Review of the Air Quality Communications Contract

Air Quality CONSULTANTS

Aether

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Author	Chris Dore, Steve Moorcroft, Justin Goodwin, Duncan Laxen, Melanie Hobson,
Signature	
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Aether Contact Details

Aether Ltd
99 Milton Park
Abingdon
Oxfordshire
OX14 4RY

chris.dore@aether-uk.com

skype: aether_chrisdore
+44 (0) 7799 633 984
+44 (0) 1235 854 054

Registered office: 99 Milton Park, Abingdon, Oxfordshire OX14 4RY. Registered in England 6630896

Executive Summary

ES1 Purpose and Objectives

The purpose of this study was to review Defra's arrangements on the provision of air quality information to the public. Much of this is handled through the current Air Quality Communications Contract, which maintains the Air Quality Archive web pages, a freephone service, and provides information through Teletext.

The specific objectives of this review were to assess:

- How well the Communications Contract currently delivers information to stakeholders;
- How effective the Archive is in terms of usability, functionality and the extent to which the UK fulfils its requirements for public information under 2008/50/EC and the 4th Daughter Directive (2004/107/EC); and
- Whether there was best practice being used by other websites etc., which could be drawn upon.

In addition to reviewing the work specifically undertaken through the Communications Contract, a basic assessment of Defra's approach to air quality communications in general was also carried out.

ES2 Tasks Undertaken

To achieve these objectives a number of tasks were undertaken:

1. Review of the UK AQ Archive Website: Time was spent stepping through different parts of the Archive, considering the available information, presentation, structure and ease of use etc. Consideration was given to the wide range of stakeholders who use the Archive.

2. Review of Teletext and Freephone services: These were reviewed in terms of the interface and the information that was made available.

3. Undertake a Stakeholder Questionnaire: Stakeholder groups and individuals were identified, and an on-line questionnaire was run for several weeks to gather the views of people in the air quality community.

4. Gather Views from Sounding Board Members: As a follow up to the questionnaire, telephone interviews were conducted with key members of the air quality community. This allowed a more detailed discussion of relevant issues.

5. Obtain Some Perspective from the General Public: This required a straw poll of the general public, and the review of Citizens Jury work undertaken on air quality.

6. Gather Examples of International Best Practice: A range of websites were reviewed to identify examples of good data handling, presentation, or functionality that could usefully be used in the UK site.

7. Consider Existing and Future Tools, Platforms and Technology: State-of-the-art approaches used for data handling and information dissemination were considered.

8. Review Defra's Current Communications Strategy and Routes: Consideration was given to the current way in which Defra provides information to the public, other Government departments, and the way it works with Local Authorities.

ES3 Principal Conclusions

The following is a summary of the conclusions from the different tasks undertaken:

1. Does the AQ Archive generally meet the needs & requirements of different user groups?

- The current communications services are generally compliant with the legislative requirements of the Directives, and only a small number of issues were identified with the provision of information for Directive 2004/107/EC. In addition, information relating to plans and programmes does not appear to be available, although this does not fall within the remit of the Communications Contract;

End-users surveyed by questionnaire recognise the Air Quality Archive to be an invaluable resource, principally for data access and LAQM resources, and the services as currently provided broadly meet the requirements of various air quality professionals.

2. Is the content, presentation and accessibility of the information adequate?

- There are a number of issues relating to general site navigation, and many end-users (both technical and general public) expressed some frustration at not being able to readily find the information that they wanted;
- There is inconsistent use of interactive maps;
- The current data extraction facilities are limited in functionality (i.e. limited to simple downloads and statistical summaries). This can result in a lengthy and repetitive extraction process;
- The metadata available for some pollutant species (in particular PM) is inconsistent;
- The Archive contains a number of broken links and out-of-date descriptions of some networks. A clearer distinction between historic and current networks needs to be provided, with greater use of interactive maps;
- The data for some non-automatic networks are only available in Excel spreadsheet format;
- The information for some data (e.g. acid deposition networks) is provided from two websites, in an inconsistent manner, with no clear links between them**;**

The purpose of some areas of the Archive is unclear, e.g. the Reports and Contracts databases.

3. Should the Archive be extended to include other data sources?

- Numerous end-users flagged the value of having a single portal to access air quality data. In particular, the integration of data from local authority automatic monitoring sites was widely supported.

The requirements for complementary datasets were less consistent among end-users, apart from the provision of meteorological data – there was a very strong opinion amongst many users that these data should be made available free of charge (at least for local government use) via the Archive**.**

4. Are the other forms of media used to communicate air quality information useful?
A consistent message was that the majority of end-users did not know of the services provided by Ceefax and Freephone, and therefore did not use them.

ES4 Recommendations

Having reached these conclusions, a number of recommendations were then formulated. These can be summarised as follows:

Key Recommendations: Communications Contract

1. Website Structure
Restructure the current Archive into an Air Quality Information Hub[1], containing the following separate components:

- Air Quality in the UK, with a map based interface to monitoring station information, and summary data on LAQM, emissions, health effects (the front page);
- Local Authority LAQM Pages (already migrated);
- Data Archive;
- Air Quality Library.

2. Website Architecture
Develop a Service Oriented Architecture, containing existing databases of data (AURN etc.), with registries and data dictionaries to support registration, discovery and extraction of data from third party services. In compliance with the SEIS and INSPIRE principles, third party data should not be imported into the website but should be discoverable, and relevant data sets extractable/analysable through the site. The arising implications associated with data management are addressed in detail by the Scoping Study.

Different parts of the proposed website structure are tailored to different users. The content of the web pages should therefore be specifically designed for the respective user, in terms of content and presentation.

3. Website Branding and Management
Determine a suitable name for the Hub, and use the term “archive” to refer to the data area only. Consider the most appropriate way of managing the hub, which may involve more than one contractor.

4. Website Mandatory Requirements and Accessibility Criteria
Ensure that actions are taken to fully comply with the requirements of the Directives relating to the provision of public information. Ensure that actions are taken to fully comply with accessibility criteria.

[1] This would reside on the Defra website, as part of the Transformational Government Website Rationalisation programme.

5. Archive Datasets

Establish quality criteria for inclusion of data in the archive. Include data from monitoring networks which comply with the data quality criteria, with the following levels of priority:

1. AURN and LAQN data
2. Local authority automatic data
3. Meteorological data
4. Non-automatic networks (NO2 Diffusion Tubes, PAH, Hydrocarbons, TOMPS, Heavy Metals, Black Smoke)
5. Acid Deposition Networks
6. Other Datasets

6. Metadata

Make substantial improvements in the metadata accompanying monitoring data on the archive (in particular for Particulate Matter).

7. Accessing Data

Make improvements to the functionality of the tools used to provide access to monitoring data. Implement map-based front end and continue to invest in the development of OpenAir as a tool for data users.

8. Complementary Datasets

Investigate the possibility of making meteorological data readily available at no cost for Public sector work. Provide considerably improved links to complementary datasets.

9. Freephone and TV Services

The addition of a "text back" service is recommended for mobile phones. Setting up a Twitter feed for air quality bulletins and alerts is also recommended. TV services are currently being moved to digital, and it is assumed that they will remain much the same.

10. Other Reporting

Maintain requirements for reporting to the Digest, Headline Indicators and European Institutions within the Communications Contract. Include requirements for reporting to the Commission once the electronic proforma is available.

Key Recommendations: Defra Communications

1. Disseminating Information to the Public

Provide air quality information in the context of the impacts on health of long-term exposure. Deliver information to the public in an active way, by working closely with the local authorities.

2. Working with Other Government Departments

Target a more substantial "buy-in" from the Department of Health, and review current process for providing information to transport planners with the Department for Transport.

Contents

1 Introduction

1.1 Objectives

The purpose of this study is to review Defra's arrangements for the provision of air quality information to the public. Much of this is handled through the current Air Quality Communications Contract (henceforth termed the "Communications Contract").

Reviewing the work undertaken through this contract requires a number of different tasks:

- Assess how well the Communications Contract currently delivers information, by consulting with a wide range of different user groups, including: academics, research scientists, consultants, Government representatives at the local, regional and national levels, and the general public.

- Review the effectiveness of the Air Quality Archive (which constitutes the centre-piece of air quality information dissemination in the UK), in terms of the purpose the Archive currently serves, its usability, functionality, technological requirements, and the extent to which the UK fulfils its requirements for public information under 2008/50/EC and the 4th Daughter Directive (2004/107/EC).

- Gather information on best practice relating to air quality information dissemination from other countries, and assess relevant developments in technology.

- Provide recommendations on how improvements could be made to air quality communications, with particular focus on timescales, costs and an improved service to user groups.

In addition to reviewing the work specifically undertaken through the Communications Contract, an assessment of Defra's approach to air quality communications in general is required. Defra's communications activities and strategies falling outside the Communications Contract were assessed by the project team, and views were also gathered from the user groups identified above.

1.2 Scope

To achieve the objectives outlined above, the following tasks were undertaken:

- A review by the project team of the current services operated by the Communications Contract;
- A consultation with numerous representatives from a range of user groups;
- Interviews with individuals know to be regular users of the Air Quality Archive website (henceforth termed the "Archive");
- An assessment of best practice in other countries;

- An assessment of currently available technology which could aid information dissemination;
- A short consideration of how people overseeing other policy issues have been successful in raising their public profile, and moving the issue "up the political agenda".

Defra has also commissioned a Data Management and Integration System (DMIS) Scoping Study (henceforth termed the "Scoping Study") which is intended to investigate and define the tasks needed to create a data infrastructure that will ensure the accessibility and reusability of the key ambient air quality resources. The Scoping Study is primarily focused on meeting the future requirements of the INSPIRE Directive, the UK Location Study and the Shared Environmental Information System (SEIS). Clearly recommendations coming out of this project have implications for data structures and formats, which in turn may impact on the Archive and subsequent communication of information.

This report therefore draws on the outcomes of the Scoping Study insofar as these affect the future requirements of the Communications Contract. A detailed consideration of the requirements to comply with the INSPIRE Directive does not form a part of this contract because it has been considered in the Scoping Study.

1.3 Approach and Limitations of Study

The approach taken to fulfil the objectives set out in Section 1.1 above has been founded on a review of the existing Communications Contract and the Air Quality Archive, a review of best practices related to the dissemination of air quality information in other countries, and a questionnaire survey of end-users.

A detailed review of the Air Quality Archive is provided in Annex 1 to this document. This provides comments on the content and functionality of the current Archive, together with the outcomes of some, limited test scenarios that were carried out. Where comments are made that information was missing, or could not be found, or that links or functions were not operational, these necessarily relate to observations made at the time of the analysis. It is also possible that the required information or data is available, but could not be readily identified at the time.

The survey of end-users included both a web-based questionnaire and limited follow-up interviews by telephone. The outcome of this survey is necessarily limited to those individuals and organisations that provided a response.

2 Review of AQ Communications in the UK:

2.1 Compared to the Legislative Requirements of the Air Quality Directive

2.1.1 Public Information

Defra and the Devolved Administrations are responsible for providing information to the public under the Ambient Air Quality Directive (2008/50/EC) and the 4th Daughter Directive (2004/107/EC). They are also responsible for reporting air quality information to the European Commission that identifies compliance (or otherwise) with the limit values, and what progress is being made to achieve the obligations under the Directives.

Information for the public is required to be made available free of charge by easily accessible media, such as the Internet, and should take into account the provisions of Directive 2007/2/EC (the "INSPIRE" Directive).

A detailed review of these requirements and the role of the Communications Contract and Air Quality Archive are provided in Annex 1. In summary, in terms of public information, the Air Quality Archive provides:

- All required information on ambient concentrations of pollutants. The information is provided free of charge via the Internet, Teletext and Freephone services;
- All required information on actual or predicted exceedences of alert thresholds, including observed exceedences (and users can choose to sign up to a free Subscription service to automatically receive this information);
- Annual Reports (*Air Pollution in the UK*) – a document that summarises measurements from national networks relating to ozone, nitrogen dioxide, sulphur dioxide, carbon monoxide, Particulate Matter, benzene and 1,3-butadiene;
- Documentation and review of site selection (via a link to the Site Information Archive) in respect of 2008/50/EC;
- Advice on Postponement Decisions (i.e. applications to the Commission to seek a postponement of the attainment deadlines for certain limit values).

Issues

In respect of the requirement to provide documentation and review of site selection (as required by Annex III, Part III of 2004/107/EC), this information does not appear to be provided via the Air Quality Archive. The relevant information may well be held by Defra elsewhere, but there is a requirement for it to be easily accessible in the public domain.

It is also noted that information on exceedences of the limit value for lead, and target values for arsenic, cadmium, mercury, nickel and benzo(a)pyrene are only provided via the annual reports which have to be downloaded. It is not clear whether this represents a non-

compliance with the Directive, but it would be better to also include the information on public web pages.

Additional omissions (related to Information and Reporting requirements) are:

- the provision of 'air quality plans', as provided for in Article 22(1) and Article 23;
- the provision of 'programmes' referred to in Article 17(2); and
- informing the public as to the competent authority designated in relation to tasks set out in Article 3.

However, these do not currently form part of the Communications Contract.

To address these omissions Defra could include links to the information as part of the web re-organisation. There is no particular need to include the provision of this information in the Communications Contract, although it may be convenient to do so. The most important point is that this information is part of the public reporting requirement under the Directive, and therefore needs to be made readily accessible.

2.1.2 Transmission of Information and Reporting

Defra and the Devolved Administrations are also required to report information on ambient air quality to the Commission on an annual basis. This information has the specific purpose of assessing compliance with the limit values and critical levels and the attainment of target values.

The Communications Contract currently requires the provision of statistical summaries, which are input to a questionnaire under the terms of a separate contract. The Commission is currently in the process of developing electronic proformas to enable data to be reported consistently and more easily.

2.1.3 Other Reporting

Defra and the Devolved Administrations also provide information on ambient air quality for other purposes (not directly related to the Directives):

- ***Digest of Environmental Statistics:*** annual summaries of environmental data are reported in the Digest. These summaries are compiled under the terms of the Communications Contract.

- ***Headline Indicator:*** The Headline Air Quality Indicator is published twice per year. The Indicator and supporting data are compiled under the terms of the Communications Contract.

- ***European Institutions:*** Defra also routinely submits data under the Exchange of Information (EOI) Decision to the European Environment Agency, for inclusion in the AIRBASE database, and to EMEP. These data are compiled under the terms of the Communications Contract.

2.2 Compliance with Accessibility Criteria

The Archive is a Government funded website and therefore it has to meet Level Double-A of the W3C Web Content Accessibility Guidelines as a minimum. A detailed review of the compliance of the Archive with these Guidelines has been carried out, and is provided in Annex 1 (Section 5.10). In general terms the Archive is compliant with the Guidelines, but a number of recommendations have been set out, which should be considered during any website revisions. These recommendations are included in Section 4.6.1 (and in Annex 1).

In light of the intent to re-brand the Archive as part of the Transformational Government Website Rationalisation, it assumed that these issues would be taken into account as part of that process.

2.3 Compared to User Expectations and Needs

This section draws together information gathered during the completion of Work Packages 1, 2 & 3, which are detailed in Annexes 1, 2 and 3 respectively.
Specific issues that are considered are:

- Does the Archive generally meet the needs and requirements of different user groups?
- Is the content, presentation and accessibility of the information in the Archive adequate?
- Should the Archive be extended to include other data sources?
- Are the other forms of media used to communicate air quality information useful?

