

Recommendations on the review of Council Directive 1999/30/EC

**CAFE Working Group on
Implementation**
June, 2004

Summary

This document gives recommendations to the European Commission for the review of the First Daughter Directive 1999/30/EC on air quality. The recommendations are given by the Working Group on Implementation under the Clean Air For Europe (CAFE) programme. The report includes additional recommendations drafted by AQUILA, the network of air quality reference laboratories in the EU. Several amendments are proposed for the First Daughter Directive and the related Air Quality Framework Directive 1996/62/EC.

The issues considered by the Working Group include the concept of zones, limit values and derogations, air quality measurement methods and measures. The issue of computer modelling was not considered because this was being addressed in a parallel consultancy study. The Working Group has also not reconsidered possible revision of the limit values, because that aspect of the review is part of the integrated assessment under the CAFE programme.

Contents

1. Introduction	4
1.1 Background of this document.....	4
1.2 The air quality directives	4
1.3 Structure of this report.....	5
2. Experience and recommendations for improvement (Part 1).....	6
2.1 Zones	6
2.2 Limit values and Margins of Tolerance.....	7
2.3 Derogations	15
2.4 Network design.....	16
2.5 Measuring methods	22
2.6 Modelling and other mathematical methods	27
2.7 Measures.....	27
2.8 Other issues	30
3 Experience and recommendations for improvement (Part 2).....	32
4. Conclusion.....	41
5. References	42
Annex Members of the Working Group on Implementation	43

1. Introduction

1.1 Background of this document

In 1999 the First Daughter Directive 1999/30/EC under the Framework Directive 96/62/EC on ambient air quality assessment and management entered into force. Article 10 of 1999/30/EC requires the Commission to submit to the Council and European Parliament a review report on the First Daughter Directive. The Commission has asked the CAFE Working Group on Implementation to give support in the preparation of this review report by giving recommendations on possible amendments, based on the experiences in the application of the directive. This group was composed of experts with experience in the implementation, coming from Member States, Acceding Countries, Industry, NGOs, the Commission and research bodies.

The evaluation of recent scientific research concerning harmful effects of the pollutants addressed by 1999/30/EC and the review of the limit values are also part of the review process that the Commission is required to undertake, but this is being dealt with in the integrated assessment of the Clean Air For Europe (CAFE) programme.

Because the First Daughter Directive is inextricably interrelated with the Framework Directive, the Working Group has included where needed the Framework Directive in the review and recommendations for amendments.

The recommendations by the Working Group are based on several elements:

- All Working Group members were extensively involved in the implementation of the First Daughter Directives and most members were representing stakeholders.
- Early 2003 the Commission had held an informal inquiry on the experience with the First Daughter Directive among Member States, Acceding Countries and other stakeholders. The 14 responses, several of which were very extensive, were anonymously available to the Working Group.
- Information from the reports on the air quality in 2001 and 2002 under the First Daughter Directive.
- Several guidance documents drafted during the first years of implementation of the First Daughter Directive dealt with relevant issues:
 - Guidance report on preliminary assessment under EC air quality directives (EEA, 1998),
 - Guidance on assessment under the EU air quality directives (Final Draft) (European Commission, 2001),
 - Guidance to member states on PM₁₀ monitoring and intercomparisons with the reference method (European Commission, 2002a),
 - Guideline referring to Commission Decision 2001/839/EC (on filling in the Reporting Questionnaire (European Commission, 2002b).
- The Position Paper on Particulate Matter, prepared by the CAFE Working Group on Particulate Matter, was finalised in parallel to the drafting of the current recommendations. This position paper evaluated, among other things, experiences under the First Daughter Directive regarding particulate matter.
- The report includes a substantial set of recommendations drafted by AQUILA, the network of air quality reference laboratories in the EU. Those recommendations have been reviewed by the Working Group and are presented in a separate chapter.

1.2 The air quality directives

The general aim of the Air Quality Framework Directive, stated in Article 1, is to define the basic principles of a common strategy to:

- define and establish objectives for ambient air quality in the Community designed to avoid, prevent or reduce harmful effects on human health and the environment as a whole,
- assess the ambient air quality in Member States on the basis of common methods and criteria,
- obtain adequate information on ambient air quality and ensure that it is made available to the public, inter alia by means of alert thresholds,
- maintain ambient air quality where it is good and improve it in other cases.

The daughter directives give a further specification of the more general provisions of the Framework Directive. Hence the First Daughter Directive should always be considered in combination with the Framework Directive.

The directives define limit values, which should be met by a specified year. It is the responsibility of the Member States to attain these in due time. For certain well-defined situations, derogations can be given. For the period before the attainment year, the Framework Directive obliges Member States to draw up plans or programmes to ensure attainment where the levels are above the limit value by more than a specified amount (the margin of tolerance).

The directives lay down requirements for Member States for assessing the air quality throughout their territory, thus harmonising the information on the air quality, including the data on exceedances of air quality thresholds. The requirements include specifications on the number and siting of stations and on the quality of the data. The directives also encourage the use of models to supplement the information collected by measurements.

The directives give requirements for reporting information to the Commission; details of these reporting requirements may be amended or further specified by a Committee.

The directives seek to strike a balance between on the one hand the aim to harmonise the assessment and management of air quality in the Member States, and on the other hand the subsidiary principle, allowing flexibility in the implementation. This balance has also played a major role for the Working Group when considering amendments.

1.3 Structure of this report

After the general introduction, Chapter 2 deals with various aspects of the directives. Chapter 3, relating to the quality of air quality measurements, has been drafted by the network AQUILA and was subsequently reviewed by the Working Group.

Each of these aspects is first shortly introduced, and then one or more specific issues that have been considered by the Working Group for amendment are dealt with. These issues are discussed as follows: first the Working Group's considerations are given, including the reason to consider revision; then the recommendation of the Working Group is described. In some cases a verbatim proposal for a directive amendment is presented. Both the existing and the proposed amended text are then given; changed text fragments are underlined. The last chapter summarises the proposals.

2. Experience and recommendations for improvement (Part 1)

This chapter has been drafted by the Working Group. It is followed by a similar chapter drafted by the AQUILA network.

2.1 Zones

All Member States have divided their territories into zones. Article 2 of the Framework Directive defines 'zone' as 'part of their territory delimited by the Member States', granting Member States freedom in choosing the approach in zone designation that is optimal for the country, taking e.g. the internal administrative structure or air pollution patterns into account.

The Framework Directive relates both administrative provisions and air quality assessment requirements to zones. This posed a dilemma to Member States when they defined their zones. For the assignment of administrative responsibilities, it would be easier to have zones coinciding with the territories of regional or local administrations. On the other hand, the air quality assessment system would be best related to air quality patterns, which have usually little to do with administrative borders. It was also complicated for Member States that the minimum number of measuring stations is dependent on whether exceedance occurs anywhere in a zone, irrespective of whether this concerns e.g. a single hotspot or a large area. Another aspect that has influenced the approach of some Member States was the concern that the public might misinterpret the non-compliance status of a zone as bad air quality throughout the entire zone. By the end of 2003, the Commission had received comprehensive information on the zone structure in all Member States except Italy.

Although a systematic evaluation has not been done, it is likely that Member States have related their zone borders more to administrative borders than to air pollution patterns. There are differences in the approach chosen by different Member States. Consequently the question has arisen whether the designation of zones is adversely affecting the network design.

Issue A: Impact of the zone concept on assessment strategy

B.1. Considerations

The Commission has in two ways received information from Member States relating to zones: in the annual reporting questionnaire under the First Daughter Directive (regarding 2001 and 2002) and, in 2001, in replies to a brief informal and voluntary inquiry on the Preliminary Assessment under the First Daughter Directive. The information sent under the Exchange of Information Decision does not include information on zones.

The provision of data on population and area of zones is voluntary in the annual questionnaire. Only part of the Member States have provided this information. Only some of the Member States have provided the coordinates of their zone borders. Even if this information would be available, an evaluation of the network design would require data on air pollution patterns in the European zones (include the local scale), which would be a study beyond the scope of the Working Group, because different databases have to be combined and appropriate characterisations air pollution patterns would have to be developed. Consequently the annual questionnaire could not be used to acquire more insight in the impact of the zone concept on assessment strategy.

In the answers to the inquiry on the Preliminary Assessment, differences in the zone designation principles could be seen between Member States. The report by the Commission on results of the Preliminary Assessment showed also that there are large differences between the zone sizes and structure in Member States. However, the report also recognises that air pollution patterns and population density differ widely and consequently the variety in zone patterns does not necessarily

imply serious differences in the network design principles.

A more theoretical consideration is that the network density requirements in Annex VII of the First Daughter Directive is independent of the area over which concentrations are elevated and hence the requirements do not differentiate between a zone with bad air quality over its entire area and a zone with good air quality except a single hot spot. As these provisions are minimum requirements, it does not necessarily affect the quality of networks, but it seems likely that an unbalanced approach could result.

B.2 Recommendation

Although an objective analysis on the impact of the zone concept on assessment strategy could not be done within the time constraints of the Working Group, there are reasons to believe that the current provisions on the number of stations are not optimal. The minimum number of stations per zone depends only on the ratio between the highest level in the zone and the limit value, and not on the area with elevated levels, which may vary from the entire zone to a single hot spot.

However, the Member States and Acceding Countries have by now designated their zones and arranged their assessment strategy accordingly. Since they have not indicated major problems with their network design, and the Working Group has only superficial insight in how the zone concept affects the assessment strategy, there is not sufficient reason for proposing an amendment. For further evaluation of the zone concept and the assessment strategies, including the compliance with the network density requirements, the Working Group strongly recommends to ensure that Member States provide information on population and area of the zone and digital maps.

2.2 Limit values and Margins of Tolerance

This section deals with the usefulness of the provisions on air quality limit values and margins of tolerance set out in the directives. It does not review the levels of the limit values.

Most respondents to the informal questionnaire (see Chapter 1) felt that the limit values were useful instruments. There were however important aspects that needed to be clarified. Several of these relate to the spatial characteristics of limit value. One question, discussed already for several years (see also the Guidance on Assessment (European Commission, 2001), is whether the limit values must be met everywhere or only at places where relevant exposure of the population occurs. A similar question pertains to the limit values for ecosystems and vegetation: where should they be applied, should this depend on the sensitivity of the ecosystems and vegetation present, should there be an additional provision on the protection of sensitive ecosystems/vegetation at places not covered by the limit values? A related aspect is the spatial resolution of limit values: should limit values be met at every square metre or should there be a spatial average over a certain area?

The concept of the Margin of Tolerance (MOT) is generally appreciated as a useful provision to avoid that plans or programmes have to be considered without necessity. The Working Group, however, notes its concern that locations where levels are currently below the LV+MOT, but may not be below the LV in the year when it has to be met, may remain unnoticed.

Although these recommendations do not include a review of the limit values – this is being done in the integrated assessment in CAFE and has, for PM₁₀, been addressed by the CAFE Working Group on Particulate Matter – the Working Group felt it important to consider the experience regarding the attainability of limit values.

A recently emerged discussion on alternative approaches to supplement limit values should be mentioned. It is summarised in the Position Paper on Particulate Matter. The Working Group regards this discussion as relevant and recommends to take this discussion further. However, as consideration

of the issues raised is currently in the first exploratory phase and pertains to the fundamentals of the Framework Directive, it has not been taken into account in relation to the short-term amendments considered here.

Issue B: Specification of where health limit values apply

B.1. Considerations

At present, there are several interpretations of where the limit values apply under the First Daughter Directive. This leads to uncertainty as to the precise measures that Member States must undertake in order to comply with their obligations under the Framework Directive and the First Daughter Directive. These problems arise because:

- It is only possible to determine Member States' obligations under the First Daughter Directive by a complicated legal and technical analysis of interactions between the articles and the annexes of the First Daughter Directive, also taking account of the provisions of the Framework Directive.
- This leads to a lack of clarity and lack of certainty as to those obligations:
 - There can be differences between the view taken by the Commission, by a Member State, and by members of the public and interest groups leading to difficulties for all parties in determining whether obligations are being met. A Member State can be uncertain as to its national obligations and have no easy means of resolving difficulties.
 - There is ambiguity as to where the limit values for the protection of human health apply. It is not clear whether the intention of the directives is to focus on achieving defined levels of pollutants in ambient air (a) everywhere in the European Union, regardless of probability of members of the public's exposure, or (b) where members of the public are regularly present and might reasonably be expected to be exposed over the relevant averaging period.
 - There is uncertainty where the limit values for the protection of vegetation and ecosystems apply, and it has to be deduced that they do not necessarily apply in all circumstances in which the limit values for the protection of human health apply.

