined strategies to achieve Community air quality and related objectives;
- (g) the experience acquired in the application of this Directive in Member States including, in particular, the conditions as laid down in Annex IV under which measurement has been carried out;

<sup>(1)</sup> OJ L 377, 31.12.1991, p. 48.

(h) current and future requirements for informing the public and for the exchange of information between Member States and the Commission;

(i) with specific regard to ozone, the potential to achieve the long-term objective, based on the guidelines of the WHO, within a foreseeable time period.

4. The report shall be accompanied as appropriate by proposals to amend this Directive.

#### Article 12

##### Guidance

1. The Commission shall develop guidance for implementing the provisions of this Directive. In so doing, it will call upon the expertise available in the Member States, the European Environment Agency and other expert bodies, as appropriate.

2. The guidance shall be adopted in accordance with the procedure laid down in Article 12(2) of Directive 96/62/EC. Such guidance shall not have the effect of modifying the target values, long-term objectives, alert threshold or information threshold either directly or indirectly.

#### Article 13

##### Penalties

Member States shall lay down the rules on penalties applicable to infringements of the national provisions adopted pursuant to this Directive and shall take all measures necessary to ensure that they are implemented. The penalties provided for must be effective, proportionate and dissuasive.

#### Article 14

##### Transposition

1. Member States shall bring into force the laws, regulations and administrative provisions necessary to comply with this Directive and shall apply those provisions from 1 January 2001. They shall forthwith inform the Commission thereof.

When Member States adopt those provisions, they shall contain a reference to this Directive or be accompanied by such a reference on the occasion of their official publication. Member States shall determine how such reference is to be made.

2. Member States shall communicate to the Commission the text of the main provisions of national law which they adopt in the field covered by this Directive.

#### Article 15

##### Repeal

Directive 92/72/EC shall be repealed from (date in Article 14).

#### Article 16

##### Entry into force

This Directive shall enter into force on the twentieth day following that of its publication in the *Official Journal of the European Communities*.

#### Article 17

##### Addressees

This Directive is addressed to the Member States.

---

## ANNEX I

## DEFINITIONS, TARGET VALUES AND LONG-TERM OBJECTIVES FOR OZONE

## I. Definitions

All values are to be expressed in  $\mu\text{g}/\text{m}^3$ . The volume must be standardised at the following conditions of temperature and pressure: 293 K and 101.3 kPa. The time is to be specified in Central European Time.

AOT40 means the sum of the difference between hourly concentrations greater than  $80 \mu\text{g}/\text{m}^3$  (= 40 parts per billion) and  $80 \mu\text{g}/\text{m}^3$  over a given period using only the 1 hour values measured between 8 a.m. and 8 p.m. Central European Time each day.

In order to be valid, the annual data on exceedances used to check compliance with the target values and long-term objectives below must meet the criteria laid down in Section II of Annex III.

## II. Target values for ozone

	Parameter	Target value	Year by which the target value must be attained as far as possible <sup>(1)</sup>
1. Target value for the protection of human health	Highest 8-hour mean within one day, calculated from hourly running 8-hour averages	$120 \mu\text{g}/\text{m}^3$ not to be exceeded on more than 20 days per calendar year averaged over three years <sup>(2)</sup>	2010
2. Target value for the protection of vegetation	AOT40, calculated from 1h values from May to July	$17\,000 \mu\text{g}/\text{m}^3 \text{ h}$ averaged over five years <sup>(2)</sup>	2010

<sup>(1)</sup> Compliance with target values will be assessed as of this date. This is, 2010 will be the first year the data for which is used in calculating compliance over the following three or five years, as appropriate.

<sup>(2)</sup> If the three or five year averages cannot be determined on the basis of a full and consecutive set of annual data, the minimum annual data required for checking compliance with the target values will be as follows:  
 — for the target value for the protection of human health: valid data for one year  
 — for the target value for the protection of vegetation: valid data for three years.

