



# City *annual* air quality reports

A proposal for a reporting format





## Component 2

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# Foreword

This document will come up with a proposal for a common reporting format. The format can simply be used as an example but it will also be available as a semi-automatic report generator. A city can annually type its data into a set of tables. The report generator produces graphs, attaches basic explanatory texts in English in the appropriate places, and generates a report including tables, graphs and text that can be exported in a number of formats for web or paper publishing. The English texts serve as an example and can be translated into national languages, with or without amendments. The beauty of the automated report generator is that the software attaches the texts to the pre-structured tables, hence while entering the majority of the data only once, an English and a local language report is produced. In addition a plain text data output (CSV) can be produced so that the data can be read by other software.

The point of departure of the common report are the data that have to be reported annually to the EU, the spreadsheet remembers up to 10 years of data entered into it to provide automatic trend graphs. These data should be available each city that falls under the reporting obligations of the EU framework. EU reporting is generally done by national authorities so cities either have the data as they are required to deliver the input for the national report or the data are available at the national level for each city. To complement the basic obligatory data, additional tables are being proposed, that help better understand the air quality and air pollution problems. These additional tables can be added to the automatic common report by selecting the appropriate options.

The annual reports that have to be made in the EU framework on air quality are not the primary focus of this document. The reporting to the EU is often done by national authorities and not by cities themselves. However, the reports and plans made at a city level are heavily influenced by the formal EU reporting obligations so the two are intimately linked. However, the point of departure for this document is the city perspective: what are their needs, concerns, etc.

The guidebook and CITEAIR template are products of the CITEAIR project (see annex 1).

The Guidebook:

- Chapter 1 The introduction to the guidebook provides a brief overview of air quality legislation and explains what the aim of this guidebook is
- Chapter 2 EU reporting Framework gives an overview of current and future air quality legislation that cities have to comply with and what give a short impression of what tools are now available for the reporting to the EU
- Chapter 3 Common air quality reporting gives an impression of what information cities report and what the difficulties encountered are and how part of the difficulties can be overcome.
- Chapter 4 Common template for reporting air quality in cities gives an overview of information that is important for reporting according to CITEAIR presents the Common template for reporting and how this template can be used.

The annexes will eventually be available on a website. Publishing the documents in electronic format ensures that additional contributions may be added during 2007.

## Acknowledgements

Thanks are due to a lot of people who have contributed bits and pieces especially for the template, or assisted with the editing. The review of a draft by Martin Lutz from the City of Berlin was greatly appreciated.

# 1 Introduction

Air Quality is one of the areas in which Europe has been most active in recent years. A series of Directives has been introduced to control levels of certain pollutants and to monitor their concentrations in the air. In 1996, the Environment Council adopted Framework Directive 96/62/EC on ambient air quality assessment and management. The aim of this Directive 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 framework directive was followed by daughter directives, which set the numerical values or in the case of ozone, target values for each of the identified pollutants. Limit values are fixed values of the permissible level of air pollution, which must not be exceeded by more than the margins of tolerance expressed as the fraction of the limit value in percent, by which this limit may be exceeded in a period laid down by the Act and its regulations for implementation. Target values are fixed levels with the aim of avoiding more long-term harmful effects on human health and/or the environment as a whole, to be attained wherever possible over a given period set by the Directive. An alert value is a level beyond which there is a risk to human health from brief exposure and at which immediate steps must be taken by the member states as laid down in this Directive. Besides setting air quality limits and alert thresholds, the objectives of the daughter directives are to harmonise monitoring strategies, measuring methods, calibration and quality assessment methods to ensure consistent assessment of the air quality and compliance check throughout the EU and to provide for good public information.

## **Box 1: Reporting, informing & communicating**

*Reporting, informing and communicating are important elements of the directives. All three terms deal with the production and dissemination of information. To avoid confusing the way the three concepts are used in this document the meaning as used in this document is described below.*

*Reporting: Submitting a formal set of data and information to authorities (regional, national or European). Specifications and/or requirements on content (and lay-out) as well as the destination (target group) and the timing of the report are defined.*

*Informing: Making information and or data available to whoever is interested in them. Informing can be done in both passive (something is available on request) and active ways (copies are available in libraries, at the reception of an organization, on the internet). Informing tend to be a one way process. The value and credibility of information is based on its accuracy and its objectivity, related to the legitimacy and neutrality of the emitter.*

*Communicating: Information is actively used to inform people with the ambition to engage in a dialogue and/or to influence their knowledge, attitudes and even behavior.*

*A report can be used while informing the public. However, the well-defined content and target group might make it not very accessible to a wider public. Likewise actively informing the public can be part of a communication campaign but without additional efforts assuring a two-way flow of information true communication is not established.*

Despite the directives cities and countries approach their obligations in different ways making comparisons from one city to the other difficult. The official questionnaires are generally duly filled and for comparison purposes a European database with reported concentrations exists.<sup>1</sup> Though this serves the scientific and the policy communities, it is not necessarily helpful to cities that have to make action plans, want to compare their situation to other cities and have to inform their citizens. Under the EU directives annual **reporting** air quality is a formal fairly well defined national obligation. If limit values are not met a plan has to be made and **progress** on the impact of the plan has to be **reported**. Contrary to the air quality report this report is less well defined. In addition, the directives spell out that **information** has to be accessible to the public. The directives require that is done in a timely and accessible manner, without being specific. As part of the plans to improve air quality, **communication** is often mentioned as a measure to create awareness and change people's attitudes towards polluting activities such as driving cars. Communication is dealt with in a separate CITEAIR<sup>2</sup> product (the communication guidebook) and won't be discussed here.

Though the reporting is a national obligation, the task to collect and compile information for cities and regions is often passed-on to regional or local authorities. Also the task to make plans to improve air quality is often a local obligation. Informing the public about the status of air quality and the progress of the air quality management and improvement plans is almost always a local task. Faced with the fact that the national reporting obligations are fairly well defined but the local task is generally much wider (provide input into national reporting, making an action plan, informing the public) we see all kind of documents ("reports") being produced at the local level. These documents serve as the basis for the formal EU report but often contain more information and are presented in multiple hard to compare ways. In conclusion: for the reports cities tend to make, the Directives lack clear advice and leave too much space for interpretation.

When this document on air quality reporting uses the word "report" we refer to the reports generally made by the cities. These reports are heavily influenced by the formal EU reports but they tend to be broader in the sense that they have to be used to make the action plans and are being used to inform the public about the local air quality situation. We believe that there are gains to be made if this local "report" can be standardized to a large extent. It will make reporting easier for a city and it will make city reports more comparable. This facilitates the exchange of experience from one city to the other.

The aim of this document is to review what is currently being required by cities in terms of reporting air quality data and to recommend a CITEAIR common reporting format. The format will obviously contain all data that have to be reported under the EU obligations (this is data that are already generated by the cities or data cities can obtain from "agencies" that report to the EU on the annual air quality in their zone or agglomeration) but will also suggest additional sections that will facilitate the use of the report for city to city comparison and help in making action plans. The ultimate goal is to develop an automated form where the relevant pollutant concentrations can be inserted and a complete report is generated. Cities and new Member states that are only just starting on reporting air quality and drawing up action plans will save themselves a lot of time by using the format, so they do not have to spend a lot of time reinventing the wheel. Not all cities have the same size, same magnitude of air pollution and the same resources to analyse and describe their air quality. The common reporting format will include three sections, one that can be filled (and contains the same data that has to be submitted for annual air quality reporting under the EU directives) and two complementary ones for those cities who can and want to do something additional. The complementary sections deal with additional air quality information but also with information that can be used for actions plans and plans and programmes. In chapter 3.1 the reporting on air quality data is described. Chapter 3.3 reviews the plans and reports on plans cities have been making the past years. As will be shown, the reports differ considerably and are hard to compare. Furthermore, reports are in a multitude of European languages, making it very hard for one city to compare itself to another, get ideas and inspiration, etc.

The European Commission has presented a proposal for a revised version of the Air Quality Directives (henceforth referred to as the CAFE-Directive). This Directive aims to merge the Framework Directive and the three daughter Directives and one council decision into one single Directive. This Directive

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<sup>1</sup> <http://air-climate.eionet.eu.int/databases/airbase>

<sup>2</sup> See annex 1 for more comprehensive information on CITEAIR.

should also include air quality standards for particulate matter with an aerodynamic diameter smaller than 2.5  $\mu\text{m}$ . ( $\text{PM}_{2.5}$ ). This Directive also provides means to grant an extension of the attainment period of the limit values for zones and agglomerations with severe compliance problems. A zone or agglomeration must provide sufficient evidence to the Commission that all proportionate effects have been made to improve air quality and on the reasons for the remaining non-compliance. Enhanced reporting is required to allow the Commission – and NGO's and the interested public to judge the legitimacy of the claim. To know what measures are proportionate and what the reasons are for the remaining non-compliance a zone or agglomeration must have a good understanding of the local air quality now and in the future.

## 2 EU Reporting framework

### 2.1 European Policies

A series of Directives has been introduced to control levels of certain pollutants and to monitor their concentrations in the air. The starting point is *Directive 96/62EC*<sup>3</sup>. The Directive establishes the framework for assessment and management of ambient air quality and provides that detailed arrangements are to be laid down for the reporting of information on air quality.

Good air quality assessment is the key to implementation of the framework directive and daughter legislation. Under the Council Directive on air quality Assessment and management, Member States are required to assess air quality throughout their territory. In Article 5 it is stated that Member States which do not have representative measurements of the levels of pollutants for all zones and agglomeration shall undertake series of representative measurements, surveys or assessments in order to have the data available in time for implementation of the Daughter Directives.

Member States must report on air quality to the Commission. Article 6 of the directive requires member states to: divide their territory into zones-whereby an agglomeration is defined as a city with more than 250.000 inhabitants or a high population density based on the results of the preliminary assessment according to article 5. Member States must perform ongoing assessment requirements related to the levels of pollution within zones. Article 11 requires Member States to report to the commission.

The commission has developed a common format for reporting the results of annual air quality assessment,

Member states annually fill in a questionnaire and send the data in an electronic file provided by the commission. The types of information to be reported to the commission are:

- Monitoring data
- Spatial concentration distribution
- Causes of pollution
- Documentation of assessment methods

Another principle is to approve ambient air quality where it is good and improve it in other cases. In order to improve air quality, Member States must draw up plans and programmes (PPs) indicating the measures to be taken in order to meet the limit values within the specified attainment period. The PPs, which must be made available to the public, must contain at least the following information:

- The location where the pollution is excessive;
- The nature, and an assessment, of the pollution;
- The origin of the pollution;
- Measures to improve air quality

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<sup>3</sup> Council Directive 96/62/EC:

<http://64.233.183.104/search?q=cache:8ky44fLX95IJ:heaven.rec.org/Links/DIRair.doc+Council+Directive+96/62/EC&hl=nl&gl=nl&ct=clnk&cd=1> or [http://www.alpnep.org/Council Directive 96-62-EC ambient air quality.pdf](http://www.alpnep.org/Council%20Directive%2096-62-EC%20ambient%20air%20quality.pdf)

The full text of the directive can be found at [http://www.alpnap.org/Council\\_Directive\\_96-62-EC\\_ambient\\_air\\_quality.pdf](http://www.alpnap.org/Council_Directive_96-62-EC_ambient_air_quality.pdf). The two parts relating to reporting and the reporting objectives are presented here.

#### **Article 1**

##### Objectives

The general aim of this Directive 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.

#### **ANNEX IV**

##### **INFORMATION TO BE INCLUDED IN THE LOCAL, REGIONAL OR NATIONAL PROGRAMMES FOR IMPROVEMENT IN THE AMBIENT AIR QUALITY**

Information to be provided under Article 8 (3)

###### 1. Localization of excess pollution

- region
- city (map)
- measuring station (map, geographical coordinates).

###### 2. General information

- type of zone (city, industrial or rural area)
- estimate of the polluted area (km<sup>2</sup>) and of the population exposed to the pollution
- useful climatic data
- relevant data on topography
- sufficient information on the type of targets requiring protection in the zone.

###### 3. Responsible authorities

Names and addresses of persons responsible for the development and implementation of improvement plans.

###### 4. Nature and assessment of pollution

- concentrations observed over previous years (before the implementation of the improvement measures)
- concentrations measured since the beginning of the project
- techniques used for the assessment.

###### 5. Origin of pollution

- list of the main emission sources responsible for pollution (map)
- total quantity of emissions from these sources (tonnes/year)
- information on pollution imported from other regions.

###### 6. Analysis of the situation

- details of those factors responsible for the excess (transport, including cross-border transport, formation)
- details of possible measures for improvement of air quality.

###### 7. Details of those measures or projects for improvement which existed prior to the entry into force of this Directive i.e.

- local, regional, national, international measures
- observed effects of these measures.

###### 8. Details of those measures or projects adopted with a view to reducing pollution following the entry into force of this Directive

- listing and description of all the measures set out in the project
- timetable for implementation
- estimate of the improvement of air quality planned and of the expected time required to attain these objectives.

###### 9. Details of the measures or projects planned or being researched for the long term.

###### 10. List of the publications, documents, work, etc., used to supplement information requested in this Annex.

The European Air Quality Directives ("Daughter Directives") associated with this framework Directive, which relate to limit or target values for specific atmospheric pollutants, are Directives 1999/30/EC, 2000/69/EC, 2002/3/EC and 2004/107/EC (2-5). Whereas the Framework Directive lays down general provisions for assessment and management of air quality, detailed arrangements for specific air pollutants are defined in the daughter Directives including limit or target values.

**Directive 1999/30/EC** (the first Air Quality Daughter Directive)

This Directive sets ambient air limit values for nitrogen dioxide and oxides of nitrogen, sulphur dioxide, lead and particulate matter. Provisions on measurement methods are laid down in Annexes VIII and IX.

**Directive 2000/69/EC** (the second Air Quality Daughter Directive)

This Directive sets ambient air limit values for benzene and carbon monoxide. This Directive (the second "daughter" Directive) supplements Directive 96/62/EC by introducing specific limit values for two pollutants: benzene and carbon monoxide. The limit value for benzene is set at 5 µg/m<sup>3</sup> (annual mean) as from 1 January 2010, and the limit value for carbon monoxide is set at 10 mg/m<sup>3</sup> (8h max) as from 1 January 2005. The Directive requires Member States routinely to inform the public of concentrations of these two substances in ambient air. The Member States had to comply with the Directive by no later than 13 December 2002.

**Directive 2002/3/EC** (the third Air Quality Daughter Directive)

This Directive sets ambient air target values for ozone.

Directive of the European Parliament and of the Council of 12 February 2002 relating to ozone in ambient air. This is the third "daughter" Directive of the Air Quality Framework Directive (96/62/EC). Its purpose is to: set long-term objectives (point III of Annex I to the Directive), target values for 2010 (point II of Annex I), an alert threshold and an information threshold (point I of Annex II) for concentrations of ozone in ambient air in the Community; establish common methods and criteria for assessing concentrations of ozone in ambient air; ensure that adequate information is obtained on ambient levels of ozone and that it is made available to the public; maintain or improve ambient air quality; promote increased cooperation between the Member States in reducing ozone levels.

**Directive 2004/107/EC** (the fourth air quality Daughter Directive)

This Directive sets ambient air quality limit values for arsenic, cadmium, mercury, nickel and polycyclic aromatic hydrocarbons.

**Thematic Strategy on air pollution**

The thematic strategy on air pollution is to present a coherent and integrated policy on air pollution which: (1) sets out priorities for future action; (2) reviews existing ambient air quality legislation and National Emission Ceilings Directive with view to reaching long-term environmental objectives; and (3) develops better systems for gathering information, modelling and forecasting air pollution.

The World Health Organisation (WHO) concluded that health implications of long term exposure to particulate matter is more worrying than previously thought. Further, recent epidemiological studies have been unable consistently to establish threshold levels for particulate matter and ozone below which no health effects of these pollutants would be found. Many studies have found that fine particulates (PM<sub>2.5</sub>) have serious health effects. The CAFÉ Working Group on Particulate Matter has proposed to develop a limit value for PM<sub>2.5</sub>.

**Directive XXXX/XXX/EC**

This directive on ambient air quality and cleaner air for Europe is a proposal for a new directive and has already been presented and should become mandatory this year. This Directive aims to merge the Framework Directive, the three daughter Directives and the Exchange of Information Decision<sup>4</sup> into one single Directive.

This Directive should also include air quality standards for particulate matter with an aerodynamic diameter smaller than 2.5 µm. (PM<sub>2.5</sub>).

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<sup>4</sup> Council Decision 97/101/EC O.J. L35,5.2.1997, p 14

The commission proposes to allow Member States to request an extension to extend the deadline for compliance in affected zones if objectively verifiable conditions are met, including information on the compliance with certain Community legislation contributing to the improvement of air quality. As a quid pro quo the Member State would have to develop an air pollution abatement programme to ensure that the limit values are attained upon expiry of the extension.

The internet will be used as the main means of delivery of reporting information and making this compatible with INSPIRE<sup>5</sup>.

The Directive is being discussed in Council and Parliament with completion of the first reading due this autumn. Hence it can be expected to be finally adopted around mid 2007. From that date Member States will have 254 month time to adopt this directive into their national legislation. The directive will become mandatory somewhere in 2009.

## 2.2 Interpretations of EU directives

The Framework Directive and the Daughter Directives strive for a balance between 1) the harmonisation of the assessment and management of air quality across the EU Member States and 2) the subsidiary principle allowing local and national flexibility in implementation. The Framework Directive obliges the European Commission to present proposals to Council for further legislation, which will fill in the basic structure which the Framework Directive establishes. All EU Member States have now implemented the Directive into their own national legislation. The way the directive is implemented in national legislation is done differently in different member States.

The Framework Directive requires air quality to be characterised in certain zones and agglomerations. It leaves a high degree of flexibility in defining these zones, leading to rather large differences between Member States. These zones correspond mainly with administrative borders rather than to patterns of ambient air quality.

The major differences in implementation of the EU Directive between the Member States<sup>6</sup> are:

- differentiation between limit values for health and ecosystems. Some Member States only use the limit values for health.
- testing building plans for limit value exceedances before these limit values are effective. In the Netherlands a plan must be checked for limit value exceedances if it lies in a zone in which is expected that in the future limit values will be exceeded. Or the plan itself may cause a limit value exceedance. Only if can be proven that due to air quality measures the limit values in the future wont be exceeded may the plan still be carried out.
- differences in measuring, modelling and calculating. Some Member States suffice with only measurements. Other Member States use models based on measurement for reporting air quality in areas where there are no measurements. The correction factor for the measured values of PM<sub>10</sub> differs considerably, 1.0 (no correction factor in France) to 1.49 (Wallonia).
- how strict limit values are applied. In some Member States limit values may be exceeded if other element such as for example economics are more important
- application of limit values for all projects with air quality consequences. Projects that only contribute marginally to the air quality are mostly not tested for limit value exceedances (except for Sweden). For example Germany uses a 3% contribution threshold for industrial installations.

The AQ Directives make a distinction between air quality assessment based on measurements alone and assessment that uses measurements and other techniques, such as emission inventories, indicative measurement methods and air quality modelling. The Framework Directive introduced the use of supplementary methods for legislative purposes because such techniques will, in combination with fixed measurements, give considerable more information than measurements alone on for example: the spatial distribution of air quality levels; human exposure and risk and on the causes of air pollution.

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<sup>5</sup> Proposal for a Directive of the European Parliament and of the Council establishing an infrastructure for spatial information the Community (INSPIRE) COM (2004) 516 final, SEC (2004) 980

<sup>6</sup> International comparison implementation EU-directives air quality (Internationale vergelijking EU-richtlijnen luchtkwaliteit) , prof. Dr. Ch.W.Backes, February 2006

AEA Technology has researched the use of models by Member states for air quality reporting for DG-environment. Only the Netherlands, Denmark, the UK and Sweden use models for annual reporting that are able to model the exceedance of the limit values of NO<sub>2</sub> and PM<sub>10</sub> at street level. As exceedances of the limit value of NO<sub>2</sub> occur mainly at street level it is important to calculate exceedances at street level or hot spots will be missed. Other Member States only report on the basis of air quality measurements (Belgium, Ireland, and Austria) or use models that can't calculate street level concentrations (Greece, Portugal). This obviously leads to a very different assessment of the extent of the ambient air quality.

Significant differences have also been noticed in the distance between monitoring stations and local sources such as traffic, leading to systematic differences in hot-spot levels measured and reported.

There are also differences in how spatial planning and environment are connected between member states. The way different member states deal with air quality problems that will be caused by future spatial project is handled differently in the Member States according to how spatial planning is embedded in national law and legislation. In the different Member States different institutes are responsible for air quality. In the Netherland local government is responsible for spatial planning and for air quality. In most of Germany a different organisation is responsible for air quality than spatial planning. The organisation that "plans" must still take air quality into account though. The authority that is responsible for air quality must still be able to solve air quality problems.

Concluding: though the directives spell out how air quality has to be assessed and reported to the EU, the methods in use differ. Hence the conclusions on the extent of the air quality problems might differ even if the physical air quality is similar. These differences in approach are even bigger when it comes to the consequences of a reported limit value exceedance. This affects principals such as equality, level playing field, etc

## 2.3 Annual questionnaire

The Questionnaire laid down in the Decision 2001/839/EC has been extended to cover also the annual reporting obligations resulting from Directives 2000/69/EC and 2002/3/EC, while at the same time introducing some amendments related to Directive 1999/30/EC, which are made for clarification and in order to ensure a better assessment of the reports.

The annual questionnaire can be found at:

[http://ec.europa.eu/environment/air/questionnaire/questionnaire2004\\_461\\_2004\\_en.pdf](http://ec.europa.eu/environment/air/questionnaire/questionnaire2004_461_2004_en.pdf)

The annual questionnaire gives a lot of information on air quality measurements in the Member States. All the information is given per zone. However to compare air quality between different cities is impossible with this questionnaire.

-The questionnaire gives no information on trends. Trends are very important to understanding air pollution and its origins. (One could use AIRBASE to retrieve multi-annual trend information, but graphs etc must still be made)

-The questionnaire supplies no clear indication of sources of a pollutant in a zone or agglomeration. There are no pie diagrams or tables with sources of a pollutant and there is no information on emission factors of pollutants in an area.

- There are no maps so the spatial distribution of a pollutant is not known. This distribution also gives information as to the sources of the pollutant.

- The questionnaire only gives information on measurements. Yet modelling is also very important, and becomes increasingly important, especially for diagnosing where the pollution comes from. Modelling at street level gives you a lot of information on which street limit values are exceeded so in your action plans you can take specific measures. With models you can also look into the future so you know in what areas extra air quality measures are needed, and at what date you will be able to comply with limit values.