These uncertainties concerning the obligations under the First Daughter Directive may cause a situation in which Member States diverge in the interpretation of where the limit values apply and what the consequences for control policies should be.

- It may be possible to change the requirements and guidance on the location of monitoring points by a comitology procedure. Changing the annexes could have the effect of changing the obligations on a Member State – and effectively changing the effect of limit values – because the description of the location of monitoring points is a key issue at present in determining a Member State's obligations under the present directive. It is undesirable that the possibility exists for such an important change to be made without consideration by the Council and the Parliament.

B.2 Recommendation

The Working Group are of the view that the Commission should consider whether the present First Daughter Directive needs to be reformulated to make its provisions clearer. The following principles should guide any reformulation:

- As now, the directive should be about the quality of outdoor air and should exclude work places.
- There should be a clear and explicit statement of Member States' obligations, in terms that will have a similar effect in all Community languages. This statement should be in the body of the directive and not rely on technical detail in the Annexes. Proposals should be checked against the practical experience of the present directive before they are published.
- The Working Group suggests that reviews and assessments for the protection of human health should be focused on those locations where members of the public are likely to be regularly present and are likely to be exposed over the averaging period of the objective. The directive should not consider exceedances of the objectives at any location where relevant public exposure would not be realistic. Clear, sensible, and logical rules are needed to establish obligations, and

these should be placed in an Article of the directive not in an Annex.

- Similar recommendations are given regarding the limit values for ecosystems and vegetation (see Issue C).
- Critical terms should be defined as clearly as possible throughout the new directive.
- Monitoring obligations must continue to respect the requirements of subsidiarity, but should be set out in terms that allow a Member State to establish clearly what is required. The role of modelling should be recognised as a valid means of establishing compliance in certain circumstances.

The structure of any new directive might usefully be informed by examples of where the health based limit values should/should not apply. The Working Group propose that the following examples should be introduced, as either guidance or for them to be incorporated into any revision of the directive.

Averaging period	Limit values for the protection of human health should apply at:	Limit values for the protection of human health should generally not apply at:
Annual mean	<ul style="list-style-type: none"> – All locations where members of the public might be regularly exposed. – Building facades of residential properties, schools, hospitals, libraries etc. 	<ul style="list-style-type: none"> – Any kerbside sites (as opposed to locations at the building facade), or any other location where public exposure is expected to be short term. – Building facades of factories or industrial installations where provisions for work places apply and where members of the public do not have regular access.
24-hour mean	<ul style="list-style-type: none"> – All locations where the annual mean limit values would apply. – Gardens of residential properties. 	<ul style="list-style-type: none"> – Kerbside sites (as opposed to locations at the building facade), or any other location where public exposure is expected to be short term.
1-hour mean	<ul style="list-style-type: none"> – All locations where the annual mean and 24-hour mean limit values apply. – Kerbside sites (e.g. pavements of busy shopping streets) – Those parts of car parks, bus stations and railway stations etc. which are not fully enclosed and effectively open to the wind, but where the public might reasonably be expected to spend 1-hour or more. – Any outdoor locations to which the public might reasonably expected to spend 1-hour or longer. 	<ul style="list-style-type: none"> – Kerbside sites where the public would not be expected to have regular access, such as lane dividers on motorways.

Issue C: Limit values for ecosystems and vegetation

C.1 Considerations

Section I in Annex I of the First Daughter Directive 1999/30/EC sets SO₂ limit values for the protection of ecosystems to be 20 µg/m³, averaged over the calendar year and over the winter. Section I in Annex II of the same directive sets a NO_x limit value for the protection of vegetation at 30 µg/m³, averaged over the calendar year. The attainment date for both SO₂ and NO_x is 19 July 2001.

The Working Group regards protection of vegetation/ecosystems as an important integral part of the First Daughter Directive. However, there is uncertainty on where the limit values for the protection of vegetation and ecosystems apply and where not. In Annex VI the macroscale siting of sampling points

targeted at the protection of ecosystems and vegetation is described. These provisions could be read as defining where the limit values for ecosystems and vegetation apply, but this is not clear.

It is very difficult to draw up detailed and generic siting criteria that are useful everywhere, and hence the criteria in the directive are very restrictive. As a consequence, very large areas (more than 100 km in diameter) exist without any location that complies with the siting requirements. This does, however, not imply that there is within such areas no ecosystem or vegetation worth protecting.

It was unclear to the Working Group whether the distinction in the First Daughter Directive between ecosystems (in relation to SO₂) and vegetation (in relation to NO_x) is intended to have any legal implications.

For the protection of ecosystems and vegetation not only the direct exposure to air quality itself, but also the exposure following other input pathways (in particular atmospheric deposition) is important. In the integrated assessment in CAFE and the UNECE Convention on Long-Range Transboundary Air Pollution the implications of these routes for emission ceilings are continually under consideration. The Working Group feels that also implications for the daughter directives, e.g. possible deposition thresholds, should be considered in the CAFE process.

C.2 Recommendation

- The Working Group feels that clear, sensible, and logical rules are needed to establish where the air quality should be assessed and where limit values for ecosystems and vegetation apply, and these should be placed in an article of the directive, not in an annex (see also Issue B).
- In the CAFE process, consideration should be given to possibilities of developing legislation concerning thresholds related to deposition.
- If the term ‘ecosystem’ in the directive has the same legal implication as ‘vegetation’, it is recommended to replace ‘ecosystem’ by ‘vegetation’.
- The Working Group considers it important to point out to Member States that if in certain areas no siting locations exist that comply with the siting requirements, this does not imply that no protection is needed there. In those areas, the protection is a subsidiarity matter: it is the Member State’s own responsibility to provide adequate protection if needed.

Issue D1: Attainability of Stage 1 limit values for PM₁₀

D1.1 Considerations

In the Second Position Paper on Particulate Matter the attainability of Stage 1 limit values has been evaluated on the basis of currently available information. It is concluded that the Stage 1 annual average limit value is likely to be attained in most Member States except at highly polluted locations or some urban background areas. The Stage 1 24-hour limit value is more stringent than the annual average limit value. With current policies, PM levels at many locations across the EU are likely to exceed the Stage 1 24-hour limit value in 2005; even with ambitious measures, these limit values seem unattainable in the most polluted areas by 2005.

- Annual average concentrations of PM₁₀ have generally decreased since the late nineties. However, there is considerable variation between different monitoring sites, and not all locations display this downward tendency. In most recent years in some Member States even an increase in concentrations has been observed. The period of observation is too short yet to disentangle the impact of control policies on one hand and the influence of meteorological variations on the other hand. There are strong indications that the reducing trend in rural and urban background concentrations has been driven mainly by reductions at the European level in precursor emissions

of SO₂ and NO_x.

- Despite the improving situation, there are currently exceedances of the Stage 1 annual and 24-hour limit values in most Member States. In 2001 the limit values were exceeded at 34% of the 718 monitoring sites reported under the Exchange of Information Decision. According to a preliminary overview by the Commission of the first annual reports under the First Daughter Directive by 13 Member States on their air quality in 2001, 11 Member States reported exceedance of a Stage 1 limit value (the annual limit value in 8 and the daily limit value in 10 Member States). The higher limit values plus margin of tolerance were exceeded in 7 Member States (the annual limit value in 6 and the daily limit value in 7 Member States). There is not enough information currently to tell to what extent natural events and resuspension of particulates following the winter sanding of roads contribute to the observed exceedances. The overwhelming part of annual average PM levels at least in mid latitudes Europe away from the influence of marine aerosol seems to originate from anthropogenic emissions.
- One of the main barriers to attainability is the high regional background concentration of PM₁₀ caused by long-range air pollution. Attainability of the limit values, particularly the more stringent Stage 1 24-hour limit value and the Stage 2 indicative limit values, is largely outside the control of individual Member States. Europe-wide action on further reducing precursor emissions is needed if limit values are to be met.
- Technical options are available to help Member States further reduce primary and PM precursor emissions. There is however comparatively little information e.g. on the most practical and cost effective balance of local, regional, national and European scale measures to meet limit values.
- The most polluted monitoring sites – most of them traffic-related sites – in the EU and Accession countries recorded concentrations around 60 µg/m³ and higher as annual mean in 2001. From statistical assessment it is known that the daily limit value (35 exceedances of a daily PM₁₀ level of 50 µg/m³) corresponds roughly to an annual mean of 30 µg/m³. Therefore, a reduction of PM₁₀ levels in the order of 50% is needed in the most polluted sites within the three years after 2001 to comply in 2005 with the daily limit value. Measures that have an almost immediate effect on emissions would be required simultaneously at a local, regional and international level, but this is impractical. Therefore, it is considered unlikely that pollution levels can be reduced sufficiently at all of these sites by the 2005 attainment date.
- The slope of concentration reduction as assumed over time in the Margin of Tolerance (MoT) for the daily limit value is much steeper than is expected will be the case in reality. Thus, the current MoT will turn out be insufficient to signal in time future non-attainment areas. Based on the available information on the relationship between the annual PM₁₀ concentrations and the daily 36th highest concentration, the daily limit value plus MoT anticipated in the directive to reduce from 75 µg/m³ in 2000 to 50 µg/m³ in 2005 is roughly equivalent to an annual concentration that reduces from 47 µg/m³ to 31 µg/m³ (urban stations). This will most probably imply that getting closer to the attainment date of January 1, 2005 an increasing number of zones and agglomerations will experience exceedance of the limit value plus MoT. The time frame that is left (1 or 2 years) to develop and implement additional control plans or programmes will be too short to meet the limit value in time.
- Apart from the technical feasibility of implementing abatement measures in a short time frame, significant additional cost will be incurred with additional control measures, as can be anticipated from the available studies as performed in two Member States. The United Kingdom has identified additional measures that could reduce industrial and domestic emissions by 40% in 2010 and traffic measures that would reduce emissions by an additional 15% in 2010. The Netherlands has similarly identified measures in addition to current legislation that would reduce primary PM₁₀ emissions by more than 50%. Both countries, however, identify significant additional costs to make these reductions (total annual cost estimated for the United Kingdom 1100-1600 million €

and for the Netherlands 6000 million €). These cost estimates go far beyond the annual costs of 87-225 million € estimated in 1997 to be associated with the emission reduction required to meet PM₁₀ standards in 2010 (Economic evaluation of air quality targets for sulphur dioxide, nitrogen dioxide, fine and suspended particulate matter and lead, Final Report, October 1997).

D1. 2 Recommendation

The Working Group acknowledges the fact that with current policies the Stage 1 limit values, in particular the 24-hour limit value, are likely to be exceeded in 2005 in part of the Member States. In order to improve the situation, the Working Group is of the opinion that actions at Community level aiming at further reducing emissions are advisable. However, even with implementation of all technologically feasible abatement measures, which are anticipated to incur high costs and need more time for implementation than is available, it will not be possible to meet the standard in all places in time.

Given this likely attainability problem, the Working Group recommends to the Commission to examine the First Daughter Directive in view of possible amendments, if appropriate. The Working Group has not discussed the options of changing either the limit value or the attainment date since it would go beyond the brief of the Working Group for preparing the review report of the First Daughter Directive. In view of the time frame (the Stage 1 limit values are to be complied with from next year on) it is not realistic to propose a specific recommendation since it will not be possible to achieve any amendment in time. However, when revising the directive, the Working Group recommends to the Commission to consider looking into possibilities of introducing derogations in time (prolonging the attainment date) for specific zones and agglomerations if limit values are still exceeded although it has been demonstrated that all reasonable measures at the time have been taken. The provisions laid down in the Second Daughter Directive for benzene could serve as an example for such a derogation scheme.

Concluding, the Working Group strongly recommends the Commission to look into further measures to reduce PM emissions but also consider the possibilities for derogation as soon as possible.

Issue D2: Attainability of Stage 2 indicative limit values for PM₁₀*D2.1 Considerations*

In Article 10 of the First Daughter Directive it is stated that in the report that the Commission shall submit to the European Parliament and the Council no later than 31 December 2003, the Commission "... will examine the limit values for the second stage for PM₁₀ with a view to making them mandatory and will consider confirming or altering the limit values for the second stage ...".

