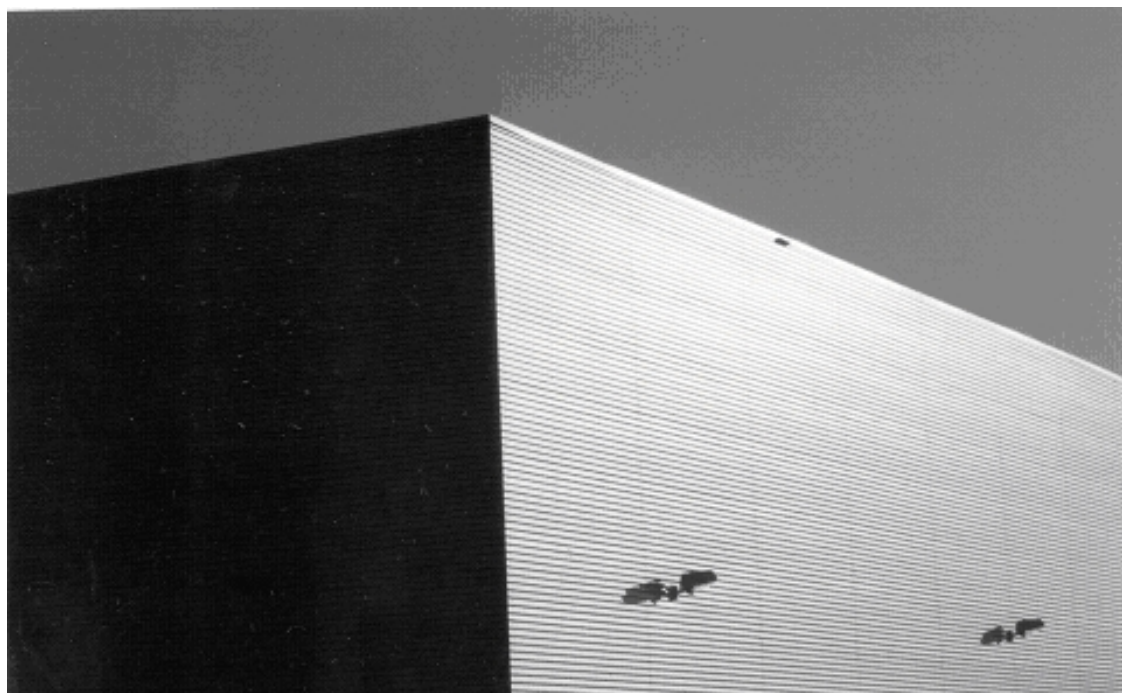


AirBase

Potentials and developments



ETC/ACC Technical Paper 2005/4
September 2005

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The European Topic Centre on Air and Climate Change (ETC/ACC)
is a consortium of European institutes under contract of the European Environmental Agency
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Contents

Summary	4
1. Introduction	5
2. The data exchange process	6
2.1 Information streams	6
2.2 Responsibility of partners involved	6
2.3 The annual data transmission cycle	7
3. Developments of AIRBASE	8
3.1 From data exchange instrument towards an assessment tool.....	8
3.2 Improving the quality of AIRBASE	8
3.3 The accessibility of AIRBASE	12
3.4 The completeness of AIRBASE	13
3.5 AIRBASE as central database for AQ meta information	14
3.6 Coupling of AIRBASE with other (geographical) data.....	14
3.7 AIRBASE within Reportnet.....	15
3.8 Accelerating the data transmission cycle	15
4. Conclusions and recommendations	16
5. Planning table	17
References	19
Annex A Exchange of Information	21

Summary

This report describes the development of AIRBASE from a storage tool for the delivery of mandatory information under the EoI towards a powerful analysing tool for making air quality assessments. This development put requirements on the quality and the accessibility of AIRBASE. AIRBASE is also developed towards a central database for air quality meta information. Meta information of stations under the EoI, EMEP and FWD/DD are stored in AIRBASE and addition of more meta information parameters will be investigated.

1. Introduction

Within the European Union a procedure to exchange information on air quality has been laid down in Council Decision 97/101/EC (EU, 1997) of 27 January 1997 establishing a reciprocal exchange of information and data from networks and individual stations measuring ambient air pollution within the Member States (the "Exchange of Information decision" or shortly EoI decision). Technical details such as pollutants covered, information on stations and networks to be communicated are specified in the annexes of the Decision. These annexes were amended by Commission Decision 2001/752/EC (EU, 2001a, 2001b). Guidance on the annexes is given in the Guidance report (Garber *et al.*, 2001). Formally the EoI applies only to the EU Member States, however, upon request of the European Environmental Agency, a large number of non-EU countries provides, on a voluntary basis, information on air quality following the requirements of the EoI Decision. In this way, information on a pan-European scale has become available.