- There is hardly any climate or meteorological data available in the questionnaire. This data is important to get the full picture of sources and distribution of pollutants.

Most results from measuring stations in the Member States are collected in Airbase, the public air quality database system of the EEA. It contains information submitted by the participating countries throughout Europe. The air quality database consists, next to multi-annual time series of air quality measurement data and their statistics for a representative selection of stations and for a number of pollutants, also meta-information on the involved monitoring networks, their stations, and measurements. The database covers geographically all countries from the European Union, the EEA member countries and some EEA candidate countries. The EU countries are bound to report under the Council Decision 97/101/EC, a reciprocal Exchange of Information (Eol) on ambient air quality. Whereas, the EEA member countries committed themselves to report to the EEA following this EU-legislation or develop the appropriate measuring and reporting infrastructure following EEA's EuroAirnet programme criteria. All data reported within EuroAirnet context are included in the database.

Air quality experts can get a lot of information out of this database. However this database does not provide enough information to properly compare cities. The database misses information on local emissions, modelling information, exposure of the population, air quality measures, etc. The new air quality directive addresses some of these aspects and could be a first step in the right direction.

## 3 Common air quality reporting

### 3.1 Cities reporting and the EU directives

There are three types of reporting required by the Air Quality Directive.

- 1 Annual reporting on the result of the assessment of air quality in each zone and agglomeration set out in Commission Decision 2004/461/EC in the form of a questionnaire;
- 2 The reporting of the essential contents of AQ plans and programmes once every two years after the first exceedance of a limit value plus the margin of tolerance. This obligation goes back to Art 11 of the Framework Directive (FWD). The details of the reporting are set out in Commission Decision 2004/224/EC in the form of a formalised questionnaire. It should also be noted that every three years Member States are to report about the status of the implementation of each plan and programme (PP) and that for this reporting item no formal specified format yet exists. The same is true concerning reporting of the content and implementation of action plans.
- 3 Annual reporting of the measured pollution data under the EoI Decision for inclusion into AIRBASE, the European air pollution data base maintained by the EEA.

This guidebook focuses mainly on the obligation cities have in the context of the reporting meant under 1; the annual reporting of the assessment of air quality. However a cities need of information is greater than the information provided for 1. The Citeair template includes a structured presentation of the information that is important for cities that have to make and report on AQ plans or Plans and Programmes (PPs) (the obligations under 2).

Adverse effects of different pollutants on human health have been well documented in Europe and other parts of the world. These include many diseases and an estimated reduction in life expectancy of a year or more for people living in European cities. One of the principles of the directive is to avoid, prevent or reduce harmful effects on human health and the environment as a whole. How to inform citizens on air quality? European legislation defines precise obligations, relating to informing the public in the event of significant pollution such as ozone exceedances of recent years. Each one of us has the right to demand national and local authorities to take action to improve our air quality. In order to inform the public, air quality reports must become available to the public. Through information obtained from monitoring networks, and modelling, government officials are able to assess what actions need to be taken to improve air quality. Local and National government then create reports, available to the EU, the government and the public, which help in informing what the state of air quality is, where trends may be occurring, and what needs to be done.

This guidebook focuses mainly on air quality information needed by the cities. The Citeair template has all the information needed to report to the EU for annual reporting, but contains extra information for the cities needed for AQ plans and PPs. Information needed for EU annual reporting is now already generated by the cities or accessible to the cities, the template makes it easy for the cities to use this information. The information generated by the template can not as such be used to inform the public about air quality. The template is too difficult to read for the lay public, the template is too complex and detailed. The template however can be used as an information source by the city and then rewritten by the city for the lay public. The main target groups for the CITEAIR template are air quality experts, decision makers in European cities and specific groups like NGO, pressure groups. More information on communication can be found in the Citeair guidebook on communication with the public about air quality (Component 3 Communicating air quality).

### 3.2 Difficulties encountered and reasons for common reporting

The commission has developed a common format for reporting the results of annual air quality assessment, and adopted this questionnaire as a Commission Decision in 2001, which was updated in 2004 (2004/461/EC). Member states now fill in this questionnaire annually and send the data in an electronic file provided by the commission. But there are considerable delays, and there is a need for further harmonisation and streamlining. The air quality reports are mostly drawn up by local governments. The Commission has provided a template to be filled by the national government which contains the minimum level of information needed for national level of reporting. The template is tailored to the needs of the commission. National reporting obligations a fairly well defined the tasks of local government however are often wider (provide input into national reporting, making an action plan, informing the public). The questionnaire does not provide enough information for local governments to do all the tasks. A result is that we see all kind of documents ("reports") being produced at the local level. These documents serve as the basis for the formal EU report but often contain more information and are presented in multiple, and hard to compare ways.

The directive refers to both assessment and management. Management of air quality requires good insight in the causes of air pollution and so their analysis is a prominent element of the assessment procedure.

All major European cities must draw up air quality plans and programmes to improve air quality. For the cities it would be helpful to compare air quality reports and learn from each others action plans. To be able to identify cities with similar problems more extensive information is needed then is now often found in the reports. Extra information needed to enable cities to compare air quality are for example a short emission data base, trend information, meteorological and climate data, fleet descriptions, etc. One must be able to compare local situations to see if an air quality measure will be effective in your own town as well. To be able to compare local situations, and for local diagnostic purposes (needed to make action plans) more and well defined, information is needed.

There is a reporting scheme for PPs. The plans and programmes can be drafted at the local, regional or national level. For the commission to make use of the plans and programmes, the information would need to be well structure and comparable. DG-environment have recently contracted UBA-Vienna to evaluate the first set of action plans delivered to DG environment. This is not an easy task, If everybody had used the same template, at least for the assessment part, evaluation of the plans would have been much easier. The suggestion now is to make a distinction between local, regional or national plans and programmes on the one hand and the information to be sent to the commission on the other hand. For the PPs to be sent to the commission a standard reporting sheet has been proposed. For plans and programmes for local, regional or national use Annex IV of the FWD gives a list of items that should at least be included. This gives the local authorities a great deal of freedom in choosing the form.

On the one hand it allows the plans and programmes to be flexible in order to allow full adaptation to the local situation, on the other hand it makes comparing with other PPs more difficult. If at least the air quality assessment part of the PPs are done in a uniform way, it would be easier to compare air quality situations.

An important goal of the directive is that air quality should be assessed and managed in a comparable way and on the basis of the same criteria in all Member States. The directives also require the Member states to report air quality to the European Commission and the public in the same way. All data is to be sent by the Member States to the Commission. The Commission will in turn make available to the Members States, its database containing information on the networks and stations and on air quality. The data is accessible to the public through an information system set up by the European Environment Agency (Airbase)<sup>7</sup> and REPORTNET, which publishes all questionnaires Member States' authorities have sent to the commission. This data is to complex for a layman to understand and not extensive enough for a city to use for their action plans and/or PPs.

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<sup>7</sup> (<http://airclimate.eionet.europe.eu/databases/index.html>)

The Directives state that Member States shall ensure that up-to-date information on ambient concentrations of sulphur dioxide, nitrogen dioxide and oxides of nitrogen, particulate matter (PM<sub>10</sub> and in the near future PM<sub>2.5</sub>) carbon monoxide, ozone, benzene and lead is routinely made available to the public as well as to appropriate organisations such as environmental organisations, consumer organisations, organisations representing the interests of sensitive populations and other relevant health-care bodies by means, for example of broadcast media, press, information screens or computer network services. The directives define the national air quality guidelines for reporting air quality for the Member States, not local or regional guidelines. Also in the presentation of up-to-date air quality information cities use widely differing approaches. The common website <http://www.airqualitynow.eu>, developed in the context of this project helps to facilitate a comparable presentation of near real time air quality information.

CAFÉ is a programme that will use information from the air quality reports. CAFÉ stand for Clean air for Europe Programme. Its goal is to establish a long-term, integrated strategy to tackle air pollution and protect against its effects on human health and the environment. CAFÉ's objectives are:

- to develop, collect and validate scientific information on the effects of air pollution (including validation of emission inventories, air quality assessment, projections, cost-effectiveness studies and integrated assessment modelling);
- to support the implementation and review the effectiveness of existing legislation and to develop new proposals as and when necessary;
- to ensure that the requisite measures are taken at the relevant level, and to develop structural links with the relevant policy areas;
- to determine an integrated strategy (by 2004 at the latest) to include appropriate objectives and cost-effective measures.
- to disseminate to the general public the information arising from the programme.

A common way of reporting on air quality would enable cities to provide sensible feedback to EU policy processes (CAFÉ). Now they must often search through the report for the information needed, and check with each report what methods and what definitions were used. Certain information needed for programmes like CAFÉ is optional information, delivered by some Member States and not by others.

The Directive requires Member States to produce plans and programmes for areas where the limit values are expected to be exceeded, indicating how the limit values will be met in the required timescale. Local air quality management is an important component in producing plans and programmes to work towards meeting the national air quality objectives, which are in all cases either equal to or more stringent than the limit values in the First Daughter Directive.

For cities themselves it would make things easier if there was a common way of reporting which enables the cities to compare the air quality between cities and see if measures proposed by other cities can be used in their own city as well, and how effective these measures would be in their own city. To think up air quality measures takes a lot of time. There is no framework for the kind of reporting that should deliver the much needed hints on the effectiveness of measures. At the moment a lot of European Cities are inventing the wheel at the same time at great costs. Once measures have been thought up, the effects of the measure must be assessed. It takes considerable knowledge of air quality to do this. It would be so much easier, cheaper and less time consuming to learn from each other. To do this more information is needed than is now mostly given in reports. Not only more information is needed but information must be given more uniformly so comparison between cities is made possible. As yet no comparison is possible. This is due to different approaches adopted to reporting and to differences in location of monitoring sites and modelling approaches. The latter two are of a highly technical nature and beyond the scope of this project.

Another problem is that air pollution moves across both natural and political borders. Thus the control of air pollution in Europe necessarily an activity best addressed by countries in cooperation with each other. In order to work together one must need a starting point that is comparable. A common air quality report would make a good starting point for air quality measures.

It is important that to know what are local- and what are European issues for solving air quality problems. This knowledge could help to improve the greater knowledge and understanding of the major air pollution issues. The local sources of air quality must be identified but it is also important to know the sources of air pollution in neighbouring areas. For instance pie charts of air quality sources of different areas could be compared.

To make effective action plans, it must be clear what are local trends and what are European trends. Information on trends in neighbouring areas or countries must be available. To be able to compare these trends, one must preferably measure air quality in the same way, one must use the same definitions as to what is for example a road or background station, one must model at the same scale. If all these things are done in a different way it becomes hard to compare trends and subsequently it is difficult to find out what are local and what are European trends. A result is a lack in knowledge of the sources of some pollutant and as a result it is difficult to identify the most effective measures.

### **3.3 Review of cities reporting**

Local authorities are involved in the national air quality programme, sometimes undertaking air quality measurements within their areas. Local authorities also have responsibility for the implementation of abatement measures to address non-compliance with air quality standards, which include the development of air quality action plans.

To be able to make action plans you must know what your pollutants are, what the concentrations of these pollutants are throughout the area, and what the main sources of this pollutant are. Only if you have a good understanding of where limit values are exceeded and how these exceedances come to pass, only then can you make effective action plans. So you need a good analysis of the current and future situation

Analysis of the current situation:

1. Localization of excess pollution: information on the region, city (with map) and measuring stations (map geographical location) of where exceedances occur.
2. General information on the type of zone (city industrial, or rural area), estimate of polluted area (km<sup>2</sup>) and of the population exposed to the pollution, useful climatic data, relevant data on topography etc
3. Responsible authorities: names and addresses of persons responsible for the air quality report
4. Nature and assessment of pollution: concentrations observed over previous years (trends) techniques used for assessment
5. Origin of pollution: list of the main emission sources responsible for pollution (map), total quantity of emissions from these sources (tonnes/year), emissions heights of the sources and information on pollution imported from other regions.
6. Analysis of the situation: details of those factors responsible for the exceedance (transport, including cross-border transport, formation)
7. Details of the measures or projects planned or being researched for the long term.
8. Models used: have models been used to model the background, regional and street level concentration. Is there a description of the models used.
9. Is there extra information given, not summed up in points 1-8

Annual air quality reports and PPs of the following cities have been checked on the subjects mentioned above.

Table 1: Analysis of air quality reporting in several European cities.

| City      | 1   | 2   | 3 | 4 | 5   | 6   | 7   | 8   | 9 |
|-----------|-----|-----|---|---|-----|-----|-----|-----|---|
| Vienna    | +/- | +/- | + | + | +/- | +/- | +/- | +/- | + |
| Rotterdam | +/- | +/- | + | + | +/- | +/- | +/- | +   | + |
| Prague    | +/- | +/- | + | + | +   | +/- | +/- | +/- | + |
| Munich    | +   | +   | + | + | +/- | +   | +   | +/- | + |
| Berlin    | +/- | +/- | + | + | +/- | +/- | +/- | +   | + |
| The Hague | +/- | +/- | + | - | +/- | +/- | +/- | +/- | - |
| Leicester | +   | +/- | + | + | +/- | +/- | +   | +   | - |
| Paris     |     |     |   |   |     |     |     |     |   |
| Rome      |     |     |   |   |     |     |     |     |   |

\* Numbers in the table refer to numbers given in the analysis above.

+ Information can be found in the air quality report of the concerned city

+/-: Information can only partially be found in the air quality report of the concerned City (see analysis concerned city)

- : Information can not be found in the air quality report of the concerned City

A more detailed account of the air quality reports and PPs of the above mentioned cities can be found in annex 2. The user can then use the link included with each city to access the cities annual reports and/or PPs for more information.

### 3.4 Conclusions

The EU directives assure a certain level of common reporting on the national level. This format is a starting point for cities though it leaves the cities extensive degrees of freedom. Also the national interpretation of the directives differs. Both factors lead to an enormous variety of reporting formats at city level.

The biggest difference between reporting in the cities are

- Emission data of sources are given in most reports but there is significant difference in how much data is given. Most cities give a sort of pie diagram with percentages per category (traffic, shipping industry, background etc). Less frequently the emission per category is given in tonnes per year. However some cities give emissions in ton per year per for example institution. Sometimes even fleet composition and emission factors are given. Big differences in how much information is given.
- If climate data and topography are just mainly given or if this data is used to explain the air current quality situation.
- How population exposure is integrated into the report, only as mentioning health effects, to number of people exposed, to maps with spatial distribution of people exposed.
- Description of the measuring station, most cities give maps with a clear description of the stations, other cities have no map of where the stations are and do not use a standard description of the station so it becomes hard to get a clear picture of what kind of a station it is.
- If models, when models are used and what the models are used for. Are models merely used to make a spatial map of the air quality situation or are models used to predict the air quality situation in the future.
- Big differences in describing air quality measures. Some cities just mention air quality measures, these measures are not connected to a hot spot. Other cities describe specific measures per hot spot. Mostly measures are describes in a percentage lower emissions, sometimes this is not even given, but sometimes a measure is described in  $\mu\text{g}/\text{m}^3$ . Mostly only the current air quality situation is described and what the effect of measures will be on this current situation. A few cities however show what the effect of these measures are on the air quality in future years and use models to predict the air quality situation as a result of air quality measures.
- Trends of pollutants or often given. The difference are in if these trends are merely used to describe the trend of a pollutant over the past few years or if this trend is used to predict the

concentrations of a pollutant in years to come. Mostly a trends are given for the pollutants but there are cities that also give trends of emissions from for example cars, institutions etc.

Information that is important to get a good picture of the pollutant but is often lacking in the reports:

- Information on emissions is often only shortly mentioned. This information however is not enough to compare the air quality between cities and to see if measures will be effective for your city as well.
- The public is very interested in population exposure; this information is often not given. The public would also like to see maps of the air quality situation in a city; these maps are often not given.
- The public is interested in when (in what year) will the air quality in his city comply with the limit values, measures are often described but when due to the measure the limit values will be met is not often given.

Cities report a lot of data already but often in considerably different ways. These differences and lack of information make it hard to compare air quality between the several cities.

# 4 Common template for reporting air quality in cities

## 4.1 Definitions and why we need them

If we want to compare air quality in different cities it is important that for example a road station in city A is the same as a road station in city B. If a road station in A means a station at 10 meters from a busy road and in B a road station can be a station in the park next to a busy road, comparing this situation is difficult. If we want to compare situations we need to know we are comparing the same things and not apples and pears. The directives provide a good number of definitions and some of them are repeated here, others are added to facilitate the production of more comparable reports.

The proposed additional definitions mainly relate to the additional reporting and analysis options proposed in the extended common reporting format. They relate for example to modelling and the description of emissions.

Definitions that are important to be able to compare the air quality between several cities can be found in annex 4

## 4.2 Recommendations for a common report to meet minimum EU requirements

Before exploring the possibilities for an assessment system, it is important to list criteria to which such a system should conform:

Member States have to report assessment related items under the Framework Directive and the First Daughter Directive. A list of these items is given in table 2.

Table 2: Overview of information items to be reported to the Commission

|   |  |
|---|--|
| 1 | Information on implementation to the Commission  |
|   | Information on implementation in national legislation<br>Definition of zones<br>Implementation and responsibilities<br>Text of transposition   |
| 2 | Report on Preliminary Assessment (PA) to the commission  |
|   | <i>Spatial distribution of levels found in the PA</i><br>Documentation of methods of the PA  |
| 3 | Information to the public  |
|   | Summary of up-to-date levels<br>Exceedance of alert threshold  |
| 4 | Provisional Report to the commission   |
|   | Exceedance of alert thresholds   |
| 5 | Annual report on ambient air quality to the commission   |
|   | Occurrences and reasons of individual exceedances of limit values<br>List of zones exceeding/ not exceeding limit value or limit value + margin of tolerance<br><i>Zones where the upper or lower assessment threshold are exceeded</i><br>Statistics on threshold exceedance of 10-minute averaged SO <sub>2</sub> concentrations<br>If claimed: list of zones with exceedance due to natural SO <sub>2</sub> sources and justification<br>Statistics on PM <sub>2,5</sub> concentrations<br>Measuring methods for PM <sub>10</sub> and PM <sub>2,5</sub><br>If claimed: list of zones with PM <sub>10</sub> exceedance due to winter sanding of roads and justification<br>Of claimed: list of zones with exceedance of the PM <sub>10</sub> limit value due to natural events and |

|    |   |
|----|---|
|    | justification<br>Documentation and results of supplementary assessment methods  |
| 6  | <i>3-year report on ambient air quality to the commission</i>   |
| 7  | PP reporting  |
|    | Review of levels in all zones and agglomerations<br>Reduction plans and progress  |
| 8  | Documentation of network  |
|    | Documentation and review of network   |
| 9  | Additional measures, any use of other than EU thresholds PP reporting   |
|    | More stringent measures than required by EU directives<br>Other (additional or more stringent) air quality thresholds than EU |
| 10 | Reports to the commission as required by the old directives   |

Information in italics is information not required by the directives.

Not all information in this table is relevant for the cities. Some information relevant for the cities is not given in this overview. As yet there is no overview of information that is important for cities.

Important information for the EU as well as for the local population as for cities is:

- Estimated number of people exposed to exceedance of the pollutant
- Maximum concentrations at relevant locations
- Expected exceedances of the air quality standards
- Expected time by which the air quality directive will be met

Information important to compare air quality between cities and to be able to understand what measures taken in other cities would have for an effect in your own city

- Estimated number of people exposed to exceedance of the pollutant
- Maximum concentrations at relevant locations
- Expected exceedances of the air quality standards
- Expected time by which the air quality directive will be met
- Detailed information on emissions and emission heights
- Trends of pollutant as well as sources (emission industry or traffic for example)
- Spatial distribution of pollutants
- Uniform description of measuring stations
- Information on grid size of models used
- Fleet composition
- Meteo data
- Background data

If the concentration of air pollutants in a certain zone is above the limit value plus the margin of tolerance, Member States have to draw up PPs to demonstrate by which measures they are going to achieve the limit values by the attainment date. The margin of tolerance decreases annually and becomes zero by the attainment date. To see if limit values are exceeded, measurements (or assessment) must be done. Member States do not only differ in the use of models but also how they handle systematic deviations in measurements of for example PM<sub>10</sub>.

Now data are often taken for granted, data as transmitted by each city is used. However, it is necessary to find out precisely which measurement method is used in order to compare values and explain the differences that could possibly exist.

Especially for the PM<sub>10</sub>, it is important to find out if a correction factor is applied or not, (and which correction factor has been chosen). The guidebook proposed in CITEAIR does not aim to solve the problem of the correction factor, and this issue will not be discussed here, but it is important to know if data are corrected or not, in order to compare it properly.

To solve the problem that different cities speak different languages a common template has been made by CITEAIR. The proposed common template can be found in annex 3. The template aims to facilitate city in gathering information needed for annual reporting and the basis needed for action plans and PPs by providing an empty report where only data has to be inserted, making life easy and at the same time assuring that all city reports look the same. The template can be filled in online or through an Excel file. Tables, figures etc have already been made; cities only have to fill in some numbers and sometimes a bit of text. The minimum requirement of information to be provided to fulfil the EU directives for annual reporting can be found under option A.

Option A does not provide enough information to be able to compare air quality between cities better than is now often the case.

### 4.3 Models

There is a large variety of models being used, with no two countries using the same one. The most commonly modelled pollutants are NO<sub>2</sub> and PM<sub>10</sub> and ozone. The models used cover all different scales, regional, urban and local (street canyons, hotspots), with a slight majority being used on the regional scale.

It is clear that air quality models have an important place in air quality management. Through models, the contribution to exceedances of limit values from various sources and source categories can be established. In addition modelling enhances the ability to map the spatial distribution of the pollutant concentrations. By using models suitable for the scale and application in question, all scales (from regional background to city quarters and streets), may be mapped.

Models have become a primary tool for analysis in air quality assessments because:

- Models can relate concentrations to sources, it is an important diagnosis and analysis tool;
- The spatial coverage is improved both in extent and detail with relatively limited costs;
- Policy options can be analysed by developing different scenarios;
- Future concentrations, and the assessment of likely compliance to future limit values can only be modelled.

Air pollution models should be used in a complementary manner to air quality measurements, with due regard for the strengths and weaknesses of both analysis techniques.

For air quality assessment by modelling, a wide variety of models have been developed, some of which have been made readily accessible and easy to use by combination with user friendly software. Information on the state of the art of modelling and on models and model applications is available in various EEA publications prepared by the European Topic Centre on Air Quality (Moussiopoulos *et al.*, 1996; de Leeuw *et al.*, 1996, Tønnesen *et al.*, 1997) and others (Oleson and Mikkelsen, 1992; Kretzschmar *et al.*, 1994).