- It is noted in the Second Position Paper on Particulate Matter that there are currently widespread exceedances of the Stage 2 indicative limit values all over Europe. This level is even exceeded significantly at some rural background sites. Recent trends and projections strongly suggest that the annual average and daily Stage 2 indicative limit values will not be met in most Member States.
- Furthermore preliminary modelling results (from EMEP and others) suggest that the Stage 2 indicative limit values will not be met widely even if Member States implement all technologically feasible abatement measures applied to primary sources of PM, and taking into account the control on precursor emissions (NO_x, SO_x, NH₃ and VOCs) resulting from implementation of the National Emission Ceilings Directive.
- There are numerous control options available for primary PM with substantial emissions reduction potential from road transport, off-road transport, industrial and commercial sources. Implementation of all technologically feasible abatement measures to further reduce PM₁₀ emissions and concentrations to meet the 2010 Indicative limit values, would incur large additional cost. The associated costs can be expected to go far beyond the costs that were anticipated at the time that was decided on the current standards (see also under Considerations related to 'Attainability of Stage 1 limit values for PM₁₀'). At the same time, the health benefits may be considerable.
- The Working Group on Particulate Matter does not recommend yet an alternative Stage 2 limit value for PM₁₀ that could be made mandatory. There remains much uncertainty in the concentration level that may be attainable in 2010 within the European Union. Conversely, the Working Group on Particulate Matter recommends the future use of PM_{2.5} rather than PM₁₀ as the principal metric for assessing exposure to particulate matter. PM_{2.5} limit values should be derived as part of the CAFE thematic strategy. Once PM_{2.5} limit values have come into force and have replaced the Stage 1 PM₁₀ limit values, the PM₁₀ Stage 2 indicative limit values should be reclassified as target values with the aim to help control the coarse fraction, PM_{2.5-10}. It is recommended that the value for the PM₁₀ target value should be reconsidered in view of the results of the integrated assessment modelling that will take place in 2004 in the context of the review of the CAFE thematic strategy.

D2.2 Recommendation

The Working Group recognizes the concern that very likely in many Member States the Stage 2 indicative limit values will not be achievable in time. It is proposed not to make these indicative limit values mandatory, but for the time being to maintain these limit values as indicative until sufficient basis exists for reclassification. Therefore, the Working Group concludes not to make any amendments on the current text of the directive.

In the process of reviewing the CAFE thematic strategy (2004/2005) it is anticipated that the current limit values for particulate matter will be revised. This may involve both the PM metric, the status as well as the level of the limit values. At that time a better basis will be available to revise the current indicative limit values into standards with an appropriate status and proper concentration levels.

Issue D3: Attainability of the annual limit value for NO₂*D3.1 Considerations*

There is limited view, yet, on the attainability of the annual NO₂ limit value of 40 µg/m³ that is to be met by January 1, 2010. The limit value plus Margin of Tolerance (MoT) is currently exceeded, but the time available till 2010 is such that plans or programmes still can be developed and implemented to enhance the decrease in annual concentrations of NO₂.

Only few countries (United Kingdom, the Netherlands) have evaluated attainability using model projections. Inevitably, the models used will contain a number of simplifications. They are driven with input data which themselves contain approximations and are subject to uncertainties. However, both country studies indicate that with current control policies, taking into account plans or programmes developed to meet the National Emission Ceilings Directive target, in 2010 at several locations the annual limit value will not be met, in particular near busy roads and highways.

An important barrier to attainability is the high regional background concentration for NO₂. The solution will have to be found in a control policy that offers an appropriate balance of local, regional, national and European scale measures to meet the limit value. Exceedances appear to concentrate very much in large urban areas, near busy roads and highways. When full advantage has been taken of options to reduce emissions, changes in infrastructure may be considered as a last resort to reduce population exposure to NO₂, but this type of measures generally will incur high costs.

It has also to be taken into account that relevant abatement measures like the introduction of more stringent EURO5 NOx-emission limits for heavy duty vehicles in 2008 will reach full effect only after 2010.

The anticipated exceedances will concern in particular the annual NO₂ limit value of 40 µg/m³.

D3.2. Recommendation

In order to improve the situation, the Working Group is of the opinion that actions at community level aiming at further reducing NO emissions are advisable. However, the Working Group acknowledges that concerns have been expressed by a number of Member States that even with implementation of all technologically feasible abatement measures it might not be possible to meet the annual NO₂ limit value of 40 µg/m³ at all relevant locations in time. Given this potential attainability problem, the Working Group recommends to the Commission to examine the Directive in view of possible amendments, if appropriate. The Working Group has not discussed the options of changing either the limit value or the attainment date since it would go beyond the brief of the Working Group for preparing the review report of the First Daughter Directive. However, when revising the directive, the Working Group recommends to the Commission to consider looking into possibilities of introducing derogations in time (prolonging the attainment date) for specific zones and agglomerations if limit values are still exceeded although it has been demonstrated that all reasonable measures at the time have been taken. The provisions laid down in the Second Daughter Directive for benzene could serve as an example for such a derogation scheme.

Contrary to the situation for PM₁₀, there is enough time to achieve an amendment to the First Daughter Directive before the attainment date of the limit value is reached. Therefore, the Working Group has drafted a possible amendment to the First Daughter Directive that would create the possibility for Member States to apply for a derogation.

In the Second Daughter Directive related to benzene a precedent has been established that can be adopted for the First Daughter Directive. In addition, in its preamble the First Daughter Directive explicitly refers to Article 130s of the Treaty establishing the European Community, in which is

stated:

Without prejudice to the principle that the polluter should pay, if a measure (.....) involves costs deemed disproportionate for the public authorities of a Member State, the Council shall, in the act adopting that measure, lay down appropriate provisions in the form of:

- temporary derogations and/or
- financial support from the Cohesion Fund (.....).

In particular in case of 'hot spot' situations like busy roads and highways, the Working Group considers that this provision may be called for. It is acknowledged that the Council, when it took its decision, did not choose to include such a derogation. However, the current knowledge that it will be difficult to meet the limit value at some locations, and the difficulties of implementing measures to reduce concentrations over a short time scale, justify reconsideration of a derogation.

In case that the annual limit value and its attainment date remain unchanged, the Working Group proposes to add in the First Daughter Directive to Article 4 (on nitrogen dioxide and oxides of nitrogen) a section that is partly similar to the provision used for benzene (Directive 2000/69/EC, Article 3(2)). As for NO₂ the attainability problems are restricted to limited hot spot areas, the Working Group proposes to relate such a derogation not to entire zones, but to specified areas within zones.

Issue D3. Attainability of the annual limit value for NO₂: proposed amendment of 1999/30/EC Article 3	
<i>Existing text</i>	<i>Possible amended text</i>
[none]	<p><u>3. When the annual limit value for protection of human health laid down in Annex II is difficult to achieve because the application of measures were to result in severe socio-economic problems, or because of site specific dispersion characteristics or relevant climatic conditions, a Member State may ask the Commission for a time-limited extension. The Commission, acting in accordance with the procedure laid down in Article 12(2) of Directive 96/62/EC, may, at the request of a Member State and without prejudice to Article 8(3) of this Directive, grant one extension for a period of up to five years if the Member State concerned:</u></p> <ul style="list-style-type: none"> – <u>designates the areas within the zones and/or agglomerations concerned; provides the necessary justification for such an extension;</u> <p><u>demonstrates that all reasonable measures have been taken to lower the concentrations of the pollutants concerned and to minimise the area over which the limit value is exceeded, and outlines the future developments with regard to the measures which it will take according to Article 8(3) of Directive 96/62/EC.</u></p>

2.3 Derogations

The provisions for derogations are regarded as useful in general. The derogations are very specific, and the Working Group felt that broadening the derogation for limit value exceedances due to natural events should be considered.

Issue E: Derogation for natural contributions to PM concentrations

E.1 Considerations

The First Daughter Directive allows derogations for compliance with limit values for PM₁₀ when

exceedances are due to natural events:

Article 5(4): Where the limit values for PM₁₀ laid down in Section I of Annex III are exceeded owing to concentrations of PM₁₀ in ambient air due to natural events which result in concentrations significantly in excess of normal background levels from natural sources, Member States shall inform the Commission in accordance with Article 11(1) of Directive 96/62/EC, providing the necessary justification to demonstrate that such exceedances are due to natural events. In such cases, Member States shall be obliged to implement action plans in accordance with Article 8(3) of Directive 96/62/EC only where the limit values laid down in Section I of Annex III are exceeded owing to causes other than natural events.

Article 2(15): 'natural events' shall mean volcanic eruptions, seismic activities, geothermal activities, wild-land fires, high-wind events or the atmospheric resuspension or transport of natural particles from dry regions;

Some responses of the informal questionnaire about Member States' experiences in applying the First Daughter Directive highlighted that in some countries natural contributions to pollutant levels can be significant not only in sporadic events but also as an almost continuous or structural contribution. In Spain, the natural contribution (mineral matter plus marine aerosols) reaches around 30% of the PM₁₀ mass in the northern and central regions of the Iberian Peninsula, 40% in the Southern and Eastern regions, and > 55% at the Canaries (6-9, 14-20 and 24 µg/m³, respectively). These contributions are in the case of PM_{2.5} also very important (from 12 to 19% for PM_{2.5} in the Iberian Peninsula and 30% in the Canaries). Other southern countries such as Portugal show similar characteristics.

In addition, in southern countries with very long dry periods there is little or no washout of dust from roads and streets; particles are being accumulated, resuspended by cars and subsequently deposited in almost the same areas. This cycle can be repeated during several days, weeks or even also months. The contribution of the resuspended road dust to the kerbside concentrations, exclusive of regional and urban background contributions, is higher or similar to that of the exhaust emissions and tyre abrasion.

In view of this, the Working Group discussed possibilities to extend the existing derogations for natural events to more continuous natural causes of high PM concentrations, such as extremely dry conditions.

Several members of the Working Group expressed their reservations concerning widening the scope of the current derogation for natural events. Because there are many uncertainties involved, there would be a danger of opening up for unintended derogations. There can be important difficulties in quantifying such natural contributions with reliable and not too expensive procedures. It would also be difficult to clearly define the boundaries of derogation cases, for example in the case of the natural contribution by resuspension of PM by traffic. Furthermore, when the current numerical values of the PM₁₀ limit values were set, they were based on data of the total PM₁₀ levels, which, in principle, included the structural natural contributions.

E.2 Recommendation

In view of the difficulties to define and to quantify natural contributions of a more continuous nature, the Working Group decided not to propose an amendment. The Working Group however feels that this matter should be given more consideration in the future.

2.4 Network design

Harmonisation of network design is a crucial element in the assessment of the progress in combating air pollution and is essential for compliance checking in a comparable way throughout the EU. It is however extremely difficult to prescribe in detail how networks should be designed, as distributions of sources and air pollution vary widely throughout Europe. Drawing up universal network requirements

is even more difficult when modelling and other mathematical methods are used to supplement the measurements. Annex VII of the First Daughter Directive gives minimum station density requirements for the case that no supplementary assessment methods are applied, but these are rather crude and leave room for substantial differences in network design between comparable European areas. The majority of the Working Group felt that the directive should give a minimum station density also for zones where levels are below the lower assessment threshold. Too large differences in network design have been observed in the proportions of station types in Member States. It is also known that there are differences in the distances between stations and local sources, which lead to systematic differences in hotspot levels measured.

Furthermore, the Working Group felt that more detailed provisions on monitoring PM_{2.5} should be considered, given the proposal by the Working Group on Particulate Matter to develop a limit value for PM_{2.5}.

Issue F: Station density provisions (rural background stations)

F.1 Considerations

In the First Daughter Directives the criteria for the number and siting of sampling points are given. These criteria assure a proper assessment of compliance with limit values for the protection of human health and – if appropriate – vegetation. For PM₁₀, which has only limit values for the protection of human health, the sampling points must be located in populated areas (see the annexes on macroscale siting). However, for a full assessment of the air quality, additional data from rural background stations will be needed, even if levels are below the lower assessment threshold. Dispersion models will, to a growing extent, be used for assessment of current and future air quality. Rural background data are needed here for validation of regional scale models or is needed for establishing the boundary condition of local scale models. For source apportionment, the background stations are essential in estimating the contribution of long-range transport.

F.2 Recommendation

The Working Group recommends that Member States establish, irrespectively of concentration levels, at least one sampling point in rural background areas for monitoring of the pollutants (including PM_{2.5}, but excluding lead). The majority of the Working Group prefers a minimum station density¹ of one station per 40 000 km². As far as possible, the background stations should participate in the EMEP-network established under the umbrella of the UN-ECE CLRTAP.