2.3.1 Presenting Information to the Different User Groups

A clear and consistent message from the questionnaire survey and the Sounding Board discussions is that the Air Quality Archive represents an invaluable resource that is widely appreciated and generally meets the needs and requirements of the wide range end-user groups. However, it was also noted by many respondents that unless they frequently visited the Archive, users would often have difficulties in finding the information that they wanted. Some frequent users also reported similar difficulties with the current structure, often using the wrong pages or systems to try and access the required data or information.

There are two aspects to this:

- The organisation of the web pages and the way they are linked to each other;
- The content of each page, and the way information is visually presented.

These issues are also identified in Annex 1, where a review of the general site navigation is reported. Some general points are:

- Some of the pages (including the “home page”) are “very busy”, presenting large amounts of information and links, and text in particular. It can be confusing to navigate around this, particularly when using a laptop (which requires scrolling);

- There are, in some cases, multiple ways to access the same information, and whilst the data are not necessarily inconsistent, they are presented in different formats, e.g. there are four different ways of accessing information on current air quality conditions from the "home page";
- Some of the data are provided in a format that is very difficult to read e.g. information on *Current Levels* under *Air Quality Bulletins* provides the user with a large number of tables and graphs;
- The current link to the Site Information Archive (for the AURN sites) is difficult to find[2], and not easily linked to the data provision.

It is therefore concluded that the structure and content of the web pages needs to be reviewed, and substantially reorganised. It would be sensible to do this in a way which provides specific areas to suit different end-user types. Detailed recommendations associated with these points are included in Chapter 4

2.3.2 Current Archive Scope

The Archive currently includes information which is relevant at the UK level, using data from UK wide monitoring networks. Local Authorities and the Devolved Administrations provide websites which contain both data and information relating to air quality at the corresponding Local and Devolved Administration scales.

This arrangement works well, and it is therefore important that the Archive continues to maintain a national level focus.

Providing clearly presented links to regional and local websites on the Archive is an area which should be improved to facilitate the co-ordination of information and clear presentation.

2.3.3 Accessibility of Datasets

A detailed review of the current data extraction facilities is provided in Annexes 1 and 2 to this document. The main conclusions of this review are endorsed by the questionnaire and Sounding Board responses, and whilst accessibility was generally judged to be "satisfactory" (with scores of between 3 and 3.5 (out of 5) for most end-users), it is clear that there is room for improvement. The pertinent observations are:

- General navigation can be confusing, especially for the non-automatic networks data;
- Provision of simple exceedence statistics is available via more than one data selector**, and these are sometimes not consistent with each other;**
- The current data extraction facilities do not easily allow the user to access data for more than one year at single sites, for multiple sites, and/or multiple pollutants. It is

[2] During the course of this project the Site Information Archive was migrated to the Defra website at http://aurn.defra.gov.uk

thus unnecessarily time-consuming to extract data, for example annual mean NO_2 and PM_{10} concentrations measured at 5 London sites over 2004-2009;

- For key pollutants, such as PM_{10} and $PM_{2.5}$, there is **inconsistent information provided on the monitoring method** used (e.g. TEOM, FDMS etc) and whether any correction has been applied (e.g. TEOM*1.3, TEOM VCM etc);
- For many users the list of available options for PM data is confusing and too large (e.g. non-volatile PM_{10} etc);
- In some instances, the user needs pre-defined knowledge of the network in order to easily extract the data. For example, the user needs to know what instrument is used for PM sampling before "hourly-measured" or "daily-measured" values are selected;
- A clearer distinction between historic and current networks needs to be made (e.g. for nitrogen dioxide diffusion tubes and the black smoke network);
- Data extraction facilities for some networks are compromised, as the data are only available to download as Excel spreadsheets.

2.3.4 Inclusion of Other Air Quality Monitoring Datasets

Numerous users flagged the value of having a single point of access for a wide range of different air quality measurement datasets, particularly for the Air Quality Strategy pollutants. There are a number of air quality measurement datasets which could usefully be added, for example data from automatic monitors operated by Local Authorities, and data from other organisations (e.g. monitoring carried out by industrial operations, airports etc).

Including these additional datasets is likely to mean that data held on the Archive comply with different data quality standards[3]. It is therefore clear that there needs to be an improvement to the way in which quality information is presented on the Archive, and significant improvements to meta-data have been flagged as very important by several key data users.

Some users are keen to see all datasets included, irrespective of quality, but this creates the opportunity for data to be used inappropriately, and for conclusions to be incorrectly drawn. The majority of end-users contacted via the Sounding Board were of the opinion that the focus of attention could be upon NOx/NO_2 and PM_{10}/$PM_{2.5}$ (and possibly SO_2 and ozone) monitoring data, as these are the principal pollutants of concern in the UK.

Monitoring data are also collected within other national networks or measurement programmes, including:

- UK EMEP Supersites
- Ammonia, Acid Gases and Aerosols, and Heavy Metals Monitoring Network

[3] A number of users did point out that if the data are deemed suitable for the purpose of Review and Assessment, then they should be suitable for inclusion in a national database. It was also noted that the costs of collecting poor data are generally the same as collecting good data, and the opportunity to have data included onto a national database may provide a useful driver for improved QA/QC arrangements.

- Black Smoke Network

EMEP Supersite: The UK contribution to the EMEP monitoring strategy is based on the operation of two Level II Supersites, one at Auchencorthmoss and the other at Harwell. A very wide range of pollutant measurements are undertaken at these sites, including trace gases and aerosols. The Auchencorthmoss Supersite is described on the CEH website[4], with "live data" provided for nitrogen dioxide and ozone concentrations over the previous two weeks. The other data do not appear to be available for download. Similar information related to the Harwell Supersite does not appear to be available.

Ammonia, Acid Gases and Aerosols, and Heavy Metals Monitoring Network: Information on the networks is provided by CEH via the UK Pollutant Deposition Portal, and site information and data downloads can be accessed via an interactive map[5].

Black Smoke Network: Information on the network is provided both in the Archive and by NPL. The Archive currently provides a description of the historic (Smoke & Sulphur Dioxide) network and the revised (Black Smoke) network (currently operated by NPL), together with data downloads up to 2008[6], and access to the 2006 Annual Report. The NPL website provides a non-interactive map showing current site locations, but there is no data download facility.

Clearly there is logic in ensuring that these datasets are available through the single interface of the Archive in a more consistent manner.

2.3.5 Inclusion of Complementary Datasets

A number of users indicated that it would be useful to provide direct access to complementary datasets, such as meteorological data, traffic data, emissions data etc. There are several key issues and policy drivers associated with this:

- Users pointed out that the meteorological data collected by the Met Office have been obtained using public money, and therefore queried why it should be paid for again. There was considerable resentment that this should be the case, especially from users undertaking work within, or for, local or central Government projects. More than one user queried the number of local authorities and organisations that have, for example, purchased the 2009 dataset for Heathrow;
- If the OpenAir system is integrated into the Archive (see Chapter 4) many of its key functionalities will be removed unless meteorological data can be directly accessed. The analyses can, of course, be done off-line, but this negates the purpose of providing an integrated system;
- Integration of complementary datasets is currently being reviewed by Defra and the devolved administrations as part of the initiatives to comply with the INSPIRE Directive and the UK Location Programme (see 2.4 below).

[4] www.uk-pollutantdeposition.ceh.ac.uk/emep
[5] www.uk-pollutantdeposition.ceh.ac.uk/networks
[6] Data from both networks are labelled as "Smoke & Sulphur Dioxide)

Whilst interoperability of datasets is an issue that will need to be resolved in order to comply with the INSPIRE Directive, it will still involve considerable effort (and associated cost) to integrate the data into a "single web site". It is important to carefully consider which data (if any) should be integrated into the Archive, or whether better links to external data sources would provide the same benefits. These issues are further explored in Chapter 4.

2.3.6 Communication Through Other Media Sources

The Air Quality Archive is only one of the media sources used to communicate air quality information. Other sources include the publication of reports, the use of Teletext/Ceefax and the provision of a Freephone service.

Feedback from the end-users indicates that little use is made of the published reports, particularly where the data are available from other sources. In particular, the *Air Pollution in the UK* annual report appears to be used very little by the air quality community. Whilst Defra and the Devolved Administrations are required to prepare annual reports (under Directive 2008/50/EC) these need only provide limited information on exceedences of the limit values, target values, long term objectives, information thresholds and alert thresholds, together with summary assessments of the effects of any exceedences. There is no requirement to provide analyses of trends (although these are useful), and no requirement to provide tabulated statistics for all of the monitoring sites (which are available elsewhere).

The Teletext/Ceefax service is now not available on Teletext. The Ceefax service is available, but is not currently available via the digital TV services (although it is understood that this is to be resolved). This provides a useful service to the public.

The Freephone service is considered to be an excellent means of communicating air quality information to the public, and only minor problems were identified (see Section 5.8).

2.3.7 Platform and Reliability:

The basic PHP/MySQL platform used for the Air Quality Archive performs adequately for the current tasks required where there is a controlled and co-ordinated flow of data associated with a number of managed dedicated databases. PERL scripts used for database management are robust and industry standard open source methods. The system speed and reliability is acceptable and the code is well managed and well organised.

It should also be noted that it is possible to use the current PHP/MySQL based system to generate any standard XML formats that are needed for compliance with INSPIRE and SEIS. The existing Archive is considered a suitable platform for providing INSPIRE and SEIS compliant outputs of data necessary to meet the UKs commitments under the Air Quality Framework Directive.

The data accessibility tests (see Annex 2) indicate that the system is adequate for handling the current sizes of datasets.

A number of recommendations have been made to improve the usability and content of the Air Quality Archive in response to user needs and are elaborated in Chapter 4.

2.4 Outcome of Data Management and Integration System Scoping Study

Defra and the Devolved Administrations have recently commissioned a Data Management and Integration System Scoping Study to investigate the current interoperability of air quality monitoring datasets and associated metadata (such as meteorological data, traffic data, land use statistics, population and health data). The objective of the Scoping Study was to investigate the feasibility of integrating these different datasets in order to increase data processing efficiency and reduce costs associated with data handling and manipulation. Such integration would also assist the UK in meeting its regulatory obligations as set out within the INSPIRE Directive and the UK Location Programme.

The various regulatory obligations and the detailed recommendations of the Scoping Study are set out in the Scoping Study report[7] and are not repeated here. It is however important that this project takes account of the recommendations of the Scoping Study, insofar as they may affect the future requirements of the Communications Contract and the structure of the Air Quality Archive.

Our review agrees with the Data Management and Integration System Scoping Study report recommendations i.e. that the Air Quality Archive becomes a focal point for UK air quality monitoring data and supporting material to facilitate wider understanding and analysis of air quality issues. This will require the provision of access to additional monitoring data held by third parties and data on meteorological conditions, activities affecting emissions etc. For this purpose, the Scoping Study recommends that a number of data providers register their datasets to an upgraded data discovery system within the Air Quality Archive. This will require the Air Quality Archive to develop a Service Oriented Architecture to enable it to provide users access to data and services offered by registered third party SEIS and INSPIRE compliant systems. Much of the burden is expected to fall upon the various data providers who will need to develop SEIS and INSPIRE compliant systems as well as providing the added metadata and categorisation required by the Archive.

The Archive will be required to develop and maintain an extensive data dictionary as well as support services to ensure that key datasets are linked reliably and transparently to the user interfaces. Further details are included in Annex 3.

[7] Air Quality Data Management and Integration System - Scoping Study. AEA Technology Report for Defra. Andrew Monteith, Ollie Cronk, Rachel Yardley, Paul Willis, Xingyu Xiao, March 2010.

2.5 Compared to International Examples of Good Practice

A review was undertaken of several websites offering air quality information, and related environmental services. Details of the review are included in Annex 7. The main findings, conclusions and recommendations are included here.

The purpose of the review was twofold:

- To see how other countries complied with Directive 2008/50/EC, which requires Member States to inform the general public and other organisations about ambient air quality.
- To find examples of good practice - in terms of presentation, functionality and content.

The main findings were as follows:

1. Many websites presented information much more clearly than the current UK Archive. This was achieved by well designed web pages, without excessive content. A good example of this is the Scottish[8] air quality website (www.scottishairquality.co.uk).
2. Websites benefit from being structured to face different user groups, and it was clear where information could be found for these different user groups. A good example is the USEPA site (http://www.epa.gov/kids/).
3. The use of interactive maps allowed information to be presented in a clear and useful way. The current Devolved Administration sites provide good examples.
4. Presenting data using interactive graphs and tables enables users to gain a good understanding of the data. The EEA website provides good examples of this (http://www.eea.europa.eu/data-and-maps/data#c5=all&c0=5&b_start=0&c11=air)
5. Background information, and an overview of ways of reducing the impacts of poor air quality, provides the public with information to be able to make constructive change. This is presented extensively on many sites.
6. A number of sites use wiki's to help co-ordinate networks of experts. However these are typically found on websites of international organisations rather than national websites.

One of the best examples of air quality websites is the Scottish site (and those for Wales and Northern Ireland). This is, perhaps, because they have undergone substantial development more recently than the other sites, and therefore incorporate the latest thinking in terms of website design.

[8] Similar air quality websites are operated in Wales and Northern Ireland

2.6 Principal Conclusions from Review

Some principal conclusions can be drawn from this review, which can then be used to inform recommendations for future development. These are provided in response to the four principal questions posed by Defra:

1. Does the AQ Archive generally meet the needs & requirements of different user groups?

- The current communications services are generally compliant with the legislative requirements of the Directives, and only a small number of issues were identified with the provision of information for Directive 2004/107/EC. In addition, information relating to plans and programmes does not appear to be available, although this does not fall within the remit of the Communications Contract;

End-users surveyed by questionnaire recognise the Air Quality Archive to be an invaluable resource, principally for data access and LAQM resources, and the services as currently provided broadly meet the requirements of various air quality professionals.

2. Is the content, presentation and accessibility of the information adequate?

- There are a number of issues relating to general site navigation, and many end-users (both technical and general public) expressed some frustration at not being able to readily find the information that they wanted;
- There is inconsistent use of interactive maps;
- The current data extraction facilities are limited in functionality (i.e. limited to simple downloads and statistical summaries). This can result in a lengthy and repetitive extraction process;
- The metadata available for some pollutant species (in particular PM) is inconsistent;
- The Archive contains a number of broken links and out-of-date descriptions of some networks. A clearer distinction between historic and current networks needs to be provided, with greater use of interactive maps;
- The data for some non-automatic networks are only available in Excel spreadsheet format;
- The information for some data (e.g. acid deposition networks) is provided from two websites, in an inconsistent manner, with no clear links between them;

The purpose of some areas of the Archive is unclear, e.g. the Reports and Contracts databases.

3. Should the Archive be extended to include other data sources?

- Numerous end-users flagged the value of having a single portal to access air quality data. In particular, the integration of data from local authority automatic monitoring sites was widely supported.

The requirements for complementary datasets were less consistent among end-users, apart from the provision of meteorological data – there was a very strong opinion amongst many users that these data should be made available free of charge (at least for local government use) via the Archive.

4. **Are the other forms of media used to communicate air quality information useful?**

A consistent message was that the majority of end-users did not know of the services provided by Ceefax and Freephone, and therefore did not use them.

3 Improving the Awareness of Air Quality Issues in the UK

Chapter 2 has considered the services included in the current Air Quality Communications contract. This Chapter considers other forms of communication, and in particular broader, more strategic activities. This Chapter therefore focuses on communicating with the general public, and draws on the information provided in Annex 5 and recent Government reports.