**Table 3:** Use of models in several EU Countries under the first daughter directive (source AEA Technology, 2004).

| Country        | Model qualities      |                 |                  |               | application               |              |
|----------------|----------------------|-----------------|------------------|---------------|---------------------------|--------------|
|                | Smallest scale level | NO <sub>2</sub> | PM <sub>10</sub> | Other matters | Exceedance of limit value | Action plans |
| Belgium        | -                    |                 |                  |               |                           |              |
| Cyprus         | -                    |                 |                  |               |                           |              |
| Denmark        | Street               | X               | X                | X             | X                         | X            |
| Germany        | Street               | X               | X                | X             | X                         | X            |
| Estonia        | -                    |                 |                  |               |                           |              |
| Greece         | Background           | X               | X                | X             | X                         |              |
| Ireland        | -                    |                 |                  |               |                           |              |
| Lithuania      | -                    |                 |                  |               |                           |              |
| Luxemburg      | -                    |                 |                  |               |                           |              |
| Malta          | -                    |                 |                  |               |                           |              |
| Netherlands    | Street               | X               | X                | X             | X                         | X            |
| Austria        | -                    |                 |                  |               |                           |              |
| Portugal       | Background           | X               |                  | X             | X                         | X            |
| Spain          | Background           |                 |                  | X             | X                         | X            |
| United Kingdom | Street               | X               | X                | X             | X                         | X            |
| Check republic |                      | X               | X                | X             |                           | X            |
| Hungary        | Background           | X               | X                | X             | X                         |              |
| Slovakia       | Background           | X               |                  | X             | X                         |              |
| Slovenia       | -                    |                 |                  |               |                           |              |
| Sweden         | Street               | X               | X                | X             | X                         | X            |
| France         | ?                    | ?               | ?                | ?             | ?                         | ?            |

Countries with the – symbol only report (annual air quality) on the basis of measurements

Using models that can model street level concentrations of pollutants will identify more hotspots than when only models that can model regional background concentrations or only measurements are used. This makes it very difficult to compare the air quality between Member States.

To be able to interpret model results and, for example assess if results of scenario analysis from another city would apply to your city as well, a description of assumptions (fleet composition, etc.), grid size and an uncertainty assessment are an essential complement to the simple model output.

#### 4.4 Important air quality assessment items for cities (according to CITEAIR)

Assessing air quality methods other than measurements alone are important to get the total picture of air quality in a city. This makes it necessary to consider the possibility that limit value exceedances are found through the use of models.

It is recommended to use information from three main assessment methods: measurements (fixed monitoring stations or short time measurement campaigns), emission inventories and modelling.

It is recommended that the results obtained from these assessment methods be presented as maps, where the spatial extent of an area exceeding limit values, or requiring a certain assessment methodology, can be easily seen. On these maps, all areas of exceedance or near-exceedance, for which limit values have been set in the directives, should be clearly indicated.

- Preliminary air quality measurements are used to explore air quality, particularly at those places where exceedances are to be expected, and / or emission information is inadequate
- Air emissions inventories provide comprehensive information on sources and their emissions and emission fluxes in the entire zone. This enables a first estimate of areas at risk of exceeding limit and target values.
- Air pollution modelling serves to relate air quality to emissions in a quantitative sense, and provide a better basis for describing areas of exceedance in the entire zone. It also provides additional essential information for the management of the air quality in the zone, as required under the Directive.

Data are taken for granted under the condition that they comply with an established set of rules specified in the directive. This applies in particular for the criteria for checking validity when aggregating data and calculating statistical parameters, such as the required proportion of valid data. For some statistical parameters, for example hourly or daily thresholds, the checking of data validity should go further than the rules strictly specified by the European directive. This is particularly important for ozone. Even if a monitoring station has more than 75% of valid data, it is also necessary to be sure that the analysers were not out of order during the few days with pollution incidents (for ozone see section II of annex III of this Directive). It is the same for each threshold calculated on a short-time basis (for example hourly means) or which is seldom exceeded.

Measurements- apart from sampling and analysis errors- may introduce major uncertainties if stations are not representative, meaning that air quality in the surroundings differ substantially from air quality at the station, or that concentrations vary appreciably in time while the measurements have only limited time coverage.

#### Five year basis for exceedance of assessment thresholds

1999/30/EC: assessment thresholds are defined on the basis of one year. Consequently, the number of exceedances of the numerical value can be determined for each year. However, the directive specifies that exceedance of the assessment thresholds should be judged on the basis of five consecutive years, to reduce the probability for exceptionally high or low concentrations in a single year to alter the assessment of requirements. This should be reviewed at least every five years or earlier in the event of significant emission changes.

The exceedance of assessment thresholds are mainly determined for the different pollutants described on the European directives, on the basis of the recent data recorded on fixed monitoring stations where a sufficient rate of valid data is available. An assessment threshold shall be deemed to have been exceeded if it has been exceeded during at least three separate years out of those previous five years. Where fewer than five years data are available, data from measurement campaigns of short duration can be combined with results obtained from information from emission inventories and modelling to determine exceedances of the assessment thresholds.

#### Delimitation of zones and agglomerations

Zones and agglomerations are supposed to be established by each Member State as specified in the European policies. The definition of the zones is done in accordance with the approach employed by the Member State, which can be quite different. Zones can be regarded as the territorial units for assessment and management of air quality under the air quality directives.

It is very important to carefully choose the type of locations considered to assess the compliance with assessment thresholds and Air Quality Standards. For example, in the agglomerations, traffic-orientated monitoring stations should be located in areas where a lot people are exposed, for example city centres, commercial roads, streets with houses, in order to bring useful information for a better knowledge of the exposure of residents, pedestrian or car drivers. In other zones, especially rural areas, it is easy to find major roads, where levels of pollution are high, for example a motorway, but it is not reasonable to consider that all the zone exceeds the assessment threshold (or the limit value), just because of this single road. In that case, the exceedance is generally only alongside the road, which is seldom densely populated. That's why both traffic and background stations should be considered for the agglomeration zone and only background stations for other zones.

It is the same for the pollutants monitored on the different types of sites. For example, ozone levels are usually very low near major roads, because of high NO concentrations. For this reason, O<sub>3</sub> monitoring is not generally undertaken on traffic-orientated sites. However, roadside monitoring of O<sub>3</sub> can lead to a better understanding of the mechanisms that determine roadside NO<sub>2</sub> concentrations. In that case, these monitoring stations should not be considered to assess the attainment of air quality standards, which are generally not exceeded on traffic-orientated sites.

The following information should be compiled for zones and agglomerations within which sources other than measurements are employed to supplement information from measurements or as the sole means or air quality assessment:

- a description of assessment activities carried out;
- the specific methods used, with references to descriptions of the method;
- the sources of data and information
- a description of results, including accuracy's and, in particular, the extent of any area or, if relevant, the length of road within a zone or agglomeration over which concentrations exceed limit values or, as may be, limit values plus applicable margins of tolerance and any area within which concentrations exceed the upper assessment threshold or the lower assessment threshold;
- for limit values the object of which is the protection of human health, the population potentially exposed to concentrations in excess of the limit value.

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

Important for action plans is information such as climate data, fleet composition, fuel qualities, sources and emissions. If cities air quality is to be compared, extra data is necessary.

## **4.5 Structure of the common template**

### **4.5.1 Introduction**

The proposed common template aims to facilitate comparison between cities regarding air quality, by providing an empty report where only data has to be inserted, making life easy and at the same time assuring that all city reports look the same. In order to make it easy to fill, the template is widely based on the directive reports, because these data should be already available for every European cities without doing an important specific work. The template can be taken as a mere example but also filled in by using the reporting generator (under development,). Tables, figures etc. have already been made, cities only have to fill in some numbers and sometimes a bit of text. Output in more than one language (CITEAIR doesn't provide the translations) is possible so it is easy to make a national and an English version report.

Depending on the city abilities, three options are offered:

Option A: minimum requirement of information to be provided to fulfil the EU directives;

Option B: additional information needed for the municipality/agglomeration to establish a simplified diagnosis of its air quality as first step for an action plan;

Option C: CITEAIR's proposal for a detailed report as complete diagnosis of the city's situation to be used for an action plan.

The automatic version of the report is available at **to be added**. The full paper version of the report is available in annex 3. An outline of the report is presented in section 4.6.2.

The commission is reviewing the current reporting requirements and contemplating a daughter directive for PM<sub>2.5</sub>. This implies that the current proposal is likely to need maintenance in the (near) future. Especially modelling, which is now being considered as a non-obligatory (option b or c) reporting item, might become an obligation as it improves both spatial coverage and problem diagnosis. A provision for PM<sub>2.5</sub> is like to be already included in the current format in anticipation on a new directive.

#### 4.5.2 Outline of the common report

The section headings of the proposed common report are given in the outline below. The next section provides explanatory examples of tables to be filled to generate the report.

##### Table of contents Common reporting template

1. Introduction
2. General data concerning the municipality/agglomeration and its surroundings
  - 2.1. General data on the municipality/agglomeration and its surroundings
  - 2.2. Climate and meteorological data
  - 2.3. Established/pursued environmental policy (OPTION C)
3. Sources of air pollution to be examined locations in the municipality/agglomeration
  - 3.1. Main emission sources for the main pollutants
  - 3.2. Point sources (OPTION B)
  - 3.3. Major roads (OPTION B) & Fleet composition (OPTION C)
4. Monitoring network and measurement methods
  - 4.1. Monitoring network
  - 4.2. Modelling (OPTION B)
  - 4.3. Measurement methods (OPTION B)
  - 4.4. Preliminary assessment (OPTION B)
5. Results and appraisal
  - 5.1. Summary of the number of exceedances of the European Air Quality Standards
    - 5.1.1. Nitrogen dioxide - NO<sub>2</sub>
    - 5.1.2. Particulate Matter - PM<sub>10</sub>
    - 5.1.3. Particulate Matter PM<sub>2,5</sub>
    - 5.1.4. Ozone - O<sub>3</sub>
    - 5.1.5. Carbon monoxide - CO
    - 5.1.6. Sulphur dioxide - SO<sub>2</sub>
    - 5.1.7. Benzene
    - 5.1.8. Lead
    - 5.1.9. Heavy metals (As, Ni, Cd) and BaP
  - 5.2. Monitoring results (OPTION B)
    - 5.2.1. Nitrogen dioxide - NO<sub>2</sub>
    - 5.2.2. Particulate Matter - PM<sub>10</sub>
    - 5.2.3. Particulate Matter PM<sub>2,5</sub>
    - 5.2.4. Carbon monoxide - CO
    - 5.2.5. Ozone - O<sub>3</sub>
    - 5.2.6. Sulphur dioxide - SO<sub>2</sub>
    - 5.2.7. Benzene
    - 5.2.8. Lead
    - 5.2.9. Heavy metals (As, Ni, Cd) and BaP
  - 5.3. Middle-term trends (OPTION C)
    - 5.3.1. Background locations
    - 5.3.2. Traffic locations
  - 5.4. Calculated exceedances of the Air Quality Standards (OPTION C)
    - 5.4.1. Nitrogen Dioxide (NO<sub>2</sub>)
    - 5.4.2. Particulate Matter PM<sub>10</sub>
  - 5.5. Maps of annual mean concentration (OPTION C)
  - 5.6. Other measurements not mandatory but of interest (OPTION C)
  - 5.7. Prospects for 2010 or later (OPTION C)

### 4.5.3 How to fill in the template

#### - Chapter 2 - General data on the municipality/agglomeration and its surroundings / Chapter 3 – Sources of air pollution

These sections aim to have a short look of the main features of a city, regarding the 3 main factors which determine the air quality: geographical, meteorological and emissions data.

Before comparing the air quality from two cities, it is necessary to assess what kind of city it is, and if some major differences exist.

Just fill the table, the charts will be done automatically.

These data are not supposed to be updated every year.

#### - Chapter 4 – Monitoring network and measurement methods

This chapter deals with the main features of the monitoring network (number and locations of data, modelling tools...), in order to see if the cities are comparable, and to explain some possible differences in the air quality data. For example, these data are particularly important for the PM10, because it is necessary to know if the monitoring networks use the same method, and if a correction factor is applied.

In the section 4.4., it is proposed to summarize the data related to the preliminary assessment, in order to understand immediately what are the main pollution problems of a city, and to explain the number and locations of stations located in the city.

The directives do not explicitly require Member States to report whether air pollution levels in a zone exceed the upper or lower assessment thresholds (UAT and LAT). However for the commission to judge compliance with the assessment requirements, it needs to be informed about the position towards these thresholds. So these data should be already available easily for the city.

#### Summary of exceedances of assessment thresholds

| Pollutant                     |              |            | LAT                                | UAT                                 |
|-------------------------------|--------------|------------|------------------------------------|-------------------------------------|
| SO <sub>2</sub>               | daily mean   | health     | <= 3 exc. 50 µg/m <sup>3</sup> D   | > 3 exc. 75 µg/m <sup>3</sup> D     |
| SO <sub>2</sub>               | Winter mean  | ecosystems | <= 8 µg/m <sup>3</sup> A           | > 12 µg/m <sup>3</sup> A            |
| NO <sub>2</sub>               | hourly mean  | health     | <= 18 exc. 100 µg/m <sup>3</sup> H | > 18 exc. 140 µg/m <sup>3</sup> H   |
| NO <sub>2</sub>               | annual mean  | health     | <= 26 µg/m <sup>3</sup> A          | > 32 µg/m <sup>3</sup> A            |
| NO <sub>x</sub>               | annual mean  | vegetation | <= 19,5 µg/m <sup>3</sup> A        | > 24 µg/m <sup>3</sup> A            |
| PM <sub>10</sub>              | daily mean   | health     | <= 7 exc. 20 µg/m <sup>3</sup> D   | > 7 exc. 30 µg/m <sup>3</sup> D     |
| PM <sub>10</sub>              | annual mean  | health     | <= 10 µg/m <sup>3</sup> A          | > 14 µg/m <sup>3</sup> A            |
| C <sub>6</sub> H <sub>6</sub> | annual mean  | health     | <= 2 µg/m <sup>3</sup> A           | > 3.5 µg/m <sup>3</sup> A           |
| CO                            | 8-hours mean | health     | 0 exc. 5000 µg/m <sup>3</sup> 8H   | >= 1 exc. 7000 µg/m <sup>3</sup> 8H |
| Pb                            | annual mean  | health     | <= 0,25 µg/m <sup>3</sup> A        | > 0,35 µg/m <sup>3</sup> A          |
| As                            | annual mean  | health     | > 3.6 ng/m <sup>3</sup> A          | <= 2.4 µg/m <sup>3</sup> A          |
| Cd                            | annual mean  | health     | > 3 ng/m <sup>3</sup> A            | <= 2 ng/m <sup>3</sup> A            |
| Ni                            | annual mean  | health     | > 10 µg/m <sup>3</sup> A           | <= 14 ng/m <sup>3</sup> A           |
| BaP                           | annual mean  | health     | > 0.6 ng/m <sup>3</sup> A          | <= 0.4 ng/m <sup>3</sup> A          |

A = annual mean D = Daily mean 8H = 8-hours mean H = hourly mean

exc. = exceedances

LAT= lower assessment threshold UAT = upper assessment threshold

For each pollutant defined in the European directives, (SO<sub>2</sub>, PM10, NO<sub>2</sub>-NO<sub>x</sub>, O<sub>3</sub>, BEN, CO, Pb, BaP, As, Cd, Ni), the situation of each monitoring station has been studied towards the upper and the lower assessment thresholds. For benzo(a)pyrène (BaP) and metals, the exercise has been done as described in the directive 2004/107/CE.

The determination of the exceedance is done in accordance with the following rules :

- If at least one monitoring station is  $> UAT$ , then the whole zone is  $>UAT$ .
- If at least one monitoring station is  $> LAT$  , but none is  $> UAT$ , then the zone is classified between the two assessment thresholds.
- If all the stations are  $\leq LAT$ , then the whole zone is classified  $\leq LAT$ .

Where fewer than five years data are available, the determination of exceedances is based on the available years. This assessment can also be completed by measurement campaigns of short duration or by comparison with levels measured in another zone (objective estimation). For example, lead levels are under the Lower Assessment Threshold in the Paris agglomeration, so it can be assumed without a risk that levels are also under the Lower Assessment Threshold out of the agglomeration, as there is no specific source of lead in this area.

When a zone is found to be in exceedance not by measurement, but only by modelling the Member State informs the Commission that this was the result of modelling, to avoid the appearance that the compliance status may be inconsistent with the annual report on measurements.

#### - Chapter 5 -

This chapter aims to a successive overview of the concentrations and the exceedances of the limit values with and without margins of tolerance for the pollutants : NO<sub>2</sub>, PM<sub>10</sub>, O<sub>3</sub>, CO, SO<sub>2</sub>, benzene, lead, Arsenic, Cadmium, Nickel and BaP. PM<sub>2.5</sub> have already been included, as their measurements are recommended by the directives. It will soon become mandatory and the following table will be modified according to the new directive once published.

#### Section 5.1. Summary of the number of exceedances of the Air Quality Standards (OPTION A)

First, the measured concentrations are compared with the limit values and the limit values plus margin of tolerance in the EU directive.

In this section, the tables aims to give a summary of the number of stations in each zone and for the different types of locations where the level has exceeded the limit value and the limit value plus margin of tolerance. The margins of tolerance are decreasing every year, so the values are summarized in a table for each pollutant.

For example : section 5.1.1. Nitrogen dioxide (NO<sub>2</sub>)

Summary of the European limit values with margin of tolerance

| Limit values | Hourly Mean<br>LV + MoT          | Annual Mean<br>LV + MoT         | Percentile 98 1 hour<br>LV  |
|--------------|----------------------------------|---------------------------------|-----------------------------|
| 2001         | 290 µg/m <sup>3</sup>            | 58 µg/m <sup>3</sup>            | <b>200 µg/m<sup>3</sup></b> |
| 2002         | 280 µg/m <sup>3</sup>            | 56 µg/m <sup>3</sup>            |                             |
| 2003         | 270 µg/m <sup>3</sup>            | 54 µg/m <sup>3</sup>            |                             |
| 2004         | 260 µg/m <sup>3</sup>            | 52 µg/m <sup>3</sup>            |                             |
| 2005         | 250 µg/m <sup>3</sup>            | 50 µg/m <sup>3</sup>            |                             |
| 2006         | 240 µg/m <sup>3</sup>            | 48 µg/m <sup>3</sup>            |                             |
| 2007         | 230 µg/m <sup>3</sup>            | 46 µg/m <sup>3</sup>            |                             |
| 2008         | 220 µg/m <sup>3</sup>            | 44 µg/m <sup>3</sup>            |                             |
| 2009         | 210 µg/m <sup>3</sup>            | 42 µg/m <sup>3</sup>            |                             |
| 2010         | <b>LV = 200 µg/m<sup>3</sup></b> | <b>LV = 40 µg/m<sup>3</sup></b> |                             |

Summary of the number of monitoring stations where the NO<sub>2</sub> concentration has exceeded the limit values and the limit values plus the margin of tolerance

| Zone Name                               | Type of location<br>(eg : background, traffic,<br>Industrial...) | Hourly Mean |       | Annual Mean |       | Percentile 98<br>1 hour |
|---|--|-------------|-------|-------------|-------|-------------------------|
|   |  | > LV + MoT  | >LV   | > LV + MoT  | >LV   | >LV                     |
| <b>Zone 1</b><br>(precise<br>which one) | .....  | XX/YY       | XX/YY | XX/YY       | XX/YY | XX/YY                   |
|   | .....  | XX/YY       | XX/YY | XX/YY       | XX/YY | XX/YY                   |
|   | .....  | XX/YY       | XX/YY | XX/YY       | XX/YY | XX/YY                   |
|   | .....  | XX/YY       | XX/YY | XX/YY       | XX/YY | XX/YY                   |
| <b>Zone 2</b><br>(precise<br>which one) | .....  | XX/YY       | XX/YY | XX/YY       | XX/YY | XX/YY                   |
|   | .....  | XX/YY       | XX/YY | XX/YY       | XX/YY | XX/YY                   |
|   | .....  | XX/YY       | XX/YY | XX/YY       | XX/YY | XX/YY                   |
|   | .....  | XX/YY       | XX/YY | XX/YY       | XX/YY | XX/YY                   |
| <b>Zone 3</b><br>(precise<br>which one) | .....  | XX/YY       | XX/YY | XX/YY       | XX/YY | XX/YY                   |
|   | .....  | XX/YY       | XX/YY | XX/YY       | XX/YY | XX/YY                   |
|   | .....  | XX/YY       | XX/YY | XX/YY       | XX/YY | XX/YY                   |
|   | .....  | XX/YY       | XX/YY | XX/YY       | XX/YY | XX/YY                   |

The column "Zone" refers to the different zones defined in the framework of the preliminary assessment. The column "Type of location" refers to the different types of locations which can exist in each zone, for example urban, suburban or rural background, traffic locations... It is particularly important to describe each type separately, because for a same pollutant, the situation can be radically different according to the type of locations. For example, NO<sub>2</sub> is a very serious problems on traffic locations, and not a problem at all on rural background location.

The first numeral (XX) is the number of monitoring stations of this type in a zone with a numerical value greater than the standard. The second numeral (YY) is the number of all the monitoring stations in the zone where the numerical value has been judged as valid (the stations shall have a sufficient rate of valid data). For a same pollutant, some statistical parameters can be averaged on different reference periods, (for example AOT40 for ozone), so the number of valid stations can be different for a same year.

The report template should be filled once a year, but it would be interesting to first of all fill it in for several years, for example 5 years, in order to build a trend of exceedances of air quality standards which is not altered by exceptionally high or low concentrations, due to exceptional meteorological conditions.

#### Special case for ozone

For ozone, the tables are based on the target values and the long term objective because the directive doesn't mention limit values. The directive for ozone [2003/3/EC] specifies that the compliance with the target values shall be judged on 2012, and the situation towards the long-term objective shall be in 2020. So the exceedances are here supplied for information only, but as the middle-term trend seems to be upward for this pollutant, recent levels are an important point of comparison.

For this pollutant, are also specified the number of exceedances of information and alert thresholds. The number of exceedances of information and alert thresholds can be very different from a year to another, because it mainly depends on local meteorological conditions but also of transport across Europe for ozone. For example, the highest number of exceedances was reached in 2003 because of exceptional meteorological conditions during spring and summer. That's why it is useful to judge these exceedances on the basis of several years, for example 5 years.