According to the EoI Decision, the European Commission, each year, prepares a technical report on meta information and air quality data exchanged, and make the information available to Member States in a database. The decision also states that the Commission will call upon the European Environment Agency (EEA) with regard to the operation and practical implementation of the information system. The European Topic Centre on Air Quality and Climate Change (ETC/ACC), under contract to EEA, manages the database system, AIRBASE. The information submitted under the EoI is stored in AIRBASE and made available to the public on the Internet via the ETC/ACC website¹. The technical report mentioned above is prepared annually by the ETC/ACC and made available at the ETC/ACC website (Buijsman *et al.*, 2004a)

This paper discusses the present status of AIRBASE and the future developments and potentials of AIRBASE.

¹ <http://etc-acc.eionet.eu.int>

2. The data exchange process

2.1 Information streams

Before 1 October EU Member States, member countries to the EEA and, on a voluntary basis, other European countries, have to submit information on air quality to the Commission (DGEnv) and/or the EEA. The ETC facilitates in this process by providing every year a DEM (Data Entry Module) in which the requested meta information and raw AQ data can easily be handled.

The Exchange of Information Decision requires a large set of meta information to be delivered to the Commission (EU, 1997; 2001a, 2001b). Part of this information is mandatory and the other items are to be delivered to the Commission 'to the extent possible' and 'as much information as feasible should be supplied'. Table 1 gives a brief summary of the requested meta-information.

All information submitted under the EoI is stored in AIRBASE and made available to the public on the internet via the ETC/ACC website.

Table 1 Summary of information on measurement stations, measurement techniques and data quality to be delivered under the Exchange of Information (EoI) (EU, 1997)

Type of information	Examples
Networks	
Organisation	Name of the network, geographical coverage, responsible authorities, organisational information
Stations	
General	Name and location of measurement site, type of station
Local surroundings	Type of surroundings
Emission sources	Sources which might influence local air quality
Traffic characterisation	For traffic stations only: traffic density
Measurement configurations	
Measurement technique	Analytical method, sampling characteristics, time resolution, calibration
Validation procedure	Procedures, criteria, data quality, data coverage

2.2 Responsibility of partners involved

The responsibilities of the Member States are given in the EoI. In relation to the annual data transmission process, the member country is responsible for a timely delivery of the requested information in one of the agreed data formats and for the quality of raw data and meta information. All transmitted data are deemed to be valid except when explicitly indicated with an error code.

In relation to the data transmission process, the Commission is responsible for:

- the specification of the technical procedure for the transfer of data;
- loading the transmitted data in a data base and making the updated results available to the Member States;
- the transfer of selected data - in agreement with the Member States - to international bodies.

Following the EoI the Commission has called upon the European Environmental Agency for assistance with regard to the operation and practical implementation of the information system and the activities of the above bullets. For this purpose the ETC/ACC has developed a software tool known as the Data Exchange Module (DEM)

(Mol, 2004) for information exchange and the central data base AIRBASE which include a web-based retrieval system.

Other responsibility with regards to reporting and reviewing of the EoI fall outside the scope of this paper and will not be discussed.

Including the transferred responsibilities with regards to the operation and practical implementation of the information system, the EEA and its Topic Centre are responsible for:

- the specification of the technical procedure for the transfer of data;
- loading the transmitted data in a data base and making the updated results available to the Member States;
- making the information accessible to the public.

2.3 The annual data transmission cycle

The data exchange software tool DEM is pre-filled with all meta information on known EoI, EuroAirnet or EMEP networks, stations and measurement configurations and distributed before 15 July to the participating countries. To support the contributing countries, the ETC operates a helpdesk for questions directly and specifically related to the current EoI data delivery and the usage of the DEM.

Before 1 October the participating countries submit meta-information and raw air quality data in one of the agreed formats (see EU, 2001a) to the Commission and/or to EEA. Receipt of the data is acknowledged by the ETC.

In the period from 1 October until 20 January of next year the received data are uploaded in AIRBASE. During the upload process the data are checked on outliers, on missing essential meta data, on possible overwriting of data already stored in AIRBASE, on possible deletion of stations and measurement configurations with data etc. Feedback reports are sent to the data suppliers. The data supplier is informed and asked to confirm the changes. In the period 20 January until the end of February of next year the feedback is processed and in March the statistics and exceedances are calculated in AIRBASE. So, from 1 April the newly submitted data are available in AIRBASE.

The ETC is responsible for a correct transfer of data into AIRBASE. Updated copies of AIRBASE are regularly made available on the web. AIRBASE contains both raw data and aggregated and statistical data. To ensure consistency between the raw (hourly) data and aggregated data (daily means, daily 8h maxima) on the one hand and the statistical parameters on the other hand the calculation of a standard set of annual statistical parameters are done under the responsibility of the ETC (Buijsman et al., 2004a). In AIRBASE only the statistical parameters calculated by ETC are stored. If a Member State delivers only statistical parameters and not hourly raw data, the delivered statistical parameters are available in AIRBASE.