## III. Long-term objectives for ozone

	Parameter	Long-term objective not to be exceeded
1. Long-term objective for the protection of human health	Highest 8-hour mean within a calendar year, calculated from hourly running 8-hour averages	$120 \mu\text{g}/\text{m}^3$
2. Long-term objective for the protection of vegetation	AOT40, calculated from 1h values from May to July	$6\,000 \mu\text{g}/\text{m}^3 \text{ h}$

## ANNEX II

**INFORMATION AND ALERT THRESHOLDS; ADDITIONAL REFERENCE LEVELS FOR INFORMING THE PUBLIC****I. Information and alert thresholds for ozone**

	Parameter	Threshold
Information threshold	1h average	180 $\mu\text{g}/\text{m}^3$
Alert threshold	1h average	240 $\mu\text{g}/\text{m}^3$

**II. Minimum details to be supplied to the public when the information or alert threshold is exceeded or exceedance is predicted**

Details to be supplied to the public on a sufficiently large scale as soon as possible should include as a minimum:

## 1. Information on observed exceedance(s):

- Location or area of the exceedance;
- Type of threshold exceeded (information or alert);
- Time and duration of the exceedance;
- Highest 1-hour and 8-hour mean concentration.

## 2. Forecast for the following afternoon/day(s):

- Time period and geographical area of expected exceedances of information and/or alert threshold;
- Predicted 1h maximum concentration or range of concentration;
- Expected change in pollution (improvement, stabilisation, or deterioration);
- Reason for occurrence and/or expected change in the situation.

## 3. Information on type of population concerned, possible health effects and recommended conduct:

- Information on population groups at risk;
- Description of likely symptoms;
- Recommended precautions to be taken by the population concerned;
- Where to find further information.

## 4. Information on preventive action to reduce pollution:

Indication of main source sectors; recommendations for action to reduce emissions.

**III. Reference levels relating to damage to materials and forests, and visible damage to crops**

Target	Reference level	Averaging/accumulation time	Type of station	Recommended frequency of publication
Visible damage to crops	AOT40 = 400 $\mu\text{g}/\text{m}^3$ h and AOT40 = 1 000 $\mu\text{g}/\text{m}^3$ h	Daily running period of 5 consecutive days; maximum value	Station targeted at protection of vegetation	Monthly, yearly
Damage to materials	40 $\mu\text{g}/\text{m}^3$	Yearly mean	Any	Yearly
Damage to forests	AOT40 = 20 000 $\mu\text{g}/\text{m}^3$ h	April-September	Station targeted at protection of vegetation	Yearly



## ANNEX III

## INFORMATION SUBMITTED BY MEMBER STATES TO THE COMMISSION AND CRITERIA FOR AGGREGATING DATA AND CALCULATING STATISTICAL PARAMETERS

## I. Information to be submitted to the Commission

The following table stipulates the type and amount of data Member States are to submit to the Commission:

Target	Type of station	Reference level	Averaging/accumulation time	Reports for each month from April to September	Report for each year
Information threshold	Any	180 µg/m <sup>3</sup>	1h	— for each day with exceedance(s): date, total hours of exceedance, maximum 1h ozone and related NO <sub>2</sub> values; — monthly 1h max. ozone	— for each day with exceedance(s): date, total hours of exceedance, maximum 1h ozone and related NO <sub>2</sub> values;
Alert threshold	Any	240 µg/m <sup>3</sup>	1h	— for each day with exceedance(s): date, total hours of exceedance, maximum 1h ozone and related NO <sub>2</sub> values;	— for each day with exceedance(s): date, total hours of exceedance, maximum 1h ozone and related NO <sub>2</sub> values;
Health protection	Any	120 µg/m <sup>3</sup>	8 hour	for each day with exceedance(s): date, 8h max	for each day with exceedance(s): date, 8h max
Vegetation protection	Suburban, rural, rural background	AOT40 <sup>(1)</sup> = 6 000 µg/m <sup>3</sup> h	1h, accumulated from May-July	Once in September	Value
Short-term vegetation, protection	Suburban, rural, rural background	AOT40 <sup>(1)</sup> = 400 µg/m <sup>3</sup> h and AOT40 <sup>(1)</sup> = 1 000 µg/m <sup>3</sup> h	1h, accumulated over five-day period	—	Max. 98 %, 50 % value from the daily running AOT40 values
Forest protection	Suburban, rural, rural background	AOT40 <sup>(1)</sup> = 20 000 µg/m <sup>3</sup> h	1h, accumulated from April-September	—	Value
Materials	Any	40 µg/m <sup>3</sup>	Year	—	Value

<sup>(1)</sup> sum of the difference between hourly concentrations greater than 80 µg/m<sup>3</sup> and 80 µg/m<sup>3</sup> using the values measured between 8.00 and 20.00 Central European Time each day.