The table below summarizes the exceedances of the information and alert threshold for ozone specified in the directive, for each zone. The number of days are averaged on the background stations located in the zone with a sufficient proportion of data, especially during the period of the pollution incident. If a station was out of order during the pollution incidents, data should be considered as non available.

|                                 | <b>Zone 1<br/>(precise which one)</b> | <b>Zone 2<br/>(precise which one)</b> | <b>Zone 3<br/>(precise which one)</b> |
|---------------------------------|---------------------------------------|---------------------------------------|---------------------------------------|
| <b>Nb H &gt;= 180</b>           |                                       |                                       |                                       |
| <b>Nb D with 1H &gt;= 180 H</b> |                                       |                                       |                                       |
| <b>Nb H &gt;= 240</b>           |                                       |                                       |                                       |
| <b>Nb D with 1H &gt;= 240 H</b> |                                       |                                       |                                       |
| <b>Nb D with 3H &gt;= 240 H</b> |                                       |                                       |                                       |

Especially high concentrations, so called 'episodes' with a life-time of a few days, are observed in urban areas when the large-scale synoptic weather situation is unfavourable for dispersion and deposition and enhanced regional concentrations are present. If the Alert value is exceeded (or expected to be exceeded) the competent authority issues a message to the general public. The assessment information needed for this message is specified in detail in the first Daughter Directive.

NB : these data can be different from the number of days when the public has been informed of the exceedances of thresholds, because the warning procedure employed by each Member State, and even by each region of a same country can be different.

There is no existing practice in reporting the reasons for exceedance. If exceedances are very rare, an elaborate analysis and report on each exceedance could be envisaged. However if a member state has to report a substantial number of exceedances it is more efficient to develop a classification of reasons for exceedances based on the occurrence of polluting activities and other information.

#### Section 5.2. : Monitoring results

*This section summarizes the results from the monitoring stations regarding to the European standards and the annual mean concentration.*

#### Section 5.3.: Middle-term trends.

The strong variability of weather conditions leads to trends of pollutant concentrations which are not only the result of emissions changes. But these "meteorological incidents" are superimposed on a general trend. It is usually easy to build a global trend on a five-year basis, or better on a 10 years basis.

These medium-term trends are a useful tool to identify recurrent problems or to reflect the influence of technological improvements or other measures taken to reduce emissions. These trends can be relevant to follow for the protection of the human health, but it can also be interesting to compare these trends on a European scale to improve the understanding of some mechanisms that determine pollutants concentrations in the atmosphere. For example, the annual mean concentrations of ozone shows a substantial increase during the last 15 years on the whole northern hemisphere. We can also identify that despite a consistent decrease of the annual NO<sub>x</sub> concentrations, NO<sub>2</sub> concentrations are rather stable at traffic locations. On the contrary, annual CO concentrations have strongly decreased and are no longer a problem.

To build these trends, annual mean concentrations are averaged on a sample of sites, on background locations on the one hand, and traffic-orientated locations on the other hand. The range of sites must be composed of a maximum number of sites with the longest dataset. When the measurements are long and numerous enough, it is better to build the trend with a constant sample of stations, that is to say that the same sites are taken to calculate the annual mean concentration. In that case, the trend is not altered by other influences than meteorological conditions and emissions changes. If it is not possible, the trend can also be built on an evaluative sample of stations, but the stations taken into account should be chosen carefully in order to have a representative trend..

In order to provide a perspective across the network, an mean from a sample of long-term sites can be averaged to produce a mean

For example, presented in figure 1 and 2 are the middle-term trend for Ozone in the Paris region and the Rijnmond region, and in tables 3 and 4 the middle-term trend is given for NO<sub>2</sub> in the Paris region and in the Rijnmond region.

### Ozone

The annual mean concentrations of O<sub>3</sub> show a substantial increase during the last 13 years. The increase is consistent during the period from 1992 to 2005, except some exceptional years such as 2003, which knew a historical heat wave in August. This increase seems to be recorded on the whole northern hemisphere. This increase of the annual mean concentration is not identified as a serious problem for human health, but it is an important data to better understand the interactions with other pollutants such as NO<sub>2</sub> for example.

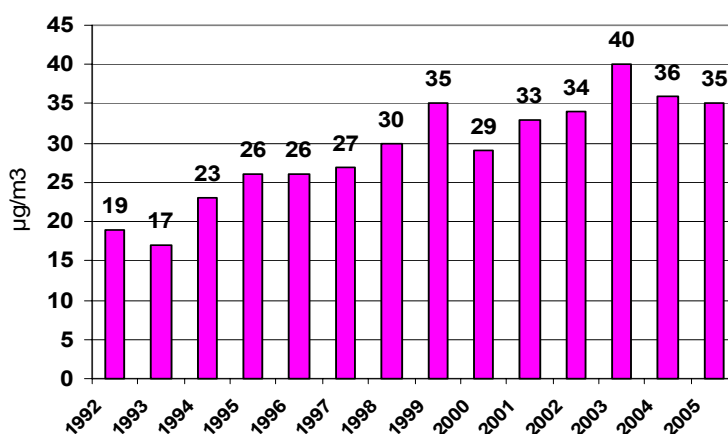


Figure 1: Annual mean concentrations of O<sub>3</sub> in Paris agglomeration (averaged on a constant sample of 3 urban background stations)

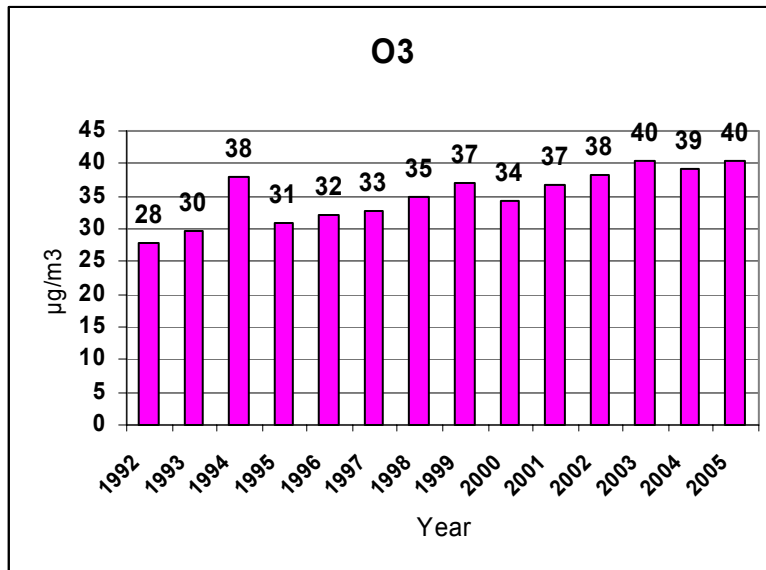


Figure 2: Annual mean concentrations of O<sub>3</sub> in the Rijnmond area (Netherlands) (averaged on a constant sample of 3 urban background stations)

### NO<sub>2</sub>

The annual mean concentrations of NO<sub>2</sub> in background locations show a regular decrease since 1999 in the Paris agglomeration (except for 2003, which was exceptionally high due to the special meteorological conditions). This is the result of reduced NO<sub>x</sub> emissions due to technological improvements in the vehicle fleet, such as catalytic converters. In Rijnmond there is less decrease of NO<sub>2</sub> concentrations between 1992 and 2005. That only a small decrease is seen is because the total concentration of NO<sub>2</sub> is largely dependant on the rising O<sub>3</sub> concentrations and not the decreasing NO<sub>x</sub> concentrations.

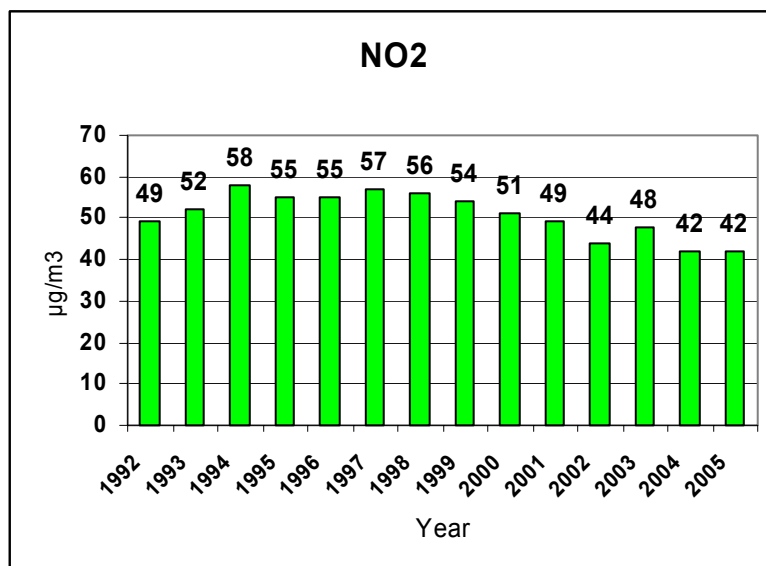


Figure 3: Annual mean concentrations of NO<sub>2</sub> in Paris agglomeration (averaged on a constant sample of 3 urban background stations)

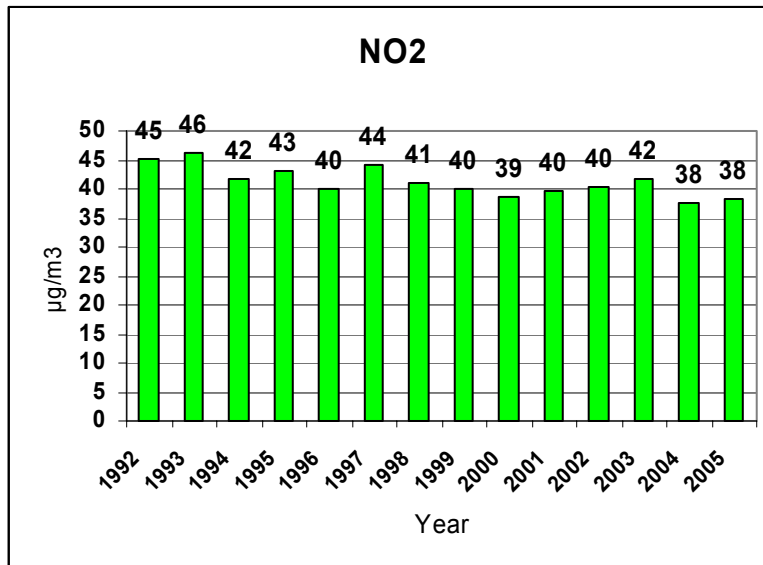


Figure4: Annual mean concentrations of NO<sub>2</sub> in the Rijnmond area (Netherlands) (averaged on a constant sample of 3 urban background stations)

By comparing these tables from several cities, it can be established what are local trends and what are national and international trends in pollutants.

In this section, you just have to fill the tables, the charts will be done automatically.

Section 5.4.: Calculated exceedances of the Air Quality Standards (OPTION C).

**PM**

# Annexes

## Annex 1 Description of the CITEAIR project

### Introduction

The development of Europe's urban centres is in many ways linked with the development of sustainable mobility options. Changes in behaviour, economic growth or recession and structure of the population are factors that have an immediate impact on transport and mobility patterns. Cities and regions are the place where the most complex challenges in transport and environment need to be solved.

Air quality has unquestionably adverse effects on human health. Because the dominant source of environmental impacts in most urban areas is traffic, local and regional authorities must find efficient and integrated solutions for their environmental and traffic problems to increase the quality of life for its citizens. The pressure on European cities and regions to implement the related EU regulations on air quality has led to a multitude of initiatives to develop a concrete sustainability perspective, which compromises between environmental quality and economic growth.

However, the absence of a common approach for the implementation of these regulations has led to isolated solutions, which requires an initiative for a) developing better solutions, b) more efficient solutions, c) solutions that go beyond the obligations of the related EU directives, d) creating synergies and e) sharing the expertise, knowledge and experiences.

The core cities Leicester (UK), Paris (FR), Prague (CZ), Rotterdam (NL), Rome (I) and most of the follower cities Munich (DE), Coventry (UK), den Hague (NL), Bratislava (SK) and Brussels (BE) have a solid base of previous and ongoing work in the area of transport and environmental management, as part of their efforts to obtain sustainable development for their regions. In most of the cities, there exists policies, an infrastructure of hardware and software tools, an excellent knowledge about environmental effects and appropriate abatement methods.

The region of Emilia-Romagna Region (I) will also be involved in the project as a Transfer Region, where better environmental and traffic solutions are required. Here, the knowledge and experiences of the core cities will be transferred.

The overall objectives of CITEAIR are:

- *to jointly develop better and more efficient solutions for assessing the impact of traffic on air quality in large urban areas using Information Society Technologies,*
- *to inform professional users and the public on the environmental situation based on common guidelines and*
- *to give guidance on efficient measures to abate adverse environmental situations through close co-operation, experience exchange and joint developments with European Cities and Regions.*

### The products

The CITEAIR project aims to support European Cities and regions in their efforts to abate adverse environmental situations and is committed to develop a variety of products. These products, briefly described below, will have the potential for a wide application, as they will meet the needs of potential users beyond the parties actually involved in the project.

The five core cities of this project developed and are operating tools integrated into a Decision Support System (DSS) that assess the environmental impacts of urban traffic in near real-time. Emilia-Romagna Region (I) has an urgent need to adopt a DSS to abate adverse environmental situations throughout the whole region. The guidebook *Transferring a traffic-environmental models chain* will analyse the procedures for transferring existing systems from the core cities to Emilia-

Romagna Region. The main component will be an implementation plan for the establishment of a DSS, meeting the needs and requirements of the Emilia-Romagna region, as well as guidance for future transfers to other European cities and regions.

The guidebook on *Air Quality Management* will propose solutions for efficient environmental management and will draw as much as possible on tried and tested experiences - derived from case studies – and where necessary identify gaps in knowledge and strategies. Solutions for reducing emissions and redistributing traffic emissions etc. will be covered, with examples of traffic demand management strategies (TDMS) and urban planning, suitable for a range of city environments.

The EU Framework Directive on ambient air quality and the Aarhus Convention on making environmental information available to the public, impose obligations on local authorities to inform the public on the environmental situation. Beyond these obligations most Cities have already put efforts into activities to inform the public via different media including the World Wide Web. The guidebook *City Annual Air Quality Reports* proposes a common reporting format. It is supported by a partly automated report generator producing reports both in English and a local language (translation not made by CITEAIR). The guidebook *Communicating Air Quality* is an introduction to communication theory and provides examples of air quality communication. Central to both the reporting and communication guidebooks is the conversion and interpretation of existing technical air quality data into accessible, interesting and comprehensible data for the public. The development of a Common Air Quality Index (described in the document *Comparing Urban Air Quality across Borders*) and the introduction of the website [www.airqualitynow.eu](http://www.airqualitynow.eu) facilitate the comparison of air quality across borders. The website [www.airqualitynow.eu](http://www.airqualitynow.eu) is a platform for cities to show easily comparable air quality data (both year averages and near real time) derived from urban background and roadside stations.

## **Annex 2: Review of cities reporting**

### **Rotterdam:**

Rotterdam's Air quality reports can be found on the DCMR (Environmental Service Rijnmond) website (<http://www.dcmr.nl>). Real time data on are given on the website. Information on emission in Rotterdam can also be found on the website. The air quality action plans for Rotterdam and the regional air quality action plans are also found on this website. All pollutants are described in the same air quality report. Separate to the air quality report action plans based on the reports are drafted.

1. Localization of excess pollution: information on the region is given in the text and as a map in the annex, Parts of the city with limit values exceedances are described in the text and in several maps in the annex. A map of the city with location of the measuring stations is not given, the limit value exceedance at these measuring stations can be found.
2. General information on the type of zone is given in the text. Useful climate data relevant data on topography etc are not given in the report. Type of measuring station is not given. Km roads with limit value exceedance are given. Population exposed to the pollutant is given.
3. The Responsible authorities: names and addresses of persons responsible for the development and implementation of improvement plans can be found in the report.
4. Nature and assessment of pollution- concentrations observed over previous years (trends) can be found in the report. Techniques used for assessment are mentioned in the txt but not in great detail.
5. Origin of pollution: list of the main emission sources responsible for pollution (map) is not given in the report but can be found in the action plan per category a total quantity of emissions from these sources (tonnes/year) is given, No separate sources are given (only industry, traffic etc) and no emission heights per source are given. Source of pollution are given in a table and pie diagram in the action plan. There is a short description of information on pollution imported from other regions in the action plan but not in the air quality report.
6. Analysis of the situation: details of those factors responsible for the excess (transport, including cross-border transport, there is a very minute description of these details in the report and a better description in the action plan. Details of possible measures are given only in the action plan. The air quality report only refers to actions described in the action plan. Effect of air quality measures on air quality in the terms of  $\mu\text{g}/\text{m}^3$  are given in the action plan. Measures already implemented are described.
7. Information is given on details of measures or projects planned or being researched for the long term in the action plan and only mentioned in the report.
8. A model has been used to estimate the km roads with exceedance of the limit values. There is a very limited description of the model, more information is needed.
9. Not only the air quality in the reporting year has been described but prognosis of the air quality situation in 2010 has also been given. The effect of the air quality measures have also been given for the years 2010, 2015 and 2010 in the action plan.

### **Paris:**

P.M.

### **The Hague:**

The Hague Air quality reports can be found on the following website : <http://www.denhaag.nl/smartsite.html?id=39321>. The air quality action plans for The Hague and the air quality action plans can also be found on this website. All pollutants are described in one air quality report. Separate to the air quality report action plans based on the reports are drafted.

1. Localization of excess pollution: information on the region is given shortly in the text. Parts of the city with limit values exceedances are described in the text and streets with exceedance are shown in tables. A map of the city with location of the measuring stations is not given, the limit value exceedance at measuring stations can not be found. Only exceedance after modelling are given.
2. General information on the type of zone is given in the text. Useful climate data relevant data on topography etc are not given in the report. Type of measuring station is not given. Km roads with limit value exceedance are given. Population exposed to the pollutant is given.

3. The Responsible authorities: names and addresses of persons responsible for the development and implementation of improvement plans can be found in the report.
4. Nature and assessment of pollution- concentrations observed over previous years (trends) can not be found in the report.
5. Origin of pollution: list of the main emission sources responsible for pollution (map) is given in the report per category. Total quantity of emissions from these sources (tonnes/year) is not given, No separate sources are given and no emission heights per source are given. There is a very short description of information on pollution imported from other regions in the action plan but not in the air quality report.
6. Analysis of the situation: details of those factors responsible for the excess (transport, including cross-border transport, there is a very minute description of these details in the report and a slightly better description in the action plan. Details of possible measures are given only in the action plan. The air quality report only refers to actions described in the action plan. Effect of air quality measures on air quality are mostly given in % reduction. Measures already implemented are not described.
7. Information is given on details of measures or projects planned or being researched for the long term in the action plan and only mentioned in the report.
8. A model has been used to estimate the km roads with exceedance of the limit values. A model has been used to calculate background concentrations in the region and a model has been used to show the air quality in the region. There is a very limited description of the model, more information is needed.
9. Not only the air quality in the reporting year has been described but prognosis of the air quality situation in 2010 has also been given. The effect of the air quality measures have also been given for the years 2010, 2015 and 2010 in the action plan.

#### **Prague:**

Prague's air quality reports are published on the local website (<http://praha-mesto.cz>) and in English (<http:envis.prague-city.cz>). Real time data for O<sub>3</sub>, PM<sub>10</sub>, SO<sub>2</sub>, NO<sub>2</sub>, NO<sub>x</sub> and measurements of benzene, toluene, ethylbenzene, metylanaxylene and ortoxylyene are given on the website ([www.premis.cz](http://www.premis.cz)).

Air quality reports are published for pollutants: NO<sub>2</sub>, PM<sub>10</sub>, O<sub>3</sub>, CO and SO<sub>2</sub> and NO<sub>x</sub>.

The Yearbook Prague Environment is printed and distributed as a publication and as a CD-ROM as well.

1. Localization of excess pollution: information about hot-spots is given in the text and tables. The yearly maps of where limit values are exceeded are published bi-annually, i.e. for year 2000, 2002, 2004 etc. A map of the city with location of the measuring stations and the limit value exceedance at these measuring stations are published every year.
2. The report provides general information on the type of climate in Prague districts. Basic information on climate data and topography etc are given in the report. Type of measuring station is given (urban industrial, background, traffic). Population exposed to the higher pollutant levels are given for concentrations of NO<sub>2</sub>, PM<sub>10</sub>.
3. The Responsible authorities: names and addresses of persons responsible for the development and implementation of air quality plans can be found in the report.
4. Nature and assessment of pollution- concentrations observed over previous years together with graphs (trends) can be found in the reports.
5. Origin of pollution: The inventory of the main emission sources responsible for pollution (map), a list is given per category (emission group, for example industries, traffic, heating). The list of main sources are given with the respective statistics of their emissions and total quantity of emissions from these sources (tonnes/year) is given in the table and the pie diagram.
6. There is no description of information on pollution imported from other regions.
7. As a part of the Air Quality Strategy an Action Plan for hot-spots has been prepared. Details of the measures or projects planned or being researched for the long term are still under internal discussion between decision-makers and experts, some information is available to public. The list of priorities for long-, and short-term measures has been set up based on environmental and financial effects for 2010 and 2015.
8. The ATEM model has been used to estimate the areas with exceedance of the limit values, especially along the communications with heavy traffic. The air quality modelling is repeated each 2nd year with tables, pie diagrams and maps of concentrations. The number of population affected by exceedance concentration values is given in pie diagrams. The background modelling is included in the model ATEM. The street level concentrations are estimated by Aeolius model.
9. Extra information is given as a comparison of measuring stations in Prague and surrounding measuring stations in Central Bohemia.

**Rome:**

P.M.