F. Density of rural background stations: proposed amendment of 1999/30/EC Annex VII(II)	
<i>Existing text (right-hand side of the table)</i>	<i>Proposed amended text (right-hand side of the table)</i>
If maximum concentrations <u>are between the upper and lower assessment thresholds</u>	If maximum concentrations <u>do not exceed the upper assessment thresholds</u>

Issue G: Proportion of station types

¹ The phrase “maximum concentrations” in the titles of the second table in Annex VII could be read as the maximum in time (e.g. in a year), but it refers to the maximum in space: the highest level anywhere in the zone. The Working Group, however, did not propose to amend this, as there are many other places, in particular in the Framework Directive, where similar clarifications could then be made.

G.1 Considerations

ANNEX VII of the First Daughter Directive gives criteria for determining minimum numbers of sampling points for fixed measurement of concentrations of sulphur dioxide (SO₂), nitrogen dioxide (NO₂) and oxides of nitrogen, particulate matter and lead in ambient air, in particular in the table on diffuse sources 'Minimum number of sampling points for fixed measurement to assess compliance with limit values for the protection of human health and alert thresholds in zones and agglomerations where fixed measurement is the sole source of information'. If concentrations exceed the upper assessment threshold, the table requires: 'For NO₂ and particulate matter: to include at least one background station and one traffic-oriented station'.

The Working Group felt that an improved recommendation on the ratio between urban-background and traffic-oriented stations to be applied to agglomerations would be necessary.

The requirement to include at least one background station and one traffic oriented station corresponds to the requirements to be applied to fixed measurements in Annex VI of the First Daughter Directive:

Sampling points directed at the protection of human health should be sited:

- (i) to provide data on the areas within zones and agglomerations where the highest concentrations occur to which the population is likely to be directly or indirectly exposed for a period which is significant in relation to the averaging period of the limit value(s);
- (ii) to provide data on levels in other areas within the zones and agglomerations which are representative of the exposure of the general population.

It is generally acknowledged that high concentrations of particulate matter and nitrogen dioxide occur in agglomerations and are essentially due to traffic. In the First Daughter Directive the minimum number of sampling points for fixed measurements is 1 in agglomerations with a population below 250 thousand inhabitants (if concentrations exceed the upper assessment threshold) or in agglomerations with a population below a million inhabitants (if concentrations are between the lower and upper assessment threshold). This does not require to assess both the urban-background situation and the traffic-oriented situation where higher concentrations occur.

G.2 Recommendation

This proposal concerns the assessment of concentrations of nitrogen oxides and particulate matter. The Working Group stresses that the numbers of sampling points given in Annex VII(Ia) of the First Daughter Directive are minimum numbers that could be increased by the Member State in order to properly assess both the urban-background and the traffic-orientated situations.

The Working Group discussed the possibility of raising the minimum number of sampling points for fixed measurements to 2 in agglomerations with a population below 250 thousand inhabitants if concentrations exceed the upper assessment threshold. The Working Group also discussed raising the minimum number of sampling points for fixed measurements to 2 in agglomerations with a population below one million inhabitants if concentrations are between the lower and upper assessment threshold. (In this latter case, however, 1 measuring station would then be enough if the Member State is able to supply assessment results of the urban-background situation through modelling.) This would allow the Member State to operate one urban-background station and one traffic-orientated station in such agglomerations. However, the time available to the Working Group was not enough to finalise its discussion on this matter, so no proposal is given here.

As a more general rule, the Working Group recommends the total number of urban-background stations and the total number of traffic-orientated stations in a Member State do not differ by more than a factor of two. If a Member State operates more than the minimum number there is no need to aim at this proportion for the additional stations.

G. Proportion of station types: proposed amendment of 1999/30/EC Annex VII(Ia)	
<i>Existing text (bottom of the table)</i>	<i>Proposed amended text (bottom of the table)</i>
For NO ₂ and particulate matter: to <u>include at least one urban-background station and one traffic-orientated station</u>	For NO ₂ and particulate matter <u>it is recommended that the total number of urban-background stations and the total number of traffic-orientated stations in a Member State do not differ by more than a factor of two.</u>

Issue H: Location of traffic stations

H.1 Considerations

The Working Group considered it important to review the provisions on where exactly traffic stations should be sited. The following considerations are relevant.

- ANNEX VI (II) of the First Daughter Directive defines the criteria for microscale siting for fixed measurements such as traffic-oriented samplers:
 - location of traffic-orientated samplers:
 - for all pollutants, such sampling points should be at least 25 m from the edge of major junctions and at least 4 m from the centre of the nearest traffic lane,
 - for nitrogen dioxide, inlets should be no more than 5 m from the kerbside,
 - for particulate matter and lead, inlets should be sited so as to be representative of air quality near to the building line.

According to these criteria, for co-located monitoring of NO_x and Particulate Matter the inlets should be located between 3 and 5 meters from the kerbside to meet the criteria, while that should be consistent with a sidewalk along a building line.

Even though it is recognised that the guidelines should be met as far as practicable, they are not rigorously followed by most Member States, particularly in relation to traffic sources; this causes uncertainties in the interpretation of monitoring data. Most traffic monitoring stations measure at the same location pollutants that have different micrositing criteria: particulate matter (PM₁₀, PM_{2.5}), CO, NO_x, benzene. Also, the differences in classification criteria for monitoring stations (by the Exchange of Information Decision; in EUROAIRNET; country specific criteria) do not help to clarify this matter.

- ANNEX IV (II) of the Second Daughter Directive 2000/69/EC defines similar criteria for CO and benzene:
 - location of traffic-orientated samplers:
 - for all pollutants, such sampling points should be at least 25 metres from the edge of major junctions and at least 4 m from the centre of the nearest traffic lane;
 - for carbon monoxide, inlets should be no more than 5 m from the kerbside;
 - for benzene, inlets should be sited so as to be representative of air quality near to the building line.

According to these criteria, for co-located monitoring of carbon monoxide and benzene the inlets should be located between 3 and 5 meters from the kerbside to meet the criteria, while that should be consistent with a sidewalk along a building line.

The criteria for PM₁₀ and benzene are the same (close to the building line, with no maximum distance limitations from the road but with a minimum of 4 meters from the centre of the nearest traffic lane), and also for NO_x and CO (no more than 5 meters from the kerbside).

3. Several traffic monitoring stations monitor different pollutants simultaneously at the same location. An evaluation of data from Portugal, particularly from Lisbon, shows that the ratio NO/NO₂ and the levels of CO can be more representative of traffic influence to population exposure and without a considerable difference if the inlets for both CO and NO_x are located up to 15 meters from the kerbside. The difference between levels at 4 and 15 meters from the kerbside would, on the other hand, cause incomparability between traffic levels measured. However, since this requires a deeper analysis consistent with the station's classification, one option is to recommend the creation of a small working group to discuss this and other related items.

ANNEX VI (II) of 1999/30/EC should be amended in order to have a more consistent approach.

H.2 Recommendation

The Working Group proposes to amend ANNEX VI (II) in order to correct the inconsistency of criteria. As a compromise between representativeness for population exposure and comparability between traffic stations, the Working Group proposes to limit the distance for traffic stations to 10 meters from the kerbside.

H. Location of traffic stations: proposed amendment in 1999/30/EC Annex VI(II)	
<i>Existing text</i>	<i>Proposed amended text</i>
<ul style="list-style-type: none"> - location of traffic-orientated samplers: <ul style="list-style-type: none"> - for all pollutants, such sampling points should be at least 25 m from the edge of major junctions and at least 4 m from the centre of the nearest traffic lane, - for nitrogen dioxide, inlets should be no more than 5 m from the kerbside, - for particulate matter and lead, inlets should be sited so as to be representative of air quality near to the building line. 	<ul style="list-style-type: none"> - location of traffic-orientated samplers: <ul style="list-style-type: none"> - for all pollutants, such sampling points should be at least 25 m from the edge of major junctions and at least 4 m from the centre of the nearest traffic lane, - for nitrogen dioxide, inlets should be no more than 5 m from the kerbside, - for particulate matter and lead, inlets should be sited so as to be representative of air quality near to the building line <u>but no more than 10 m from the kerbside.</u>

Issue I: Measurements of PM_{2.5}

I.1 Considerations

The CAFE Particulate Matter Working Group's draft report recommends the use of PM_{2.5} rather than PM₁₀ as the principle metric for assessing exposure to particulate matter. Furthermore it recommends that – with the emphasis on PM_{2.5} in the new WHO recommendations – PM_{2.5} monitoring should be intensified as soon as possible to give representative data from Europe, covering all relevant area types.

The CAFE Particulate Matter Working Group considered it was ‘... too early to consider regulation of PM_{1.0} and ultrafine particles...’ and recommended that ‘...Member States be asked to carry out more research in the coming years to establish more valid information on these PM metrics with regard to both concentration levels and adverse health effects...’. They also recommended that ‘... the Commission should collect and review the results of this work within five years...’.

In view of the apparent shift to PM_{2.5} for future air quality standards, there is a case to make more measurements of PM_{2.5} mandatory. There are however still uncertainties as to which monitoring method will be prescribed in future (no CEN method is available at present, although one may become available in late 2004). The Working Group therefore is of the opinion that only a moderate increase in PM_{2.5} measurements should be proposed at the moment, and that this increase should not be a mandatory requirement but rather a recommendation to Member States.

1.2 Recommendation

Increasing the monitoring of PM_{2.5} across Europe will assist Member States in assessing possible controls on PM_{2.5}. Increased co-located monitoring of PM_{2.5} and other metrics with PM₁₀ monitors will also assist any future studies of the health effects of particles. Health studies generally require long running (greater than 1-2 years) air quality data to allow statistically robust studies to be carried out.

On the other hand the disadvantages of increasing the monitoring are twofold:

- 1) the current lack of a CEN standard for monitoring PM_{2.5}; and
- 2) the expense of purchasing monitoring equipment and ongoing annual running costs.

The expense depends much on the finally agreed CEN standard and equivalence issues. Any issues raised with equivalence for PM₁₀ monitoring equipment will be the same for PM_{2.5}. Equipment prices vary across Member States but rough purchase costs are around €17,000 per gravimetric monitor; €37,000 per TEOM including FDMS (€27,000 without FDMS). Running costs per year are about €15,000 - €30,000 per gravimetric monitor (weekly/fortnightly- daily visits to stations); and about €4,500 per TEOM.

The majority of the Working Group proposes that Member States should have as a minimum co-located PM_{2.5} and PM₁₀ at an urban roadside, an urban background and a rural station. Where appropriate to their situation, Member States could install industrial and remote stations. Member States may also wish to monitor in regions with different source types or strengths. As a guideline, the Working Group recommends to perform measurements at sites co-located with sampling points for PM₁₀, at about 20% of the number of sites used to measure PM₁₀. It is anticipated that measurements of PM_{2.5} at this indicative number of sites will provide sufficient data to obtain a meaningful overall insight in PM_{2.5} levels in a Member State.

It is also suggested that Member States should monitor other particulate matter metrics at, as a minimum, an urban roadside, an urban background and a rural station. However, unlike PM_{2.5}, these other metrics have not yet been proposed as a serious candidate for limit values and are therefore more of a research tool to assist with any future studies of the health effects of particles, rather than a demonstration of the implementation of a legally binding limit value.

Monitoring data indicate that PM_{2.5} contributes on average around two thirds of the PM₁₀ mix. Individual annual average PM_{2.5}/PM₁₀ ratios vary between about 0.4 and 0.8.

I. Measurements of PM_{2.5}: proposed amendment of 1999/30/EC Article 5(2)	
<i>Existing text</i>	<i>Proposed amended text</i>
Member States shall ensure that measuring stations to supply data on concentration of PM _{2.5} are installed and operated. Each Member State shall choose the number and siting of the stations at which PM _{2.5} is to be measured as representative of concentrations of PM _{2.5} within the Member State. Where possible sampling points for PM _{2.5} shall be co-located with sampling points for PM ₁₀ .	Member States shall ensure that measuring stations to supply data on concentrations of PM _{2.5} are installed and operated. Each Member State shall choose the number and siting of the stations at which PM _{2.5} is to be measured as representative of concentrations of PM _{2.5} within the Member State. <u>It is recommended, by way of guidance, that</u> where possible, sampling points for PM _{2.5} <u>should</u> be co-located with sampling points for PM ₁₀ <u>and that measurement for PM_{2.5} should be made at about 20% of a Member States' sites for measuring PM₁₀. It is</u>

	<u>recommended that measuring stations should be placed at the different types of locations including traffic-orientated, urban background and rural locations. It is further recommended that Member States measure PM_{1.0} and other metrics such as particle number at stations co-located with sampling locations for PM₁₀ and PM_{2.5}.</u>
--	--

2.5 Measuring methods

Annexes VIII and IX of the First Daughter Directive give provisions on measuring methods. The Working Group considered some problems experienced in this field, the most urgent of which pertained to PM₁₀: the difficulty in establishing equivalence for non-reference methods and the impossibility to comply with the obligation to publish within a day PM levels measured with the reference method. Another difficulty considered was that the minimum data capture requirements are in practice not always met, resulting from the legal perspective in loss of the entire data series. Finally, the Working Group considered improvement of a provision regarding random measurements.