The ETC will not make any modification in raw data and/or meta information without prior written permission of the owner of the data (that is the Member State represented by the NRC and data supplier). In case ambiguous information has been received, the NRC and data supplier will be contacted and asked to check and - if needed - to deliver correct information. As long as feedback has not received, the ambiguous data is flagged and made inaccessible to the extern users of AIRBASE. In case the NRC and data supplier of a EU Member State decide that raw data has to be deleted from AIRBASE, DG Environment is informed.

3. Developments of AIRBASE

3.1 From data exchange instrument towards an assessment tool

AIRBASE is the only air quality database system which covers the whole of Europe and which contains air quality information on rural as well as on urban air quality. In addition it is an important instrument for making European wide air quality assessments.

Originally, a major goal of AIRBASE was to support the implementation of the EoI. AIRBASE provides the member states of the European Union with a facility to deliver mandatory information under the Exchange of Information (EoI), in that way stimulating the reciprocal exchange of information among the countries. Conform Article 4.3 of the EoI-97: "The information should be accessible for the public through an EEA information system". Gradually AIRBASE has been developed towards a database for analysing and evaluating air quality as well.

The increasing use of AIRBASE data for analysing and evaluating air quality puts increasing requirements on the validity of AIRBASE data. Ensuring or improving the quality of data in AIRBASE, both measurement data and meta information, is an ongoing activity of high priority to improve the quality of European air quality assessments using the data. In addition to data quality, items like accessibility and completeness of the data needs further attention.

3.2 Improving the quality of AIRBASE

Since its introduction in 1997 AIRBASE has grown into a database which nowadays contains air quality data from 30 European countries for the years ranging from 1968 to 2003 for many pollutants. For example, for the year 2003 information on major air pollutants measured at more than 2000 monitoring stations throughout Europe is available. However, these measurement data originate from many different monitoring networks and are as such subject to different QA/QC regimes. Consequently, European wide assessments based on AIRBASE data are prone to uncertainties. Therefore, it is of the utmost importance that AIRBASE contains reliable and – even more important - comparable air quality information. As discussed above, this includes meta information on networks, its stations and measurement configurations. Continuously actions have to be taken to improve and guarantee the quality of the contents of AIRBASE. We call this 'Quality first' to emphasize that for the time being it is more important that the efforts are devoted to quality improvement of the current contents of AIRBASE than, for instance, to a further expansion of the number of components.

3.2.1. Already existing quality actions

Leading under the EoI is that the data supplier responsible is for validation and quality assurance of the data. To assist her/him with this task, the DEM itself has several possibilities to check the data. So the data supplier can check:

- the meta data by way of the DEM screens and by making reports of the meta data; it is also possible to export to a XML-file and, in the next DEM (DEMv8), to an Excel file
- the station coordinates by visualisation (graphs)

- the format and the contents of the imported files with meta data, raw data and statistics
- outliers in the measurement data
- the measurement data by visualisation (graphs)

The ETC/ACC also performs some acceptance checks during the yearly upload on:

- outliers
- missing essential meta data
- resubmission of data which have already been delivered at a previous time
- deletion of stations and measurement configurations which have data in AIRBASE

Reports of these checks are sent to the data suppliers inviting their feedback.

In 2004 a feedback action on “phantom stations” was taken. In AIRBASE a number of “phantom” stations and measurement configurations, *i.e.* stations and measurement configurations for which (in general incomplete) meta information is available but for which no AQ data has been submitted, are stored. A list of phantom stations has been sent to the data suppliers with a request to indicate whether AQ data for this station or measurement configuration is available and will be submitted to AIRBASE or the station or measurement configuration can be deleted from AIRBASE. The response of the Member States is processed in AIRBASE.

Another QA/QC action in 2004 was addressing correction factors for PM₁₀ measurement results. Submission of information on the measurement method is a non-mandatory item for the EoI. However in case of PM₁₀, intercomparison exercises of different PM₁₀ monitoring methods showed large deviations from the European Reference Method (as described in CEN standard EN 12341). It was recognised that results from non-reference methods have to be corrected and enhanced efforts to harmonise the PM-measurements in the EU are needed (EU, 2003). An inquiry was held among the data suppliers of PM₁₀ measurement data in order to gain a clear insight into the used correction factors. This has resulted in a memo *Correction factors and PM₁₀ measurements* (Buijsman and de Leeuw., 2004c).