**Munich:**

The air quality report and action plan are integrated into one document. The Munich report is a 120 page document giving detailed information on most subjects. Detailed information is only given for PM<sub>10</sub> and NO<sub>2</sub>. There is a very detailed description of the current air quality situation. Modelling with scenarios of future air quality is not described. Information on the report and the measuring stations can be found at <http://www.muenchen.de/Rathaus/rgu/umweltdaten/luft/luftreinhalteplan/98045/index.html>

1. Localization of excess pollution: information on the region is given in the text and in maps traffic intensity on roads, sources of pollution etc, no map of where limit values are exceeded is given, Part of the city with limit values exceedances are described in the text, maps of areas with exceedances are provided. A map of the city with location of the measuring stations cannot be found in the report but can be found on the website and the limit value exceedance at these measuring stations can not be found in the report. General information on the type of zone is given. Useful climate data relevant data on topography etc are given in an extensive chapter, and later in the report where relevant. Type of measuring station is given (City, background, road). Km roads with limit value exceedance are given. Population exposed to the pollutant is given in the text and on a map .
2. The Responsible authorities: names and addresses of persons responsible for the development and implementation of improvement plans can be found in the report.
3. Nature and assessment of pollution- concentrations observed over previous years (trends) can be found in some detail in the report.
4. Origin of pollution: list of the main emission sources responsible for pollution (map), a list is given per category (emission group, for example road traffic, glass industry) per category a total quantity of emissions from these sources (tonnes/year) is given, Separate sources are given and emission of the largest sources are given and these emission sources can be found on a map Emission heights are given for a few sources when these sources are mentioned as a measure. Source of pollution are given in a table and pie diagram. There is a description of information on pollution imported from other regions and pollution caused by traffic in the city and in the region, and pollution caused by other sources in the city. The local background concentration are also described.
5. Analysis of the situation: details of those factors responsible for the excess (transport, including cross-border transport, there is a description of these details in the text. Details of possible measures are given in detail but their effect on air quality in the terms of µg/m<sup>3</sup> is mostly not given. Measures already implemented are also described.
6. Details of those measurements or projects for improvement which existed prior to the Directive are described.
7. A model has been used to estimate the km roads with exceedance of the limit values. There is a very limited description of the model, more information is needed. No information on background or regional modelling can be found.
8. The Munich report is very detailed.. Especially on emissions and emission factors a lot of information is given.

**Vienna:**

Vienna's air quality reports can be found on their local website (<http://www.wien.gv.at>). On the website real time data is given for O<sub>3</sub> , PM<sub>10</sub>, SO<sub>2</sub>, NO<sub>2</sub> and CO.

Vienna writes separate air quality reports for the following pollutants: NO<sub>2</sub>, PM<sub>10</sub> and SO<sub>2</sub>.

1. Localization of excess pollution: information on the region is given in the text, no map of where limit values are exceeded is given, Part of the city with limit values exceedances are roughly described in the text, no map with exceedances in the city is given. A map of the city with location of the measuring stations and the limit value exceedance at these measuring stations can be found.
2. General information on the type of zone is given. Useful climate data relevant data on topography etc are given in the report. Type of measuring station is given (City, background, road). Km roads with limit value exceedance are given. Population exposed to the pollutant is not given.
3. The Responsible authorities: names and addresses of persons responsible for the development and implementation of improvement plans can be found in the report.
4. Nature and assessment of pollution- concentrations observed over previous years (trends) can be found in some detail in the reports.

5. Origin of pollution: list of the main emission sources responsible for pollution (map), a list is given per category (emission group, for example road traffic, heating) per category a total quantity of emissions from these sources (tonnes/year) is given, No separate sources are given and no emission heights per source are given. Source of pollution are given in a table and pie diagram. No emission in tons are given. There is a short description of information on pollution imported from other regions
6. Analysis of the situation: details of those factors responsible for the excess (transport, including cross-border transport, there is a very minute description of these details. Details of possible measures are given but their effect on air quality in the terms of  $\mu\text{g}/\text{m}^3$  is not given. Measures already implemented are also described.
7. A little information is given on details of measures or projects planned or being researched for the long term.
8. A simple model has been used to estimate the km roads with exceedance of the limit values. There is a very limited description of the model, more information is needed. No information on background or regional modelling can be found.
9. Extra information is given as a comparison of measuring stations in Vienne and other measuring stations in Austria.

**Berlin:**

The air quality report and action plan are integrated into one document. This document gives a lot of detailed information on the sources of air pollution in Berlin. Real time data on air quality and extra information can be found at; <http://www.stadtentwicklung.berlin.de/umwelt/luftqualitaet/de/messnetz/>

1. Localization of excess pollution: information on the region is given in the text and in maps, several maps of where limit values are exceeded are given (maps of the city and the region), Parts of the city with limit values exceedances are described in the text, maps of areas with exceedances are provided. A map of the city with location of the measuring stations and the limit value exceedance at these measuring stations can be found on their local website but not in the report.
2. General information on the type of zone is given in a lot of detail. Useful climate data relevant data on topography etc are given in the report. Type of measuring station is given not given in the report (City, background, road). Km roads with limit value exceedance are given. Population exposed to the pollutant is not given.
3. The Responsible authorities: names and addresses of persons responsible for the development and implementation of improvement plans can be found in the report.
4. Nature and assessment of pollution- concentrations observed over previous years (trends) can be found in some detail in the report. Trends are given for several sources of pollutants.
5. Origin of pollution: list of the main emission sources responsible for pollution (map), a list is given per category (emission group, for example road traffic, industry) per category a total of emissions from these sources (tonnes/year) is given, Separate sources are given and emission of the largest sources are given and these emission sources can be found on several maps. Emission heights are not given. There is a description of information on pollution imported from other regions and pollution caused by traffic in the city and in the region, and pollution caused by other sources in the city. The local background concentration are also described.
6. Analysis of the situation: details of those factors responsible for the excess (transport, including cross-border transport, there is a description of these details in the text, in figures and on maps. Details of emissions are given in detail and their effect on air quality in the terms of  $\mu\text{g}/\text{m}^3$  is mostly given. Measures are described.
7. A little information is given on details of measures or projects planned or being researched for the long term.
8. A model has been used to estimate the km roads with exceedance of the limit values. Models have been used for background concentration map. Models have been used for a map with regional concentrations. There is a description of the model, a little more information is needed.
9. Trends are given for several sources. Comparisons with other German towns have been made. Trends have been used to make predictions of the sources in the future.

**Leicester:**

Leicester's air quality reports can be found on their local website (<http://www.leicester.gov.uk/your-council--services/ep/environmental-health--licensing/pollution-control/air-quality/review>). Real time data can be found on the website for: O<sub>3</sub>, PM<sub>10</sub>, SO<sub>2</sub>, NO<sub>2</sub> and CO as well as a 3-day forecast. Also pollution data on asbestos, contaminated land, noise and water can be found on the Leicester City Council website. Action plans for air quality of Leicester city and surrounding region are located on the website alongside air quality management and review section.

1. Localization of excess pollution: Detailed localization of pollution sources (hot spots) information is given for each pollutant in the report. Maps of the designated areas show those hotspots. Also list of roads with heavy traffic. The real time data is available on <http://rcweb.leicester.gov.uk/pollution/asp/home.asp> and <http://www.leicesterequal.co.uk/>
2. General information on the type of zone is given. No additional information is given for population numbers in particular zones. The map shown indicates the administrative areas of City Council from which we can obtain the number of population in particular area. Zones are described in a text and general information on the type of zone is given. The importance of meteorological data is stressed in the report, as well as the impact of topographical data. Measuring stations are described in a great detail and their positions are described on maps provided for each pollutant. The limitations and quality control measurements for each type of station are also described.
3. The Responsible authorities: names and addresses of persons responsible for the development and implementation of improvement plans can be found in the report.
4. The Nature of the pollutants is described in detail in the report along with the best ways to measure them. Previous data collected by Leicester City Council is also available in the report so comparison can be carried out.
5. Origin of pollution: Origin of each pollutant is described in detail and pollution map is provided with measuring stations indicated. The detailed data is given for each pollutant indicating the year, exceedance, highest and lowest measurement recorded per period measured i.e. an hour, 24 hours etc. Studies and computer modelling carried out on each pollutant are also presented in the report. Background pollution is also taken into consideration for the models applied.
6. Analysis of the situation: Data collected is presented in the form of tables and graphs; containing information dating no more than 10 years back. Leicester City Council has measured air pollution since 1950s and is keen to implement new strategies for reducing air pollution
7. Information is given on details of measures or projects planned or being researched for the long term.
8. Extensive computer modelling is used in Leicester to predict if the pollution levels will exceed national limits. Airviro and ADMS-urban modelling systems are used. Detailed information is available in the report about models applied, quality control, time intervals at which measurements are taken.

**Annex 3: Proposed Citeair reporting template**

This page contains a number of macro's that help you run the report.

Empty cells coloured red can be filled, **red text** can be replaced. To remove a red cell you don't want to fill: type a space

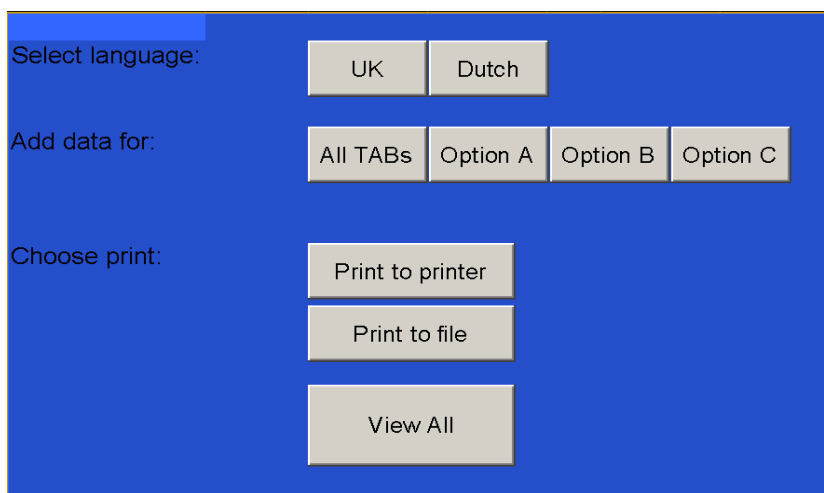
As explained in the Air Quality Guidebook, the aim of this report is to propose a common template for reporting, in order to compare more easily the air quality of the different cities. The choices made by CITEAIR and recommendations are detailed in the Guidebook. The template can be filled out online or through a Word file. Depending on the city abilities, three options are offered:

**Option A:** minimum required information to be provided to meet the EU directives

**Option B:** additional information needed for the municipality/agglomeration to establish a simplified diagnosis of its air quality as first step for an action plan

**Option C:** CITEAIR's proposal for a detailed report as complete diagnosis of the city's situation to be used for an action plan

Some data are supposed to be updated every year (results from monitoring stations). Other data (general data on the city, emissions data...) should be filled out once, and then updated only when new data are available.



**Replace citeair  
logo with your  
city logo**

**Air quality annual report  
20xx**

**name of your municipality  
name of your country  
name of region**

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  - 5.6. Other measurements not mandatory but of interest (OPTION C)
  - 5.7. Prospects for 2010 or later (OPTION C)

## 1. Introduction

Air quality report for                      name of your municipality                      for the year    20xx

According to the EU Framework Directive 96/62/EC on ambient air quality assessment and management and its daughter directives, all local authorities are required to periodically review and assess air quality in their areas against health based objectives prescribed by the national government. Where it is found that the objective levels are unlikely to be met, local authorities must draw up air quality action plans for improving air quality in those areas.

This report shows if the municipality or agglomeration has met the air quality standards of the EU directive for Nitrogen dioxide (NO<sub>2</sub>), Particular matter (PM<sub>10</sub>), Ozone (O<sub>3</sub>), Carbon monoxide (CO), Sulphur dioxide (SO<sub>2</sub>), Benzene (C<sub>6</sub>H<sub>6</sub>), Lead (Pb), Arsenic, Nickel, Cadmium and Benzo(a)pyrene. Calculations are mainly carried out in those locations that are suspected to have exceedences of the air quality standards from the EU directive. PM<sub>2.5</sub> has also already been included, as its measurement is recommended by the directives and will probably become mandatory and the following table will be modified according to the new directive once published.

Some data are supposed to be updated every year (results from monitoring stations). Other data (general data on the city, emissions data...) don't change substantially from year to year and are only updated when new data are available.

This is a standard report with predefined sections. The basic report contains the data necessary to fulfil the information requirements as described in the EU directives. Options B. and C. contain complementary data needed to get a full picture of the air quality situation and problems. Options B. and C. may, or may not be filled, according to information availability

Author                      **inset authors names**  
Contact adress: **Street**  
                                 **City**  
                                 **zipp code**  
                                 **country**  
Phone                      **phone number**  
Email                      **email adress**

This report was produced with the report generator developed in the CITEAIR project, with financial support from Interreg IIIc. By Veronique Ghersi, Sylke Davison, Karine Léger and Sef van den Elshout.



## 2. General data concerning the municipality/agglomeration and its surroundings

This chapter summarizes general data related to geographical and meteorological conditions of the municipality/agglomeration and its surroundings which impact the air quality of the area considered and must thus be taken into account.

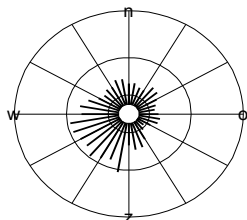
### 2.1. General data on the municipality/agglomeration and its surroundings

|  |   |
|--|---|
| Type of area   | Industrial/Urban  |
| Number of inhabitants  | 1,4 million   |
| Surface (km <sup>2</sup> )                                     | 720 km <sup>2</sup>   |
| Density of inhabitants (inhab/km <sup>2</sup> ) :              |   |
| Urban area   | 1944 inhab/km <sup>2</sup>  |
| Rural area   | None  |
| Municipal subdivision  | Not available   |
| Type of surroundings   | Not available   |
| <b>OPTION C :</b>  |   |
| Important topographical data                                   |   |
| Elevation  | < 0 m   |
| Latitude longitude   |   |
| Planned spatial developments or modification in infrastructure | Several motorway developments, Port extension: Maasvlakte 2 from 2010 onward. |

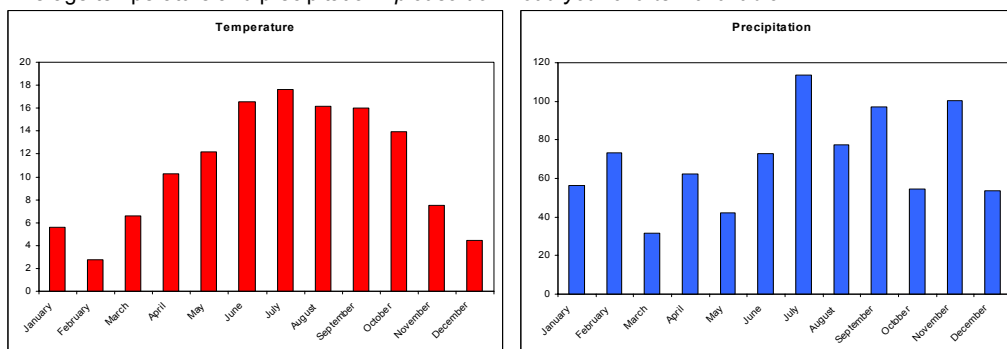
### 2.2. Climate and geographical data (OPTION A)

|   |                       |
|---|-----------------------|
| Main climate and meteorological features              | Sea climate           |
| Prevailing winds                                      | South west            |
| Average annual precipitation                          | Average = 835 mm      |
| Annual average wind speed / higher/lower than average | 4 m/s = Dutch average |

Description of the prevailing winds : *please download the wind compass if available*



Average temperature and precipitation : *please download your charts if available*



### 2.3. Established/pursued environmental policy (OPTION C)

Established co-operation bond with/between municipality/agglomeration(s) and/or the national level :

Cooperation between Rotterdam, Ministry of Environment, ROM-Rijnmond, DCMR-EPA, Port of Rotterdam, Ministry of Transport, Stadregio Rotterdam, Province of South Holland:

Documents describing policy regarding air quality (main points of interest, references):

Air quality policy is government by national legislation ("Het besluit Luchtkwaliteit") and provincial and local policy documents. Currently there are policy documents on PM10 and odour (the latter both at the provincial and local level). The PM10 policy focusses on abatement of PM10 emissions by the oil refineries by the year 2007, and abatement of fugitive dust emissions in the transshipment sector.

Established air quality plan

Name of the plan:

Date of issue:

20xx

Body in charge of its establishments : ROM-RIJNMOND

Website where it can be consulted : <http://www.rom-rijnmond.nl/english/projecten/milieu/index.html#air>

Main reduction measures implemented :

Main measures already carried out or taken into action according to the air quality action plan or differently :

Measure 1: Clean public transport (buses)

Measure 2: Clean municipal vehicle fleet

Measure 3: Park and ride measures

Results:

### 3. Sources of air pollution to be examined locations in the municipality / agglomeration

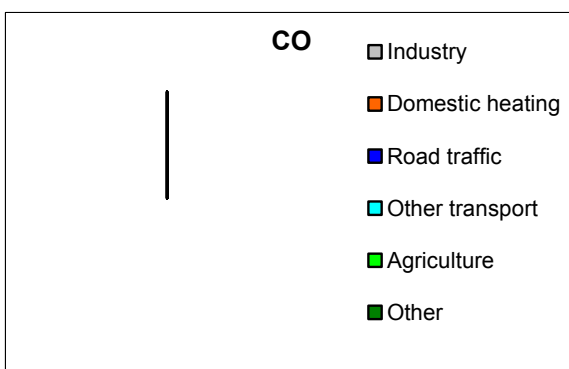
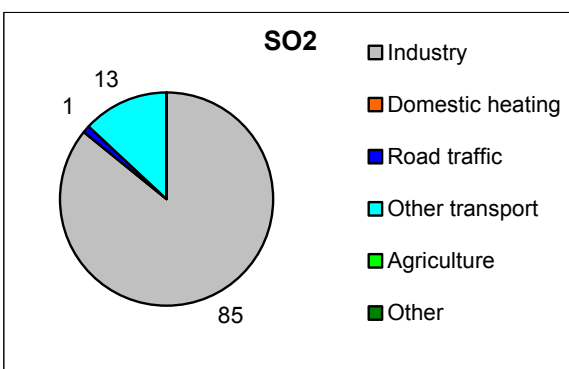
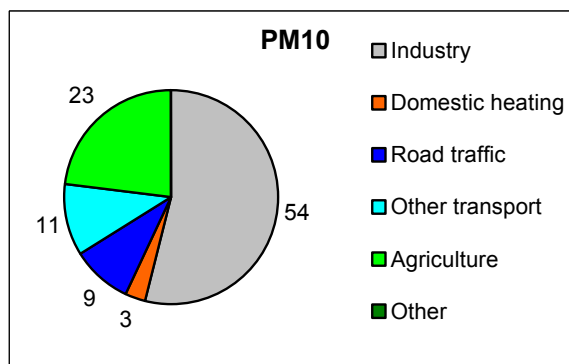
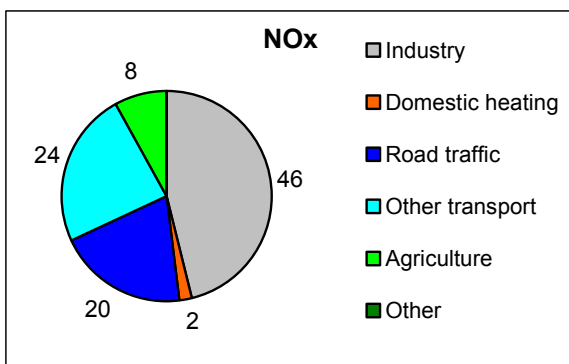
This chapter, presents the main sources of air pollution within the municipality/agglomeration.

#### 3.1. Contribution of the main pollution sources to the annual emissions

The sectors are defined according to the SNAP codes of CORINEAIR :

|                        |           |   |
|------------------------|-----------|---|
| <b>Industry</b>        | refers to | Refineries, powerplants, waste processing |
| <b>Road traffic</b>    | refers to | Cars and trucks                           |
| <b>Other transport</b> | refers to | Shipping                                  |
| <b>Agriculture</b>     | refers to | Greenhouses and cattle breeding           |
| <b>Other</b>           | refers to |   |

| Pollution sources : | Contribution to the annual emissions (%) |      |     |    |
|---------------------|--|------|-----|----|
|                     | NOx                                      | PM10 | SO2 | CO |
| Industry            | 46                                       | 54   | 85  |    |
| Domestic heating    | 2  | 3    |     |    |
| Road traffic        | 20                                       | 9    | 1   |    |
| Other transport     | 24                                       | 11   | 13  |    |
| Agriculture         | 8  | 23   |     |    |
| Other               |  |      |     |    |



### 3.2. Point sources in the municipality/agglomeration (OPTION B)

Describe your top five point sources:

| Name | Location | Pollutant | Annual emission | Emission height | Emission period |
|------|----------|-----------|-----------------|-----------------|-----------------|
|      |          |           |                 |                 |                 |
|      |          |           |                 |                 |                 |
|      |          |           |                 |                 |                 |
|      |          |           |                 |                 |                 |

If available insert a map.

### 3.3. Major roads and fleet composition (OPTION B)

Describe your five most busy streets:

| Name of the street | Traffic intensity (## / 24h) | % 2-wheelers | % Private cars |
|--------------------|------------------------------|--------------|----------------|
|                    |                              |              |                |
|                    |                              |              |                |
|                    |                              |              |                |
|                    |                              |              |                |

general fleet composition

| Euro class | % |
|------------|---|
| pre 1      |   |
| 1          |   |
| 2          |   |
| 3          |   |
| 4          |   |

If available insert a map.