Chapter 3 drafted by AQUILA gives further considerations and proposals dealing with measuring methods.

Issue J: Demonstrating equivalence of PM measurements by automatic instruments

J.1 Considerations

The reference method for PM₁₀ and the provisional reference method for PM_{2.5} (prEN 14907 Ambient air quality- Reference gravimetric measurement method for the determination of the PM_{2.5} mass fraction of suspended particulate matter in ambient air) are both based on collection of particulate matter on a filter over a 24-hour period and then weighing the filter under controlled conditions. The First Daughter Directive requires up-to-date information on PM₁₀ is made available to the public and others at least on a daily basis (Article 8). This requirement can only be met through use of automatic monitors and not the reference method. For this reason, and because automatic monitors provides useful information on hourly concentrations and are felt to be less labour intensive, most Member States have based their PM monitoring networks largely on automatic monitors (the first year report under the directive showed that 84% of the PM₁₀ monitors were automatic).

A problem arises, however, due to the need for most automatic monitors to heat the sample e.g. to avoid problems due to humidity. This heating of the sample is now recognised to remove volatile components, one of the most important being ammonium nitrate. The loss from the sample is variable depending on the proportion of volatile material in the air being sampled, which can vary from day to day and place to place.

The First Daughter Directive makes provision for the use of automatic monitors, but requires Member States to demonstrate that the results are equivalent to the reference method (Annex IX(IV)). This demonstration of equivalence may rely upon use of a correction factor where a consistent relationship to the reference method can be demonstrated.

Recognising the problem with the use of automatic monitors for PM, the Commission arranged for the preparation of *'Guidance to Member States on PM₁₀ Monitoring and Intercomparisons with the*

Reference Method', January 2002, EC Working Group on Particulate Matter. This guidance reviewed the available information on intercomparisons and established a set of recommendations for intercomparison measurements between automatic candidate instruments and the reference method. Only as long as results from intercomparison measurements were not available, a single default factor of 1.3 could be applied to PM₁₀ data, both daily averages and annual means, from either TEOM or β -attenuation instruments, but there remained an over-riding legal responsibility on Member States to demonstrate equivalence. Since then the Commission has arranged for an expert group to prepare a guidance document on '*Demonstration of Equivalence of Ambient Air Monitoring Methods*', 2004 (unpublished at the time of preparation of this report), but there is no clear procedure or timetable for Member States to submit equivalence reports with reference to this guidance.

J.2 Recommendation

The Working Group wishes to see the issue of equivalence dealt with as a matter of some urgency. Member States should be given procedures and a timetable to demonstrate equivalence to the satisfaction of the Commission. Member States should be required to submit an equivalence report to the Commission, which takes account of the Commission's equivalence guidance.

The Working Group also considers it is appropriate to require Member States to use the CEN reference method for PM_{2.5}, once it is adopted, or an equivalent method using the guidance on equivalence noted above.

These matters can be covered by amendments to Items IV and V in Annex IX to the First Daughter Directive.

J. Provisions for demonstrating equivalence of PM measurements by automatic instruments: proposed amendment of 1999/30/EC Annex IX(IV)	
<i>Existing text</i>	<i>Proposed amended text</i>
<p>IV Reference method for the sampling and measurement of PM₁₀</p> <p>The reference method for the sampling and measurement of PM₁₀ will be that described in EN 12341 'Air Quality – <u>Field Test Procedure to Demonstrate Reference Equivalence of Sampling Methods for the PM₁₀ fraction of particulate matter</u>'. The measurement principle is based on the collection on a filter of the PM₁₀ fraction of ambient particulate matter and the gravimetric mass determination.</p> <p>A Member State may use any other method which it can demonstrate gives results equivalent to the <u>above method or any other method which the Member State concerned can demonstrate displays a consistent relationship to the reference method. In that event the results achieved by that method must be corrected by a relevant factor to produce results equivalent to those that would have been achieved by using the reference method.</u></p>	<p>IV Reference method for the sampling and measurement of PM₁₀</p> <p>The reference method for the sampling and measurement of PM₁₀ will be that described in EN 12341 'Air Quality – <u>Determination for the PM₁₀ fraction of suspended particulate matter – Reference method and field test procedure to demonstrate reference equivalence of measurement methods</u>'. The measurement principle is based on the collection on a filter of the PM₁₀ fraction of ambient particulate matter and the gravimetric mass determination.</p> <p>A Member State may use any other method which it can demonstrate gives results equivalent to the <u>reference method. It should submit a report to the Commission demonstrating the equivalence of the method(s) it is using, within 24 months of the publication by the Commission of suitable guidance. The Commission will make reference to this guidance when assessing the acceptability of the report. Where Member States have been using interim factors to approximate equivalence then</u></p>

<p><u>Each Member State must inform the Commission of the method used to sample and measure PM₁₀. The Commission must as soon as possible carry out intercomparison exercises for PM₁₀ sampling and measurement methods in order to provide information for the review of this Directive in accordance with Article 10.</u></p> <p>V <u>Provisional</u> reference method for the sampling and measurement of PM_{2.5}</p> <p><u>The Commission will produce guidelines, in consultation with the committee referred to in Article 12 of Directive 96/62/EEC, for an appropriate provisional reference method for the sampling and assessment of PM_{2.5} by 19 July 2001.</u></p> <p>A Member State may use any other method which it <u>considers suitable</u>.</p> <p><u>Each Member State must inform the Commission of the method used to sample and measure PM_{2.5}. The Commission must as soon as possible carry out intercomparison exercises for PM_{2.5} sampling and measurement methods in order to provide information for the review of this Directive in accordance with Article 10.</u></p>	<p><u>these will be confirmed and/or amended within the above timescale, and with reference to the Commission's guidance.</u></p> <p><u>Whenever reporting data, the method used to sample and measure PM₁₀, and any correction factor applied, must be included.</u></p> <p>V. <u>Reference and provisional</u> reference method for the sampling and measurement of PM_{2.5}</p> <p><u>The reference method for the sampling and measurement of PM_{2.5} will be based on the collection on a filter of the PM_{2.5} fraction of ambient particulate matter and the gravimetric mass determination. The guidelines published by the committee referred to in Article 12 of Directive 96/62/EEC, for an appropriate provisional reference method will be followed until the CEN standard, which is under preparation, is published.</u></p> <p>A Member State may use any other method which it <u>can demonstrate gives results equivalent to the reference method</u>. It should <u>submit a report to the Commission demonstrating the equivalence of the method(s) it is using, within 24 months of the publication by the Commission of suitable guidance. The Commission will make reference to this guidance when assessing the acceptability of the report. Where Member States have been using interim factors to approximate equivalence then these will be confirmed and/or amended within the above timescale, and with reference to the Commission's guidance.</u></p> <p><u>Whenever reporting data, the method used to sample and measure PM_{2.5}, and any correction factor applied, must be included.</u></p>
---	--

Issue K: Public information and the reference method for PM₁₀

K.1 Considerations

Article 8(1) of the First Daughter Directive requires for public information that information on ambient concentrations of particulate matter shall be updated on at least a daily basis. Annex IX(IV) of the First Daughter Directive gives the reference method for the sampling and measurement of PM₁₀. This method is a manual one and requires several days to obtain the measurement result, which is not in compliance with the requirement of Article 8(1).

The Working Group saw two possibilities for removing this inconsistency: adding requirements for the use of automated instruments or changing the requirement to provide up-to-date information to the public. Both solutions have substantial drawbacks. Making the PM concentrations public with a larger delay is not in accordance with the aim of providing full and timely information to the public. Adding provisions for automatic measurements would, in the view of the Working Group, in practice discourage the use of the reference method.

K.2 Recommendation

On balance, the Working Group felt that although the reference method should not be discouraged, its use should be supplemented by automatic measurements in order to inform the public in due time. It also wishes to point out that data to inform the public are provisional whereas validated information – which is obtained with some delay - is needed to assess compliance to the limit values.

Issue L: Minimum data capture (1999/30/EC, Annex VIII)*L.1 Considerations*

In Annex VIII data quality objectives have been defined for continuous and indicative measurements of SO₂, NO₂, NO_x, PM and lead. In all cases, the minimum data capture is set to 90%. This requirement does not include losses of data due to the regular calibration or the normal maintenance of the instrumentation².

In the response to the informal questionnaire one Member State indicated that the requirement on minimum data capture is "much too stringent and unnecessarily high". The Working Group considered it necessary to analyse the current practice before proposing any amendments.

Based on the information available in AIRBASE the European Topic Centre on Air and Climate Change has analysed the performance of operational SO₂, NO₂ and PM₁₀ monitoring stations in EU15 countries in the period 1999-2001. The following conclusions were reached:

- Performance improves over the period 1999-2001;
- Highest data capture is obtained for SO₂, lowest for PM₁₀;
- About 70% of the PM₁₀ monitoring stations and about 75% of the SO₂ and NO₂ stations have a data capture of more than 90%;
- A data capture of 85% (see note) is observed at 75% (PM₁₀) and 85% (SO₂ and NO₂) of the stations.

L.2 Recommendation

² The numbers on data capture given above relates to the maximum possible number of measurements per year (that is, 8760 hourly values, 365 daily values). The data received under the Exchange of Information Decision does not include information on the reason of missing value (e.g. due to calibration, maintenance or any other reason). In general, a data loss of 5% as maximum for calibration and normal maintenance of the instrumentation is to be expected. Correcting for these losses, the requirement for data capture corresponds to a requirement of 85% when related to a whole year.

Based on this the Working Group concluded that there is no need to revise the requirements on data capture.

Issue M: Random measurements (1999/30/EC, Annex VIII)

M.1 Considerations

If continuous measurements which safeguard at least in principle a complete time coverage of monitoring data are replaced by random measurements (for example sampling every third day), an additional uncertainty of the monitoring result (for example an annual average) will arise, which adds to other parts of the uncertainty budget such as calibration or the use of an equivalence instead of the reference method. Continuous measurements are therefore considered as standard procedures for compliance checking in the First and Second Daughter Directive. However, random measurements offer the following advantages:

- Cost reduction, in particular for laboratory analyses. For example, the number of analyses of lead or benzene can be reduced by factors of 2 or more.
- The use of the (manual) reference methods is facilitated (PM₁₀, benzene), and additional uncertainties due to non-reference methods (e.g. continuous PM₁₀ monitors) can be avoided.

Consequently, annex VIII of the First Daughter Directive and Annex VI of the Second Daughter Directive allow for random measurements also for compliance checking under certain conditions. However, the provisions dealing with random measurements in the two annexes are not identical. Annex VIII of the First Daughter Directive states that random measurements may be applied for PM and lead provided that the additional uncertainty introduced by the incomplete time coverage of random measurements is within 10 % (95 % confidence interval). Annex VI of the Second Daughter Directive states that random measurements may be applied if the uncertainty, including the uncertainty due to random sampling, meets the quality objective of 25 %. Both annexes require that the random sampling must be evenly distributed over the year.

M.2 Recommendation

The Working Group proposes to harmonise the provisions of the two annexes, as they cover identical items. In addition, the wording of Annex VIII of the First Daughter Directive is somewhat ambiguous. It opens room for an interpretation that the overall uncertainty of random measurements may be larger than 25 %, as long as the additional uncertainty for random sampling which adds to other parts of the uncertainty budget is within 10 %. On the other hand, the Working Group feels that the wording of Annex VI of the Second Daughter Directive is appropriate. Since the Second Daughter Directive went into force (13 December 2000), an ISO standard (ISO 11222 'Air quality - Determination of the uncertainty of the time average of air quality measurements') has been published in December 2002, which can be used to estimate the additional uncertainty introduced by random measurements in a simple way. Consequently, the last paragraph of the First Daughter Directive, Annex VIII, should read as follows.

To avoid ambiguity in how the number of exceedances in the entire year is estimated from the number of exceedances observed in random measurements, the Working Group has added a prescription for this calculation in the proposal.