3.2.2. Short term actions to improve the quality

Besides the existing QA/QC actions mentioned above the following actions are planned in the Implementation Plan 2005 of the ETC/ACC:

- **Filling the time gaps:** In AIRBASE substantial data gaps exist for the period up to 1998 which hampers a European –wide assessment of systematic changes in air quality over the last 10-20 year. In line with Article 5(4) Member States have responsibility to submit historical data for the period 1989-1998 where available. Emphasis will be laid on the components of the daughter directives. The ETC/ACC will generate feedback reports from AIRBASE with information about gaps in time series and send these reports to the Member States with a reminder to this obligation.
- **Adding accreditation flags:** Measurement data in AIRBASE originate from many different monitoring networks throughout Europe and are subject to different QA/QC regimes. Larssen *et al.* (1999) proposed a set of QA/QC criteria for classification and subsequent selection of air quality monitoring stations to be included in EUROAIRNET. These QA/QC criteria can be used in AIRBASE to flag data. By doing so, users can select data from AIRBASE according to their own quality criteria or intended quality of their product. We propose a slightly modified QA/QC criteria scheme in which we consider the accreditation as the most important quality indicator:

1. Network with stations that are part of a national or local air quality monitoring network. A complete *and accredited* QA/QC plan implemented in the network is the key feature of this quality level.
2. Network with stations that are part of a national or a local air quality monitoring network. The work has a complete QA/QC plan implemented.
3. Individually operated networks or stations (or even a national network) implementing a minimum QA/QC plan.
4. Includes networks or stations without a documented QA/QC plan.

Data suppliers will be asked to classify their networks according to the scheme above. This information will be included in AIRBASE and also in the next report on meta information.

- **Checking station coordinates.** There are stations of a certain Member State in AIRBASE which are not situated in the country or are located in the sea. To get rid of these stations the EEA will make GIS maps for each country with the station locations to identify these wrong station coordinates.

3.2.3. Long term actions

Suggestions for QA/QC actions in later years

Suggestions for improvement are given in the report *QA/QC plan for air quality data collecting under the Exchange of Information decision* (Buijsman *et al.*, 2004b), which are not included in the 2005 work plan of the ETC/ACC but should be addressed in future years. Possibly, if time and resources allow, a start could be made with planning for the following activities:

- **Statistical parameters.** If a Member State has submitted both raw data and statistical parameters the calculated statistical parameters can be compared with the delivered statistical parameters. In case deviations between statistical parameters directly submitted by the data supplier and those calculated by ETC/ACC are larger than expected (that is, more than a few %), the data supplier can be contacted.
According to the EoI the Member States shall send raw data or shall send raw data and statistics. But maybe it should be considered to change this requirement into: the Member States shall only send raw data with averaging times listed in the table in Annex 1 of the EoI. If a Member State sends hourly data, no aggregated data or statistics are delivered. These data are calculated by ETC/ACC in an uniform way, so that these parameters are comparable for each Member State.
- **Adding more detailed quality flags:** Measurement data in AIRBASE have a quality flag. The quality flag classification is rather rough: 1= validated, 0=missing value, -1=not validated and -2=erroneous. Sometimes more detailed quality information is needed e.g. for heavy metals in the 4th DD it is necessary to know more about the measurement quality. The EMEP uses a more detailed quality code list. If the Nasa Ames format is used to import the measurement data into the DEM, it is already possible to use these EMEP quality flags. It should be investigated if it is also necessary to add these detailed quality flags to the DEM import files.
- **Follow up of the inquiry on PM₁₀ correction factors.** Information on PM₁₀ and PM_{2.5} measuring methods (see *Correction factors and PM₁₀ measurements* (Buijsman *et de Leeuw.*, 2004c) can be screened on completeness and correctness. So far no provisions have been made in the EoI to submit

information on correction factors which have been applied by countries to the results from automated instruments. It is possible to make necessary changes in DEM and AIRBASE to accommodate the time- and location depending correction factors.