#### 4.2 Modelling (OPTION A)

Describe here your modelling tools (type of the model (statistical, deterministic model...), name of the model, ownership, website where a detailed description is available)

Background locations :

CAR, URBIS, Pluimsnelweg

Traffic orientated locations :

CAR, URBIS, Pluimsnelweg

Industrial locations :

CAR, URBIS, Pluimsnelweg

#### 4.3. Measurement methods (OPTION B)

| Pollutant                           | Measurement method  | Other possible method measurement   |
|-------------------------------------|---|---|
| Sulphur dioxide (SO <sub>2</sub> )  | UV fluorescence   |   |
| Nitrogen dioxide (NO <sub>2</sub> ) | Chemiluminescence   |   |
| Particulate Matter (PM10)           | Measurement method : TEOM<br>Correction factor (yes/no) : YES<br>Factor or method : 1.3 | Measurement method : gravimetric<br>Correction factor (yes/no) : no<br>Factor or method : KFG |
| Particulate Matter (PM2.5)          | TEOM  |   |
| Pollutant                           | gaschromatograph (SYNTECH)  |   |
| Carbon monoxide (CO)                | Gas filter correlation  |   |
| Ozone (O <sub>3</sub> )             | Ultraviolet Light Absorption  |   |
| Lead (Pb)                           | HVS filter method   |   |
| BaP                                 | HVS filter method   |   |
| As, Ni, Cd                          | HVS filter method   |   |

#### 4.4. Preliminary assessment (OPTION B)

Here is the summary of the situation of each zone towards the assessment thresholds, as described in the Air Quality Guidebook

| Five year basis :<br>2001 / 2005         | Summary of exceedances of assessment thresholds |                  |       |                      |                  |       |                      |                  |       |                      |                  |       |
|--|---|------------------|-------|----------------------|------------------|-------|----------------------|------------------|-------|----------------------|------------------|-------|
|  | <i>Rijnmond</i>                                 |                  |       | <i>Zone 2 (name)</i> |                  |       | <i>Zone 3 (name)</i> |                  |       | <i>Zone 4 (name)</i> |                  |       |
| Pollutant                                | <= LAT  | > LAT and <= UAT | > UAT | <= LAT               | > LAT and <= UAT | > UAT | <= LAT               | > LAT and <= UAT | > UAT | <= LAT               | > LAT and <= UAT | > UAT |
| Sulphur dioxide (SO <sub>2</sub> )       | 7   | 2                | 0     |                      |                  |       |                      |                  |       |                      |                  |       |
| Nitrogen dioxide (NO <sub>2</sub> )      | 0   | 0                | 6     |                      |                  |       |                      |                  |       |                      |                  |       |
| Particulate Matter (PM10)                | 0   | 0                | 5     |                      |                  |       |                      |                  |       |                      |                  |       |
| Benzene (C <sub>6</sub> H <sub>6</sub> ) | 1   | 6                | 0     |                      |                  |       |                      |                  |       |                      |                  |       |
| Carbon monoxide (CO)                     | 2   | 0                | 0     |                      |                  |       |                      |                  |       |                      |                  |       |
| Lead (Pb)                                | 5   | 0                | 0     |                      |                  |       |                      |                  |       |                      |                  |       |
| BaP                                      | 1   | 0                | 0     |                      |                  |       |                      |                  |       |                      |                  |       |
| As, Ni, Cd                               | 5   | 0                | 0     |                      |                  |       |                      |                  |       |                      |                  |       |
| SO <sub>2</sub> ecosystems               | 0   | 2                | 7     |                      |                  |       |                      |                  |       |                      |                  |       |
| NOx vegetation                           | 0   | 0                | 6     |                      |                  |       |                      |                  |       |                      |                  |       |

UAT = Upper Assessment Threshold  
LAT = Lower Assessment Threshold

The location of the monitoring stations can be shown (please download your map):

## 5. Results and appraisal (OPTION A & B)

In this chapter a successive overview will be given of the concentrations and the exceedances of the limit values and margins of tolerance for the pollutants : NO<sub>2</sub>, PM<sub>10</sub>, O<sub>3</sub>, CO, SO<sub>2</sub>, benzene, lead, Arsenic, Cadmium, Nickel and BaP. PM<sub>2.5</sub> has already been included, as its measurement is recommended by the directives. It will soon become mandatory and the following table will be modified according to the new directive once published.

Section 5.1. summarizes the number of exceedances of the limit values and limit values plus margin of tolerance, assessed by measured results.

Section 5.2. summarizes the results from the monitoring stations regarding to the European standards

Section 5.3. deals with middle-term trends.

Section 5.4. summarizes the calculated exceedances.

### OPTION A: minimum requirements

- summary of the number of exceedances of the Air Quality Standards (NO<sub>2</sub>, PM<sub>10</sub>, O<sub>3</sub>, CO, SO<sub>2</sub>, Benzene, Lead, As, Ni, Cd, BaP, PM<sub>2.5</sub>)

### OPTION B: data interesting in order to assess and compare the air quality in the different cities

- results of the monitoring stations regarding to the Air Quality Standards and the annual mean

### OPTION C: additional information not mandatory but need to establish a diagnosis of the situation as basis of an action plan

- Middle-term trends

- Calculated exceedances of the Air Quality Standards

- Maps of annual mean concentration

- Other measurements not mandatory but of interest

- Prospects for 2010 or later

### 5.1. Summary of the number of exceedances of the Air Quality Standards (OPTION A)

Situation towards the European limit values have been assessed for every monitoring station described in part 4.2. Here are summarized the numbers of stations in each zone where concentrations have exceeded the limit value with and without the margin of tolerance.

#### Glossary

LV = Limit Value  
 LV + MoT = Limit Value plus Margin of Tolerance  
 TV = Target Value  
 LTO = Long Term Objective  
 CC + MoT = Concentration Cap plus Margin of Tolerance

"Nb D > LV" annual number of daily means greater than the limit value

"Nb H > XX" annual number of hourly means greater than the limit value

"Nb D > 120 8H" = annual number of days with the maximum 8-hour mean greater than 120 µg/m<sup>3</sup>

"Nb D with 1H >= XX H" annual number of days with at least one hourly mean equal or greater than XX µg/m<sup>3</sup>

"Nb D with 3H >= XX H" annual number of days with at least three consecutive hourly means equal or greater than XX µg/m<sup>3</sup>

XX/YY

XX = number of monitoring stations of this type where the threshold is exceeded

YY = total number of monitoring stations of this type in the zone

Example :

| Type of location | Annual Mean > LV |
|------------------|------------------|
| Urban background | 3/12             |

means that 3 urban stations from the 12 urban stations in this zone are above the limit value for the annual mean

### 5.1.1. Nitrogen Dioxide (NO<sub>2</sub>)

| Limit values | Hourly Mean<br>LV + MoT          | Annual Mean<br>LV + MoT         | Percentile 98 1 hour<br>LV  |
|--------------|----------------------------------|---------------------------------|-----------------------------|
| 2001         | 290 µg/m <sup>3</sup>            | 58 µg/m <sup>3</sup>            | <b>200 µg/m<sup>3</sup></b> |
| 2002         | 280 µg/m <sup>3</sup>            | 56 µg/m <sup>3</sup>            |                             |
| 2003         | 270 µg/m <sup>3</sup>            | 54 µg/m <sup>3</sup>            |                             |
| 2004         | 260 µg/m <sup>3</sup>            | 52 µg/m <sup>3</sup>            |                             |
| 2005         | 250 µg/m <sup>3</sup>            | 50 µg/m <sup>3</sup>            |                             |
| 2006         | 240 µg/m <sup>3</sup>            | 48 µg/m <sup>3</sup>            |                             |
| 2007         | 230 µg/m <sup>3</sup>            | 46 µg/m <sup>3</sup>            |                             |
| 2008         | 220 µg/m <sup>3</sup>            | 44 µg/m <sup>3</sup>            |                             |
| 2009         | 210 µg/m <sup>3</sup>            | 42 µg/m <sup>3</sup>            |                             |
| 2010         | <b>LV = 200 µg/m<sup>3</sup></b> | <b>LV = 40 µg/m<sup>3</sup></b> |                             |

The table below summarizes the number of monitoring stations where the NO<sub>2</sub> concentration has exceeded the limit value or the limit value plus the margin of tolerance

| Zone Name                            | Type of location<br>(eg : background, traffic,<br>industrial...) | Hourly Mean |       | Annual Mean |       | Percentile 98<br>1 hour |
|--------------------------------------|--|-------------|-------|-------------|-------|-------------------------|
|                                      |  | > LV + MoT  | >LV   | > LV + MoT  | >LV   | >LV                     |
| <b>Zone 1</b><br><i>Rijnmond</i>     | Urban Background   | 00/03       | 00/03 | 00/03       | 01/03 | 00/03                   |
|                                      | Traffic  | 00/02       | 00/02 | 02/02       | 02/02 | 00/02                   |
|                                      | Street   | 00/01       | 00/01 | 00/01       | 01/01 | 00/01                   |
| <b>Zone 2</b><br>(precise which one) |  |             |       |             |       |                         |
|                                      |  |             |       |             |       |                         |
|                                      |  |             |       |             |       |                         |
| <b>Zone 3</b><br>(precise which one) |  |             |       |             |       |                         |
|                                      |  |             |       |             |       |                         |
|                                      |  |             |       |             |       |                         |

With respect to the report of last year, the amount of locations with exceedance of the annual limit value have increased / decreased :

No change.

The main reasons why the limit values concerning NO<sub>2</sub> has been exceeded are :

The traffic stations are under the influence of road traffic.

If necessary, name of the zone(s) where the annual mean concentration of NO<sub>x</sub> is above the critical level for the protection of vegetation (30 µg/m<sup>3</sup>):

### 5.1.2. Particulate Matter (PM10)

| Limit values | Daily Mean<br>LV + MoT    | Annual Mean<br>LV + MoT   |
|--------------|---------------------------|---------------------------|
| 2001         | 70 µg/m <sup>3</sup>      | 46 µg/m <sup>3</sup>      |
| 2002         | 65 µg/m <sup>3</sup>      | 44 µg/m <sup>3</sup>      |
| 2003         | 60 µg/m <sup>3</sup>      | 43 µg/m <sup>3</sup>      |
| 2004         | 55 µg/m <sup>3</sup>      | 41 µg/m <sup>3</sup>      |
| 2005         | LV = 50 µg/m <sup>3</sup> | LV = 40 µg/m <sup>3</sup> |

The table below summarizes the number of monitoring stations where the PM10 concentration has exceeded the limit value (no more Margin of Tolerance since 2005)

| Zone Name                            | Type of location<br>(eg : background, traffic,<br>industrial...) | Daily Mean | Annual Mean |
|--------------------------------------|--|------------|-------------|
|                                      |  | > LV       | >LV         |
| Zone 1<br><i>Rijnmond</i>            | Urban Background   | 00/03      | 00/03       |
|                                      | Traffic  | 00/02      | 00/02       |
| Zone 2<br><i>(precise which one)</i> |  |            |             |
|                                      |  |            |             |
|                                      |  |            |             |
| Zone 3<br><i>(precise which one)</i> |  |            |             |
|                                      |  |            |             |
|                                      |  |            |             |

Please precise if data are corrected or not, and if yes, what kind of correction factor is used :

With respect to the report of last year, the amount of locations with exceedance of the annual limit value have increased / decreased :

No change.

The main reasons why the limit values concerning PM10 has been exceeded are :

N/A

### 5.1.3. Particulate Matter (PM2.5)

| Concentration Cap | Annual mean<br>CC + MoT   |
|-------------------|---------------------------|
| 2010              | CC = 25 µg/m <sup>3</sup> |

The table below summarizes the number of monitoring stations where the PM2.5 concentration has exceeded the concentration cap or the concentration cap plus Margin of Tolerance

| Zone Name                            | Type of location<br>(eg : background, traffic,<br>industrial...) | Annual Mean |
|--------------------------------------|--|-------------|
|                                      |  | >CC         |
| Zone 1<br><i>Rijnmond</i>            | Urban background   | 00/03       |
|                                      |  |             |
| Zone 2<br><i>(precise which one)</i> |  |             |
|                                      |  |             |
|                                      |  |             |
| Zone 3<br><i>(precise which one)</i> |  |             |
|                                      |  |             |
|                                      |  |             |

#### 5.1.4. Ozone (O<sub>3</sub>)

| TV and LTO                | Target Value  | Long Term Objective       |
|---------------------------|---|---------------------------|
| Maximum daily 8-hour mean | 120 µg/m <sup>3</sup> not to be exceeded on more than 25 days per calendar year averaged over 3 years | 120 µg/m <sup>3</sup>     |
| AOT40 (May to July)       | 18000 µg/m <sup>3</sup> .h averaged over 5 years  | 6000 µg/m <sup>3</sup> .h |

The table below summarizes the number of monitoring stations where the O<sub>3</sub> concentration has exceeded the Target Value and the Long Term Objective

| Zone Name                     | Type of location<br>(eg : background, traffic, industrial...) | Protection of human health<br>Nb D > 120 8H |       | Protection of vegetation<br>AOT veg. |       |
|-------------------------------|---|---|-------|--------------------------------------|-------|
|                               |   | > TV  | > LTO | > TV                                 | > LTO |
| Zone 1<br><i>Rijnmond</i>     | Urban background  | 00/03                                       | 03/03 | 00/03                                | 00/03 |
|                               |   |   |       |                                      |       |
| Zone 2<br>(precise which one) |   |   |       |                                      |       |
|                               |   |   |       |                                      |       |
| Zone 3<br>(precise which one) |   |   |       |                                      |       |
|                               |   |   |       |                                      |       |

The main reasons why the Target Values concerning O<sub>3</sub> has been exceeded are :

No target value has been exceeded

The table below summarizes the exceedances of information and alert thresholds for ozone

|                       | Zone 1<br>Rijnmond | Zone 2<br>(precise which one) | Zone 3<br>(precise which one) |
|-----------------------|--------------------|-------------------------------|-------------------------------|
| Nb H >= 180           | 16                 |                               |                               |
| Nb D with 1H >= 180 H | 4                  |                               |                               |
| Nb H >= 240           | 1                  |                               |                               |
| Nb D with 1H >= 240 H | 1                  |                               |                               |
| Nb D with 3H >= 240 H | 1                  |                               |                               |

#### 5.1.5. Carbon monoxide (CO)

The table below summarizes the number of monitoring stations where the CO concentration has exceeded the limit value

| Zone Name                     | Type of location<br>(eg : background, traffic, industrial...) | Max daily 8-hour mean<br>LV = 10000 µg/m <sup>3</sup><br>> LV |
|-------------------------------|---|---|
| Zone 1<br><i>Rijnmond</i>     | Traffic   | 00/01   |
|                               | Street  | 00/01   |
| Zone 2<br>(precise which one) |   |   |
|                               |   |   |
| Zone 3<br>(precise which one) |   |   |
|                               |   |   |

### 5.1.6. Sulphur dioxide (SO<sub>2</sub>)

| Limit Values | Hourly mean<br>LV + MoT    |                       | Daily mean<br>LV   |
|--------------|----------------------------|-----------------------|--|
|              | 2001                       | 470 µg/m <sup>3</sup> | not to be exceeded more than<br>24 times a calendar year |
| 2002         | 440 µg/m <sup>3</sup>      |                       |  |
| 2003         | 410 µg/m <sup>3</sup>      |                       |  |
| 2004         | 380 µg/m <sup>3</sup>      |                       |  |
| 2005         | LV = 350 µg/m <sup>3</sup> |                       |  |

The table below summarizes the number of monitoring stations where the SO<sub>2</sub> concentration has exceeded the limit values (no more margin of tolerance since 2005)

| Zone Name                     | Type of location<br>(eg : background, traffic, industrial...) | Protection of human health |            | Protection of vegetation |                        |
|-------------------------------|---|----------------------------|------------|--------------------------|------------------------|
|                               |   | Nb H > 350                 | Nb D > 125 | Annual mean              | Winter mean            |
|                               |   | > LV                       | > LV       | > 20 µg/m <sup>3</sup>   | > 20 µg/m <sup>3</sup> |
| Zone 1<br>Rijnmond            | Industry  | 01/06                      | 01/06      | 00/06                    | 00/06                  |
|                               | Urban Background  | 00/03                      | 00/03      | 00/03                    | 00/03                  |
| Zone 2<br>(precise which one) |   |                            |            |                          |                        |
| Zone 3<br>(precise which one) |   |                            |            |                          |                        |

The main reasons why the limit value concerning SO<sub>2</sub> has been exceeded are :

One of our stations is in the neighborhood of a refinery. At the moment of the exceedance there were some troubles with the processing.

### 5.1.7. Benzene (C<sub>6</sub>H<sub>6</sub>)

| Limit value | Annual mean<br>LV + MoT  |
|-------------|--------------------------|
| 2001-2005   | 10 µg/m <sup>3</sup>     |
| 2006        | 9 µg/m <sup>3</sup>      |
| 2007        | 8 µg/m <sup>3</sup>      |
| 2008        | 7 µg/m <sup>3</sup>      |
| 2009        | 6 µg/m <sup>3</sup>      |
| 2010        | LV = 5 µg/m <sup>3</sup> |

The table below summarizes the number of monitoring stations where the benzene concentration has exceeded the limit value or the limit value plus Margin of tolerance

| Zone Name                     | Type of location<br>(eg : background, traffic, industrial...) | Annual Mean |       |
|-------------------------------|---|-------------|-------|
|                               |   | > LV + MoT  | > LV  |
| Zone 1<br>(precise which one) | Urban Background  | 00/03       | 00/03 |
|                               | Traffic   | 00/02       | 00/02 |
|                               | Street  | 00/01       | 00/01 |
| Zone 1<br>(precise which one) |   |             |       |
| Zone 1<br>(precise which one) |   |             |       |

### 5.1.8. Lead (Pb)

The table below summarizes the number of monitoring stations where the benzene concentration has exceeded the limit value (no more margin of tolerance since 2002)

| Zone Name                     | Type of location<br>(eg : background, traffic, industrial...) | Annual Mean<br>LV = 0.5 µg/m <sup>3</sup><br>> LV |
|-------------------------------|---|---|
| Zone 1<br>(precise which one) | Industry  | 00/03   |
|                               | Street  | 00/01   |
|                               | Rural   | 00/01   |
| Zone 1<br>(precise which one) |   |   |
|                               |   |   |
|                               |   |   |
| Zone 1<br>(precise which one) |   |   |
|                               |   |   |
|                               |   |   |

### 5.1.9. Heavy metals (As, Ni, Cd) and BaP

The table below summarizes the number of monitoring stations where the heavy metals and BaP concentration has exceeded the target values

| Zone Name                     | Type of location<br>(eg : background, traffic, industrial...) | As                               | Cd                               | Ni                                | BaP                              |
|-------------------------------|---|----------------------------------|----------------------------------|-----------------------------------|----------------------------------|
|                               |   | Annual Mean                      | Annual Mean                      | Annual Mean                       | Annual Mean                      |
|                               |   | TV = 6 ng/m <sup>3</sup><br>> TV | TV = 5 ng/m <sup>3</sup><br>> TV | TV = 20 ng/m <sup>3</sup><br>> TV | TV = 1 ng/m <sup>3</sup><br>> TV |
| Zone 1<br><i>Rijnmond</i>     | Industry  | 00/01                            | 00/03                            | 00/01                             |                                  |
|                               | Street  | 00/01                            | 00/01                            | 00/01                             | 00/01                            |
|                               | Rural   |                                  | 00/01                            |                                   |                                  |
| Zone 1<br>(precise which one) |   |                                  |                                  |                                   |                                  |
|                               |   |                                  |                                  |                                   |                                  |
|                               |   |                                  |                                  |                                   |                                  |
| Zone 1<br>(precise which one) |   |                                  |                                  |                                   |                                  |
|                               |   |                                  |                                  |                                   |                                  |
|                               |   |                                  |                                  |                                   |                                  |

The main reasons why the target values have been exceeded are :

No target values have been exceeded.





### 5.2.8. Lead

| Station name     | Annual mean | % of valid data |
|------------------|-------------|-----------------|
| Hoek van Holland | 9.3         | 88              |
| Oostvoorne       | 7.6         | 63              |
| Vasteland        | 11.3        | 52              |
| Vlaardingen      | 10.3        | 66              |
| Markweg          | 8.3         | 73              |
|                  |             |                 |
|                  |             |                 |
|                  |             |                 |
|                  |             |                 |

### 5.2.9. Heavy metals (As, Cd, Ni) and BaP

| Station name     | As Annual mean | Cd Annual mean | Ni Annual mean | % of valid data | BaP Annual mean | % of valid data |
|------------------|----------------|----------------|----------------|-----------------|-----------------|-----------------|
| Hoek van Holland |                | 0.30           |                | 88              |                 |                 |
| Oostvoorne       |                | 0.30           |                | 63              |                 |                 |
| Vasteland        | 1.63           | 0.27           | 3.9            | 52              | 0.08            | 77              |
| Vlaardingen      | 1.63           | 0.30           | 9.5            | 66              |                 |                 |
| Markweg          |                | 0.26           |                | 73              |                 |                 |
|                  |                |                |                |                 |                 |                 |
|                  |                |                |                |                 |                 |                 |
|                  |                |                |                |                 |                 |                 |
|                  |                |                |                |                 |                 |                 |

## 5. Results and appraisal (OPTION C)

### 5.3 Middle term trends (OPTION C)

#### 5.3.1. Background locations

| Please precise constant sample (precise number of stations) or evolutive sample | NO2/NOx | O3 | SO2 | Benzene | PM10 | PM2.5 |
|---|---------|----|-----|---------|------|-------|
|   | 3       | 3  | 3   | 3       | 3    | 2     |