It should be noted that there are limits to what can be covered by this project. Clearly a more comprehensive strategic study would be required to identify the most effective methods of engagement with the public, other Government departments and the governing political party.

3.1 Improving Public Awareness

3.1.1 Priority Levels in Government

The priority level which is assigned to communicating air quality issues, and educating the general public was flagged in the recent Air Quality report from the Environmental Audit Committee. It noted:

"Air quality must be a higher priority for Government. Defra must raise the profile of the issue by publicising the latest data on premature deaths more widely and making clear the benefits of improving air quality."

3.1.2 Current Levels of Public Awareness and Understanding

A Citizens' Jury project in 2006 found that the public understanding of air quality issues was generally very basic, and did not extend much beyond a simple concept of the main sources. There was a general perception that larger urban areas were more polluted that rural ones (which can make it particularly difficult to explain issues associated with ozone).

The IHPC Review of Local Air Quality Management, which was reported in 2010, reached similar findings:

"Although there is some evidence of public concern from public attitude survey results in London, the general consensus among those we met – including a group of local councillors serving on the LGA environment and transport boards – was that air quality was not an issue of great significance to the general public, except in the context of controversial development (such as incinerators)."

So there is a clear need to provide improved information to the general public.

The Citizens' Jury project also concluded that the level of priority attached to air quality issues was generally very low. However following an explanation of the health issues associated with poor air quality, people's perceptions changed, and air quality was regarded as being a high priority. Furthermore, as ways to reduce emissions and avoid exposure were explained, members of the public became more engaged in the topic, and considered it their responsibility to undertake behavioural changes.

This suggests that the provision of information to the general public (in an appropriate format), could actually give rise to beneficial behavioural change. The Air Quality report from the Environmental Audit Committee makes similar observations, and notes that:
"Better understanding of air quality issues is critical. The Government must educate the public about the health risk from poor air quality and about how they can limit their exposure and improve air quality. Any campaign on air quality should raise awareness of the actions people can take to reduce emissions of dangerous pollutants and to reduce their exposure,"

3.1.3 Active Communication

Information on air quality is readily available to those members of the public that choose to look for it. However, for the majority of the public, information on harmful levels of air pollution is not generally seen, with the exception of occasional "pollution episodes".

To reach the majority of the public, considerably more "active" forms of communication would be required. The Citizens' Jury work makes a number of suggestions, and cites Jamie Oliver's school dinners campaign as an example of successful information management. They suggested that:

- Information will only be of interest if it is relevant. Explaining air quality issues in terms of health impacts achieves this;
- Information needs to be provided in small, manageable amounts;
- Information needs to be provided frequently, otherwise the issue is not kept at the forefront of people's minds;
- The language, and the key messages, need to be understandable by the "man in the street";
- Information needs to include the measures that the public can undertake to make a contribution;
- Celebrities make an impact, but only when they are clearly credible, and lead by example.

One of the challenges associated with communicating air quality issues to the public is that it, and the associated health data, can be complex. Poor air quality is also not generally a visible problem. However, climate change has been successfully communicated to the public, and whilst this has been achieved through a large investment, it would be possible to draw on the experience of those who have been involved in this work. It may also be possible to raise the profile of air quality issues in conjunction with communications about climate change.

Providing information on health impacts is seen as the most effective way of communicating an air quality message. Most communications to date have focused on short-term episodes e.g. air quality information in television weather forecasts. However there needs to be more of a focus on long-term exposure issues, to explain that there are some air quality issues which are on-going. This is not helped though by daily pollution levels often being reported as low throughout the year at the same time as annual mean objectives are exceeded, as can be the case for nitrogen dioxide. It reiterates the need for clear messages to be communicated in a clear way.

3.1.4 Education in Schools

Most school children are now very aware of environmental issues. However, following consultation with a number of teachers in Oxford, it appears that issues discussed with children of primary school ages are typically dominated by climate change and recycling.

Defra staff commented that air quality is included in the national curriculum for children at secondary schools. However they also noted that the budgets made available to promote awareness for issues such as climate change were considerably larger than those for air quality.

Interestingly, the Citizens' Jury project undertaken in 2006 found that many members of the public considered their children to be better informed than themselves on environmental issues. Participants specifically requested that educational information be made more generally available for adults.

3.1.5 Geographical Variations and Scales

There is considerable variation across the UK in the level to which air quality is reported in the press. It is not surprising, though, that air quality issues typically occupy a higher profile in areas where pollutant levels are higher. For example, in London, air quality issues are frequently reported in local newspapers, and as a result it is likely that Londoners are generally more knowledgeable with regards to air quality issues than other parts of the UK.

Given that air quality issues can be very localised, it is important that the overall communications strategy that Defra employs is co-ordinated with the work that is conducted by the Devolved Administrations and Local Authorities. This will require some considerable thought and planning.

3.2 Moving Air Quality Up the Political Agenda

3.2.1 Working with Other Government Departments

It has been concluded that air quality information needs to be presented in the context of health impacts. As a result, it will be important for Defra to jointly plan any information dissemination campaigns with the Department of Health and other key Government departments. This is noted in the IHPC Review of Local Air Quality Management:
"We recommend that Defra and the DAs work with their respective health departments to develop a stronger story about the health impact of air quality for communication to decision makers in central and local government, and to the general public,"

The Environmental Audit Committee report on Air Quality notes that whilst Defra and DfT are working together to address air quality issues:
Only Defra and DfT are formally accountable for air quality, under the Public Service Agreements; other departments that contribute to the problem, including DCLG, DoH, DECC and HMT, are not.

It is very surprising that the Department of Health do not have Public Service Agreements (PSA's) relating to air quality. HMT are also noted to be in a similar position, and it is reasonable to question whether either will be prepared to assign a suitably high level of priority to air quality issues until this position changes.

3.2.2 Defra's Communications with Ministers, and Ministers Communications with the Public

The IHPC Review of Local Air Quality Management also addressed the issues of communicating clearer messages:

"To win over support for further action in local government and elsewhere, central Government needs to combine fuller information on current levels of air pollution with better information on the health impacts, and to present the information in a way which is designed to highlight the need for further action, rather than to celebrate policy successes to date."

This is a view supported by a number of the stakeholders and the Sounding Board who were interviewed as part of the stakeholder questionnaire. The observation was made that the party in Government will always use information and statistics in a positive light, which can sometimes be misleading.

As a result, it will be important to keep reviewing the Air Quality Strategy periodically. This not only provides a "media opportunity" for Defra, but also ensures that scientifically determined targets are included in national policies.

Another comment from stakeholders was that the possibility of unlimited fines from the European Commission was making headlines. However the underlying message that the threat of fines was due to there being unacceptably high levels of pollutants, was not being broadcast. This was regarded as something of a lost opportunity to disseminate messages about air quality, and measures which the public could take to contribute to mitigation.

3.3 Principal Conclusions

A number of conclusions are drawn from the above:

- Defra should take steps to raise the profile of air quality issues with the general public, especially in the context of the resulting health implications;
- The general public need educational material to understand the health implications arising from poor air quality;
- Information that is actively provided to the general public in the right way does create behavioural change;
- Co-ordination with Local Authorities provides an effective dissemination route;
- Improved inter-departmental work brings challenges, but will be important in delivering information to the public;
- There are some specific opportunities where the media could be used to raise public awareness.

4 Recommendations for Future Development

4.1 Introduction

The Air Quality Archive has evolved over the past decade to fulfil a number of cross-cutting roles. Originally intended as the principal repository of data collected from the national monitoring networks, it has expanded to play an important role in meeting various requirements of the Directives to provide public information, and it is recommended that this function be retained.

Recommendations in this section include:

- Changes that could, or should be made to improve the content, presentation and accessibility of the Archive, taking account of the different end users;
- The use of data analysis tools to improve functionality, and expansion of the database to include other parameters to assist data interpretation.
- The role of the Air Quality Archive, taking into account changes that are planned under the Transformational Government Website Rationalisation;
- Changes to Defra's communications strategy in general, including disseminating information to the public, and working with other Government departments;
- Minor changes to the obligations set out within the Communications Contract.

The intended migration of the Archive material under the Transformational Government Website Rationalisation process presents a number of opportunities to restructure the format and manner in which air quality information is provided to the general public and the wider air quality community. In particular, it allows for better segregation of the information to provide more focused services to different end-users.

4.2 The Air Quality Archive Contents

The Archive currently provides air quality data collected through the various automatic and non-automatic networks. The Archive also hosts nitrogen dioxide diffusion tube data collected by local authorities, but only those authorities that choose to use the data storage facility hosted by AEA; in this case AEA provides support services to the local authorities, who upload their data onto the Archive. A number of survey responses and the recent review of the Local Air Quality Management process have indicated the need for additional monitoring and complementary data to be incorporated into the Archive so that a comprehensive set of air quality data and supplementary supporting data are accessible in one place.

Most users consider that providing links to these datasets from the Archive is sufficient, and if this can be done in a geographic/location specific way, then that would be advantageous.

AEA Technology has recently undertaken a Scoping Study for Defra to investigate the steps needed to improve the integration of different datasets. The findings and recommendations from this study are directly relevant to the following sections, and if taken up, would allow a wider set of data to be registered with and accessible through the Archive. It is recognised that this integration is expected to have significant cost implications and will require the adaptation of data services from third parties. As such a fully integrated set of data will require time to develop. This is probably best done in phases and in the order of priority as listed below:

1. AURN and LAQN data;
2. Local authority automatic data;
3. Meteorological data;
4. Non-automatic networks (NO_2 Diffusion Tubes, PAH, Hydrocarbons, TOMPS, Heavy Metals, Black Smoke);
5. Acid Deposition Networks;
6. Other Datasets.

4.2.1 Inclusion of Additional Automatic Monitoring Data

The recent review of the Local Air Quality Management process, carried out on behalf of Defra by the In House Policy Consultancy (IHPC), addressed the issue of making better use of data collected by local authorities. The report noted that local authorities run in the order on 1,000 automatic monitoring sites to support their LAQM responsibilities, but that little use is made centrally of these data.

The IHPC report concluded that "*there would be considerable benefit in creating a larger national information pool of measured data on ambient air quality, integrating the good quality data generated by local authorities onto the national Air Quality Archive, and including it in annual UK-wide analyses of trends. This will provide a fuller and more robust evidence base for central policy making*".

The case for including these additional data is compelling; aside from the benefits to Defra of a larger information pool, such a system could also provide an important driver to local authorities to improve and/or maintain the quality of the data they collect. The question is then which data should be included, and how would such a system operate. It is also of interest to note that the air quality sites operated by the Devolved Administrations include a large number of local authority monitoring stations, for which a harmonised QA/QC procedure has been adopted.

It is important that a clear distinction is made between the national networks that provide data to fulfil the various requirements of the EU Directives and the local authority monitoring

sites[9]. The Directives impose strict QA and siting requirements for the measurements, and any attempt to validate or impose these requirements across a large number of local authority sites would incur large and unnecessary costs.

Which sites should be included? Whilst including all local authority sites, for all pollutants, has potential benefits simply in terms of the volume of data that would be provided, this approach has several drawbacks:

- Unless some quality standards are set, there is a danger that the data could be misleading and detrimental to policy development and scientific research. Issues such as site classification, data capture, calibration and independent auditing, are necessary to provide a minimum standard that would allow a robust use of the data. The approach taken by the Devolved Administrations to fund a harmonised QA/QC system would not be feasible for Defra given the very large number of monitoring stations in England.

- The priority pollutants are nitrogen dioxide, PM_{10} and $PM_{2.5}$, together with sulphur dioxide and ozone. Collection and processing of data associated with other pollutants would not substantially add to the current level of scientific knowledge.

In addition to the local authority monitoring sites, there are other air quality monitoring networks in the UK that could be considered for integration, such as those operated by the Highways Agency, and various industrial sectors, e.g. power generators and airports:

- The Highways Agency operates a small network of monitoring stations, at sites located alongside major trunk roads and motorways;

- The Joint Environmental Programme (JEP) is a programme of research into the environmental effects of electricity generation funded by eight of the leading producers in the UK. A number of the electricity-generating companies operate networks of automatic monitoring stations that provide information that feeds into the JEP, and is also used from compliance monitoring purposes for the permits;

- Operators of major airports maintain small air quality networks at sites in and around the airport. The Heathrow data are already in the public domain via a dedicated website[10];

In general terms, these sites are operated to high quality standards, synonymous with national networks. Discussions with the various organisations and regulators (e.g. Environment Agency) should be carried out to ascertain whether data from these sites could be included in a national database.

It is recommended that a minimum standard be set for inclusion of local authority (and other) monitoring sites. There are several approaches to this that are founded on existing arrangements:

[9] It is recognised that the national networks have affiliated some local authority monitoring sites, but these are subject to the same stringent QA/QC requirements to ensure compliance with the Directives. There are considerable cost implications associated with this.
[10] www.heathrowairwatch.co.uk

- ***London Air Quality Network (LAQN)*** – the LAQN is operated by King's College ERG on behalf of the London boroughs, and currently comprises of over 100 monitoring stations. The data are made available via the LAQN website, but a greater integration of the data would be useful. The monitoring stations are assigned QA/QC categories corresponding to national or local standards

- ***Herts and Beds Air Quality Network*** and the ***Sussex Air Quality Partnership*** – these networks are operated King's College ERG in a similar manner to the LAQN

- ***KentAir*** – a network of approximately 30 sites in Kent and Medway operated by AEA. The network is operated in a manner consistent with national standards

- The air quality archive sites operated by the Devolved Administrations in Scotland, Wales and Northern Ireland currently access information from local authority sites that could be integrated into the UK Air Quality Archive. There are currently 62 sites in Scotland, 23 In Wales and 28 in Northern Ireland

- ***AEA Calibration Club*** – a large number of local authority sites participate in the "Calibration Club". Excluding those sites in Scotland, Wales and Northern Ireland (that are already subject to harmonised QA/QC procedures through the devolved administrations) there are approximately a further 140 local authority sites in England that use this service. The Calibration Club provides a package of services; at the minimum level, independent audits are carried out; data ratification services are also provided in most cases.

The above are only examples of quality criteria that could be applied, and it is not suggested that Defra be prescriptive. Individual local authorities (or other organisations) should be free to demonstrate that individual networks or sites are operated in a manner that is equivalent to the above by use of whatever means they deem appropriate. A minimum standard might include:

- Service and maintenance contract with one of the national network providers (or equivalent), including a maximum 5 day response emergency call-out service;

- Accredited calibration standards;

- Independent audits undertaken by one of the national network providers (or equivalent).

How should the data be provided? There is no overwhelming need for the data to be provided in "real-time", and depending upon the origins of the data (and the operational procedures in place) it would be undesirable to do so in many cases[11]. Data could be

[11] Unless data are routinely verified before they are uploaded, erroneous data could be easily posted onto the Archive. Note that the provision of only "finalised" datasets is a different approach to the AURN data, to avoid the administrative burden of "overwriting" datasets when ratification had been completed.

uploaded where data providers do not have their own online databases or made available for discovery by users of the Archive. However, data holders/providers would be required to ensure that the data are available and provided according to a required standard.

4.2.2 Meteorological Data

There is a clear demand from a wide range of stakeholders for meteorological data, and such data are the most commonly requested of the complementary datasets. There are also clear advantages for online analysis to of having meteorological data (see Annex 3).