- **Spatial coverage.** The density of monitoring stations differs considerably amongst countries and ranges for instance from 0.09 station/10.000 km² in Sweden to 6.2 in Austria. The differences in network density are apparently related to the severity of the air pollution problems and population density in a country or region. However, the information in AIRBASE does not necessarily reflect the real density of stations in the different countries as not all countries deliver data for all of their stations. Especially in the Eastern European countries some air quality measurement networks are within the responsibility of the Ministries of Health. The data from these networks are not yet available in AIRBASE. Addition of these measurement data improves the spatial coverage in these regions.
- **EuroAirnet.** Some years ago, a proposal for the so-called EuroAirnet was published (Larssen *et al.*, 1999, 2003). EuroAirnet was intended to be a quality assured set of air quality monitoring stations throughout Europe. The goal of EuroAirnet was defined as: 'to establish a network with sufficient spatial coverage, representativeness and quality to provide the basic data as soon as possible, with a time delay not longer than six months, to fulfil the information requirements of EEA'. Although EuroAirnet gave a significant impetus to network criteria it did not reach a full European wide operational level. Nevertheless, the underlying concepts of EuroAirnet as well as the information needs EuroAirnet intended to fulfil are still valid. The concept of EuroAirnet should therefore be translated in a more operational status. Moreover, such a well-defined goal will help to focus on priorities in AIRBASE. First efforts are already undertaken by making the DEM fully EuroAirnet reporting compatible by partly incorporating its requirements into the EoI reporting requirements. Application of the EuroAirnet criteria on the national networks can be helpful to identify the spatial gaps in the networks.
- **Classification and representativeness of urban stations.** AIRBASE contains data from a large number of urban monitoring sites². The information is not always complete. Essential meta information to make assessments of urban air quality and population exposure are the station characteristics in terms of type of station and area, the geographical coordinates and altitude and the station name. All these parameters are mandatory under the EoI except the type of station (traffic, industrial or background). For assessments on population exposure it is also essential to know in which city the station is located.

By definition, urban stations have a low (urban background) or very low (traffic) spatial representativeness (Larssen *et al.*, 1999). More information has to be extracted from AIRBASE to get a better insight about the representativeness. Certain stations will be influenced by near-by sources. The type of station should then be defined on the basis of the predominant sources influencing the station. Recent research has shown the presence of possibilities to define the type of station using the measurement data themselves (Snel, 2004). Although further research is certainly needed the method seems promising. The method requires, for example, nitrogen monoxide (NO) data as input. Unfortunately, a limited number of countries

² In 2002, the number of urban stations ranged from 28 for PM_{2.5} to 1206 for nitrogen dioxide (Buijsman *et al.*, 2004b).

deliver these data. Most networks perform measurements on an hourly basis. Current technology allows that in these cases, measurement results for nitrogen dioxide (NO₂), as well as for nitrogen monoxide and nitrogen oxides (NO_x), can easily be made available. From the point of view of quality control the suggestion has been made to include nitrogen monoxide in the regular data delivery.

- In depth review of (meta) data quality of AIRBASE. Despite all procedures, it can not be excluded that AIRBASE contains faulty information. This holds especially for older data, as these data have been subject to less stringent quality control procedures. Therefore, it is necessary to perform an in depth review of the quality of (meta) data in AIRBASE. The most convenient way is to do this at a country level. A preliminary review of data from Belgium and The Netherlands revealed some minor discrepancies or inconsistencies.

To improve the meta data in AIRBASE it is necessary to match the old stations and measurement configurations with later imported stations and measurement configurations, while these stations and measurement configurations should be the same. When importing the new stations and measurement configurations, the data supplier may not have recognized the old ones. Because of these apparently new meta information AIRBASE contains more stations and measurement configurations than in reality.

In addition to the outlier checks on submitted data that has been described in 3.2.1., also outlier checks can be performed on historical data in AIRBASE. A more extensive quality control of the measurement data in AIRBASE is possible by making use of the statistical analysis procedures which are based on the results of research by the ETC/ACC partner CHMI (Brabec, 2003).

3.3 The accessibility of AIRBASE

The developments of the past, *ie* AIRBASE changing from a data storage facility into a analysing tool, put new requirements on the accessibility of AIRBASE.

Roughly speaking there are three categories of users of the data: the scientist, the policy maker and the public. Each user category requires another type of data and user interface. The scientist is primarily interested in numerical information in the form of tables (Excel sheets), graphs and maps, the policy makers mostly in detailed visual information ; generally the scientist will need a large amount of data. The policy maker might be more interested in more general overviews presented in graphs (trends) and maps, and the public is probably mostly interested in information at a higher aggregation level

AIRBASE is accessible to the public via Internet in two ways: via AirView³ - an interactive Web based user interface and via the so-called XML-dumps- dumps. On a country-by-country basis the complete information of AIRBASE is available on the web⁴. After downloading the XML- dumps, the information can be loaded in a web browser or in MS Excel for further processing by the user.

A third way will be realized in 2005. Overviews of meta information, statistical parameters, exceedances etc. will become available at the EEA's data service in the form of flat tables.

³ <http://etc-acc.eionet.eu.int/databases/airview.html>

⁴ <http://etc-acc.eionet.eu.int/databases/AirBaseXML.html>

In terms of contents, AirView (Mol, 2003) is thus far focused on the scientist and to a smaller extent on the policy maker. The user can select the data in a graphical way and present the selected data in the form of tables, graphs and maps. If large amount of data are required, it will be more efficient to download the XML-dumps for importing into Excel. He/she can select, process and visualize the data in Excel.

If the policy maker and the public want to use AirView more effectively, the user interface has to be made more user-friendly. Moreover, for the public more aggregated data should be available than now is present in AIRBASE.