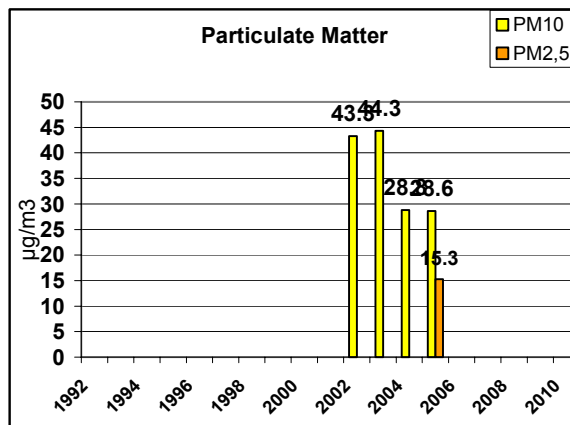
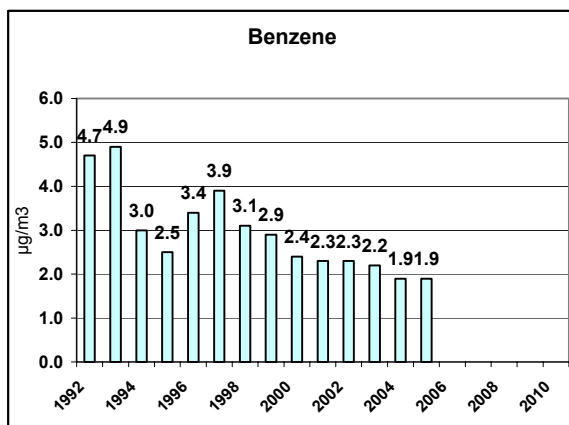
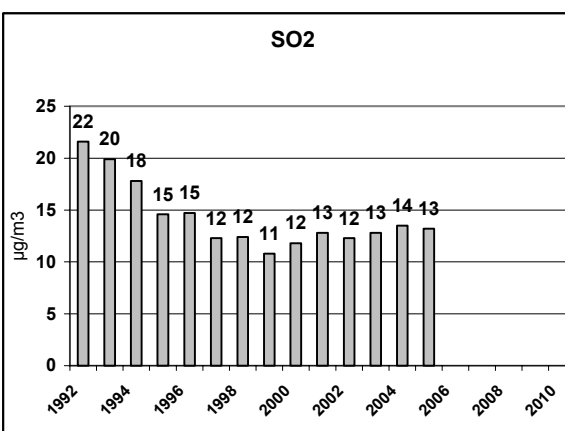
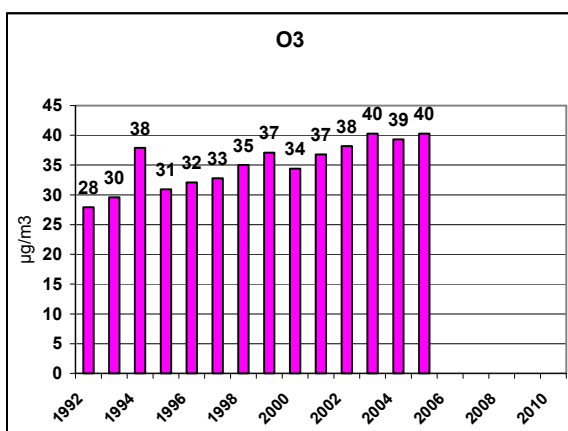
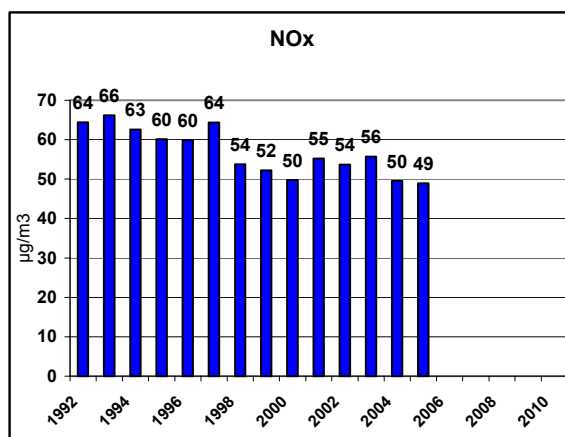
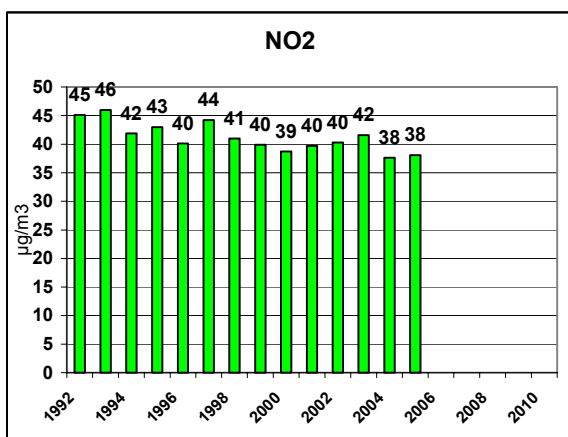
| Calendar year | NO2 | NOx ( $\mu\text{g}/\text{m}^3 \text{NO}_2$ ) | O3 | SO2 | Benzene | PM10 | PM2,5 |
|---------------|-----|--|----|-----|---------|------|-------|
| 1992          | 45  | 64   | 28 | 22  | 4.7     |      |       |
| 1993          | 46  | 66   | 30 | 20  | 4.9     |      |       |
| 1994          | 42  | 63   | 38 | 18  | 3.0     |      |       |
| 1995          | 43  | 60   | 31 | 15  | 2.5     |      |       |
| 1996          | 40  | 60   | 32 | 15  | 3.4     |      |       |
| 1997          | 44  | 64   | 33 | 12  | 3.9     |      |       |
| 1998          | 41  | 54   | 35 | 12  | 3.1     |      |       |
| 1999          | 40  | 52   | 37 | 11  | 2.9     |      |       |
| 2000          | 39  | 50   | 34 | 12  | 2.4     |      |       |
| 2001          | 40  | 55   | 37 | 13  | 2.3     |      |       |
| 2002          | 40  | 54   | 38 | 12  | 2.3     | 43.3 |       |
| 2003          | 42  | 56   | 40 | 13  | 2.2     | 44.3 |       |
| 2004          | 38  | 50   | 39 | 14  | 1.9     | 28.8 |       |
| 2005          | 38  | 49   | 40 | 13  | 1.9     | 28.6 | 15.3  |
| 2006          |     |  |    |     |         |      |       |
| 2007          |     |  |    |     |         |      |       |
| 2008          |     |  |    |     |         |      |       |
| 2009          |     |  |    |     |         |      |       |
| 2010          |     |  |    |     |         |      |       |

#### 5.3.2. Traffic locations

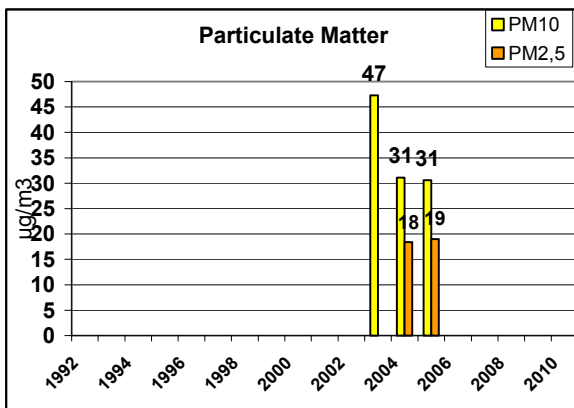
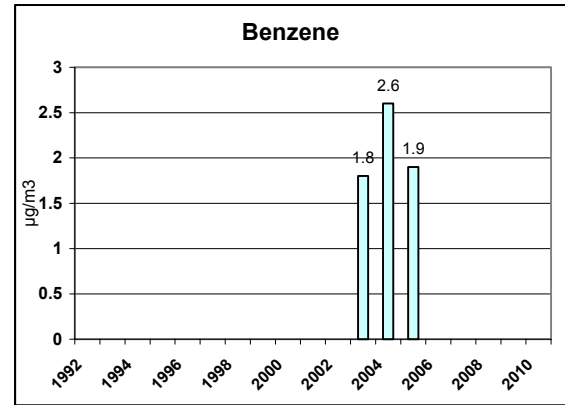
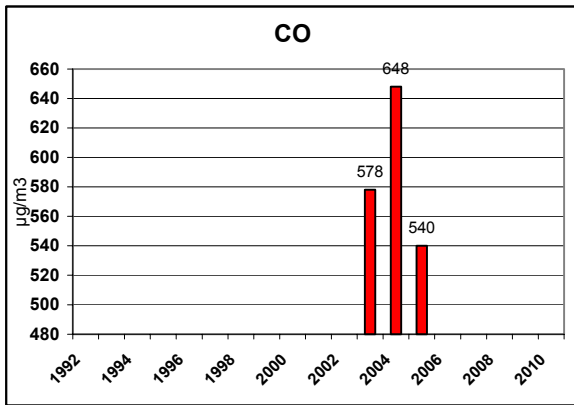
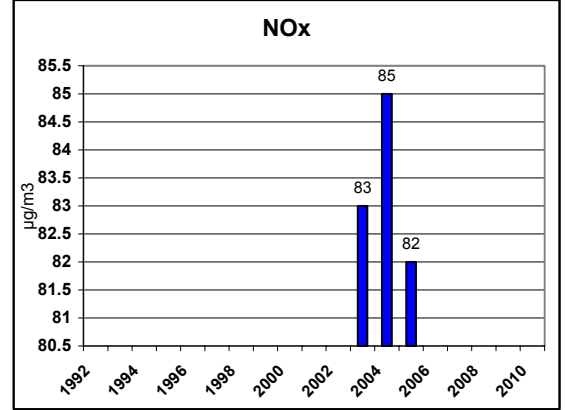
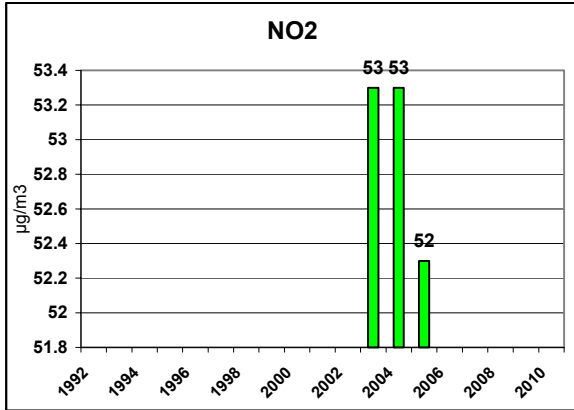
| Please precise constant sample (precise number of stations) or evolutive sample | NO2/NOx | CO | Benzene | PM10 | PM2.5 |
|---|---------|----|---------|------|-------|
|   | 2       | 2  | 2       | 2    | 1     |

| Calendar year | NO2 | NOx ( $\mu\text{g}/\text{m}^3 \text{NO}_2$ ) | CO  | Benzene | PM10 | PM2,5 |
|---------------|-----|--|-----|---------|------|-------|
| 1992          |     |  |     |         |      |       |
| 1993          |     |  |     |         |      |       |
| 1994          |     |  |     |         |      |       |
| 1995          |     |  |     |         |      |       |
| 1996          |     |  |     |         |      |       |
| 1997          |     |  |     |         |      |       |
| 1998          |     |  |     |         |      |       |
| 1999          |     |  |     |         |      |       |
| 2000          |     |  |     |         |      |       |
| 2001          |     |  |     |         |      |       |
| 2002          |     |  |     |         |      |       |
| 2003          | 53  | 83   | 578 | 1.8     | 47   |       |
| 2004          | 53  | 85   | 648 | 2.6     | 31   | 18    |
| 2005          | 52  | 82   | 540 | 1.9     | 31   | 19    |
| 2006          |     |  |     |         |      |       |
| 2007          |     |  |     |         |      |       |
| 2008          |     |  |     |         |      |       |
| 2009          |     |  |     |         |      |       |
| 2010          |     |  |     |         |      |       |

Middle-term trends - Background locations



Middle-term trends - Traffic locations



**5.4 Calculated exceedances of the Air Quality Standards (OPTION C)**

For a number of locations for which exceedance is expected on the basis of a particular situation, the annual standards that have exceeded the limit have been calculated. In the tables below, the locations for which the annual standards for NO<sub>2</sub> and PM<sub>10</sub> have been calculated (by modelling tools for example) and where there is an exceedance of the limit value with or without the margin of tolerance have been closely specified.

**5.4.1. Nitrogen Dioxide (NO<sub>2</sub>)**

**Annual mean concentration**

The tables below focus on the main locations where the annual mean concentration of NO<sub>2</sub> has exceeded the European limit value (40 µg/m<sup>3</sup>)

| Street name or name of the area | Used calculating models | Calculated Concentration | Number of houses | Road length (m) | Object to protect |        | Persons exposed [amount] |
|---------------------------------|-------------------------|--------------------------|------------------|-----------------|-------------------|--------|--------------------------|
|                                 |                         |                          |                  |                 | Kind              | Amount |                          |
|                                 |                         |                          |                  |                 |                   |        |                          |
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|                                 |                         |                          |                  |                 |                   |        |                          |

Main locations where the mean concentration of NO<sub>2</sub> has exceeded the limit value plus the margin of tolerance

| Street name or name of the area | Used calculating models | Calculated Concentration | Number of houses | Road length (m) | Object to protect |        | Persons exposed [amount] |
|---------------------------------|-------------------------|--------------------------|------------------|-----------------|-------------------|--------|--------------------------|
|                                 |                         |                          |                  |                 | Kind              | Amount |                          |
|                                 |                         |                          |                  |                 |                   |        |                          |
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**Number of persons potentially exposed to an exceedance of the limit value**

Traffic-orientated locations

Length of roads where the NO<sub>2</sub> annual mean concentration has exceeded the european limit value : ..... km

Number of persons subjected to air pollution along these roads : .....

Length of roads where the NO<sub>2</sub> annual mean concentration has exceeded the limit value plus the margin of tolerance : ..... km

Number of persons subjected to air pollution along these roads : .....

Background locations

Surface of the area where the NO<sub>2</sub> annual mean concentration has exceeded the limit value ..... km

Number of people subjected the air pollution in these locations : .....

Surface of the area where the annual mean concentration has exceeded the limit value plus the margin of tolerance : ..... km

Number of people subjected to air pollution in these locations : .....

For bigger cities, calculated resultats can also be drawn with a map (see further)

Calculated exceedances of the Air Quality Standards - Nitrogen Dioxide (NO<sub>2</sub>) (continuation)

**Hourly average concentration**

The tables below focus on the main locations where the NO<sub>2</sub> hourly average concentration has exceeded the limit value (200 µg/m<sup>3</sup>) more often than 18 times

| Street name or name of the area | Used calculating models | Calculated Concentration | Number of houses | Road length (m) | Object to protect |        | Persons exposed [amount] |
|---------------------------------|-------------------------|--------------------------|------------------|-----------------|-------------------|--------|--------------------------|
|                                 |                         |                          |                  |                 | Kind              | Amount |                          |
|                                 |                         |                          |                  |                 |                   |        |                          |
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|                                 |                         |                          |                  |                 |                   |        |                          |

The tables below focuses on the main locations where the NO<sub>2</sub> hourly average concentration has exceeded the limit value plus margin of tolerance more often than 18 times

| Street name or name of the area | Used calculating models | Calculated Concentration | Number of houses | Road length (m) | Object to protect |        | Persons exposed [amount] |
|---------------------------------|-------------------------|--------------------------|------------------|-----------------|-------------------|--------|--------------------------|
|                                 |                         |                          |                  |                 | Kind              | Amount |                          |
|                                 |                         |                          |                  |                 |                   |        |                          |
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|                                 |                         |                          |                  |                 |                   |        |                          |

**Number of persons potentially exposed to an exceedance of the limit value**

Traffic-orientated locations

Length of roads where NO<sub>2</sub> hourly average concentration has exceeded the limit value more often than 18 times : ..... km  
 Number of persons subjected to air pollution along these roads : .....

Length of roads where NO<sub>2</sub> hourly average concentration has exceeded the limit value plus margin of tolerance more often than 18 times : ..... km  
 Number of persons subjected to air pollution along these roads : .....

Background locations

Surface of the area where NO<sub>2</sub> hourly average concentration has exceeded the limit value more often than 18 times : ..... km  
 Number of people subjected the air pollution in these locations : .....

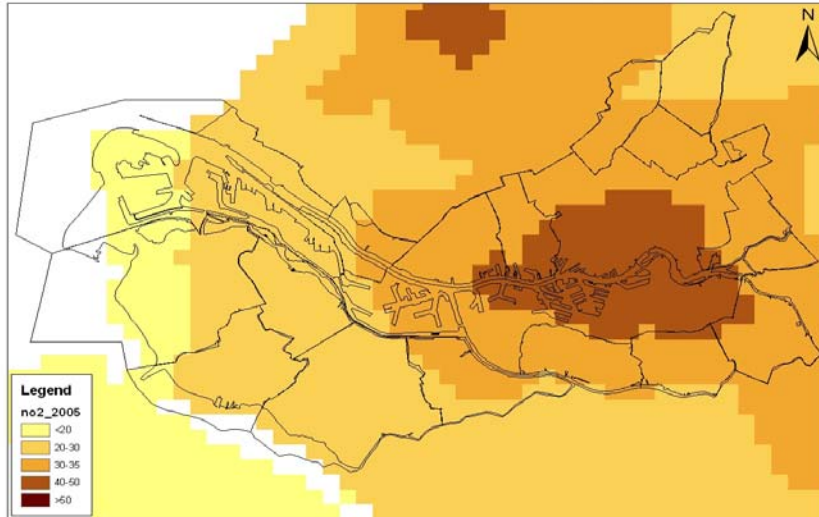
Surface of the area where NO<sub>2</sub> hourly average concentration has exceeded the limit value plus margin of tolerance more often than 18 times : ..... km  
 Number of people subjected to air pollution in these locations : .....

For bigger cities, calculated resultats can also be drawn with a map (see next page)

Calculated exceedances of the Air Quality Standards - Nitrogen Dioxide (NO<sub>2</sub>) (continuation)

For bigger cities, calculated results can also be drawn with a map (please download your maps)

**Annual mean concentration**



**Hourly average concentration**

No exceedence of hourly limit value

**5.4.2. Particulate Matter (PM10)**

**Annual mean concentration**

The table below focuses on the main locations where the PM10 annual mean concentration has exceeded the European limit value (40 µg/m<sup>3</sup>)

| Street name or name of the area | Used calculating models | Calculated Concentration | Number of houses | Road length (m) | Object to protect |        | Persons exposed [amount] |
|---------------------------------|-------------------------|--------------------------|------------------|-----------------|-------------------|--------|--------------------------|
|                                 |                         |                          |                  |                 | Kind              | Amount |                          |
|                                 |                         |                          |                  |                 |                   |        |                          |
|                                 |                         |                          |                  |                 |                   |        |                          |
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|                                 |                         |                          |                  |                 |                   |        |                          |
|                                 |                         |                          |                  |                 |                   |        |                          |

**Number of persons potentially exposed to an exceedance of the limit value**

Traffic-orientated locations:

Length of roads where the PM10 annual mean concentration has exceeded the european limit value : ..... km  
 Number of persons subjected to air pollution along these roads : .....

Background locations

Surface of the area where the PM10 annual mean concentration has exceeded the limit value : ..... km  
 Number of people subjected to air pollution in these locations : .....

**Daily average concentration**

The table below focuses on the main locations where the PM10 daily average concentration has exceeded the European limit value (50 µg/m<sup>3</sup>) more often than 35 times

| Street name or name of the area | Used calculating models | Calculated Concentration | Number of houses | Road length (m) | Object to protect |        | Persons exposed [amount] |
|---------------------------------|-------------------------|--------------------------|------------------|-----------------|-------------------|--------|--------------------------|
|                                 |                         |                          |                  |                 | Kind              | Amount |                          |
|                                 |                         |                          |                  |                 |                   |        |                          |
|                                 |                         |                          |                  |                 |                   |        |                          |
|                                 |                         |                          |                  |                 |                   |        |                          |
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|                                 |                         |                          |                  |                 |                   |        |                          |
|                                 |                         |                          |                  |                 |                   |        |                          |

**Number of persons potentially exposed to an exceedance of the limit value**

Traffic-orientated locations:

Length of roads where the PM10 daily average concentration has exceeded the European limit value (50 µg/m<sup>3</sup>) more often than 35 times ..... km  
 Number of persons subjected to air pollution along these roads : .....

Background locations

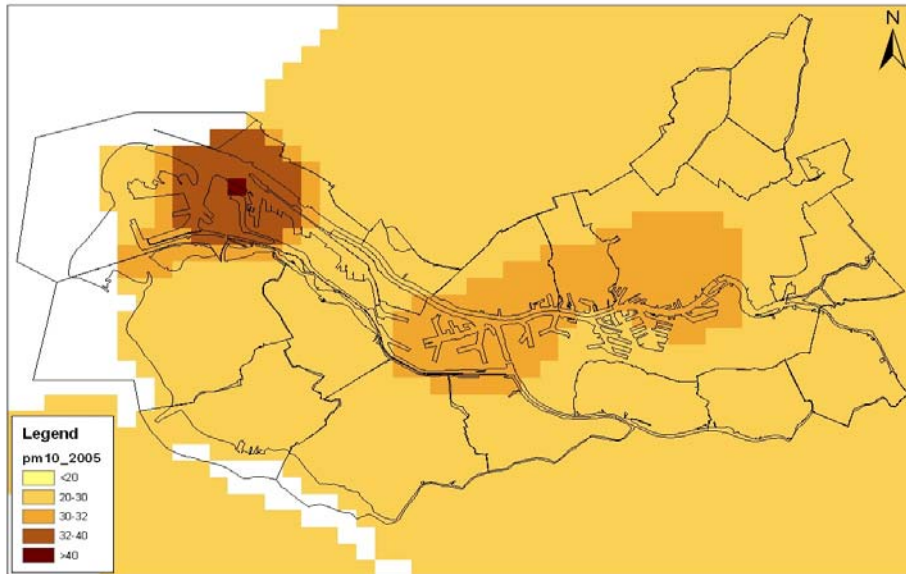
Surface of the area where the PM10 daily average concentration has exceeded the European limit value (50 µg/m<sup>3</sup>) more often than 35 times ..... km  
 Number of people subjected to air pollution in these locations : .....

For bigger cities, calculated resultats can also be drawn with a map (see next page)

Calculated exceedances of the Air Quality Standards - Particulate Matter (PM10) (continuation)

For bigger cities, calculated results can also be drawn with a map (please download your maps)

**Annual mean concentration**



**Daily average concentration**

No Data available



**5.5 Maps of annual mean concentration (OPTION C)**

Please download the maps of the annual mean concentration for other pollutants.  
Please precise the methodology used to build the map (monitoring results / modelling tools...)



## Annex 4: Definitions

Definitions that are important to be able to compare the air quality between several cities are:

**exceedance of a standard:** a period of time (which is defined in each standard) where the concentration reaches or is higher than that set down by the standard. In order to make useful comparisons between pollutants, for which the standards may be expressed in terms of different averaging times, the number of days on which an exceedance has been recorded is often reported.

**regional background contribution:** long range transport of anthropogenic emissions leads to a regional increase in the concentration levels of many pollutants and their chemical transformation products. Emissions from cities themselves contribute to this regional background concentration.

**city background contribution:** concentration levels of a number of pollutants are higher in cities than in the surrounding rural areas. 'City background' concentrations refers to the concentrations of pollutants at places within cities, not directly influenced by source such as industry or traffic.

**traffic or industrial contribution:** In busy streets and near industrial sources the concentration field is further elevated through nearby emissions. 'Traffic' or 'industrial' concentrations refer to the concentration of pollutants at places directly influenced by traffic or industry. The contribution of each of these to the concentration levels in the city may be expressed as a fraction or, more usually as a concentration

**ambient air:** outdoor air in the troposphere, excluding work places

**pollutant:** any substance introduced directly or indirectly by man into the ambient air and likely to have harmful effects on human health and/or on the environment as a whole

**pollution level:** the concentration of a pollutant in ambient air or the deposition thereof on surfaces in a given time

**assessment of air quality:** any method used to measure, calculate, predict or estimate the level of a pollutant in the ambient air

**limit value:** a level of pollution fixed on the basis of scientific knowledge, with the aim of avoiding, preventing or reducing harmful effects on human health and/or the environment as a whole, to be attained within a given period and not to be exceeded once attained.

This is the fixed value of the permissible level of air pollution, which must not be exceeded by more than the margins of tolerance expressed as the fraction of the limit value in percent, by which this limit may be exceeded in a period laid down by the Act and its regulations for implementation

**target value:** a level fixed with the aim of avoiding more long-term harmful effects on human health and/or the environment as a whole, to be attained wherever possible over a given period set by the Directive

**alert threshold:** a level beyond which there is a risk to human health from brief exposure and at which immediate steps must be taken by the member states as laid down in this Directive

**zone:** part of a territory delimited by the member states where the air quality is assessed

**agglomeration (area with lower air quality with high population concentration):** a zone with a population concentration in excess of 250 000 inhabitants or a territory with urban settlements with a population of 200 inhabitants per km<sup>2</sup>

(According to urban indices in the Czech Republic, the Czech average population concentration is 130 inhabitants/km<sup>2</sup>, rural settlement corresponds to a population concentration of less than 100 inhabitants/km<sup>2</sup>, and large cities have a density of over 500 inhabitants/km<sup>2</sup> (Prague, Brno).)