The main barrier to inclusion on the website is the fact that access to meteorological data from the Met Office is not cost free. It is recommended that Defra undertake high level discussions to see whether this situation can be changed. Doing so would provide considerable benefits to many people in the air quality community, although it is appreciated that Defra themselves would probably not see any resulting financial benefits from this. Ideally access to meteorological data would be linked to maps of monitoring stations, and/or included for bulk download alongside monitoring data.

Access to meteorological data (in the way indicated above) is considered to be a higher priority than any of the other "complementary" (i.e. non-monitoring) datasets.

4.2.3 Inclusion of Additional Non-Automatic Data

Provision for local authorities to upload nitrogen dioxide diffusion tube data currently exists, with AEA proving support to those authorities. This system works well, although these new data need to be more clearly separated from the historic information, and better explanatory text needs to be included.

Given the relatively low priority of pollutants collected through other non-automatic networks, it is recommended that these data are incorporated into the national database if funding levels allow. Improved accessibility and harmonisation of the non-automatic data is discussed in Section 4.5.

4.2.4 Acid Deposition Networks

Data are already collected and made available from these networks, and it is a sensible step to incorporate these data into the Data Archive. However these data are generally used less extensively than the datasets listed above, and are therefore given a correspondingly lower priority.

4.2.5 Other Datasets

Traffic Count Data

A number of users flagged the value of having ready access to traffic count data. These data are used extensively for LAQM purposes, and therefore it is sensible to assign a higher priority to this.

It is recommended that Defra investigate the amount of work needed to include links from the Archive to location specific traffic count data[12]. If the data source was updated reasonably often, then providing links is considered sufficient functionality- rather than undertaking the task of completely embedding traffic count data in the database that also hold the monitoring data.

NAEI Emission Maps

UK emission maps from the NAEI are already made available through the current archive. It would be possible to improve the way in which these are available, but some consideration needs to be given to the purpose. If users are trying to access emissions data, then files are readily available for LAQM purposes. If access is required to visualise emissions data with other mapped information, then the expense would probably outweigh the benefit.

Well planned use of hyperlinks to the NAEI website (or more specifically the data archive area or emission map areas) is considered to be a suitable approach.

Results from Modelling Studies

A number of users have requested that the results of Defra funded modelling studies (such as output from AEA Technology's PCM modelling team) are made available on the archive in a way that allows interactive access to the data.

As there are a limited number of users who would find these modelling outputs of value, it is unlikely that there is much to be gained by incorporating the outputs into the current archive database, when the modelling teams can more straightforwardly provide the data directly. There would also be the concern that some users might not necessarily understand the underlying assumptions and limitations. So this course of action is not recommended.

However, this recommendation should not be confused with publishing findings and making results available in the normal way. This is something to be supported, and data files could be included alongside reports in, for example, the Air Quality Library (see Section 4.2.5), or a similar area for technical members of the air quality community.

Other Relevant Information

There are a number of other complementary datasets, which are of value to consider. These are typically updated annually, and some are calculated at the national level, rather than being geographically specific. Simple links to these data would therefore suffice. Some examples include:

- Traffic fleet data;
- Emissions data (at the UK level);
- Projected emission factors and activity for industrial sectors (road transport already being provided);

[12] Traffic data on the national trunk road network are currently available from DfT, via an interactive website

- Population exposure data[13];
- Economic indicators;
- Local land-use data;
- Medical statistics (Asthma statistics, COPD statistics, hospital admissions etc.).

We recommend that links to these datasets are provided where this is easily achieved.

4.3 Improving User Experience

There is a need to change the structure of the web pages driven by current users and the Government Website Rationalisation which is already underway.

A principal area of concern identified in this review, and reinforced by feedback from end-users, relates to the ease of access to the data within the Archive. These issues are summarised in Chapter 2, and outlined in greater detail within the Annexes. There are different requirements for users of the Public Pages and the Data Archive.

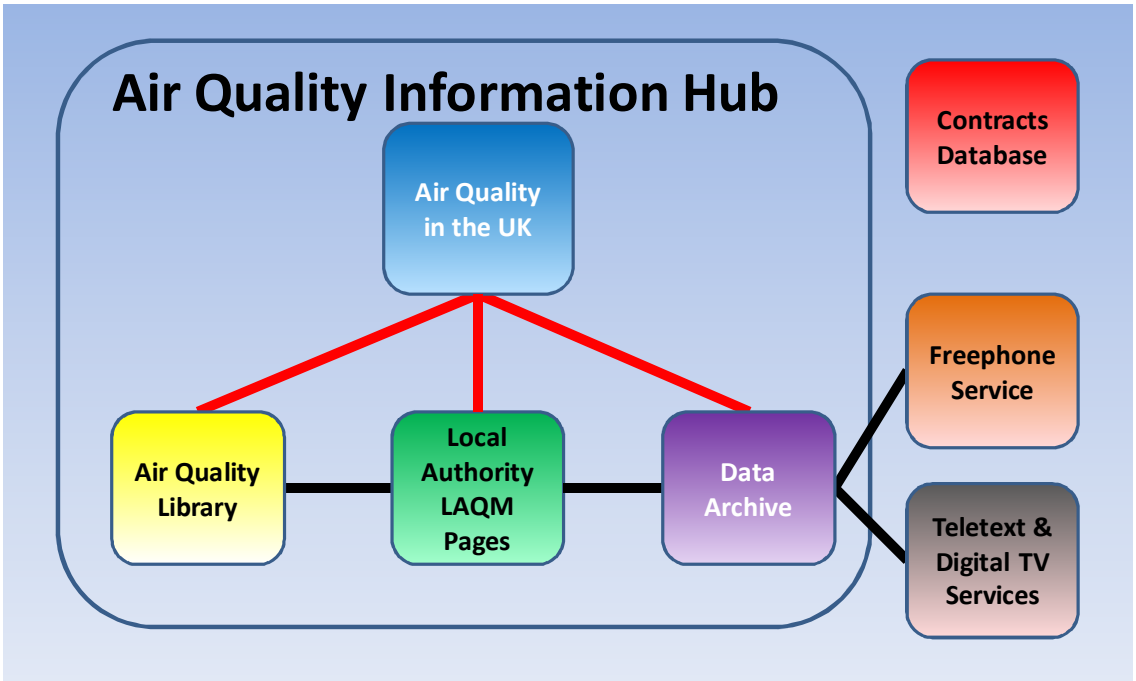
Public Pages: general members of the public need access to information on current air quality conditions (specifically within their local area), forecast air quality conditions, and information related to exceedences of alert thresholds. It is only necessary to provide this information in respect of those pollutants included in the Air Quality Strategy for which there are alert thresholds. This should be provided via an interactive map, with improved links to the Site Information Archive.

Data Archive: users of the Data Archive are predominantly air quality professionals, who need to be able to find, extract and analyse comprehensive datasets. Specific requirements for the Data Archive include:

- Clear identification of the current and historic datasets available, together with descriptions of the networks. Clear identification of what data are available at what sites;
- Links to and from the public page map interface for easy geographical referencing and checking of site locations and finding neighbouring sites;
- Better use of metadata to describe, for instance, monitoring methods for PM (NB: the term “gravimetric equivalent” should be avoided as it has been previously used to describe TEOM*1.3 data);
- Better integration of data from all networks (e.g. non-automatic networks, acid deposition etc);
- Improved data selector that allows queries for multiple sites, multiple pollutants, multiple years, and multiple statistics to be processed together;
- Integration of data processing tools, such as OpenAir, that allow statistical analyses to be performed “on-line”.

[13] It has been suggested that this information is already held by AEA Technology (although we have not sought to confirm this). If these data were collated under a UK Government contract, then they could be made available.

Figure 4.3 Proposed Structure for an Air Quality Information Hub



Each of the separate components of the new "Hub" is briefly considered below, in terms presentation and accessibility. The Contracts Database, Freephone service and Teletext & Digital TV services are presented separately in sections 4.4 – 4.7 below, as they are services provided that are outside the scope considered for the Air Quality Website. The "LAQM site" component is only considered briefly in terms of its links to the Air Quality Website as it is being migrated under separate arrangements.

In addition, It is recommended that a "last updated" date stamp is included on all pages and datasets. This will help with the general management of the website, and will also provide valuable information for users.

4.3.1 Air Quality in the UK (Air Quality Website Landing Page)

This page would act as the front page for members of the public. The page would include "air quality now", air quality forecasts, the option to sign up to alerts and bulletins, and links to other areas with simple text and reduced links to make the landing point clear and concise. It would also have a clear link for users who want to access detailed air quality data (to the Data Archive Pages).

Drawing on observations made during the review of international websites (see Section 2.5 and Annex 7) a map based interface, should be implemented and would provide a user friendly entry point for most user groups concerned with air quality data. This service could be developed by drawing on the examples of good practise presented on Scottish, Welsh

and Northern Ireland websites These are PHP/MYSQL and Google Maps API based, and would be compatible with the current Archive systems.

The functionality that should be included and integrated with the prominent map, includes the following[14]:

- summaries of the latest data (current levels);
- graphs of concentration trends for the last few days;
- site details and photos (or direct links to the Site Information Archive);
- summarised historical statistics;
- options to search by Postcode;
- a pollutant filter for searching;
- provision of measurements, forecasts and alerts;
- access to mobile phone services (providing information on air quality via text messages to mobile phones).

Other site content should also include the following:

- information related to health and environmental effects, and measures that can be taken to reduce pollution and/or exposure ("About Air Quality"). For example a simple table of when regulations were introduced. This information could be in the form of Factsheets for public users or links to information from local sources (e.g. Local Authority web sites);
- Frequently Asked Questions (FAQs). The FAQs appearing in this part of the Hub would be for the general public, and should therefore be written in a non-technical way;
- information on how air quality in the UK compares to other countries;
- information on pollutant trends;
- links to annual reports (see Section 4.4);
- links to "plans and programmes".

There is other content relevant to air quality which could be considered. For example information on health impacts, ecological impacts, impacts on buildings and infrastructure etc. The focus for these topics are better placed outside the Hub.

One stakeholder suggestion was that the Archive could include a gallery of air quality images for use in air quality communications. Such a gallery would allow general access to images relevant to air quality (whether photographs or schematic diagrams etc.). These could be used in presentations and promotional material by Government staff, academics and consultants. This is considered to be a very good idea. However, image copyright could prove to be an unwanted complication (with potential cost implications). It may be possible to avoid this by requiring any submitted images to be freely usable in the public domain.

[14] Examples for many of these can be seen at http://www.scottishairquality.co.uk/, and the air quality sites for Wales and Northern Ireland.

CEH run an annual competition for environmental photos, which is open to employees. Something similar, but open to the public, might also be a way of encouraging photos to be submitted to a gallery (with the requirement that submitted photographs are subsequently freely usable), and provide a marketing opportunity for air quality information in general.

Accessibility Criteria
The accessibility criteria of the Archive were reviewed, and we recommend:

1. That the accessibility statement is elaborated upon and that an accessibility policy for the website is developed;
2. That a validation audit should be undertaken;
3. Language – that the wording on the site is simplified where possible, so that the site is more user friendly to a wider range of people;
4. Text – that at small screen resolutions, the full headings are readable and that the full detail of the associated hyper links are provided;
5. Images - the alt text should be re-worded where it is a repeat of the standard text;
6. Images – the width and height attributes should be provide for all images;
7. Colouring – the colour contrast on the site needs to be improved;
8. Links and navigation - the link text in all cases should provide a clear idea of the destination;
9. Links and navigation – the site map should contain images or icons to visually signpost the different areas.

4.3.2 Local Authority LAQM Pages

Local Authority LAQM Pages

These are already being migrated as part of the Defra web rationalisation programme, and are therefore not considered in detail here. We presume that these pages will have their own front page, as well as being clearly linked from the main 'Air Quality in the UK' page.

- LAQM should consider linking to services such as "air quality now", air quality forecasts and the option to sign up to alerts and bulletins as it is expected that Local Authority representatives will use this page as the main entrance point.

- We also encourage the LAQM data be made available to support bullet point 4 in section 4.2.1 above to ensure that the UK Air Quality website interactive maps can provide information on LAQM areas and a summary of the actions being implemented to reduce poor air quality.

4.3.3 Data Archive

Data extraction and analysis tools are needed to support analysis of air quality information by a wide spectrum of users. The system will need to be able to provide ready access to simple raw data, as well as provide detailed statistical analysis. It may also be sensible to have some restricted access pages which are tailored to providing very specific statistics, which are used by a small number of heavy data users (e.g. the PCM team).

The review team agreed that the experimental OpenAir system developed for analyzing Air Quality data had the potential to provide these functions for the Data Archive. The "OpenAir functionality" would be primarily aimed at air quality professionals who wish to obtain statistical summaries of pollutant concentrations, undertake "on-line" analyses, or to download data for off-line processing and analysis.

The OpenAir services embedded within the current PHP/MYSQL based Archive platform could provide the following functionality:

1. A tool for online analysis across multiple sites and using multiple datasets (with further development and refinements as indicated in Box 1 in annex 3);
2. A tool for managing data extraction/export queries and export of data for offline analysis by users.

In addition this data analysis and extraction functionality could be embedded within the main map based user interface to provide detailed data and analysis for single sites (as, for example, under the "Statistics" tab in http://www.scottishairquality.co.uk/#site_info). This would allow users to drill gently into the analysis tools for a specific site and extract xml, Excel or other formatted data tables and plots.

A number of further developments listed in annex 3 Box 1 would be required to address the current limitations of the OpenAir prototype.

The *Data Archive* should include clear links to the 'Site Information Archive' for the AURN, and provide a link to corresponding information for those sites operated under 2004/107/EC

A potential scheme for the Data Archive

A potential scheme for the Data Archive is outlined below, for illustrative purposes only.

"Home Page" has interactive map.

Side Bar to the map provides

- Filter Monitoring Sites on Map
- Data Selector (Statistical Analysis and Download)
- Description of Networks (text)
- Historical Network Data

Filter Monitoring Sites on Map (provides drop down menus, with options for multiple selections to filter in/out sites of interest for ***current networks***) e.g.

- AURN
  - Nitrogen Oxides

  - Nitrogen Dioxide
  - PM_{10}
  - $PM_{2.5}$
  - Sulphur Dioxide
  - Carbon Monoxide
  - Ozone
- LAQN
  - Nitrogen Oxides
  - Nitrogen Dioxide
  - PM_{10}
  - $PM_{2.5}$
  - Carbon Monoxide
  - Sulphur Dioxide
  - Ozone
- Non-AURN (Local Authority Sites)
  - Nitrogen Oxides
  - Nitrogen Dioxide
  - PM_{10}
  - $PM_{2.5}$
  - Sulphur Dioxide
  - Ozone
- Hydrocarbon Network
  - Benzene
  - [List of other pollutants at automatic sites]
- Black Smoke Network
- UK Heavy Metals Network
  - Lead
  - Cadmium
  - Arsenic
  - Nickel
  - Mercury
- Acid Deposition Network
  - [List of pollutants]
- UK Polycyclic Aromatic Hydrocarbons (PAH) Network
  - [List of pollutants]
- Toxic Organic Micro Pollutants (TOMPS) Network
  - List of pollutants
- UK Particle Monitoring Programme
  - SMPS data
  - CPC data
  - EC/OC data
  - Nitrate data
- Nitrogen Dioxide Diffusion Tube data

Clicking on a site "balloon" on the interactive map provides a "side pane" with:

- Link to Site Information (where available)
- Relevant summary statistics (by individual pollutant and individual year) [e.g. for PM_{10}, annual mean, no. days>50 µg/m^3, data capture]
- Select year
- Select pollutant

Data Selector

Background information on "home page" that describes what this can do. The data selector provides

Simple Statistics

- Select a Network (list as above)
- Select sites
  - List of available sites
- Select parameters
  - List of available pollutants
- Select years
  - List of available years
- Select statistics
  - Annual mean
  - No, days>50 µg/m3 PM_{10} etc.