It is difficult to know what the target groups scientists, policy makers and the public want. Therefore, AirView must have a facility where the user can drop his/her wishes on behalf of AirView.

The EEA has initiated a project to develop a portal for localized environmental information. This project, called "in your neighbourhood" (IYN), is geared especially towards the European citizens and will enable the public to find information about their surrounding environment. The Web system will contain a variety of historical and real-time data on environmental quality. For the historical air quality data the Web portal can be linked with the AIRBASE database.

3.4 The completeness of AIRBASE

When AIRBASE information is used for air quality assessments, problems may arise if the (meta) information which is delivered is incomplete. The EoI distinguishes mandatory (see Annex A, table A.1) and non-mandatory information (see Annex A, table A.2). Lack of certain types of (non mandatory) meta information makes the appropriate use of measurement results questionable or diminishes the value of measurement results. Some examples of missing essential meta information has been given.

- Essential for air quality assessment purposes and population exposure are the station parameters terms of type of station and area, the geographical coordinates and altitude and station name. Note that only the type of station is non-mandatory.
- The EoI requests, on a voluntary basis, detailed information on station and measurement methods. For a proper interpretation of PM₁₀ (and PM_{2.5}) measurements, information on the measuring method including information on the possible use of correction factors is also essential for proper evaluation of air quality (see 3.2.1.)
- Nitrogen dioxide (NO₂) is reported for a large number of stations (in 2003 at xxxx sampling points). Although the most widely used monitors measures simultaneously nitrogen dioxide and nitrogen monoxide (NO), the latter compound is surprisingly less well reported. For various applications (e.g. when relating changes in emission of nitrogen oxides with changes in air quality or in classification of urban stations, see 3.2.3 classification of urban stations) information on both NO₂ and NO is essential. Reporting of nitrogen monoxide in the regular data delivery is essential
- It is also advisable to expand the mandatory items with the specification of the NUTS IV level. Especially in case of urban or suburban stations (see 3.2.3 classification of urban stations) the name of the city in which the station is located, is important.
- The pollutant list in the EoI needs revision. Some pollutants must be added (nitrogen monoxide is missing, for all kind of assessments this is indispensable. As it is measured together with NO₂ it is widely available but hardly reported) some pollutants needs a better definition (speciation of Hg?,

define "nitrogen/sulphur wet deposition", etc.). Further we have to consider whether the EoI has to be extended with precipitation data (in view of the 4th DD).

3.5 AIRBASE as central database for AQ meta information

Besides the Exchange of Information there are more AQ reporting obligations. One of them is the reporting in the framework of EMEP/LRTAP. The LRTAP Convention is the other major international agreement with provisions for air quality monitoring and reporting, under which an EMEP rural monitoring network and ICP Forest monitoring have been established. The EMEP data are loaded in the EMEP database (Ebas). The data exchange tools in AIRBASE (DEM) facilitate the data supplier to report his data both to EMEP as well as to the EEA ("submit once, report twice"). The meta information of the EMEP monitoring stations are also available in AIRBASE.

Another AQ European reporting obligation is based on the Air Quality Framework Directive (FWD) (EU, 1996) on ambient air quality assessment and management. FWD is complemented by Daughter Directives which set limit or target values and specific assessment provisions for pollutants cited in the FWD : sulphur dioxide, nitrogen oxides, particulate matter, lead (all 1st DD) (EU, 1999), carbon monoxide and benzene (2nd DD) (EU, 2000), ozone (3rd DD) (EU, 2002), PAH-polyaromatic hydrocarbons and heavy metals arsenic, cadmium, mercury and nickel (4th DD) (EU, 2004a). A questionnaire (EU, 2004b) has been developed to manage the reporting under the first 3 daughter directives. Among other items, the questionnaire requests meta information on zones and agglomeration, on stations and on monitoring methods.

The EoI states that also data from stations used under the FWD should be submitted under the EoI. Furthermore, the Commission is intending to merge the EoI and FWD directives and so the data streams. Therefore, it is important and even necessary to synchronize the meta information of the EoI and the FWD/DDs stations. The first step is to use for the EoI and FWD the same unique EoI station code, which is generated by AIRBASE. A further (partial) merge of the two data flows is possible by extending AIRBASE with all relevant meta-information used in the FWD such as information on zones and agglomerations (code, name, area population number, fraction of area with ecosystems, vegetation etc) and by extending the current station meta-information with FWD-parameters (is the station used under FWD, then the zone code must be given). As a consequence, it has to be considered to upgrade these EoI parameters from voluntary to mandatory (in addition to the parameters mentioned in 3.4). ETC/ACC will make a proposal with proposed mandatory parameters. Using the DEM a first check on completeness and correctness of the FWD related meta data can be made. Having a common database with meta-information, interpretation of both the compliance data and the EoI-AQ data will be facilitated.