As part of the yearly reporting, the following must also be provided:

- for ozone and the sum of ozone and nitrogen dioxide (expressed in  $\mu\text{g}/\text{m}^3$ ), the maximum, 99.9th, 98th, 50th percentile and number of valid data from hourly series,
- the maximum, 98th, and 50th percentile from the series of daily 8-hour maxima,
- the annual average of nitrogen dioxide and nitrogen oxide <sup>(1)</sup> ( $\text{NO}_x$ ).

The information specified in Annex II of Council Decision 97/101/EC <sup>(2)</sup> concerning new stations is to be submitted together with the first data submission, if it has not already been delivered under the framework of the said Council Decision.

Data submitted in the monthly reports are considered provisional and are to be updated, if necessary, in subsequent submissions.

## II. Criteria for aggregating data and calculating statistical parameters

Percentiles are to be calculated using the method specified in Council Decision 97/101/EC

The following criteria are to be used for checking validity when aggregating data and calculating statistical parameters:

Parameter	Required proportion of valid data
1h values	75 % (i.e. 45 minutes)
8h values	75 % of 1h values (i.e. 6 hours)
AOT 40	90 % of the 1h values over the time period defined for calculating the AOT40 value
Annual mean	75 % of the 1h values over summer (April-September) and winter (January-March, October-December) seasons separately
Number of exceedances and maximum values per month	90 % of the daily maximum 8h mean values (23 available daily values per month) 90 % of the 1h values between 8.00 and 20.00 Central European Time
Number of exceedances and maximum values per year	five out of six months over the summer season (April-September)

<sup>(1)</sup> Sum of nitric oxide and nitrogen dioxide added as parts per billion and expressed as nitrogen dioxide in  $\mu\text{g}/\text{m}^3$ .

<sup>(2)</sup> OJ L 35, 5.2.1997, p. 14.

## ANNEX IV

## CRITERIA FOR CLASSIFYING AND LOCATING SAMPLING POINTS FOR ASSESSMENTS OF OZONE CONCENTRATIONS

The following considerations apply to fixed measurements:

## I. Macroscale siting

Type of station	Objectives of measurement	Representativeness	Macroscale siting criteria
Urban	<b>Protection of human health:</b> to assess the exposure of the urban population to ozone, i.e. where population density and ozone concentration are relatively high	A few km <sup>2</sup>	Away from the influence of local emissions such as traffic, petrol stations, etc.; Vented locations where well mixed levels can be measured; Locations such as residential and commercial areas of cities, parks (away from the trees), big streets or squares with very little or no traffic, open areas characteristic of educational, sports or recreation facilities
Suburban	<b>Protection of human health and vegetation:</b> to determine the exposure of the population and vegetation located in the outskirts of the agglomeration, where ozone levels tend to be highest.	Some tens of km <sup>2</sup>	At a certain distance from the area of maximum emissions, downwind following the main wind direction/directions during conditions favourable to ozone formation; Where population, sensitive crops or natural ecosystems located in the outer fringe of an agglomeration are exposed to high ozone levels; Where appropriate, some suburban stations also upwind of the area of maximum emissions, in order to determine the regional background levels of ozone.
Rural	<b>Protection of human health and vegetation:</b> to determine the exposure of population, crops and natural ecosystems to sub-regional scale ozone concentrations	Sub-regional levels (a few 100 km <sup>2</sup> )	Stations can be located in small settlements and/or areas with natural ecosystems, forests or crops; Representative for ozone away from the influence of immediate local emissions such as industrial installations and roads; At open area sites, but not on higher mountain tops.
Rural back-ground	<b>Protection of vegetation and human health:</b> to assess the exposure of crops and natural ecosystems to regional-scale ozone concentrations as well as exposure of the population	Regional/national/continental levels (1 000 to 10 000 km <sup>2</sup> )	Station located in areas with lower population density, e.g. with natural ecosystems, forests, far removed from urban and industrial areas and away from local emissions; Avoid locations which are subject to locally enhanced formation of ground-near inversion conditions, also summits of higher mountains; Coastal sites with pronounced diurnal wind cycles of local character are not recommended.

For rural and rural background stations, consideration should be given, where appropriate, to coordination with the monitoring requirements of Commission Regulation (EC) No 1091/94 concerning protection of the Community's forests against atmospheric pollution<sup>(1)</sup>.