**Fleet description:** a description of the CAR fleet in terms of % personal cars and medium and heavy trucks, % diesel and petrol, average age of the fleet or preferably the % of the fleet complying with each Euro class.

**Grid size:** When modelling, the size of the receptor grid influences the outcome of the calculations considerably. The higher the resolution of the grid the higher the concentrations one is likely to find. There are no guidelines (yet?) on the grid size to be used in modelling for air quality assessment. When presenting modelling results grid size should be mentioned for others to be able to interpret and compare the results. (E.g. NO<sub>2</sub> concentration maps in Rotterdam show numerous hotspots when modelled with a 100x100m resolution, a few on a 1x1 km resolution and none on a 5x5 km resolution.)

**Emission height:** when compiling emission inventories it is important to add (average) emission heights per sector. High stack emission contribute comparatively less to ambient concentrations than low level (traffic) emissions. For policy development not only the absolute amount of emissions but also their effective contribution to concentration needs to be known/assessed. (E.g. In the port-industrial area of Rotterdam petrochemical industries and utility plants are responsible for over 50 % of the NO<sub>x</sub> emissions. With average stack heights close to 100m their contribution to NO<sub>2</sub> concentrations is limited. In terms of concentrations traffic is responsible for over 50 % of the NO<sub>2</sub>.)

## **Annex 5: Council Directive 96/62/EC**

Council Directive 96/62/EC of 27 September 1996 on ambient air quality assessment and management

OJ NO. L 296 , 21/11/1996 P. 0055

THE COUNCIL OF THE EUROPEAN UNION,

Having regard to the Treaty establishing the European Community,

and in particular Article 130s (1) thereof,

Having regard to the proposal from the Commission (1),

Having regard to the opinion of the Economic and Social Committee (2),

Acting in accordance with the procedure laid down in Article 189c of the Treaty (3),

Whereas the fifth action programme of 1992 on the environment, the general approach of which was endorsed by the Council and the Representatives of the Governments of the Member States, meeting within the Council, in their resolution 93/C 138/01 of 1 February 1993 (4), envisages amendments to existing legislation on air pollutants; whereas the said programme recommends the establishment of long-term air quality objectives;

Whereas, in order to protect the environment as a whole and human health, concentrations of harmful air pollutants should be avoided, prevented or reduced and limit values and/or alert thresholds set for ambient air pollution levels;

Whereas, in order to take into account the specific formation mechanisms of ozone, these limit values and alert thresholds may need to be complemented or replaced by target values;

Whereas the numerical values for limit values, alert thresholds and, as regards ozone, target values and/or limit values and alert thresholds are to be based on the findings of work carried out by international scientific groups active in the field;

Whereas the Commission is to carry out studies to analyse the effects of the combined action of various pollutants or sources of pollution and the effect of climate on the activity of the various pollutants examined in the context of this Directive;

Whereas the ambient air quality needs to be assessed against limit values and/or alert thresholds, and, as regards ozone, target values and/or limit values taking into account the size of populations and ecosystems exposed to air pollution, as well as the environment;

Whereas, in order for assessment of ambient air quality based on measurements made in Member States to be comparable, the location and number of sampling points and reference methods of measurement used should be specified when values are set for alert thresholds, limit values and target values;

Whereas, to allow for the use of other techniques of estimation of ambient air quality besides direct measurement, it is necessary to define the criteria for use and required accuracy of these techniques;

Whereas the general measures set up under this Directive have to be supplemented by others specific to individual substances covered;

Whereas these specific measures need to be adopted as soon as possible in order to fulfil the overall objectives of this Directive;

Whereas preliminary representative data on the levels of pollutants should be collected;

Whereas, in order to protect the environment as a whole and human health, it is necessary that Member States take action when limit values are exceeded in order to comply with these values within the time fixed;

Whereas the measures taken by Member States must take into account the requirements set by regulations concerning the operation of industrial installations in conformity with Community legislation in the field of integrated prevention and reduction of pollution when this legislation applies;

Whereas, because these actions require time to be implemented and become effective, temporary margins of tolerance of the limit value may need to be set;

Whereas areas may exist in Member States where pollution levels are greater than the limit value but within the allowed margin of tolerance;

Whereas the limit value must be complied with within the time specified;

Whereas Member States must consult with one another if the level of a pollutant exceeds, or is likely to exceed, the limit value plus the margin of tolerance or, as the case may be, the alert threshold, following significant pollution originating in another Member State;

Whereas the setting of alert thresholds at which precautionary measures should be taken will make it possible to limit the impact of pollution episodes on human health;

Whereas, in zones and agglomerations where the levels of pollutants are below the limit values, Member States must endeavour to preserve the best ambient air quality compatible with sustainable development;

Whereas, in order to facilitate the handling and comparison of data received, such data should be provided to the Commission in standardized form;

Whereas the implementation of a wide and comprehensive policy of ambient air quality assessment and management needs to be based on strong technical and scientific grounds and permanent exchange of views between the Member States;

Whereas there is a need to avoid increasing unnecessarily the amount of information to be transmitted by

Member States;

Whereas the information gathered by the Commission pursuant to the implementation of this Directive is useful to the European Environment Agency (EEA) and may therefore be transmitted to it by the Commission;

Whereas the adaptation of criteria and techniques used for the assessment of the ambient air quality to scientific and technical progress and the arrangements needed to exchange the information to be provided pursuant to this Directive may be desirable;

Whereas, in order to facilitate implementation of the work necessary to this end, a procedure should be set up to establish close cooperation between the Member States and the Commission within a committee;

Whereas, in order to promote the reciprocal exchange of information between Member States and the EEA, the Commission, with the assistance of the EEA, is to publish a report on ambient air quality in the Community every three years;

Whereas the substances already covered by Council Directive 80/779/EEC of 15 July 1980 on air quality limit values and guide values for sulphur dioxide and suspended particulates (1), Council Directive 82/884/EEC of 3 December 1982 on a limit value for lead in the air (2), Council Directive 85/203/EEC of 7 March 1985 on air quality standards for nitrogen dioxide (3) and Council Directive 92/72/EEC of 21 September 1992 on air pollution by ozone (4) should be dealt with first,

HAS ADOPTED THIS DIRECTIVE:

Article 1

Objectives

The general aim of this Directive 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.

Article 2

Definitions

For the purposes of this Directive:

1. 'ambient air' shall mean outdoor air in the troposphere, excluding work places;
2. 'pollutant' shall mean any substance introduced directly or indirectly by man into the ambient air and likely to have harmful effects on human health and/or the environment as a whole;
3. 'level' shall mean the concentration of a pollutant in ambient air or the deposition thereof on surfaces in a

given time;

4. 'assessment' shall mean any method used to measure, calculate, predict or estimate the level of a pollutant in the ambient air;

5. 'limit value' shall mean a level fixed on the basis of scientific knowledge, with the aim of avoiding, preventing or reducing harmful effects on human health and/or the environment as a whole, to be attained within a given period and not to be exceeded once attained;

6. 'target value' shall mean a level fixed with the aim of avoiding more long-term harmful effects on human health and/or the environment as a whole, to be attained where possible over a given period;

7. 'alert threshold' shall mean a level beyond which there is a risk to human health from brief exposure and at which immediate steps shall be taken by the Member States as laid down in this Directive;

8. 'margin of tolerance' shall mean the percentage of the limit value by which this value may be exceeded subject to the conditions laid down in this Directive;

9. 'zone' shall mean part of their territory delimited by the Member States;

10. 'agglomeration' shall mean a zone with a population concentration in excess of 250.000 inhabitants or, where the population concentration is 250.000 inhabitants or less, a population density per km<sup>2</sup> which for the Member States justifies the need for ambient air quality to be assessed and managed.

### Article 3

#### Implementation and responsibilities

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,
- assessment of ambient air quality,
- approval of the measuring devices (methods, equipment, networks, laboratories),
- 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,
- analysis of assessment methods,
- coordination on their territory of Community-wide quality assurance programmes organized by the Commission. When they supply it to the Commission, the Member States shall make the information referred to in the first subparagraph available to the public.

### Article 4

#### Setting of the limit values and alert thresholds for ambient air

1. For those pollutants listed in Annex I, the Commission shall submit to the Council proposals for the setting of limit values and, as appropriate, alert thresholds according to the following timetable:

- no later than 31 December 1996 for pollutants 1 to 5,
- in accordance with Article 8 of Directive 92/72/EEC for ozone,
- no later than 31 December 1997 for pollutants 7 and 8,

- as soon as possible, and no later than 31 December 1999, for pollutants 9 to 13.

In fixing the limit values and, as appropriate, alert thresholds, account shall be taken, by way of example, of the factors laid down in Annex II.

Regarding ozone, these proposals will take account of the specific formation mechanisms of this pollutant and, to this end, provision may be made for target values and/or limit values. If a target value fixed for ozone is exceeded, Member States shall inform the Commission of the measures taken in order to attain that value.

On the basis of this information the Commission shall evaluate whether additional measures are necessary at Community level and, should the need arise, shall submit proposals to the Council.

For other pollutants, the Commission shall submit to the Council proposals for fixing limit values and, as appropriate, alert thresholds if, on the basis of scientific progress and taking into account the criteria laid down in Annex III, it appears necessary to avoid, prevent or reduce the harmful effects of such pollutants on human health and/or the environment as a whole within the Community.

2. The Commission shall be responsible, taking account of the most recent scientific-research data in the epidemiological and environmental fields concerned and of the most recent advances in metrology, for re-examining the elements on which the limit values and alert thresholds referred to in paragraph 1 are based.

3. When limit values and alert thresholds are set, criteria and techniques shall be established for:

(a) the measurement to be used in implementing the legislation referred to in paragraph 1:

- the location of the sampling points,
- the minimum number of sampling points,
- the reference measurement and sampling techniques;

(b) the use of other techniques for assessing ambient air quality, particularly modelling:

- spatial resolution for modelling and objective assessment methods,
- reference modelling techniques.

These criteria and techniques shall be established in respect of each pollutant according to the size of agglomerations or to the levels of pollutants in the zones examined.

4. To take into account the actual levels of a given pollutant when setting limit values and the time needed to implement measures for improving the ambient air quality, the Council may also set a temporary margin of tolerance for the limit value. This margin shall be reduced according to procedures to be defined for each pollutant in order to attain the level of the limit value at the latest at the end of a period to be determined for each pollutant when that value is set.

5. In accordance with the Treaty, the Council shall adopt the legislation provided for in paragraph 1 and the provisions laid down in paragraphs 3 and 4.

6. When a Member State takes more stringent measures than those laid down in the provisions referred to in paragraph 5, it shall inform the Commission thereof.

7. When a Member State intends to set limit values or alert thresholds for pollutants not referred to in Annex I and not covered by Community provisions concerning ambient air quality in the Community, it shall inform the Commission thereof in sufficient time. The Commission shall be required to supply, in sufficient time, an answer to the question of the need to act at Community level following the criteria laid down in Annex III.

#### Article 5

##### Preliminary assessment of ambient air quality

Member States which do not have representative measurements of the levels of pollutants for all zones and agglomerations shall undertake series of representative measurements, surveys or assessments in order to have the data available in time for implementation of the legislation referred to in Article 4 (1).

#### Article 6

##### Assessment of ambient air quality

1. Once limit values and alert thresholds have been set, ambient air quality shall be assessed throughout the territory of the Member States, in accordance with this Article.

2. In accordance with the criteria referred to in Article 4 (3), and in respect of the relevant pollutants under Article 4 (3), measurement is mandatory in the following zones:

- agglomerations as defined in Article 2 (10),
- zones in which levels are between the limit values and the levels provided for in paragraph 3, and
- other zones where levels exceed the limit values.

The measures provided for may be supplemented by modelling techniques to provide an adequate level of information on ambient air quality.

3. A combination of measurements and modelling techniques may be used to assess ambient air quality where the levels over a representative period are below a level lower than the limit value, to be determined according to the provisions referred to in Article 4 (5).

4. Where the levels are below a level to be determined according to the provisions referred to in Article 4 (5), the sole use of modelling or objective estimation techniques for assessing levels shall be possible. This provision shall not apply to agglomerations in the case of pollutants for which alert thresholds have been fixed according to the provisions referred to in Article 4 (5).

5. Where pollutants have to be measured, the measurements shall be taken at fixed sites either continuously or by random sampling; the number of measurements shall be sufficiently large to enable the levels observed to be determined.

#### Article 7

##### Improvement of ambient air quality

## General requirements

1. Member States shall take the necessary measures to ensure compliance with the limit values.
2. Measures taken in order to achieve the aims of this Directive shall:
  - (a) take into account an integrated approach to the protection of air, water and soil;
  - (b) not contravene Community legislation on the protection of safety and health of workers at work;
  - (c) have no significant negative effects on the environment in the other Member States.
3. 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

### Measures applicable in zones where levels are higher than the limit value

1. Member States shall draw up a list of zones and agglomerations in which the levels of one or more pollutants are higher than the limit value plus the margin of tolerance. Where no margin of tolerance has been fixed for a specific pollutant, zones and agglomerations in which the level of that pollutant exceeds the limit value shall be treated in the same way as the zones and agglomerations referred to in the first subparagraph, and paragraphs 3, 4 and 5 shall apply to them.
2. Member States shall draw up a list of zones and agglomerations in which the levels of one or more pollutants are between the limit value and the limit value plus the margin of tolerance.
3. In the zones and agglomerations referred to in paragraph 1, 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 said plan or programme, which must be made available to the public, shall incorporate at least the information listed in Annex IV.
4. In the zones and agglomerations referred to in paragraph 1, where the level of more than one pollutant is higher than the limit values, Member States shall provide an integrated plan covering all the pollutants concerned.
5. The Commission shall regularly check the implementation of the plans or programmes submitted under paragraph 3 by examining their progress and the trends in air pollution.
6. When the level of a pollutant exceeds, or is likely to exceed, the limit value plus the margin of tolerance or, as the case may be, the alert threshold following significant pollution originating in another Member State, the Member States concerned shall consult with one another with a view to finding a solution. The Commission may be present at such consultations.

## Article 9

### Requirements in zones where the levels are lower than the limit value

Member States shall draw up a list of zones and agglomerations in which the levels of pollutants are below the limit values. Member States shall maintain the levels of pollutants in these zones and agglomerations

below the limit values and shall endeavour to preserve the best ambient air quality, compatible with sustainable development.

#### Article 10

Measures applicable in the event of the alert thresholds being exceeded

When the alert thresholds are exceeded, Member States shall undertake to ensure that the necessary steps are taken to inform the public (e.g. by means of radio, television and the press). Member States shall also forward to the Commission on a provisional basis information concerning the levels recorded and the duration of the episode(s) of pollution no later than three months following their occurrence. A list of minimum details to be supplied to the public shall be drawn up together with the alert thresholds.

#### Article 11

Transmission of information and reports

After adoption by the Council of the first proposal referred to in the first indent of Article 4 (1):

1. Member States shall notify to the Commission the competent authorities, laboratories and bodies referred to in Article 3 and

(a) in the zones referred to in Article 8 (1) shall:

(i) inform the Commission of the occurrence of levels exceeding the limit value plus the margin of tolerance, of the dates or periods when such levels were observed and the values recorded in the nine-month period after the end of each year. When no margin of tolerance has been fixed for a given pollutant, the zones and agglomerations where the level of such pollutant exceeds the limit value shall be treated in the same way as the zones and agglomerations referred to in the first subparagraph;

(ii) inform the Commission of the reasons for each recorded instance, in the nine-month period after the end of each year;

(iii) send to the Commission the plans or programmes referred to in Article 8 (3) no later than two years after the end of the year during which the levels were observed;

(iv) inform the Commission every three years of the progress of the plan or programme;

(b) shall forward to the Commission annually, and no later than nine months after the end of each year, the list of zones and agglomerations referred to in Article 8 (1) and (2) and in Article 9;

(c) shall forward to the Commission every three years within the framework of the sectoral report referred to in Article 4 of Council Directive 91/692/EEC of 23 December 1991 standardizing and rationalizing reports on the implementation of certain Directives relating to the environment (1), and no later than nine months after the end of each three-year period, information reviewing the levels observed or assessed, as appropriate, in the zones and agglomerations referred to in Article 8 and Article 9;

(d) shall inform the Commission of the methods used for the preliminary assessment of air quality provided for in Article 5.

2. the Commission shall publish:

(a) annually, a list of the zones and agglomerations referred to in Article 8 (1);

(b) every three years, a report on the ambient air quality in the Community. This report shall show in summary form the information received through a mechanism for the exchange of information between the Commission and the Member States.

3. the Commission will call upon as necessary the expertise available in the European Environment Agency in drafting the report referred to in paragraph 2 (b).

## Article 12

### Committee and its functions

1. The amendments necessary to adapt the criteria and techniques referred to in Article 4 (2) to scientific and technical progress, and the detailed arrangements for forwarding the information to be provided under Article 11, and other tasks specified in the provisions referred to in Article 4 (3), shall be adopted in accordance with the procedure laid down in paragraph 2 of this Article. Such adaptation must not have the effect of modifying the limit values or the alert thresholds either directly or indirectly.

2. The Commission shall be assisted by a committee composed of the representatives of the Member States and chaired by the representative of the Commission. The representative of the Commission shall submit to the committee a draft of the measures to be taken. The committee shall deliver its opinion on the draft within a time limit which the chairman may lay down according to the urgency of the matter. The opinion shall be delivered by the majority laid down in Article 148 (2) of the Treaty in the case of decisions which the Council is required to adopt on a proposal from the Commission. The votes of the representatives of the Member States within the committee shall be weighted in the manner set out in that Article. The chairman shall not vote. The Commission shall adopt the measures envisaged if they are in accordance with the opinion of the committee. If the measures envisaged are not in accordance with the opinion of the committee, or if no opinion is delivered, the Commission shall, without delay, submit to the Council a proposal relating to the measures to be taken. The Council shall act by a qualified majority. If, on the expiry of a period of three months from the date of referral to the Council, the Council has not acted, the proposed measures shall be adopted by the Commission.

## Article 13

1. Member States shall bring into force the laws, regulations and administrative provisions necessary to comply with this Directive not later than 18 months after it comes into force with regard to the provisions relating to Articles 1 to 4 and 12 and Annexes I, II, III and IV, and at the latest on the date on which the provisions referred to in Article 4 (5) apply, with regard to the provisions relating to the other Articles. When

Member States adopt these measures, they shall contain a reference to this Directive or shall be accompanied by such a reference at the time of their official publication. The procedures for such a reference shall be adopted by Member States.

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

## Article 14

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

#### Article 15

This Directive is addressed to the Member States.

Done at Brussels, 27 September 1996.

For the Council

The President

M. LOWRY

(1) OJ No L 377, 31. 12. 1991, p. 48.

#### ANNEX I: LIST OF ATMOSPHERIC POLLUTANTS TO BE TAKEN INTO CONSIDERATION IN THE ASSESSMENT AND MANAGEMENT OF AMBIENT AIR QUALITY

I. Pollutants to be studied at an initial stage, including pollutants governed by existing ambient air quality directives

1. Sulphur dioxide
2. Nitrogen dioxide
3. Fine particulate matter such as soot (including mw 10)
4. Suspended particulate matter
5. Lead
6. Ozone

II. Other air pollutants

7. Benzene
8. Carbon monoxide
9. Poly-aromatic hydrocarbons
10. Cadmium
11. Arsenic
12. Nickel
13. Mercury

#### ANNEX II: FACTORS TO BE TAKEN INTO ACCOUNT WHEN SETTING LIMIT VALUES AND ALERT THRESHOLDS

When setting the limit value and, as appropriate, alert threshold, the following factors may, by way of example, be taken into account:

- degree of exposure of sectors of the population, and in particular sensitive sub-groups,
- climatic conditions,
- sensitivity of flora and fauna and their habitats,
- historic heritage exposed to pollutants,
- economic and technical feasibility,
- long-range transmission of pollutants, of which secondary pollutants, including ozone.

#### ANNEX III: GUIDELINES FOR SELECTING AIR POLLUTANTS FOR

## CONSIDERATION

1. Possibility, severity and frequency of effects; with regard to human health and the environment as a whole, the irreversible effects must be of special concern.
2. Ubiquity and high concentration of the pollutant in the atmosphere.
3. Environmental transformations or metabolic alterations, as these alterations may lead to the production of chemicals with greater toxicity.
4. Persistence in the environment, particularly if the pollutant is not biodegradable and can accumulate in humans, the environment or food chains.
5. Impact of the pollutant:
  - size of exposed population, living resources or ecosystems,
  - existence of particularly sensitive targets in the zone concerned.
6. Risk-assessment methods may also be used.

The pertinent danger criteria established under Directive 67/548/EEC (1) and its successive adaptations must be taken into account in the selection of the pollutants.

## ANNEX IV: INFORMATION TO BE INCLUDED IN THE LOCAL, REGIONAL OR NATIONAL PROGRAMMES FOR IMPROVEMENT IN THE AMBIENT AIR QUALITY

Information to be provided under Article 8 (3)

1. Localization of excess pollution
  - region
  - city (map)
  - measuring station (map, geographical coordinates).
2. General information
  - type of zone (city, industrial or rural area)
  - estimate of the polluted area (km<sup>2</sup>) and of the population exposed to the pollution
  - useful climatic data
  - relevant data on topography
  - sufficient information on the type of targets requiring protection in the zone.
3. Responsible authorities: Names and addresses of persons responsible for the development and implementation of improvement plans.
4. Nature and assessment of pollution
  - concentrations observed over previous years (before the implementation of the improvement measures)
  - concentrations measured since the beginning of the project
  - techniques used for the assessment.
5. Origin of pollution
  - list of the main emission sources responsible for pollution (map)
  - total quantity of emissions from these sources (tonnes/year)
  - information on pollution imported from other regions.

6. Analysis of the situation

- details of those factors responsible for the excess (transport, including cross-border transport, formation)
- details of possible measures for improvement of air quality.

7. Details of those measures or projects for improvement which existed prior to the entry into force of this

Directive i.e.

- local, regional, national, international measures
- observed effects of these measures.

8. Details of those measures or projects adopted with a view to reducing pollution following the entry into force of this Directive

- listing and description of all the measures set out in the project
- timetable for implementation
- estimate of the improvement of air quality planned and of the expected time required to attain these objectives.

9. Details of the measures or projects planned or being researched for the long term.

10. List of the publications, documents, work, etc., used to supplement information requested in this Annex.