OpenAir Functions

- List of Functions

Description of Networks

Short summaries of each current network in terms of pollutants measured, monitoring techniques etc.

Historical Networks

It is suggested that the historical networks are segregated from the current networks to avoid confusion. Whilst end users will still require access to data from historical networks (e.g. smoke and sulphur dioxide etc), this is likely to be a less frequent occurrence, and it should be acceptable (at least in the short term) to only provide these data for simple download.

Links to Other National Datasets and Archives

It would be helpful if the Data Archive included links to archives and datasets in other countries, especially those in the EU.

Also, a link should be provided to other pages in the UK where statistical information is provided. For example Defra's e-statistics pages on air quality.

4.3.4 Air Quality Library

Air Quality Library

We suggest that all relevant reports are made available in an Air Quality Library. If this is equipped with a good metadata, categorisation and appropriate semantic search options, then there shouldn't be the need to divide up the reports into different sections. Dynamic search result filter options should also be considered so users can see valid filtering options and the number of results that would be returned. The Library would allow users to find reports stored directly in the Air Quality Website or located elsewhere on third party servers registered with the Air Quality Hub.

It would be beneficial to include an upload facility, so that contract officers can easily add contract reports to the library. The library would also benefit from the inclusion of links to reports written by research groups and Governments outside the UK. It may also be useful to include a list of links to other websites which publish reports (the EEA, European Commission etc.).

The library could be developed into a comprehensive resource, but it is appreciated that funding this is likely to be of lower priority than some other tasks.

4.3.5 Branding

A suitable easily identifiable branding will need to be developed for all of the web pages/areas would constitute the UK's "Air Quality Information Hub". This will be important in promoting the service to first time users. It has been suggested that a competition might be a good way of collecting suggestions.

Any rebranding and restructuring of the websites should take full account of the W3C Web Content Accessibility Guidelines as a minimum, and draw upon specific recommendations set out in Annex 1 (Section 5.10) of this report.

4.3.6 Management of the Hub

If the core Air Quality Information Hub is developed around a Service Oriented Architecture, the different pieces of content can be managed by different organisations as long as they comply with the service provision protocols for the site.
For example the information available in the Library could easily be provided through one or a number of services that could form parts of different Defra contracts or by Defra themselves.

4.3.7 Co-ordination with the Devolved Administrations and Local Authorities

As the Air Quality Information Hub will cover the whole UK it will integrate information for the Devolved Administrations and Local Authorities to present a UK wide picture. However, where dedicated websites exist for sub regions of the UK the Air Quality Information Hub will need to link to these at the appropriate points. This will need carefully co-ordinated with services offered by the Devolved Administrations and Local Authorities.

4.4 Air Quality in the UK Report

It is further recommended that the current *Air Quality in the UK* report be substantially revised, to provide a much shorter and focussed document. This should include all of the mandatory reporting requirements for the public (as defined within both 2008/50/EC and 2004/107EC), together with a short analysis of pollution events and trends in pollutant concentrations (NOx, NO_2 and PM). It is recommended that the report should no longer include tables of statistical summaries of data, as these can be more easily, and appropriately, provided elsewhere.

4.5 Freephone Service

We recommend that this service is continued, and have no changes to propose to the existing service. However, we do recommend some additions.

The addition of a new "text back" service for mobile phones would be a good added facility. This would serve the same purpose as the e-mail bulletins, but would be in the form of an SMS Message. This has the advantage that the information is actively delivered to people, rather than being available for those wishing to access it.

We also suggest that a Twitter service is set up to provide air quality bulletins as Tweets. Twitter is now an established form of dissemination, and is well suited to communicating topical air quality information. We recognise that it is usually accessed by computer, but include it under the Freephone section because the use of smart mobile phones to access Twitter feeds is also common.

A Twitter account could be generated for each zone/agglomeration or similar, to provide the information at a suitably localised level. Twitter allows information to be disseminated in much the same way as the text-back service (mentioned above) and the existing e-mail bulletins. However, information disseminated through Twitter is generally much more "viral" in nature, and an alert would probably be forwarded to many people not originally "following" the air quality accounts. It therefore has great potential to reach a large number of people very quickly.

The Freephone service is presented here as being outside the hub in Figure 4.3, because it is not a web based service. But this is a fairly arbitrary decision.

4.6 Teletext and Digital TV Services

Information services through the TV media are currently undergoing some change. It has not been possible to review the services that will be available through digital, but it is presumed that they will be broadly similar to those on analogue TV.

As with the Freephone service, the TV services are presented as being outside the hub, and again, this is a fairly arbitrary decision.

4.7 Contracts Database

As the purpose of the Contracts Database is to provide procurement information, we suggest that the current Contracts Database is not included in the Air Quality Information Hub as it should contain wider content, and is moved to a part of the Defra website which provides information on strategic planning and procurement.

Defra will need to decide whether this database should be managed internally or by contractors. This decision may well depend on the future of their existing internal system which provides contract information to the Defra web pages.

4.8 Raising Public Awareness of Air Quality and its Impacts

Observations and findings with regards to raising public awareness are provided in Chapter 3 (and Annex 5). Relevant recommendations are provided here.

Health Context

To ensure an effective message, air quality information needs to be provided to the public in the context of health implications, and therefore the benefits of improving air quality. Reporting exceedence data may comply with requirements, but it does not link strongly with the underlying message that pollutant levels are having unacceptably high health impacts.

Active Dissemination

We recommend that material is *provided to* the general public, rather than simply being made available to those looking for it. However we recognise that this would mean associated expense.

Material would need to explain how the public can take suitable action to reduce the causes of poor air quality, and to avoid exposure. This would need to be done regularly and in small doses, and focus on long-term exposure rather than episodes (although these do provide useful media opportunities).

Local Management

Defra already work closely with Local Authorities on air quality. However we recommend that there is strong co-ordination between national and local Government specifically relating to providing information to the public. For example, Defra's main focus could be the steering and co-ordinating the information dissemination undertaken at local levels. This would also have the benefit of improving co-operation between Local Authorities.

Other Government Departments[15]

We recommend that Defra improve their links with the Department of Heath to ensure more effective information dissemination. The most effective way of doing this would be to ensure a suitable level of "buy-in" from the Department of Heath, and whilst it is not within the remit of Defra, ensuring that the Department of Heath have PSA targets relating to air quality would significantly help this. Whilst this is also desirable for HMT, it is probably not realistic.

Whilst Defra are noted to already be working closely with DfT, we recommend that Defra review how information is currently being provided to transport planners. A number of stakeholders indicated that an improvement here would ensure that air quality issues were given a higher priority.

[15] A number of comments have been made by stakeholders about general co-ordination across Government. These comments are included in Annexes 4A and 4B, but in this section we focus on aspects relating to communications specifically.

Levels of Funding

Evidently the majority of the above actions will require funding beyond that which is currently available, and we recognise that availability of funds is likely to be a limiting factor in achieving these recommendations. So we recommend that one of the first steps must be to seek additional funding to allow these recommendations to be implemented.

4.9 Communications Contract

The obligations set out within the existing Communications Contract need little expansion, although it is recommended that the various reporting requirements of the Directives to provide information on ambient air quality to the Commission on an annual basis be incorporated once electronic proformas become available.

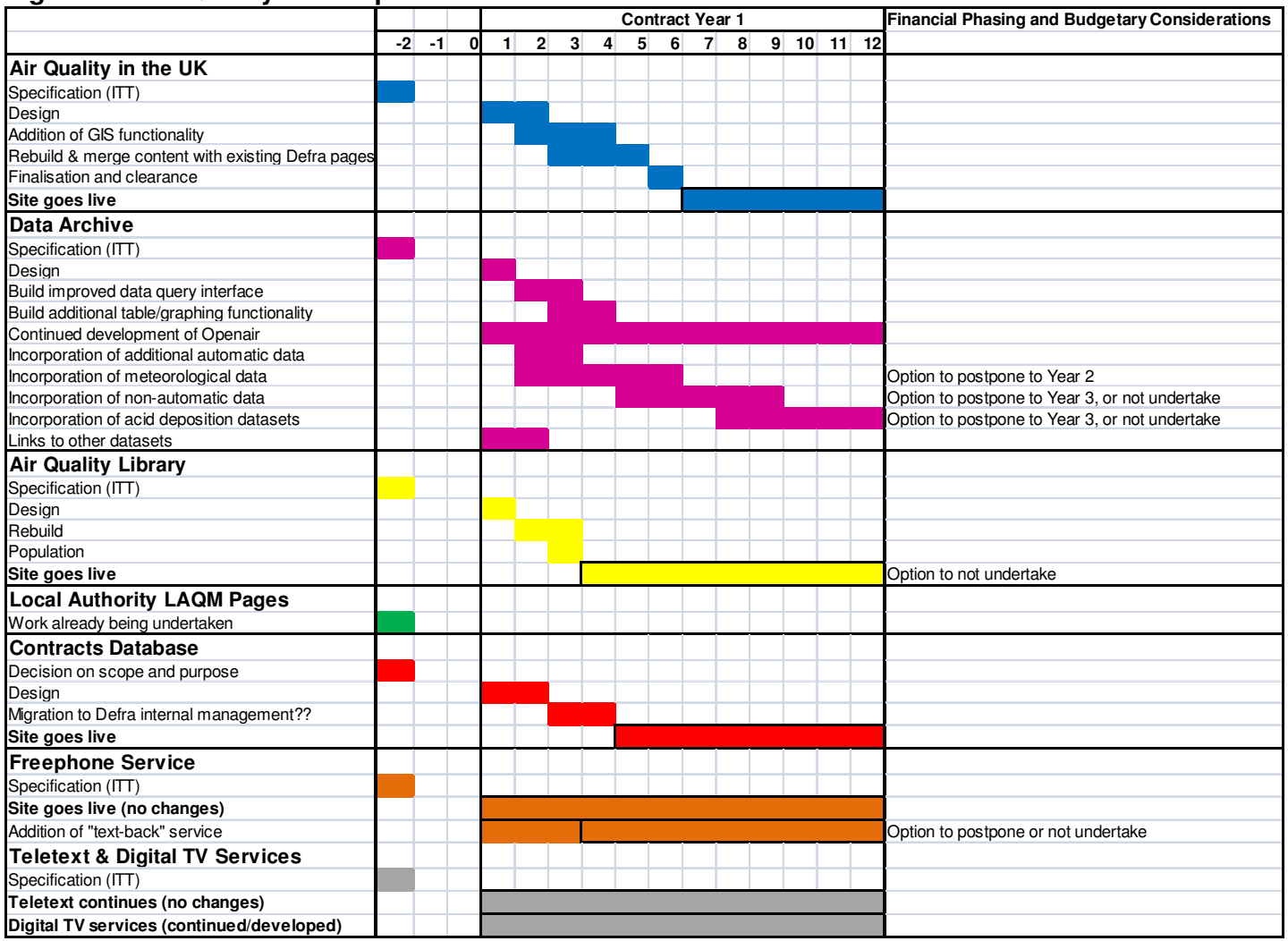
Specific revisions to the Communications Contract would of course be dependent on how Defra wishes to take forwards any of the above recommendations, and whether these services are provided by one or more external organisations.

4.10 Improvements Timeline

A number of improvements to the current Archive website have been suggested. Many of these tasks will require careful planning. A timeline is proposed in Figure 4.9 below. This provides time estimates for the work, which are considered to be reasonably generous. It also provides an indication of the likely phasing of the work across the first year of a contract.

In compiling Figure 4.9, the current timeline of both the Transformational Government Website Rationalisation project, and recommendations from the Scoping Study have been taken into account. Many of the recommendations included in this report are however dependent upon the actions taken to resolve the data integration issues set out within the Scoping Study, and are not repeated here, Consideration is also given to the cost implications, and suggestions have been included that would allow the expense to be spread over a three year period, or indeed postponed indefinitely.

Figure 4.9 Air Quality Hub Improvements Timeline



ANNEXES

ANNEX 1:	**Review of the current UK Air Quality Archive Contents and Linkages**
ANNEX 2:	**Data Accessibility Tests**
ANNEX 3:	**Overview of Technology, Functionality and Interface**
ANNEX 4A:	**Responses to User Questionnaire**
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5 ANNEX 1: Review of the current UK Air Quality Archive Contents and Linkages

5.1 Objectives and Scope of the Review

This component of the study provides a detailed review of the existing UK Air Quality Archive including its layout, content and accessibility. It does not take into account the responses received from external stakeholders via the questionnaire – these are reported separately in Annex 4 to this document.

At the outset, is important to recognise the manner in which the UK Air Quality Archive has evolved over the past decade. The number of monitoring sites has expanded rapidly, as have the complexities in measuring some of the critical pollutants; for example, the issues associated with measurements of particulate matter could not have been envisaged during the early stages of monitoring. In addition, there have been significant advances in information technology, and the numbers of types of users wishing to access air quality information for a range of different purposes has also grown substantially.

In undertaking this review, it has also been borne in mind that Defra are intending to re-brand the Archive as part of the Transformational Government Website Rationalisation, and that the existing means of site access will, in any case, be changed in line with this approach. However, issues related to site design and interface are still raised, so as to inform any decisions for the revised "Archive".

5.1.1 General Comment

An initial comment is with regard to the name of the website. "Air Quality Archive" implies a resource that is dedicated to the provision of data, whilst the current Archive provides access to a much wider range of information, including air pollution forecasting, LAQM material, various reports and news items etc. This issue is taken up in Chapter 2 of the main report.

5.2 General Site Navigation

The "home" page of the Archive is "very busy"; it contain a lot of information and links that are difficult to view on a widescreen laptop without scrolling. It provides links to a variety of information links including:

- Air Pollution Bulletins
- Forecast for the next 24 hours
- View UK Air Pollution using Google Earth
- Quick Links
- Current regional Air Quality Data (via a map)
- Annual Report
- Latest News Headlines
- Subscriptions

A number of “tabs” across the top of the page provide links to other areas of the site, but these do not follow the logic of the “Site Map” link in much smaller typeface at the very top of the page, and some of the tabs are confusing e.g. what is the intended difference between “Data” and “Monitoring”? A description of the Monitoring Networks would flow into the provision of data, rather than existing as separate entities. It is not clear why the selected items have been given prominence on the home page.

Throughout the Archive, the selection of links on the right hand side of the page often seems to be random with no clear association to the information the user is currently accessing (e.g. on the Research page, there are links to subscriptions to the mailing list and bulletins).

5.2.1 Air Pollution Bulletins

This header provides four links:

- Current Levels
- 24 Hour Summary
- Air Pollution Forecasting in the UK
- UK and European Ozone

Current Levels takes the user into a large table, with the monitoring sites sorted by region. Clicking on the name of the monitoring site leads to a set of graphs displaying the previous weeks’ concentrations for all pollutants, but the plots are so small they are unreadable (on a laptop screen). Clicking on the pollutant name, produces a large number (hundreds) of graphs showing the previous weeks’ pollutant concentrations for all of the monitoring sites. It is not straightforward to locate the monitoring site(s) of interest.