3.6 Coupling of AIRBASE with other (geographical) data

AIRBASE contains besides measurement data also meta information like station coordinates, station characteristics, information measurement methods etc. For assessments also information is needed about population numbers, zone polygons, land use, but this information cannot be delivered by the data suppliers with sufficient accuracy. A lot of this information is known in other geographical databases. AIRBASE is in principle a database with information delivered by data suppliers. The data suppliers are asked to deliver e.g. population numbers of cities. In practice it is probably better to obtain this information with better quality from other

geographical databases. To get this geographical information it is proposed to make a simple link between AIRBASE and the geographical databases. Also links with picture material (photographs of stations) can be implemented.

3.7 AIRBASE within Reportnet

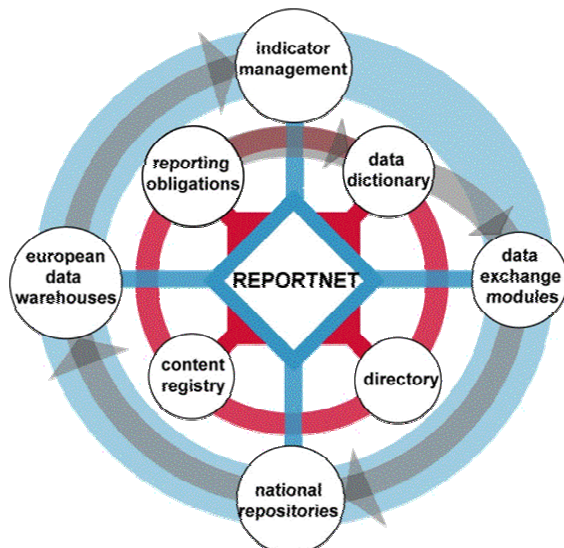


Figure 3.7.1.

Reportnet is the EEA reporting and information system of integrated IT tools and processes to support European environmental reporting. The AIRBASE and the DEM infrastructure form a part of the Reportnet “football” as follows:

- The AQ-DEM is part of the “data exchange modules” circle. AQ-DEM is an MS Access database with a MS VB user interface. Each year the AQ-DEM is preloaded with all meta information available in AIRBASE and is sent to the data suppliers. The data suppliers can modify the meta information and import the measurement data. After that the AQ-DEM is sent back to the EEA. The AQ-DEM’s are stored in the Central Data Repository (CDR).
- In fact the CDR is the circle “national repository”. Only a few countries have their own national repository, the CDR is physically located at the EEA. The AQ-DEM’s in CDR are copied to the ETC/ACC for further uploading in AIRBASE which is part of the circle “European data warehouses”. After the quality checks feedback reports are generated; these reports are also placed in the CDR.

The EEA is now implementing a so-called GDEM (general DEM). The GDEM is Web based and makes use of Web forms. To manage the meta information the GDEM seems to be a promising alternative to the AQ-DEM. How to process the (large amounts of measurement data) with the GDEM needs further research. Maybe we should combine the GDEM for the meta data and the DEM for the measurement data.

The data definitions used in the GDEM Web forms have to be defined in the Data Dictionary (DD). EEA is filling the DD with the data definitions of AIRBASE.

3.8 Accelerating the data transmission cycle

Several times it has been suggested to make measurement results in AIRBASE available earlier. This requires a more tight time schedule of the annual .The fully

processed data and statistical information are now publicly available by April 1. There are several options possible to speed up the transmission cycle:

- Improving the efficiency of the current procedure. Processing and uploading the data at ETC/ACC is most efficient when the data is submitted in the DEM. In the EoI other acceptable formats are indicated as well and some countries make use of these alternative. This increases the workload at ETC/ACC. When all countries deliver data in the DEM and with a further optimisation of the feedback cycle, a maximum gain of four weeks (delivery date March 1) can be obtained
- Advancing the 1 October EoI deadline to a date earlier in the year e.g. 1 April. This will result in a final delivery date of October 1.
- A more frequent submission of the data (e.g. twice or 4 times per year). Allowing a timelag of 3 months for each delivery this implies that the latest delivery will be received on April 1. Final delivery date will be October 1. This option is however probably not better than the option under the last bullet, because it requires more capacity (4 times submitting). The statistics can be calculated after the last data submission.
- Asking the MS to deliver the EoI data earlier than October 1.
- Process the data immediately when the data are delivered by the data suppliers. So, when data are delivered before 1 October ETC/ACC will start with the processing (upload in AirBase, making the feedback reports etc.)
- Before the end of this year nearly all countries will be uploaded in AirBase and a number of feedback reactions will be processed. So, ETC/ACC can release an update of AirBase at, say, 15 December with the uploaded raw data. Note that the raw data, which are not yet quality controlled, are flagged off, so they are not yet visible. Moreover, no statistics of the new raw data are available. The statistics are calculated at the end of the AirBase upload process.