M. Random measurements: proposed amendment for 1999/30/EC, Annex VIII			
<i>Existing text</i>		<i>Proposed amended text</i>	
By way of derogation, Member States may	Member States may	apply	random

<p>apply random measurements instead of continuous measurements for particulate matter and lead if they can demonstrate to the Commission that <u>accuracy within the 95 % confidence interval with respect to continuous monitoring is within 10 %</u>. Random sampling must be spread evenly over the year.</p>	<p>measurements instead of continuous measurements for particulate matter and lead if they can demonstrate to the Commission that <u>the uncertainty, including the uncertainty due to random sampling, meets the quality objective of 25 %</u>. Random sampling must be evenly distributed over the year in order to avoid skewing of results. The uncertainty due to random sampling can be determined by the procedure laid down in ISO 11222 (2002) ‘Air quality - Determination of the uncertainty of the time average of air quality measurements’. If random measurements are used to assess the number N of exceedances of the PM₁₀ daily limit value, the following correction shall be applied: $N_{\text{estimate}} = N_{\text{measurement}} \times [365 \text{ days}] / [\text{number of measured days}]$</p>
	<p><i>Additional proposal for amendment:</i> [The proposal assumes that also the first paragraph of 1999/30/EC Annex VIII and Second Daughter Directive 2000/69/EC Annex VI will be harmonised (e.g. substitute ‘accuracy’ by ‘uncertainty’) as under Issue AQ6.]</p>

2.6 Modelling and other mathematical methods

The air quality directives have introduced the use of models for the assessment of air quality. Models may be used instead of measurements in zones where the levels are below the Lower Assessment Threshold, but also in zones where levels are higher, but then in combination with measurements (‘supplementary assessment’). There are no explicit provisions on the use of models for analysing the causes of air pollution or for calculating prognoses, but in current practice models have a prominent role in this. At the time of preparation of this report, a consultancy study assigned by the Commission was being carried out, aiming to survey and analyse the current practice of computer models in Member States for the implementation of the air quality directives and to develop proposals for improving the provisions on modelling in the directives. In view of this parallel activity the Working Group did not discuss the use of models. However, the Working Group regards this issue as very important and recommends that the Commission consider improving the current provisions in the directives.

2.7 Measures

The Framework Directive specifies measures to be taken to prevent limit values being exceeded in two articles: Article 8(3) on plans and programmes to ensure that the limit value is attained when it has to be met and Article 7(3) on action plans to be taken in the short term where there is a risk of the limit values and/or alert thresholds being exceeded. The Working Group considered it useful to discuss and clarify how these provisions relate. The Working Group also felt that it should consider the usefulness of short-term measures, in view of the ongoing debate on this.

Transboundary pollution is very important for pollutants addressed by the First Daughter Directive. 96/62/EC Article 8(6) gives provisions on consultation between Member States, but such consultation

does not seem to take place in practice, at least not within the framework under Article 8(3). The Working Group felt that consultations between Member States are very useful, but at the same time felt that the current provision in Article 8 is adequate. Hence the Working Group does not propose changes to the directives, but it wishes to emphasise the importance of consultations between neighbour Member States, in addition to the consultations within CAFE and the UNECE Convention on Long Range Transboundary Air Pollution.

Issue N: Short term measures

N.1 Considerations

Article 7 of the Framework Directive sets general requirements on the improvement of ambient air quality. According to Paragraph 1 'Member States shall take the necessary measures to ensure compliance with the limit values', and Paragraph 3 states that:

'Member States shall draw up action plans indicating the measures to be taken in the short term where there is a risk of the limit values and/or alert thresholds being exceeded, in order to reduce that risk and to limit the duration of such an occurrence. Such plans may, depending on the individual case, provide for measures to control and, where necessary, suspend activities, including motor vehicle traffic, which contribute to the limit values being exceeded.'

Article 8 of the Framework Directive is more specific and is applicable to zones where levels are higher than the limit value plus the margin of tolerance. Paragraph 3 requires that:

'In zones and agglomerations [where the levels of one or more pollutants are higher than the limit value plus the margin of tolerance] Member States shall take measures to ensure that a plan or programme is prepared or implemented for attaining the limit value within the specific time limit.'

The Working Group was of the opinion that the provisions in Article 7(3) and 8(3) were unclear. The Working Group considered different options to improve the text and to make it more transparent. These options included the possibility to link Article 7(3) action plans only to alert thresholds; another possibility was to make this linkage to health based hourly and daily limit values as well as alert thresholds, and a third option was to leave the text as it is. There was also general discussion about the usefulness of preparing short term action plans in relation to limit values and alert values, and a more specific question whether the action plans referred to in Article 7(3) should be made available to the public and whether they should also be sent to the Commission.

Some members of the Working Group felt very strongly that any requirements adopted under the Framework Directive could not be omitted or relaxed without a full co-decision procedure. Many were of the opinion, that it was necessary to make the provisions of Article 7(3) and 8(3) of the Framework Directive more transparent and self explanatory. It was however, decided not to propose changing the text. As a minimum, it would be helpful to explain the main differences of these articles and how they should be applied. Some members stated that short term measures were not at all effective, or had been shown to have very little effect on air quality. It was also pointed out that Article 7(3) action plans did not actually restrict themselves to 'short term measures' but probably to a much broader set of 'measures to be taken in the short term where a risk of exceedance exists or is to be expected'. Such measures, although taken in the short term, i.e. at short notice, could include also more permanent arrangements and solutions. Following this interpretation, Article 7(3) could be a basis for appropriate actions to meet also annual limit values after the attainment dates. The Working Group had been informed that a consultancy study assigned by the Commission was investigating the effectiveness of short term measures, and that this study could help to identify appropriate measures to be taken in the short term in various Member States. The results of this study were due mid 2004, so after completion of the Working Group's report.

As a result of the discussions the Working Group concluded that, although it did not recommend

changing the text of the Framework Directive, it would be useful to clarify the two articles by giving the following interpretation:

- Article 8(3) on plans and programmes is applied only until the attainment dates for limit values specified in the daughter directives. After the attainment date, which depends on the pollutant, Article 7(3) of the Framework Directive is applied instead of Article 8(3).
- Also the reporting obligations of Article 11(1.iii and iv) of the Framework Directive related to Article 8(3) plans and programmes expire as from the date when the limit values become binding.
- However, if Member States have prepared and started to implement long-term plans and programmes in accordance with Article 8(3), it is still possible that the concentrations will exceed the limit values after the attainment date, e.g. because the measures had not yet taken their full effect. In such situations, the Working Group felt, that it is advisable to continue keeping the Commission informed about the developments.
- Article 7(3) mixes different time periods and objectives into one single sentence, which makes it ambiguous. Certain obligations of the article apply as from starting date of the national enforcement of the daughter directive and others only after the given attainment dates. The Working Group concluded that action plans indicating the measures to be taken in the short term are needed if there is a risk that:
 - the health based limit values for sulphur dioxide, particulate matter (PM₁₀) or lead are exceeded any time after 1 January 2005 or the health based limit values for nitrogen dioxide are exceeded any time after 1 January 2010 (these provisions apply for hourly, daily and annual limit values),
 - the vegetation protection limit value or the ecosystem protection limit value are exceeded any time after 19 July 2001, or
 - the alert thresholds for sulphur dioxide or nitrogen dioxide are exceeded any time after 19 July 2001.
- The Working Group recognized that also the concept of risk, mentioned in Article 7(3), can be ambiguous. The necessity to draw up action plans if there is a risk of exceeding limit values is difficult to define, and it is not clear how one should estimate that risk. For example, is there a risk when there have been no observed exceedances in several years but the concentrations are relatively close to the limit value? How should the allowed number of exceedances be taken into account? Should one take action in the middle of the year, and at what point in time if an exceedance is foreseen? What should trigger these actions? A very concrete problem is how to draft action plans, indicating measures to be taken in the short term to reduce the risk of exceeding annual limit values; what kind of measures could reduce the risk of exceeding vegetation or ecosystem protection limit values in rural areas? The risk obviously depends also on sources of the pollution and is different for example for tail pipe emissions, natural particles and road sand. As for the risk concept, the Working Group did not arrive at any particular interpretation. The risk has to be evaluated on a case by case basis.
- Finally, the Working Group discussed what will happen, if the Member State fulfils its obligation to draw up Article 7(3) action plans in order to reduce the risk and to limit the duration of exceedances, but still fails to comply with the actual limit values or alert values. It was argued that a serious attempt to prevent exceedance can be considered in a positive way, even if it does not result in full compliance at all locations. Also in such occasions, it is advisable to inform the Commission about the actual situation on a voluntary basis.
- According to 96/62/EC Article 7(3), action plans do not have to be reported to the Commission or made available to the public. The Working Group considered the possibility to add to the Framework Directive an obligation to give information and to report on Article 7(3) action plans, but decided not to propose such an additional reporting requirement.

N.2 Recommendation

The Working Group does not propose amending the text in 96/62/EC Article 7(3) on short-term measures. However, it is proposed to include alert values in the last sentence of Article 7(3).

N. Short term measures: proposed amendment of 96/62/EC Article 7(3)	
<i>Existing text</i>	<i>Proposed amended text</i>
Member States shall draw up action plans indicating the measures to be taken in the short term where there is a risk of the limit values and/or alert thresholds being exceeded, in order to reduce that risk and to limit the duration of such an occurrence. Such plans may, depending on the individual case, provide for measures to control and, where necessary, suspend activities, including motor vehicle traffic, which contribute to the limit values being exceeded.	Member States shall draw up action plans indicating the measures to be taken in the short term where there is a risk of the limit values and/or alert thresholds being exceeded, in order to reduce that risk and to limit the duration of such an occurrence. Such plans may, depending on the individual case, provide for measures to control and, where necessary, suspend activities, including motor vehicle traffic, which contribute to the limit values <u>and/or alert thresholds</u> being exceeded.

2.8 Other issues

Article 11 of the Framework Directive gives detailed provisions on what Member States have to report to the Commission on the air quality. The Working Group has considered bringing the specification and possible revision of technical details under the responsibility of the Committee specified in 96/62/EC Article 12.

The Working Group also discussed the alert values for SO₂ and NO₂. These thresholds are so high that most Member States regard it as highly improbable that they will ever be reached in their territory; consequently they have no practical meaning for them. However, the alert values may still be relevant in some (current or future) Member States and they do not constitute a real burden to the other Member States, and hence the Working Group does not propose a change in this respect.

Issue P: Bringing the specification of reporting details under responsibility of Article 12 Committee

P.1 Considerations

Article 12 of the Framework Directive states that certain technical aspects of the directive shall be adopted by the comitology procedure. Over the last eight years, since the Framework Directive has entered into force, there has been positive experience with the Committee procedure ('Comitology' procedure) on the issues mentioned in Article 12. The advantages are that it is more straightforward, less administrative and consequently also much faster than a co-decision procedure, in which the European Parliament and the Council are involved.

For technical items in the Framework Directive and daughter directives frequent changes in legislation might be needed due to several reasons, e.g. implementation problems, progress in scientific knowledge, new CEN standards, etc. Good examples can also be found in this report, suggesting several revisions in articles and annexes of the First Daughter Directive. The Working Group believes that for several specific technical issues implementation of a more flexible adoption mechanism such as comitology should be favoured.

P.2 Recommendation

The Working Group recommends to the Commission to make a thorough analysis of the provisions in all articles and annexes of the Framework Directive and daughter directives that are of a technical nature. Based on this analysis, the technical parts of directives should be made subject to Comitology procedure, as appropriate.

Examples of technical issues in the Framework Directive and the First Daughter Directive to be proposed for the Committee procedure are:

- details on reporting requirements for the Member States (96/62/EC, Article 11),
- specification of abatement plans and programmes (96/62/EC, Annex IV),
- measuring methods (1999/30/EC, Annex IX).

3 Experience and recommendations for improvement (Part 2)

This chapter has been drafted by AQUILA, the network of air quality reference laboratories in the EU. The recommendations here focus on measuring methods.

A questionnaire was distributed to the AQUILA Group in January 2004. This sought their views on their experiences in the implementation of quality systems, standards, harmonisation programmes etc. The outcomes of these views has been summarised below.

The AQUILA Group, in their role as the Network of European National Reference Laboratories, considers a number of issues as very important to review, and where practical to revise, in the current legislation. One important example relates to Article 3 of the Framework Directive discussing the approval of measuring devices, accuracy (measurement uncertainty) of methods and quality control, which should be explained in more detail. A second important concern relates to the annexes of the First Daughter Directive, in particular Annex VIII covering “accuracy” and its definition, and Annex IX concerning the reference measurement methods and the equivalence statement. These are also discussed further below.