The ***24 hour Summary*** provides effectively the same information, and in the same format, for the maximum pollutant concentrations recorded over the previous 24-hour period.

Air Pollution Forecasting provides a page where the user can quickly select forecasts for the following 24 hours from a map. A summary is then provided in the right hand side of the page, together with a colour-coded key that explains the Indices. The map interface works much better than a large number of tables – the only disadvantage will occur where users are interested in locations close to the boundary of regions, and may not know which region to select.

UK and European Ozone takes the user to a map that does not appear to work until a further link (to the EEA website) is selected. It would be quite difficult for members of the public or other non-expert users to use such a facility.

5.2.2 Forecast for the next 24 hours

This provides a text summary of the forecast for the UK. It would sit better in a summary box together with current air quality conditions.

5.2.3 View UK Air Pollution using Google Earth

This takes the user to an overview of the latest air pollution levels across the UK, with each monitoring site colour coded to the Health Bandings. By clicking on individual sites, a "pop up" box is provided which includes a more detailed overview of the banding for each measured pollutant, a graph showing the previous weeks' results, and links to more detailed information on concentrations (in a tabular format) and site information (via the Site Information Archive). This system works extremely well, but does require the user to install GoogleEarth.

5.2.4 Quick Links

This header provides four links:

- What causes air pollution?
- What are the effects of air pollution?
- What is the air pollution like near me?
- What are we doing about air pollution?
-

What causes air pollution takes the user to a page that provides helpful background, and summary information for each pollutant on the right-hand side. The link to Enviropedia does not work.

What are the effects of air pollution also provides a useful summary and links to download leaflets. The link to the Department of Health leads to the Department of Heath home page, and it is not immediately obvious where the Health Pack referred to can be found.

What is the air pollution like near me provides another map but this time with sixteen urban areas identified, as opposed to the regions. The purpose of this link (in addition to the three other links that provide information on current air quality) is not clear. A link is provided to the 2001 background maps which are now out of date.

What are we doing about air pollution provides a summary of central and local government initiatives to improve air quality, but the information needs to be provided over several pages with clearer links. It is assumed that the link to the Air Quality (Scotland) Amendment Regulations 2002 is erroneous. The information relating to the European Directives is now out of date.

5.2.5 Regional air quality data

This provides information via a map of the regions. Having selected a region, the user is provided with a colour-coded summary of current air pollution levels (with respect to the Health Bandings). It is also possible to display additional information on individual sites by selecting a monitoring station from a map – options for last hour's, weekly graphs, and site information. A link is also provided to the UK 1 x 1 km background maps, but the purpose of this is unclear.

5.2.6 Air Pollution in the UK – Annual Report

Links are provided to download the Annual Reports in pdf format.

5.2.7 Latest News Headlines

Some of the items listed are out of date, and it is very difficult to identify items of interest.

5.2.8 Subscriptions

Links allow users to subscribe to useful links on latest news, website updates etc, and pollution bulletins (including forecasts and alerts).

5.2.9 Quick Link

A further Quick Link is provided at the top bar, which produces a drop down menu with access to topics of interest listed in alphabetical order. This is a useful feature, but is not readily noticeable on the Home Page, and the user needs to be informed as to precisely what information they are looking for (which is not always the case).

5.3 Monitoring Data

Access to the monitoring data is one of the prime functions of the Archive. It also needs to cater for a very wide range of stakeholders with differing requirements. These range from researchers and academics that are looking to download extensive data sets for their own "off-line" analysis, to consultants and local authorities who may be seeking simple statistical summaries of data, to members of the public who are simply interested in air quality conditions in their area.

The "*Monitoring*" tab takes the user to a page that describes the various UK Air Quality Monitoring Networks. The information is segregated into Automatic and Non-Automatic Networks.

For the *Automatic Networks*, it is not clear how up to date the information is: the data availability shows the current date, but the descriptive text and the associated maps showing the site locations appears to date back to 2007, and is now out of date. There are no direct links to data access, nor any information on how to obtain it.

For the *Non-Automatic Networks* again the information appears to date back to 2007. In some cases links to the data are provided (e.g. for the PAH Network) but not in others (e.g. Heavy Metals Monitoring Network). The link related to nitrogen dioxide diffusion tubes is also puzzling; "*Nitrogen Dioxide Diffusion Tube (1993 to 2005)*" takes the user to a page where an account of the UK NO_2 Diffusion Network that was operated on behalf of Defra up until 2005, is provided. The lower part of this page discusses the Diffusion Tube Calendar, but the table to the right describes the calendar for 2010. The current service that is provided to local authorities in respect of diffusion tubes is briefly referenced, but the web site referenced for data download does not exist.

Access to monitoring data is predominantly via the "*Data*" tab. It is here that the complexity of the monitoring data the Archive has to cope with becomes apparent; this includes data

from automatic networks (that are updated every hour), data from non-automatic networks that are updated monthly or annually, and historic archives from monitoring sites or networks that are no longer operating.

The home page **"Air Quality Data and Statistics"** is a "very busy" page and it is not obvious what data are available, in what form, or how to obtain them. Whilst it is stated that the data are stored under three categories *Monitoring data*, *Descriptive statistics* and *Exceedence statistics*, the box to the left hand side of the page *Get Air Quality Data*, does not provide options that are consistent with this format. The page does not provide an easy route to understanding what data are available, nor how to access them. Confusingly, access to the local authority nitrogen dioxide diffusion tube results are accessed via a link here, rather than with the other data. There is no clear description of what the current nitrogen dioxide diffusion tube network is, how it operates, what support services are provided, or to how to access the data.

The *Get Data Now* button takes the user to a data selector page. Three main options are provided:

- ***Measured data and simple statistics:*** this provides raw monitoring data (e.g. as measured µg/m^3) or simple statistics, such as daily minimum, maximum, mean or running means;
- ***Annual statistics and exceedence statistics;*** provides annual or monthly statistics, annual percentiles or exceedences of the objectives;
- ***Data availability:*** provides information on what data are available for given pollutants and monitoring sites, and percentage of data in the Archive.

The role and purpose of the "*Measured data and simple statistics*" page is not entirely clear. If it is intended to provide "simple statistics", then why, for example, does it not provide annual mean concentrations? The same (but more complete range of) statistics seem to be provided from the "*Annual statistics and exceedence statistics*" page. The *Data Selector* is not straightforward to use, and the range of data provided does not appear to be complete (nor is it made clear that this is the case). e.g. by selecting *Monitoring Network* the user is given the following options:

- Automatic Monitoring Data (data from the AURN, together with benzene and 1,3-butadiene data from the Hydrocarbon Network)
- Air Quality Strategy Pollutants
- Hydrocarbons (data from the Automatic Hydrocarbon Network)
- Nitrogen Dioxide Diffusion Tube Data (historic data for 1993-2005 only)
- Smoke and Sulphur Dioxide Monitoring Data (up to 2008)
- Particulate Matter (including both automatic and non-automatic sites)
- Acid Deposition
- Benzene Pumped Data
- Dioxins and Furans (not clear what data are available, nor why PAH and PCB data from the TOMPS network is not included)
- 1,3- butadiene Pumped Data

The "*Data availability*" option provides information on the start and (if appropriate) end dates of each of the monitoring sites, and the data availability across the entire measurement period. It does not, however, provide the information on an annualised basis, to assist the user in selecting suitable years for which data are available.
The page also provides access to a number of other datasets including:

- Pre-formatted Files of Automatic Monitoring Data
- UK Particle Monitoring Programme
- Marylebone Road, London – Non-Automatic Data
- Polycyclic Aromatic Hydrocarbons (PAH) Data
- Lead, Trace Elements and Industrial Metals Data
- PCB Quarterly Data
- Dioxins, Furans and Co-Planar PCB Data

The *Pre-Formatted Files* only provide access to monitoring sites within the Automatic Urban and Rural Network (AURN). The mode of access is excellent, and is based on a map, which leads to a table of monitoring stations in each region, the periods for which data are available, and a link to download the csv files. These can then be downloaded in a column of table format for easy post-processing.

The remaining datasets (e.g. for PAH and Heavy Metals) are available only as Excel files. It is not clear where the user would access information on annual exceedences of the target values, and no links to the relevant reports are provided.

5.3.1 Use of Annual Statistics and Exceedence Statistics Facility

Apart from users who wish to download entire datasets for their own post-processing, the "*Annual statistics and exceedence statistics*" facility provides the most useful means by which various stakeholders can obtain air quality data. However there are many limitations with the facility, and deriving the required information for a range of sites can become an unnecessarily time-consuming exercise.

As an example, users may wish to compile a simple table showing how measured values at a number of monitoring stations in London compare with the objectives over the past 5 years, for the key pollutants of nitrogen dioxide and PM_{10}. The facility allows multiple sites within the same agglomeration or zone etc to be interrogated, but only for one year, one pollutant and one metric at time (e.g. annual mean nitrogen dioxide concentrations in London for 2009). The results do not indicate the data capture, only that it is above or below a 75% threshold. An indication of the number of steps that are required to complete a number of selected, simple analyses, and the time required to do so, are provided in Annex 2 (Tasks 1 to 4).

There are additional issues regarding particulate matter that reflects the specific complexities of this pollutant. As an example, the question was asked "how many exceedence days for PM_{10} were recorded at Marylebone Road in 2009?"

It was not possible to derive the answer with any confidence, and the Archive appeared to provide a different answer to that of the London Air Quality Network site. More details of this exercise are set out in Annex 2 (Task 5). Specific concerns are:

- It is not always made clear what units the results are expressed in, and it is important to always indicate the method (e.g. µg/m^3 gravimetric (Partisol), FDMS, VCM/TEOM, TEOMx1.3, etc);
- The list of available options for pollutant selection is too large and confusing for many users (PM_{10}, hourly measured, daily measured, non-volatile PM_{10} etc). A decision on whether hourly or daily measured values can only be made if the user has prior knowledge of the monitoring technique used at site.

5.4 Local Air Quality Management

The Archive currently provides one of the main portals to support the LAQM process. This is one specific area that is currently being revised as part of the Transformational Government Website Rationalisation, and information held on this, and the LAQM sites will be reorganised to provide a single means of access via a Defra site to all necessary information.

The Archive site, as it stands, is well laid out, but there are confusing routes to finding information that should be on the "Home" page (many of the concerns outlined below are being addressed with the relocation of the site under the Defra banner arising from the Transformational Government Website Rationalisation, which should go live in May 2010).

- The Home page provides no background to the LAQM process;
- Links to the relevant Policy and Technical Guidance are listed under "LAQM Tools";
- Greater prominence needs to be given to the Helpdesks, what they do, and how to contact them;
- A direct link to the RSW (web based reporting) should be provided here (it is not an LAQM Tool).

List of local authorities with Air Quality Management Areas can be easily accessed via a map and "drop down" window.

Three tabs provide links to "*Action Planning*", "*LAQM Tools*" and "*Background Maps*".

5.4.1 Action Planning

The page provides useful links to Guidance, Good Practice and learning Exchange at the foot of the page.

The "*Contact the Helpdesk*" link actually provides an email link to the LA Support Helpdesk, and details of the Action Plan Helpdesk are not provided.

The links at the right hand side of the page are not really associated with Action Planning. It is not an appropriate location to link to "*LAQM Tools*". The link "*What Can I do?*" is entirely related to individuals and not local authorities (at whom this page is aimed).

5.4.2 LAQM Tools

The Tools should be distinctly separated from stand-alone reports (e.g. relationship between annual and 1-hour mean NO_2 concentrations) and FAQs (e.g. related to railway emissions). This is not the most appropriate place to provide the first links to the Guidance.

5.5 Research

This section of the Archive hosts a 'reports and a contract' database

5.5.1 Reports Database

It is not clear, and nor is it stated, what the precise function of the Reports Database is. Is it to hold an archive of **all** research reports carried out on behalf of Defra and the Devolved Administrations?

If this is the function, then the database appears to be very incomplete. Also, some reports become superseded, and it would be helpful to make this clear where it happens, e.g. the reports describing the calculator for NOx to NO_2. This could be achieved in much the same way as datasets on the NAEI website, which have an expected expiry/superseded date.

The search function could be made more obvious on this page.

5.5.2 Contracts Database

It is not clear whether the Contracts database is intended to be limited to Defra contracts alone (i.e. excluding those let by the Devolved Administrations). It would be helpful to split current contracts from historical (completed) contracts, and indicate when the last update was carried out.

The link "*Introduction to AQ Research Programme*" leads to a dead page.

5.6 Top Banner Links

The very top banner of the site provides a number of discrete links to "*FAQs*", "*Site Map*", "*About the Site*" and "*Links*".

5.6.1 FAQs

This section is confusing, as it seems to provide an open question and response forum rather than a list of true FAQs. The information is interesting, but should be posted in a

different section. If the page is intended to provide proper "FAQs" then it would be useful to provide a number of different categories. (Note: FAQs are being transferred from the Archive to the Defra site under the Transformational Government Website Rationalisation, which should go live in May 2010. They are being reorganised in the process.)

5.6.2 Site Map

This provides a quick link to the individual pages held on the Archive. It is not clear what the intended difference between this and the "*Quick Link"* tab immediately below it is. Provision of rapid access to individual pages is useful, but the organisation could be improved e.g. "North Wales" is listed under the Home, but it is not clear that this provides a link to the monitoring sites and data within that region, particularly when there are "*Data"* and "*Monitoring"* sub-headers below.

5.6.3 About the Site

Provides contact details and usage statistics which are useful. The right-hand side of the page provides a link for "*More Information"*. It is not clear, but it is assumed that this is meant to lead to the two headers below, related to Teletext and Freephone services. There are two issues:

- It is important that information on the Teletext and Freephone services be provided, but given that the user is currently accessing the Air Quality Archive, suggesting that they can get more information from these resources is clearly untrue, and potentially wastes time. The purpose of the Teletext and Freephone services needs to be made clear.

- This appears to be the only place where the Teletext and Freephone services are advertised, but they do not appear on the Site Map or Quick Links. This information should be provided at the front end.

5.6.4 Links

This provides links to a wide variety of external web sites and resources, but it is difficult to readily access specific information as there is no search facility (and the links can therefore be often more readily accessed via Google).

5.7 Teletext and Ceefax

Information on current and forecast air quality conditions is provided via the Telextext/Ceefax service. It is assumed that the Contractor is only required to make data available to the service providers, and thus the content and layout of the pages are outside the scope of this contract. There are however some important issues:

- The service does not appear to be available through the digital TV services, although Defra staff have commented that this is in the process of being addressed;

- Pages on Ceefax are available, but there appears to be no pages at all available through Teletext.

5.8 Freephone Service

The Freephone service is excellent, and provides ready access to information. The service was occasionally "not recognised" on dialling when tested, and sometimes reported an "invalid dialling code". The use of area codes allows fast access to information regarding specific locations.

There does not currently appear to be a national text alert service, and there is potential that this could be added to the current Bulletins subscriptions.

The provision of air quality information could be made available to the general public via mobile phones in a similar manner to that in Scotland[16].

5.9 Compliance with the Provision of Information

Defra and the Devolved Administrations are responsible for providing information to the public under the Ambient Air Quality Directive (2008/50/EC) and the 4th Daughter Directive. A summary of the various requirements and how the current Air Quality Archive and Communications Contract achieve compliance with these obligations is set out in the following tables.