<sup>(1)</sup> OJ L 125, 18.5.1994, p. 1.

## II. Microscale siting

The following guidelines should be followed, as far as practicable:

1. The flow around the inlet sampling probe should be unrestricted (free in an arc if at least 270°) without any obstructions affecting the air flow in the vicinity of the sampler, i.e. away from buildings, balconies, trees, and other obstacles by more than twice the height the obstacle protrudes above the sampler.
2. In general, the inlet sampling point should be between 1,5 m (the breathing zone) and 4 m above the ground. Higher positions are possible for urban stations in some circumstances and in wooded areas.
3. The inlet probe should be positioned well away from such sources as furnaces and incineration flues and more than 10 m from the nearest road, with distance increasing as a function of traffic intensity.
4. The sampler's exhaust outlet should be positioned so as to avoid re-circulation of exhaust air to the sampler inlet.

The following factors may also be taken into account:

1. interfering sources;
2. security;
3. access;
4. availability of electrical power and telephone communications;
5. visibility of the site in relation to its surroundings;
6. safety of public and operators;
7. the desirability of collocating sampling points for different pollutants;
8. planning requirements.

## III. Documentation and review of site selection

Site selection procedures should be fully documented at the classification stage by such means as compass point photographs of the surroundings and a detailed map. Sites should be reviewed at regular intervals with repeated documentation to ensure that selection criteria are still being met.

This requires proper screening and interpretation of the monitoring data in the context of the meteorological and photochemical processes affecting the ozone concentrations measured at the respective site.

---

## ANNEX V

**CRITERIA FOR DETERMINING THE MINIMUM NUMBER OF SAMPLING POINTS FOR FIXED MEASUREMENT OF CONCENTRATIONS OF OZONE AND RELEVANT PRECURSOR SUBSTANCES****I. Minimum number of sampling points for fixed continuous measurements to assess compliance with the target values, long-term objectives and information and alert thresholds where continuous measurement is the sole source of information**

Population (× 1 000)	Agglomerations		Other zones		
	urban	suburban	suburban	rural	rural background
< 250				1	1 station/ 50 000 <sup>(1)</sup> km <sup>2</sup> as an average density over all zones per country
< 500		1	1	1	
< 1 000		2	1	2	
< 1 500	1	2	1	3	
< 2 000	1	3	1	4	
< 2 750	2	3	1	5	
< 3 750	2	4	1	7	
> 3 750	2	1 additional station per 2 million inhabitants	1	1 additional station per 0,5 million inhabitants	

<sup>(1)</sup> 1 station per 25 000 km<sup>2</sup> for complex terrain in regions below 55° N latitude.

**II. Minimum number of sampling points for fixed measurements for zones and agglomerations attaining the long-term objectives**

The number of sampling points for ozone must, in combination with other means of supplementary assessment such as air quality modelling and collocated nitrogen dioxide measurements, be sufficient to examine the trend of ozone pollution and check compliance with the long-term objectives. The number of stations located in suburban areas of agglomerations and in rural areas around agglomerations may be reduced to one-third of the number specified in Section I. If the result of this is that a zone has no remaining station, coordination with the number of stations in neighbouring zones must ensure adequate assessment of ozone concentrations against long-term objectives. The number of rural background stations should be 1 per 100 000 km<sup>2</sup>.

## ANNEX VI

## MEASUREMENTS OF OZONE PRECURSOR SUBSTANCES

**Objectives**

The main objectives of such measurements are to analyse any trend in ozone precursors, to check the efficiency of emission reduction strategies, to check the consistency of emission inventories and to help attribute emission sources to pollution concentration.

An additional aim is to support the understanding of ozone formation and precursor dispersion processes, as well as the application of photochemical models.

**Substances**

Measurement of ozone precursor substances must include at least nitrogen oxide, carbon monoxide and appropriate volatile organic compounds (VOC). A list of volatile organic compounds recommended for measurement is given below.

Methane	1-Butene	Isoprene	Ethyl benzene
Ethane	trans-2-Butene	n-Hexane	m+p-Xylene
Ethylene	cis-2-Butene	i-Hexene	o-Xylene
Acetylene	1,3-Butadiene	n-Heptane	1,2,4-Trimeth. Benzene
Propane	n-Pentane	n-Octane	1,2,3-Trimeth. Benzene
Propene	i-Pentane	i-Octane	1,3,5-Trimeth. Benzene
n-Butane	1-Pentene	Benzene	Fomaldehyde
i-Butane	2-Pentene	Toluene	Total non-methane Hydrocarbons

**Reference methods**

The reference method specified in Directive 85/203/EEC or in subsequent Community legislation will apply for nitrogen oxides.