Issue AQ1: Type approval of instruments

AQ1.1 Considerations

The approval of instruments as suitable to the requirements of the EU Data Quality Objectives (DQOs) is one of the requirements of the Framework Directive. It is also a requirement included in the Terms of Reference for the standardization work on ambient air reference methods that CEN is conducting with a remit from the European Commission. Every EN standardized method will therefore include a requirement for the type approval/testing of these methods to determine if they conform to these established DQOs.

A number of Member States are already implementing certification schemes that are compatible with the requirements of the Framework Directive and the (draft) EN standards. This is the case in France, Germany and the United Kingdom. However, in the absence of published EN standards, most of the Member States have not yet fully begun the type approval of instruments. Also, in the absence of a mutually-recognised European certification procedure, a number of other Member States rely on type approval/certification performed in other countries (e.g. US-EPA, France INERIS, Germany TÜV), which are available.

AQ1.2 Recommendation

The AQUILA Group supports the concept of developing a European certification scheme, based on the mutual agreement of type approvals carried out by authorized bodies in the EU Member states. It should be noted that CEN TC 264 Working Group 22 entitled “Certification of Automated Methods” is currently drafting standards on this. This should be endorsed as far as practical.

Issue AQ2: Implementation of air quality systems

AQ2.1 Considerations

Article 3 of the Framework Directive specifies a requirement to carry out quality control in accordance with the requirements of European quality assurance standards. As a consequence of this article, formal accreditation (previously to EN 45001, currently to EN/ISO 17025) of laboratories has been

promoted. The majority of the National Reference Laboratories are now accredited at least for SO₂ and NO_x, with fewer for PM₁₀, and up until now rarely for lead. However, the scope of accreditation varies greatly: For example, it may cover accreditation of 'testing' measurements in the laboratory or in the field sites, or calibrations in the laboratory or at the field sites. The accreditation may refer to monitoring of ambient air, to the certification of gas mixtures, or to the evaluation of the performance of monitors. In the context of the monitoring networks, network QA/QC laboratories are accredited for field monitoring in some countries (up to 20 % of network QA/QC laboratories for a few countries - where these are not done by the NRLs themselves). For others, only the regional or national reference laboratories are accredited, and the network laboratories are expected to document their QA/QC procedures, or more rarely to apply for a formal ISO 9001 certification.

AQ2.2 Recommendation

The directive should give specific details of what is expected from the National Reference Laboratories and the Monitoring Networks concerning their quality systems. Whether accreditation according to EN/ISO 17025, or certification of conformity to the ISO 9001 is required, or whether documented procedures for the quality control/quality assurance are sufficient - at each level. The AQUILA Group recommends that the National Reference Laboratories (at least) should be accredited to EN/ISO 17025, and that this accreditation should include PM₁₀ measurements. The accreditation for the QA/QC of the monitoring networks themselves is also recommended, but with limited resources this is more difficult to implement. However, all monitoring networks should be required to design and implement a quality system describing their procedures for quality assurance and quality control of their calibration and testing activities at field sites. This quality system should be at least consistent with the (less technically rigorous) ISO 9001 standard, and the technical and QA/QC requirements in the upcoming EN standards. It is recommended in addition, that non-accredited laboratories should control the education/training/qualification process of their technical staff, participate to field inter-comparisons where sampling effects are also evaluated, and also be subjected to field audits in order to demonstrate the technical validity and the traceability of their activities. It is recommended that these audits are conducted by the relevant National Reference Laboratories. The scopes of accreditation should be consistent with the DQOs and hence ensure the required measurement uncertainty and comparability (using equivalent or reference methods of measurement) for all the ambient air quality measurements required by the First Daughter Directive.

See also the proposed amendment of 96/62/EC Article 3 below.

Issue AQ3: Quality control in monitoring networks

AQ3.1 Considerations

Quality Control (QC) in monitoring networks is carried out in form of span and zero checks, calibrations and maintenance procedures on the continuous system, as well as checks on the whole sampling system - in order to avoid e.g. losses in the sampling line.

The auditing and calibration at monitoring network sites is mainly carried out by the QA/QC operators of their local network. In some Member States quality manuals are followed to enable the same tasks to be performed in different local networks. Only in a few countries is the QA/QC carried out directly by the National Reference Laboratory for all measurement sites. Some of the networks perform daily automatic zero/span checks.

Calibrations are carried out either by the National Reference Laboratory, a network operator, an external company, or a combination of these. These use calibration mixtures of gases that are generated with different techniques such as permeation, dynamic dilution, low concentration gas cylinders, and ozone generators. In the case of PM some laboratories carry out regular flow checks.

Calibration of the mass determination is carried out either by foils (Beta-gauge instruments), or the calibration factor is verified gravimetrically (TEOM). The calibration is usually performed regularly at fixed time intervals, which can vary from 1-2 weeks to six months.

AQ3.2 Recommendation

In order to improve QC in monitoring networks, the AQUILA Group propose that Member States should begin immediately to work towards implementation of all the QA/QC requirements of the draft EN standards. In addition, attention should be drawn to quality control of the measurement site itself (air conditioning, cleaning of sample inlets etc), which is usually included in the new EN standards.

See also the proposed amendment of 96/62/EC Article 3 below.

Issue AQ4: Traceability

AQ4.1 Considerations

The traceability chain, as a part of overall quality assurance requirements, should begin with national standards held by a National Metrological Institute, or from another nationally-designated laboratory, and end at the on-site ambient air measurements.

For SO₂ and NO_x, the majority of National Reference Laboratories (NRLs) have developed traceability chains to national/international standards. Often, the NRLs implement several independent methods of preparing calibration gases, in order to strengthen the confidence of the traceability of their measurements (use of Certified Reference Materials (CRMs), participation in round-robins and inter-comparisons, use of primary calibration methods, accreditation as a calibration laboratory etc. are all applied by different laboratories). Moreover, they all participate in the same JRC inter-comparisons where the results of their measurements can be related to national/international standards. The traceability of on-site ambient air measurements is also in general well established for SO₂ and NO_x field and laboratory inter-comparisons, round-robin tests, traceable working standards and field audits are among the methods used for demonstrating the traceability.

For PM₁₀, full traceability can only be demonstrated through comparisons with the by-definition reference method. A number of Member States have had many technical discussions on the implementation of valid correction factors for continuous PM measurements and for demonstrations of equivalence, and some have organised field inter-comparisons. Others have implemented only flow measurement traceability.

AQ4.2 Recommendation

For SO₂ and NO_x, it is recommended that the traceability chains down to the monitoring networks are completed where these are not yet in place. For PM₁₀, inter-comparisons should be promoted, including those with the reference methods, which should involve the NRLs and also the monitoring network sites. Accreditation of the NRLs for PM₁₀ testing with the reference method is also recommended. The traceability chain for Pb, As, Cd and Ni needs to be defined and established in the majority of Member States. To support this, European CRMs should be developed and used to audit the performance of all the institutes involved.

See also the proposed amendment of 96/62/EC Article 3 below.

Issue AQ5: Intercomparison exercises*AQ5.1 Considerations*

There are two main types of intercomparison exercises: the so called 'round-robin' exercises, where gas cylinders are circulated between laboratories, and intercomparisons, where a gas mixture is generated on the spot and distributed to several laboratories at the same time.

Round-robin exercises have been carried out in the past e.g. in the framework of FP5 projects such as HAMAQ. A disadvantage is the lack of stability of certain gas mixtures, which influences the reference value of such a mixture. Research activities, however, being undertaken within the aegis of EUROMET and CCQM (BIPM), aim to minimise these effects on the validity of their intercomparisons.

Intercomparison exercises carried out using on-line generation of gas mixtures are carried out in Germany on a regular basis for the 16 monitoring networks. The WHO is also organizing intercomparisons for (mainly) Eastern European public health institutes. The EC Joint Research Centre is organizing, on a regular basis, intercomparisons for the National Reference Laboratories of Member States and the Accession Countries. The exercises have been carried out intermittently since 1994 for the measurement of ozone or nitrogen dioxide, and since 1999 for several inorganic pollutants simultaneously. On average it should be possible for each laboratory to participate once every two years. Although in this case the effort for the NRL arising from travelling etc is large, as the laboratories have to bring their own measuring and transfer calibration equipment, most of the participants wish for more frequent participation. Accredited laboratories require such participation as a proficiency test, and laboratories without a sophisticated implemented quality system use the exercise to compare their standards internationally. In general, these comparisons are recognised and accepted as an important tool for the harmonization of measurements, and for the exchange of technical information. Comparisons of performance over past years have shown major improvements in terms of the reproducibility between the participating laboratories - particularly for the compounds ozone and nitrogen dioxide.

AQ5.2 Recommendation

The following recommendations came out of the evaluation of a questionnaire answered by AQUILA members:

- Involve field networks in comparisons, where practical;
- Extend intercomparisons to organic pollutants and PM (including speciated metals and PAHs)
- Agree a defined protocol for evaluation of the results with unambiguous acceptance/rejection criteria.

More technical discussions are also required on the reasons for failure to meet the DQOs, and recommendations for improvements should be provided (through the aegis of AQUILA or another body).

See also the proposed amendment of 96/62/EC Article 3 below.

Issues AQ2-5. Proposed amendment of 96/62/EC Article 3	
<i>Existing text</i>	<i>Proposed amended text</i>
For the implementation of this Directive, the Member States shall designate at the appropriate levels the competent authorities and bodies responsible for:	For the implementation of this Directive, the Member States shall designate at the appropriate levels the competent authorities and bodies responsible for:
- implementation of this Directive,	- implementation of this Directive,

<ul style="list-style-type: none"> - assessment of ambient air quality, - approval of the measuring devices (methods, equipment, <u>networks, laboratories</u>), - <u>ensuring accuracy of measurement by measuring devices and checking the maintenance of such accuracy by those devices, in particular by internal quality controls carried out in accordance, inter alia, with the requirements of European quality assurance standards,</u> - analysis of assessment methods, - coordination on their territory of Community-wide quality assurance programmes organized by the Commission. <p>[...]</p>	<ul style="list-style-type: none"> - assessment of ambient air quality, - approval of the measuring devices (methods, equipment, <u>equivalence</u>), - <u>serving as National Reference Laboratories,</u> - <u>auditing of the quality of air quality data,</u> - analysis of assessment methods, - coordination on their territory of Community-wide quality assurance programmes organized by the Commission. <p>[...]</p> <p><u>National Reference Laboratories shall comply with the requisite European quality assurance standard (EN/ISO 17025) and participate in EU quality assurance programmes.</u></p>
--	--

Issue AQ6: Uncertainty

AQ6.1 Considerations

The definitions in the First, Second and Third Daughter Directives are not coherent and should be updated and unified.

AQ6.2 Recommendation

AQUILA recommends replacing the word ‘accuracy’ by ‘uncertainty’ throughout the First Daughter Directive and revisit the use of it in Annex VIII.

AQ6. Uncertainty: proposed amendment throughout 1999/30/EC	
<i>Existing text</i>	<i>Proposed amended text</i>
Accuracy	Uncertainty

Issue AQ7: Reference measurement methods and equivalent methods

AQ7.1 Considerations

In some cases, because of practical and/or economical reasons, the reference method given by the directives is not the common method operating in routine monitoring networks. In these cases, to guarantee the Data Quality Objectives (DQOs) in the network, the equivalence with respect to the reference method needs to be demonstrated for all the relevant influence parameters including, for example, the corresponding time periods and ambient conditions of the sampling location.

It is noted that this is the case of the measurement of particulate matter at network stations, where continuous methods such as TEOM, β -gauge, or optical monitors are frequently implemented. Additionally, for gaseous pollutants such as NO₂ or benzene, diffusive sampling techniques are extensively used at indicative levels and may be candidates for equivalence.

AQ7.2 Recommendation

Regarding reference methods:

The published CEN PM10 standard (EN 12341) should be revised, harmonised with the draft PM_{2.5} standard, and brought into line with findings of modern research. The EC Equivalence Procedure should also be implemented at a EU level, and if this is achieved the development of other CEN standards (for example, for candidate methods for continuous and automated PM sampling and for indicative techniques such as diffusive sampling) may be limited mainly to performance requirements and to specifications for their calibration and analysis.