[16] www.scottishairquality.co.uk/mobile-services.php

Table A1.1: Summary of Information Requirements in n2008/50/EC

Directive 2008/50/EC of the European Parliament and of the Council of 21 May 2008 on ambient air quality and cleaner air for Europe

	Comment on Compliance
CHAPTER V: INFORMATION AND REPORTING	
Article 26	
Public information	
1. Member States shall ensure that the public as well as appropriate organisations such as environmental organisations, consumer organisations, organisations representing the interests of sensitive populations, other relevant health-care bodies and the relevant industrial federations are informed, adequately and in good time, of the following:	
(a) ambient air quality in accordance with Annex XVI;	Yes – see below
(b) any postponement decisions pursuant to Article 22(1);	Yes – the Archive advises of postponement decisions via Latest News items and provides a link to the technical report on Defra website
(c) any exemptions pursuant to Article 22(2);	Exemptions have not been applied for
(d) air quality plans as provided for in Article 22(1) and Article 23 and programmes referred to in Article 17(2).	No. Whilst this is not a current requirement under the Communications Contract, no links to these plans and programmes could be found on the Archive or Defra website.
The information shall be made available free of charge by means of any easily accessible media including the Internet or any other appropriate means of telecommunication, and shall take into account the provisions laid down in Directive 2007/2/EC.	Information is made freely available via the Internet, Teletext and Freephone. At this stage the INSPIRE Directive is in its' final phase of preparing for implementation, and compliance for air quality monitoring data is not required until 2014.

2. Member States shall make available to the public annual reports for all pollutants covered by this Directive.	
Those reports shall summarise the levels exceeding limit values, target values, long-term objectives, information thresholds and alert thresholds, for the relevant averaging periods. That information shall be combined with a summary assessment of the effects of those exceedences. The reports may include, where appropriate, further information and assessments on forest protection as well as information on other pollutants for which monitoring provisions are specified in this Directive, such as, inter alia, selected non-regulated ozone precursor substances as listed in Section B of Annex X.	Yes. The current report format goes well beyond the requirement in the Directive and provides statistical summaries for all sites, together with analyses on trends, diurnal concentrations and example time series plots for all pollutants.
3. Member States shall inform the public of the competent authority or body designated in relation to the tasks referred to in Article 3.	Not a currently a requirement of the Communications Contract
ANNEX III ASSESSMENT OF AMBIENT AIR QUALITY AND LOCATION OF SAMPLING POINTS	
D. Documentation and review of site selection	
The site selection procedures shall be fully documented at the classification stage by such means as compass-point photographs of the surrounding area and a detailed map.	Yes, via Site Information Archive currently hosted by Bureau Veritas.
ANNEX XVI: PUBLIC INFORMATION	
1. Member States shall ensure that up-to-date information on ambient concentrations of the pollutants covered by this Directive is routinely made available to the public.	Yes. Information is updated on a hourly basis (where possible) on the Archive.
2. Ambient concentrations provided shall be presented as average values according to the appropriate averaging period as laid down in Annex VII and Annexes XI to XIV. The information shall at least indicate any levels exceeding air quality objectives including limit values, target values, alert thresholds, information thresholds or long term objectives of the regulated pollutant. It shall also provide a short assessment in relation to the air quality objectives and appropriate information regarding effects on health, or, where appropriate, vegetation.	Yes. Information is provided with the appropriate averaging periods.

3. Information on ambient concentrations of sulphur dioxide, nitrogen dioxide, particulate matter (at least PM_{10}), ozone and carbon monoxide shall be updated on at least a daily basis, and, wherever practicable, information shall be updated on an hourly basis. Information on ambient concentrations of lead and benzene, presented as an average value for the last 12 months, shall be updated on a three-monthly basis, and on a monthly basis, wherever practicable.	Yes. Information is updated, where possible, on an hourly basis. Information related to daily measured PM_{10}, and concentrations of lead and benzene is updated on a quarterly basis.
4. Member States shall ensure that timely information about actual or predicted exceedences of alert thresholds, and any information threshold is provided to the public. Details supplied shall include at least the following information:	Information on alert thresholds is provided, but only via a subscription service. The information links on current and forecast air quality conditions are related to the Air Pollution Bandings
(a) information on observed exceedence(s):	
- location or area of the exceedence,	
- type of threshold exceeded (information or alert),	
- start time and duration of the exceedence,	
- highest one hour concentration and in addition highest eight hour mean concentration in the case of ozone;	
(b) forecast for the following afternoon/day(s):	
- geographical area of expected exceedences of information and/or alert threshold,	
- expected changes in pollution (improvement, stabilisation or deterioration), together with the reasons for those changes;	
(c) information on the type of population concerned, possible health effects and recommended behaviour:	
- information on population groups at risk,	
- description of likely symptoms,	
- recommended precautions to be taken by the population concerned,	
- where to find further information;	
(d) information on preventive action to reduce pollution and/or exposure to it: indication of main source sectors; recommendations for action to reduce	

emissions;	
(e) in the case of predicted exceedences, Member State shall take steps to ensure that such details are supplied to the extent practicable.	

Directive 2004/107/EC of the European Parliament and of the Council of 15 December 2004 related to arsenic, cadmium, mercury, nickel and polycyclic aromatic hydrocarbons in ambient air

	Comment on Compliance
Article 7	
Public information	
1. Member States shall ensure that clear and comprehensible information is accessible and is routinely made available to the public as well as to appropriate organisations, consumer organisations, organisations representing the interests of sensitive populations and other relevant healthcare bodies, on ambient air concentrations of arsenic, cadmium, mercury, nickel and benzo(a)pyrene and the other polycyclic aromatic hydrocarbons referred to in Article 4(8).	Yes. Information is provided via reports and data downloads (as excel spreadsheets)
2. The information shall also indicate any annual exceedence of the target values for arsenic, cadmium, mercury, nickel and benzo(a)pyrene laid down in Annex 1. The information shall give the reasons for the exceedence and the area to which it applies. It shall provide a short assessment in relation to the target value and the appropriate information regarding effects on health and the impact on the environment.	Yes. But information is only made available via published reports. Raw data downloads are available, but any statistical interpretation has to be done off line.
3. The information shall be made available by means of, for example, Internet, press and other easily accessible media.	Yes. Reports are downloadable from the Archive
Annex III Location and minimum number of sampling points (III) The site selection procedures should be fully documented at the classification stage by such means as compass-point photographs of the surrounding area and a detailed map.	No. The only map available on the Archive is UK-wide, and does not show compass point photographs or detailed location maps.

5.10 Compliance with Accessibility Criteria

The air quality archive is a Government funded website and therefore it has to meet Level Double-A of the W3C Web Content Accessibility Guidelines as a minimum. COI 2009[17] provides information and practical guidance on how to achieve this. The following section summarises the results of an accessibility audit carried out on the site and makes appropriate recommendations.

5.10.1 Accessibility Statements and Policy

Public sector website owners must provide an accessibility statement on the website and in addition to this, develop an accessibility policy. The policy must:

- Demonstrate disability awareness
- Explain how disabled users are to be involved in the development of the website
- State the level of W3C conformance to be upheld; and
- Plan how the level of accessibility will be maintained over time.

Currently the website includes a brief accessibility statement, but there is no accessibility policy for the site. It is recommended that in future website updates, the accessibility statement is expanded to include information about any areas of the site that do not yet conform to the overall accessibility targets of the website. In addition an accessibility policy should be developed and posted on the Accessibility sub-group of the digital people network[18].

5.10.2 Measuring Accessibility

There are two elements to verifying that a website is accessible: technical accessibility and usable accessibility. Technical accessibility determines whether the site will work with a range of assistive technologies. Usable accessibility determines whether the site will be usable by disabled people. Validation testing is an important part of technical accessibility; this should be undertaken by the website developers to ensure that their site conforms to W3C guidelines. This aspect has not been assessed in detail as part of this study, but it is recommended that the website developers conduct an audit of this nature. For example, a simple test undertaken as part of this audit highlighted a few issues such as form labels missing.

5.10.3 Language

Guideline 14 of the web content accessibility guidelines requires that documents are clear and simple. Readability tests can provide a rough guide to the likelihood of a document being clearly understood. The Gunning Fog, Flesch Reading Ease and Flesch-Kincaid are three types of reading level algorithms that can be helpful in determining how readable content is. The following scores were obtained for Airquality.co.uk:

- Gunning Fog - a rough measure of how many years of schooling it would take someone to understand the content. The lower the number the more understandable

[17] COI, 2009. Delivering inclusive websites. October 2009 www.coi.gov.uk/guidance.php?page=129
[18] http://communities.idea.gov.uk/login.do

the content will be. A figure of 10.79 was obtained. This falls between what typically Newsweek and the Wall Street Journal provide.

- Flesch Reading Ease - the result is a number that rates the text on a 100 point scale. The higher the score, the easier it is to understand the document. Authors are encouraged to aim for a score of approximately 60 to 70. A figure of 47.67 was obtained.
- Flesch-Kincaid Grade: 7.69. Like the Gunning Fox index, it is a rough measure of how many years of schooling it would take someone to understand the content.

The results of the readability tests suggest that the website should be simplified so that it is more appealing to a wider range of people.

5.10.4 Text

The website text is not justified, which is beneficial for users with dyslexia. In addition, the text size is not fixed and can be re-sized, which is helpful for people with visionary difficulties and motor control difficulties as they may need to increase the text size to select links.

The web page can be resized and the user can still move about the screen easily. However, sometimes at small resolutions full headings are truncated. In addition, when the screen is resized to small, you cannot see the full detail of the associated hyperlinks.

5.10.5 Headings

It was found that the headings were nested correctly and that the headings provide an effective overview of the contents of the page.

5.10.6 Images

Images and other media used to enhance textual content can often aid in the understanding of information. The guidelines state that all meaningful images should have meaningful alternative (alt) text, so that the user understands what is being shown on the screen.
On the air quality website if images are turned off, appropriate alternative text is shown for images that are meaningful. However, in some cases the alt text conveys the information already shown in the image heading, which the guidance describes as pointless and distracting for users of screen readers.

It is also recommended that for each image, width and height attributes are provided. Whist they are given for the majority of images, there are a few such as the Scottish Government logo that have this missing.

5.10.7 Colouring

Some dyslexic users find it more comfortable to read text on a beige background. Therefore, one should be able to change the colours and they should not be forced by the web developer. This criterion has been achieved as the user can select their preferred background colour in internet options.

The foreground and background colour combination should provide sufficient contrast when viewed by someone who has colour deficits or when viewed on a black and white screen. Two colours provide good colour visibility if the brightness difference and the colour difference between the two colours are greater than a set range. A simple test was undertaken to assess the colour contrast of the site. A fail was provided at four locations on the home page: (1) class: smaller_link, (2) span class moderate, (3) span and (4) menu link. The website also failed in this respect on other pages too.

5.10.8 Links and Navigation

The links and images on the site are a decent size and not too close together. In addition, the link text in the majority of cases gives a clear idea of the destination, although in a few cases could be expanded upon. A site map is provided which allows users to gain an overall feel for the layout of the site and provides direct access to any page on the website. The guidance states that if possible images or icons should be included to visually signpost the different areas. This could be included in future website updates.

5.10.9 Layout

The website uses cascading style sheets and this can be useful for users with cognitive impairments.

5.10.10 Keyboard Shortcuts

All functionality should be available through the keyboard as well as the mouse. This has been checked by tabbing through the links and forms using the keyboard to ensure that they can be accessed and in a sensible order. It was found that the tabs were appropriately set up and therefore navigating through the site by solely using the mouse was possible.

5.10.11 Tables

Using table headers, table summaries and IDs can help users associate the content of a data cell with the row or column it's in. An assessment of the tables contained within the website was undertaken and it was found that this criteria was not met. For example, for the table titled "On site information for automatic monitoring sites in the south east zone", there are no table headers, no table summaries or scopes or IDs for each table heading. In addition, linearization of the tables could be improved – there are no spaces between information, so this makes it difficult to interpret.

5.10.12 Summary

The following recommendations are made:

- That the accessibility statement is elaborated upon and that an accessibility policy for the website is developed.
- That a validation audit should be undertaken.
- Language – that the wording on the site is simplified where possible, so that the site is more user friendly to a wider range of people.

- Text – that at small screen resolutions, the full headings are readable and that the full detail of the associated hyper links are provided.
- Images - the alt text should be re-worded where it is a repeat of the standard text.
- Images – the width and height attributes should be provide for all images.
- Colouring – the colour contrast on the site needs to be improved.
- Links and navigation - the link text in all cases should provide a clear idea of the destination.
- Links and navigation – the site map should contain images or icons to visually signpost the different areas.

6 Annex 2: Data Accessibility Tests

As described in Annex 1, a number of detailed tests on the functionality of the Air Quality Archive were carried out. These were intended to test how well the current system performed in undertaking what are viewed as routine data queries.

These tests were carried out by professional consultants, who have knowledge of air quality issues, but who are not frequent users of the Archive. It is accepted that regular users of the Archive would probably be able to access the data more rapidly.

The following summarises the times taken for different tasks, with more detailed provided in the Sections that follow:

Task	Data Required	Time Taken
1	2008 Summary Information for 3 Sites	5 minutes
2	Summary Information for One Site, 2004-2009	17 minutes
3	One Hour Datasets for One Site, 2008-2009	6 minutes
4	PM Annual Mean at One Site, 2008-2009	2 minutes
5	Number of PM_{10} Exceedences at One Site, 2009	No definitive answer after 1 hour

6.1 Task 1: 2008 Summary Information for 3 Sites

Task 1 required the user to download the data to generate a table showing summary information for 3 monitoring stations in 2008; Marylebone Road, Glasgow Centre and York Bootham:

- Annual mean NO_2
- Annual mean NOx
- 99.8th percentile of 1 –hr mean NO_2

Completion of Task 1 took approximately five minutes.

The steps that had to be carried out to achieve this are shown below:

(a) Annual Mean NO_2 at Marylebone Road

1. Select Data Tab at top of page
2. Click on get data now
3. Select Annual Statistics and Exceedence Statistics
4. Select a Parameter Group – Automatic Monitoring Data
5. Select a Pollutant – Nitrogen Dioxide
6. Select a Region – Government Region
7. For Year – 2008
8. Output Options – Screen
9. Click on Step 2
10. Select Sub-zone – Greater London
11. Click on Step 3
12. Select Annual Mean from drop down list
13. Click on GO

14. Look down list for Marylebone Road

(b) Annual Mean NO_2 at Glasgow Centre and York Bootham. Repeat of all the steps for Marylebone Road, but replacing the region with Scotland and Yorkshire & Humberside.

(c) Annual Mean NO_x at Marylebone Road

1. Click on Data tab at top of page
2. Click on get data now
3. Click on Annual Statistics and Exceedence Statistics
4. Select a Parameter Group – Automatic Monitoring Data
5. Select a Pollutant – Nitrogen Oxides as Nitrogen Dioxide
6. Select a Region – Government Region
7. For Year – 2008
8. Output Options – Screen
9. Click on Step 2
10. Select Sub-zone – Greater London
11. Click on Step 3
12. Select Annual Mean from drop down list
13. Click on GO
14. Look down list for Marylebone Road

(d) Annual Mean NO_x at Glasgow Centre and York Bootham. Repeat of all the steps for Marylebone Road, but replacing the region with Scotland and Yorkshire & Humberside.