The method to be specified in future legislation pursuant to Directive 96/62/EC is to be used for carbon monoxide once it has entered into force.

Each Member State must inform the Commission of the methods it uses to sample and measure VOC. The Commission must carry out intercomparison exercises as soon as possible and investigate the potential for defining reference methods for precursor sampling and measurement in order to improve the comparability and precision of measurements for the review of this Directive in accordance with Article 11.

**Siting**

Measurements should be taken in particular in urban and suburban areas at any monitoring site set up in accordance with the requirements of Directive 96/62/EC and considered appropriate with regard to the above monitoring objectives.

## ANNEX VII

**DATA QUALITY OBJECTIVES AND COMPILATION OF THE RESULTS OF  
AIR QUALITY ASSESSMENT**

**I. Data quality objectives**

The following data quality objectives are proposed to ensure the requisite accuracy assessment methods:

	For ozone, NO and NO <sub>2</sub>
<b>Continuous measurement</b>	
Accuracy of individual measurements	15 %
Minimum data capture	90 % during summer 75 % during winter
<b>Indicative measurement</b>	
Accuracy of individual measurements	30 %
Minimum data capture	90 %
Minimum time coverage	> 10 % during summer period
<b>Modelling</b>	
Accuracy	
1 h averages (daytime)	50 %
8 h daily maximum	50 %
<b>Objective estimation</b>	
Accuracy	75 %

Accuracy of measurement has the definition given in the 'Guide to the Expression of Uncertainty of Measurements' (ISO 1993), or in ISO 5725-1 'Accuracy (trueness and precision) of measurement methods and results' (1994). The percentages in the table are given for individual measurements, averaged over the period for calculating target values and long-term objectives, for a 95 % confidence interval. The accuracy for continuous measurements should be interpreted as being applicable in the region of the concentration used for the appropriate threshold.

The accuracy for modelling and objective estimation is defined as the maximum deviation of the measured and calculated concentration levels, over the period for calculating the appropriate threshold, without taking into account the timing of the events.

Time coverage is defined as the percentage of the time considered for setting the threshold value during which the pollutant is measured. Data capture is defined as the percentage of the time of measurement during which the instrument produced valid data. The requirements for minimum data capture and time coverage do not include losses of data due to the regular calibration or normal maintenance of the instrumentation.

**II. Results of air quality assessment**

The following information should be compiled for zones or agglomerations within which sources other than measurement are employed to supplement information from measurement:

- A description of the assessment activities carried out;
- Specific methods used, with references to descriptions of the method;
- Sources of data and information;
- A description of results, including accuracies and, in particular, the extent of any area within the zone or agglomeration over which concentrations exceed long-term objectives of target values;
- For long-term objectives or target values whose object is the protection of human health, the population potentially exposed to concentrations in excess of the threshold.

Where possible, Member States should compile maps showing concentration distributions within each zone and agglomeration.

### III. **Standardisation**

For ozone the volume must be standardised at the following conditions of temperature and pressure: 293 K, 101.3 kPa. For nitrogen oxides the standardisation specified in Directive 85/203/EEC or in subsequent Community legislation will apply.

---

## ANNEX VIII

### REFERENCE METHOD FOR ANALYSIS OF OZONE AND CALIBRATION OF OZONE INSTRUMENTS

#### I. **Reference method for analysis of ozone and calibration of ozone instruments**

- Analysis method: UV photometric method (ISO FDIS 13964)
- Calibration method: Reference UV-photometer (ISO FDIS 13964, VDI 2468, Bl. 6)

This method is being standardised by the CEN <sup>(1)</sup>. Once the latter has published the relevant standard, the method and techniques described therein will constitute the reference and calibration method in this Directive.

Member States may use any other method for analysing ozone which they can demonstrate as giving equivalent results to the above method.

#### II. **Reference modelling technique for ozone**

Reference modelling techniques cannot be specified at present. Any amendments to adapt this point to scientific and technical progress will be adopted in accordance with the procedure laid down in Article 12(2) of Directive 96/62/EC.

---

<sup>(1)</sup> European Committee for Standardisation.