Regarding equivalence:

A guidance protocol has been prepared, providing a harmonized methodology for the demonstration of equivalence. The document has the following characteristics:

- The protocol is compatible with the DQOs of the directives.
- The protocol is consistent with the type-approval/validation procedures specified in the different EN standards.
- The extent of the testing procedure required is proportional to the level of variations between the candidate and reference methods.
- The protocol utilises both laboratory and field validation experiments.
- All the experimental test results should be supported by rigorous quality assurance and quality control using traceability to national/internationally accepted standards.
- A statistical procedure for the evaluation of the candidate method is included in the protocol, and the rigorous valuation of the uncertainty budget of the candidate method is also required (in a manner that is compatible with GUM).
- The range of applicability over which the method is to be considered equivalent should be clearly defined.

The establishment of a European structure for the approval of equivalence is also specified in the protocol, and this should be implemented. It is recommended to the Commission to publish guidance to Member States on this important issue.³

See the proposed amendments for 1999/30/EC Annexes VIII and IX below.

Issue AQ8: Standardisation of measurement methods

AQ8.1 Considerations

The CEN Standards for most of the pollutants covered by the First Daughter Directive are not yet published. For these, the ISO standards specified in the directive are being used in the meantime. However, excellent progress has been made in the drafting of new CEN standards for SO₂, NO_x, Pb and PM_{2.5}. These are major improvements on the previous ISO standards, and EC funding has been vital to their successful development and validation. When they are fully implemented they should enable the First Daughter Directive data quality objectives to be achieved in a much more harmonised manner across Europe.

³ The Working Group on Implementation has not reviewed the guidance protocol, but agrees with AQUILA that the Commission should publish guidance on this important issue.

AQ8.2 Recommendation

It is proposed to take the above new developments into account by amending Annex VIII of the First Daughter Directive. See the proposed amendment below.

Issues AQ7-8: proposed amendment of 1999/30/EC Annex VIII	
<i>Existing text</i>	<i>Proposed amended text</i>
<p>The <u>accuracy</u> of the measurement is defined as laid down 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 considered, by the limit value, <u>for a 95 % confidence interval (bias + two times the standard deviation)</u>. The <u>accuracy</u> for continuous measurements should be interpreted as being applicable in the region of the appropriate limit value.</p>	<p>The <u>uncertainty</u> of the measurement is defined as laid down in the 'Guide to the Expression of Uncertainty of Measurements' (GUM, ENV 13005:1999).</p> <p>The percentages in the table are given for individual measurements averaged, over the period considered, by the limit value, <u>expressed at a level of confidence of 95 % (expanded uncertainty)</u>. The <u>uncertainty</u> for continuous measurements should be interpreted as being applicable in the region of the appropriate limit value.</p>
	<p><i>Additional proposal for amendment:</i> In the table of Annex VIII: replace the term '<u>accuracy</u>' in relation to measurement by '<u>measurement uncertainty</u>'</p>

Issues AQ6-9: proposed amendment of 1999/30/EC Annex IX	
<i>Existing text</i>	<i>Proposed amended text</i>
<p>REFERENCE METHODS FOR ASSESSMENT OF CONCENTRATIONS OF SULPHUR DIOXIDE, NITROGEN DIOXIDE AND OXIDES OF NITROGEN, PARTICULATE MATTER (<u>PM₁₀</u> AND <u>PM_{2.5}</u>) AND LEAD</p> <p>I. Reference method for the analysis of sulphur dioxide: <u>ISO/FDIS 10498 (Standard in draft) Ambient air – determination of sulphur dioxide – ultraviolet fluorescence method.</u></p> <p>A Member State may use any other method which it can demonstrate gives results equivalent to the above method.</p> <p>II. Reference method for the analysis of nitrogen dioxide and oxides of nitrogen: <u>ISO 7996: 1985 Ambient air – determination of the mass concentrations of nitrogen oxides – chemiluminescence method.</u></p>	<p>REFERENCE METHODS FOR ASSESSMENT OF CONCENTRATIONS OF SULPHUR DIOXIDE, NITROGEN DIOXIDE AND OXIDES OF NITROGEN, PARTICULATE MATTER (<u>PM_{2.5}</u> AND <u>PM₁₀</u>) AND LEAD</p> <p>I. Reference method for the analysis of sulphur dioxide: <u>The reference method for the measurement of SO₂ will be that described in prEN 14212 'Ambient air quality – Standard method for the measurement of the concentration of sulphur dioxide by ultraviolet fluorescence'.</u></p> <p>A Member State may use any other method which it can demonstrate gives results equivalent to the above method.</p> <p>II. Reference method for the analysis of nitrogen dioxide and oxides of nitrogen: <u>The reference method for the measurement of NO₂ and NO will be that described in prEN 14211 'Ambient air quality – Standard method</u></p>

<p>A Member State may use any other method which it can demonstrate gives results equivalent to the above method.</p> <p>III.A Reference method for the sampling of lead: <u>The reference method for the sampling of lead will be that described in the Annex to Directive 82/884/EEC until such time as the limit value in Annex IV to this Directive is to be met, when the reference method will be that for PM₁₀ as laid down in Section IV of this Annex.</u></p> <p>A Member State may use any other method which it can demonstrate gives results equivalent to the above method.</p> <p>III.B Reference method for the analysis of lead <u>ISO 9855: 1993 Ambient air – Determination of the particulate lead content of aerosols collected in filters. Atomic absorption spectroscopy method.</u></p> <p>A Member State may use any other method which it can demonstrate gives results equivalent to the above method.</p> <p>IV. Reference method for the sampling and measurement of PM₁₀ <u>The reference method for the sampling and measurement of PM₁₀ will be that described in EN 12341 'Air Quality – Field Test Procedure to Demonstrate Reference Equivalence of Sampling Methods for the PM₁₀ fraction of particulate matter'. The measurement principle is based on the collection on a filter of the PM₁₀ fraction of ambient particulate matter and the gravimetric mass determination.</u></p> <p>A Member State may use any other method which it can demonstrate gives results equivalent to the above method <u>or any other method which the Member State concerned can demonstrate displays a consistent relationship to the reference method. In that event the results achieved by that method must be corrected by a relevant factor to produce results equivalent to those that would have been achieved by using</u></p>	<p><u>for the measurement of the concentration of nitrogen dioxide and nitrogen monoxide by chemiluminescence'.</u></p> <p>A Member State may use any other method which it can demonstrate gives results equivalent to the above method.</p> <p>III.A Reference method for the sampling of lead <u>The reference method for the sampling of lead will be that described in EN 12341 'Air Quality – Determination for the PM₁₀ fraction of suspended particulate matter – Reference method and field test procedure to demonstrate reference equivalence of measurement methods'.</u></p> <p>A Member State may use any other method which it can demonstrate gives results equivalent to the above method.</p> <p>III.B Reference method for the analysis of lead <u>The reference method for the analysis of lead will be that described in draft prEN 14902 'Ambient air quality – Standard method for the measurement of Pb/Cd/As/Ni in ambient air'.</u></p> <p>A Member State may use any other method which it can demonstrate gives results equivalent to the above method.</p> <p>IV. Reference method for the sampling and measurement of PM₁₀ <u>The reference method for the sampling and measurement of PM₁₀ is described in EN 12341 'Air Quality – Determination for the PM₁₀ fraction of suspended particulate matter – Reference method and field test procedure to demonstrate reference equivalence of measurement methods'. The measurement principle is based on the collection on a filter of the PM₁₀ fraction of ambient particulate matter and the gravimetric mass determination.</u></p> <p>A Member State may use any other method which it can demonstrate gives results equivalent to the above method. <u>[See the alternative proposal under Issue J in Chapter 2 by the Working Group on Implementation on demonstrating equivalence]</u></p>
--	---

<p><u>the reference method.</u> <u>Each Member State must inform the Commission of the method used to sample and measure PM₁₀. The Commission must as soon as possible carry out intercomparison exercises for PM₁₀ sampling and measurement methods in order to provide information for the review of this Directive in accordance with Article 10.</u></p> <p>V. <u>Provisional reference method for the sampling and measurement of PM_{2.5}</u> <u>The Commission will produce guidelines, in consultation with the committee referred to in Article 12 of Directive 96/62/EEC, for an appropriate provisional reference method for the sampling and assessment of PM_{2.5} by 19 July 2001</u></p> <p>A Member State may use any other method which it considers suitable. <u>Each Member State must inform the Commission of the method used to sample and measure PM_{2.5}. The Commission must as soon as possible carry out intercomparison exercises for PM_{2.5} sampling and measurement methods in order to provide information for the review of this Directive in accordance with Article 10.</u></p>	<p>V. Reference method for the sampling and measurement of PM_{2.5} <u>The reference method for the sampling and measurement of PM_{2.5} is described in draft prEN 14907 'Ambient air – Reference gravimetric measurement method for the determination of the PM_{2.5} mass fraction of suspended particulate matter'. The measurement principle is based on the collection on a filter of the PM_{2.5} fraction of ambient particulate matter and the gravimetric mass determination.</u></p> <p>A Member State may use any other method which it can demonstrate gives results equivalent to the above method. <i>[See the alternative proposal under Issue J in Chapter 2 by the Working Group on Implementation on demonstrating equivalence.]</i></p>
--	--

4. Conclusion

Based on the experiences in implementing the First Daughter Directive, the Working Group proposes several amendments to the Commission (see Table 1). It should be noted that apart from the proposals listed in the table, Chapters 2 and 3 contain several other recommendations.

Table 1 Summary of the Working Group's proposals for amendment of the First Daughter Directive 1999/30/EC and the Framework Directive 96/62/EC

Nr	Issue	Article(s) of amendment proposals
A	Impact of zone concept on assessment strategy	None
B	Specification of where health limit values apply	None ¹⁾
C	LVs for ecosystems and vegetation	None ¹⁾
D1	Attainability of Stage 1 limit values for PM ₁₀	None ¹⁾
D2	Attainability of Stage 2 indicative limit values for PM ₁₀	None ¹⁾
D3	Attainability of the annual limit value for NO ₂	1999/30/EC Art. 3
E	Derogation for natural contributions	None ¹⁾
F	Density of rural background stations	Annex VII(II)
G	Proportion of station types	1999/30/EC Annex VII(Ia)
H	Location of traffic stations	1999/30/EC Annex VI(II)
I	Measurements of PM _{2.5}	1999/30/EC Art. 5(2)
J	Equivalence of PM ₁₀ measurements by automatic methods	1999/30/EC Annex IX(IV)
K	Public information and the reference method for PM ₁₀	None
L	Minimum data capture	None
M	Random measurements	1999/30/EC Annex VIII
	Modelling	N.a.
N	Short term measures	96/62/EC Article 7(3)
O	Long range transport	Dropped
P	The competence of the 'Article 12 Committee'	96/62/EC Article 11 and Annex IV; 1999/30/EC Annex IX, possibly more
AQ1	Type approval of instruments	None
AQ2	Implementation of air quality systems	96/62/EC Article 3
AQ3	Quality control in monitoring networks	
AQ4	Traceability	
AQ5	Intercomparison exercises	
AQ6	Uncertainty	2)
AQ7	Reference measurement methods and equivalent methods	1999/30/EC Annexes VIII and IX
AQ8	Standardisation of measurement methods	

¹⁾ The Working Group does not propose an amendment, but recommends to the Commission to further consider this issue.

²⁾ A change of terminology throughout the First Daughter Directive is proposed.

5. References

EEA, 1998. Guidance report on preliminary assessment under EC air quality.
<http://reports.eea.eu.int/TEC11a/en/tech11.pdf>

European Commission, 2001. Guidance on assessment under the EU air quality directives (Final Draft). <http://www.europa.eu.int/comm/environment/air/pdf/guidanceunderairquality.pdf>

European Commission, 2002a. Guidance to member states on PM₁₀ monitoring and intercomparisons with the reference method. <http://www.europa.eu.int/comm/environment/air/pdf/finalwgreporten.pdf>

European Commission, 2002b. Guideline referring to Commission Decision 2001/839/EC.
http://www.europa.eu.int/comm/environment/air/pdf/guideline_on_questionnaire.pdf

Annex Members of the Working Group on Implementation

Chairman

Hans Herremans Netherlands

Members

Annette Borowiak	Joint Research Centre and AQUILA
Manuel Bravo	Europia
Joelle Colosio	France
Francisco Ferreira	Portugal
Jutta Geiger	Germany
Michael Harryman	United Kingdom
Dick van den Hout	TNO
Stefan Jacobi	European Commission DG Environment
Tarja Lahtinen	Finland
Duncan Laxen	European Environment Bureau
Frank de Leeuw	European Topic Centre Air and Climate Change
Melanija Lesnjak	Slovenia
Fernando Martin	Spain
Daniel Rasse	Belgium
Erland Rosten	Norway
Lubomir Ziak	Slovakia