4. Conclusions and recommendations

AIRBASE is a very powerful database system for assessment of European air quality data. AIRBASE has changed from a data storage facility to satisfy the legal requirements of the EoI into a tool to assess air quality across Europe. ETC/ACC has made great efforts to improve AIRBASE in order to increase its potential as a tool for European air quality assessments. However, more things have to be done to fully develop this potential. The accessibility of AIRBASE has been found to satisfy the needs of primarily scientific users. Some parameters which are now provided on a voluntary basis would have to be made mandatory, a task for the Commission. The first steps are made for AIRBASE to be a central database for air quality meta data. The EoI, FWD and EMEP have the same EoI station code, but some FWD parameters have to be added to AIRBASE. Links from AIRBASE to other geographical database have to be made. Several additional QA/QC actions are proposed in this paper. And finally some suggestions are made to accelerate the data transmission cycle.

The following table gives an overview of all activities planned for 2005 and future activities. Realization of long term actions depends on priority and capacity.

5. Planning table

Item	Paragraph	Planning
Filling the time gaps	3.2.2.	2005
Adding accreditation flags	3.2.2.	2005
Checking station coordinates by maps	3.2.2.	2005
Make a list of necessary and mandatory parameters on top of the existing EoI-list (inclusive the FWD/DD parameters)	3.2.3. 3.4 3.5.	2005
Accessibility of AirBase: 1. Improving AirView 2. Macro's XML 3. Flat tables EEA Data Service 4. Link with "in your neighbourhood" portal	3.3	>=2005 2005 2005 >2005
Further integration AirBase and DEM in Reportnet: GDEM, DD, CDR	3.7	>=2005
Adaptation of AirBase and DEM to the extended parameter list	3.2.3. 3.4 3.5	>2005
Statistical parameters: checking deviations (alternative: Commission Decision to send only raw data)	3.2.3.	>2005
Screening PM10/PM2.5 measurement methods and adaptation AirBase/DEM for correction factors	3.2.3.	>2005
Filling spatial gaps	3.2.3.	>2005
Application EuroAirnet criteria on national networks	3.2.3.	>2005
Classification urban stations using measurement data in AirBase	3.2.3.	>2005
Matching old stations/measurement configurations with later imported stations/measurement configurations	3.2.3.	>2005

Outlier checks on historical data	3.2.3.	>2005
Statistical analysis on the measurement data in AirBase.	3.2.3.	>2005
Coupling AirBase with other (geographical) data	3.6	>2005
Acceleration data transmission cycle	3.8	>= 2005

Table 4.1

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Annex A Exchange of Information

The Exchange of Information Decision requires a large set of meta information to be delivered to the Commission (EU, 1997, 2001). Part of this information is mandatory (*Table A.1*) and the other items (*Table A.2*) are to be delivered to the Commission 'to the extent possible' and 'as much information as feasible should be supplied'.

Table A.1 Overview of mandatory meta information to be delivered under the Exchange of Information (EoI)

Item ^a	Description
I.1.	Name of the network
I.4.1.	Name of the body responsible for network management
I.4.2.	Name of person responsible
I.4.3.	Address
I.4.4.	Telephone and fax numbers
I.5.	Time reference basis
II.1.1.	Name of the station
II.1.4.	Station code given under the present decision and to be provided by the Commission
II.1.8.	Geographical co-ordinates
II.1.10.	Pollutants measured
II.1.11.	Meteorological parameters measured
II.2.1.	Type of area

(a) Numbers according to Annex II of the EoI (EU, 2001)

Table A.2. Overview of non-mandatory meta information to be delivered under the Exchange of Information (EoI)

Item ^a	Description
I.2.	Abbreviation (of the network)
I.3.	Type of networks
I.4.5.	E-mail (of the body responsible for the network)
I.4.6.	Website address
II.1.2.	Name of the town/city of location (of the station)
II.1.3.	National and/or local reference number or code
II.1.5.	Name of technical body responsible for the station
II.1.6.	Bodies or programmes to which data are reported
II.1.7.	Monitoring objectives
II.1.9.	NUTS level IV
II.1.12	Other relevant information
II.2.2.	Type of station in relation to dominant emission sources
II.2.3.	Additional information about the station
III.1.1.	Name (of measurement equipment)
III.1.2.	Analytical principle or measurement method
III.2.1.	Location of sampling point
III.2.2	Height of sampling point
III.2.3	Result-integrating time
III.2.4	Sampling time

(a) Numbers according to the Annex II of the Exchange of Information (EU, 2001).