(e) 99.8th percentile of 1-hr mean concentrations at Marylebone Road

1. Click on Data tab at top of page
2. Click on get data now
3. Click on Annual Statistics and Exceedence Statistics
4. Select a Parameter Group – Automatic Monitoring Data
5. Select a Pollutant –Nitrogen Dioxide
6. Select a Region – Government Region
7. For Year – 2008
8. Output Options – Screen
9. Click on Step 2
10. Select Sub-zone – Greater London
11. Click on Step 3
12. Select 99.8th percentile of hourly means from drop down list
13. Click on GO
14. Look down list for Marylebone Road

(f) **) 99.8th percentile of 1-hr mean concentrations at Glasgow Centre and York Bootham**. Repeat of all the steps for Marylebone Road, but replacing the region with Scotland and Yorkshire & Humberside.

6.2 Task 2 : Summary Information for One Site, 2004-2009

Task 2 required the user to download the data to generate a table showing summary information for London Bloomsbury in all six years from 2004 to 2009:

- Annual mean NO_2
- Annual mean PM_{10} (gravimetric equivalent)
- Number of 1 hour mean NO_2 concentrations > 200 µg/m^3
- Number of 24 hour mean PM_{10} concentrations > 50 µg/m^3

- Data capture for NO_2 and PM_{10}

Completion of Task 2 took approximately 17 minutes.

The steps that had to be carried out to achieve this are summarised below:

(a) Annual Mean NO_2 for London Bloomsbury 2004-2009

1. Select Data Tab at top of page
2. Click on get data now
3. Click on Annual Statistics and Exceedence Statistics
4. Select a Parameter Group – Automatic Monitoring Data
5. Select a Pollutant – Nitrogen Dioxide
6. Select a Region – Government Region
7. For Year – 2004
8. Output Options – Screen
9. Click on Step 2
10. Select Sub-zone – Greater London
11. Click on Step 3
12. Select Annual Mean from drop down list
13. Click on GO
14. Look down list for London Bloomsbury

Repeat for 2005, 2006, 2007, 2008 and 2009

(b) Annual Mean PM_{10} for London Bloomsbury 2004-2009

1. Select Data Tab at top of page
2. Click on get data now
3. Click on Annual Statistics and Exceedence Statistics
4. Select a Parameter Group – Automatic Monitoring Data
5. Select a Pollutant – PM_{10} (hourly measured)
6. Select a Region – Government Region
7. For Year – 2004
8. Output Options – Screen
9. Click on Step 2
10. Select Sub-zone – Greater London
11. Click on Step 3
12. Select Annual Mean from drop down list
13. Click on GO
14. Look down list for London Bloomsbury

Repeat for 2005, 2006, 2007, 2008 and 2009

(b) Number of Exceedences of 200µg/m^{-3} as 1-hour mean NO_2 concentration for London Bloomsbury 2004-2009

1. Select Data Tab at top of page
2. Click on get data now
3. Click on Annual Statistics and Exceedence Statistics
4. Select a Parameter Group – Automatic Monitoring Data
5. Select a Pollutant – Nitrogen Dioxide
6. Select a Region – Government Region
7. For Year – 2004
8. Output Options – Screen
9. Click on Step 2
10. Select Sub-zone – Greater London
11. Click on Step 3
12. Select Air Quality Standard for 2005 (NO_2) Annual Mean >200µg/m^{-3}
13. Click on GO
14. Look down list for London Bloomsbury

Repeat for 2005, 2006, 2007, 2008 and 2009

(d) Number of Exceedences of 50µg/m^{-3} as 24-hour mean PM_{10} concentration for London Bloomsbury 2004-2009

1. Select Data Tab at top of page
2. Click on get data now
3. Click on Annual Statistics and Exceedence Statistics
4. Select a Parameter Group – Automatic Monitoring Data
5. Select a Pollutant – PM_{10} (Hourly measured)
6. Select a Region – Government Region
7. For Year – 2004
8. Output Options – Screen
9. Click on Step 2
10. Select Sub-zone – Greater London
11. Click on Step 3
12. Select Air Quality Standard (PM_{10}) Daily Mean >50µg/m^{-3}
13. Click on GO
14. Look down list for London Bloomsbury

Repeat for 2005, 2006, 2007, 2008 and 2009

(e) Data Capture for London Bloomsbury 2004-2009

1. Select Data Tab at top of page
2. Click on get data now
3. Select Annual Statistics and Exceedence Statistics
4. Select a Parameter Group – Automatic Monitoring Data
5. Select a Pollutant – Either Nitrogen Dioxide or PM_{10} (Hourly measured)
6. Select a Region – Government Region
7. For Year – 2004
8. Output Options – Screen
9. Click on Step 2
10. Select Sub-zone – Greater London
11. Click on Step 3
12. Select % annual data capture
13. Click on GO
14. Look down list for London Bloomsbury

Repeat for 2005, 2006, 2007, 2008 and 2009

6.3 Task 3: One Hour Datasets for One Site, 2008-2009

Task 3 required the user to download the full 1-hour datasets for NO2, NOx and PM_{10} (gravimetric) concentrations measured at the Bristol St Pauls site in 2008 and 2009. Completion of the task took approximately six minutes. The following steps were taken:

1. Select Data Tab at top of page
2. Click on get data now
3. Click on measured data and simple statistics
4. Select data type – Measured data – update selection
5. Select Monitoring sites – Local Authority – Bristol City Council – Bristol St Paul's – Ok
6. Select pollutants – pollutant name –nitrogen oxides as nitrogen dioxide or nitrogen dioxide or PM_{10} (hourly measured) – Click on update selection
7. Select data range – select either last year (for 2009) or select dates for 2008 01/01/08-31/12/08 – then Update selection
8. Select output type – Data to email address –type your email address in box – update selection.

6.4 Task 4: PM Annual Mean at One Site, 2008-2009

Task 4 required the user to generate a table showing annual mean PM_{10} and $PM_{2.5}$ concentrations (gravimetric equivalent) measured at Marylebone Road in 2008 and 2009. The task took approximately two minutes to complete and involved the following steps:

1. Select Data Tab at top of page
2. Click on get data now
3. Click on Annual Statistics and Exceedence Statistics
4. Select a Parameter Group – Automatic Monitoring Data
5. Select a Pollutant – PM_{10} (Hourly measured) or $PM_{2.5}$ (Hourly measured)
6. Select a Region – Government Region
7. For Year – 2008 or 2009
8. Output Options – Screen
9. Click on Step 2
10. Select Sub-zone – Greater London
11. Click on Step 3
12. Select Statistic - Annual Mean
13. Click on GO
14. Look down list for London Marylebone Road

6.5 Task 5: Number of PM_{10} Exceedences at One Site, 2009

Task 5 was organised in a slightly different way, and required the user to determine how many exceedence days for PM_{10} were recorded at Marylebone Road in 2009. The search took almost 1 hour and failed to provide a definitive answer. The following steps and outcomes were recorded:

Select **Annual Statistics and Exceedence Statistics**

- Automatic Monitoring Data
- Select Pollutant (this allows 11 potential choices)
  - PM_{10} particulate matter (Hourly measured)
  - PM_{10} particulate matter (Daily measured)
  - Non-volatile PM_{10} (Hourly measured)
  - Non-volatile $PM_{2.5}$ (Hourly measured)
  - $PM_{2.5}$ particulate matter (Hourly measured)
  - Volatile PM_{10} (Hourly measured)
  - Volatile $PM_{2.5}$ (Hourly measured)
  - Daily measured PM_{10} (uncorrected)
  - Daily measured $PM_{2\,5}$ (uncorrected)
  - $PM_{2.5}$ particulate matter (Daily measured)

It is not entirely clear from this list which parameter should be selected. If the user does not know which type of instrument is deployed at Marylebone Road, it is not possible to determine whether hourly or daily measured data are available. Many of the options would be required by specialist users only, and even then some of the terms are not clearly defined (for example, what is "uncorrected daily measured PM_{10}"?). "PM_{10} hourly measured was selected".

- PM_{10} hourly measured
- Agglomeration for 2009
- Select screen view
- Greater London Urban Area
- Select statistic (allows numerous choices)
  - AQS objective for 2004 (PM_{10}) daily mean >50 µg/m3 no more than 35 days
  - AQS standard for PM_{10} daily mean >50 $\mu g/m^3$
  - 90th percentile of daily means

It is not clear which of these statistics should be selected. AQS standard for PM_{10} daily mean >50 µg/m^3 was chosen:

- AQS standard for PM10 daily mean >50 µg/m3

This generates the following table:

Air Quality Strategy Standard (PM_{10}) daily mean > 50 μgm^{-3}

List of monitoring sites with exceedences in 2009 for Hourly measured PM_{10}	
Site	**Number of Exceedences**
Camden Kerbside	12
Haringey Roadside	4
London Bloomsbury	9
London Harlington	4
London Marylebone Road	45
London N. Kensington	1

This table shows there were 45 exceedence days at Marylebone Road in 2009, but there is no indication of what method was used, and whether the units are ug/m^3 gravimetric equivalent.[19]

A different approach was selected using the 90th percentile of daily means:

- 90th percentile of daily means

This generates the following table:

Site Name	90th Percentile of daily mean Hourly measured PM_{10} for 2009	Units
Camden Kerbside	n/a	
Haringey Roadside	n/a	μgm^{-3} (TEOM FDMS)
London Bloomsbury	34	μgm^{-3} (TEOM FDMS)
London Harlington	n/a	μgm^{-3} (TEOM FDMS)
London Marylebone Road	n/a	
London N. Kensington	n/a	μgm^{-3} (GRAV EQ)

The two tables are inconsistent:

- The second table only provides data for London Bloomsbury – it is inferred that data capture was below 75% at all other sites
- The second table provides appropriate units (e.g. µg/m^3 TEOM FDMS)

[19] In the past, "gravimetric equivalent" was used to mean TEOM x 1.3, however this is no longer considered suitable. We believe that the Archive may still be using this definition. To ensure clarity, this term should no longer be used.

The user cannot be certain from this information whether there were 45 exceedence days at Marylebone Road in 2009 or not. Was there sufficient data capture? Are the exceedence days measured as gravimetric equivalent?

With this uncertainty in mind, a check was made with the London Air Quality Network website. A statistical summary is provided for Westminster Marylebone Road for 2009. This provides two possible answers:

PM_{10} Particulate: No. days 24hr mean >50 µg/m^3 = 39
PM_{10} (redundant method): No. days 24hr mean >50 µg/m^3 = 110

It is assumed (although not stated) that the redundant method refers to TEOM*1.3. It is not clear what the measurement method for the first result is (VCM corrected TEOM or FDMS TEOM?).

The 39 days exceedence is different to that reported from the UK Air Quality Archive.

7 Annex 3: Overview of Technology, Functionality and Interface.

7.1 Analysis of Current Platform and Functionality:

The basic PHP/MySQL platform used for the Air Quality archive performs adequately for the current tasks required where there is a controlled and co-ordinated flow of data associated with a number of managed dedicated databases.

The data accessibility tests (see Annex 2) indicate that the system is adequate for handling the current sizes of datasets.

Two priority improvements have been identified:

- Data discovery, analysis and extraction needs improvement to reduce the steps and ambiguity in the data selection process and to provide better data analysis tools (see below for further details);
- Improvements to the interface to the monitoring sites should embrace mapping technologies. A good example of this kind of development can be seen at http://www.scottishairquality.co.uk/ . More details are provided below.

These two improvement tasks have been identified from the review of the archive (see Annex 1) and results from the stakeholder questionnaire (see Annex 4). These improvements are considered to be within the functional capabilities of the current platform, although resources will be required to develop the interfaces.

It should also be noted that it is possible to use the current PHP/MySQL based system to generate any standard XML formats that are needed for compliance with INSPIRE and SEIS. The existing Archive is considered a suitable platform for providing INSPIRE and SEIS compliant outputs of data necessary to meet the UKs commitments under the Air Quality Framework Directive.

In addition to the established Air Quality archive, “OpenAir”, a new open-source software package for analysing air quality data has been developed (available from www.OpenAir-project.org/). This free-of-charge open-source software provides a powerful tool for analysing and visualising air quality data. It is still under development but is increasingly being used and commended by the air quality community. Its principal advantage over the use of conventional packages such as Excel, is that it can handle very large datasets, and the processing is very rapid. It uses largely pre-defined graphical outputs.

AEA has recently developed a draft web-page that allows OpenAir to provide analyses for the vast air quality archive database held for the AURN, using a web-browser. It is intended that this would be supplemented with an option to download files of data in a suitable format for further off-line analysis using OpenAir. It also allows images of the graphs to be printed. There are (currently) 8 preset data analysis tools available:

- Summarise Data
- Time Plot
- Time Variation
- Smooth Trend
- Mann-Kendall
- Trend decomposition plots
- Trend hour weekday plots
- Trend Level Hour

In most cases there are options to include one or more sites, and one or more pollutants, in the analyses. The options for analysis of trends also allows for the data to be de-seasonalised.

An evaluation of the draft system (not yet publicly available) was carried out as part of this review. This has demonstrated that useful analyses and visual presentations of data can be obtained relatively quickly. A typical plot covering one or two pollutants, for one site, for several years, took of the order of 15 seconds to generate. More complicated analyses took somewhat longer, but the times were not excessive. The web pages include useful descriptions of the analyses being provided and how to set up the data requirements. There are also particularly useful 'Help' buttons which explain how to use the selection menus.

Some specific issues related to the web-site in its draft form are presented in the box 1 below.

In summary, implementation of the OpenAir feature would be a valuable addition to the Air Quality Archive and one that could be embedded in the existing archive platform. A number of further developments would be required to address the issues identified below and to improve the user interface and transparency of the data.

Box 1: Specific issues related to the Archives OpenAir web-site in its draft form:

- The names assigned to the 8 available data analysis tools (see Box 1) are not very self-explanatory. Consideration should be given to improving the names to make clear what the analyses will provide.
- The current text requires careful proof reading.
- Consideration should be given to improving the text applied to the chart axes.
- When using the Smooth Trend option to graph data for three sites, the title given to the resultant Figure was that of the last site selected.
- The Smooth Trend 'weekday' option produced a graph in which it is impossible to see the years for which the analysis applies, as the numbers overlap.
- It would be helpful if the introductory text for each of the 8 data analysis tools could include an example plot of the output.
- There is currently only an option to print the resulting plot, which actually prints the whole web-page and not just the chart. It would be important to be able to provide an option to save the chart as an image that could be pasted in to a document, e.g. as a .jpg image (currently, right clicking allows the image to be saved as a .png file) and to extract the data behind the chart.
- The PM_{10} and $PM_{2.5}$ data need to be properly defined. It is not clear if the data are gravimetric equivalent or not. Trends are provided for sites where the results have probably changed from TEOM x 1.3 (a non-equivalent measure) to TEOM-FDMS (which is equivalent to the reference method). This will give a false indication of the trend and should not be allowed.
- If insufficient data are input for an analysis to be carried out there is no message on the output page to warn of this, just a blank icon.
- It would be very helpful if OpenAir could be developed to provide summary tables, e.g. annual means and other relevant statistics, as this would be a more user-friendly system than is currently available (see Appendix A of this report).
- Whilst statistical tools provide a very useful and powerful means of analysing data, care needs to be taken to ensure that the analyses are robust and that inappropriate conclusions are not drawn. For example, when comparing datasets from different sites, it is important that the data are truly comparable (e.g. it would be incorrect to compare PM_{10} data measured using TEOMs and FDMS analysers).
- It is also important that the analysis includes a sufficient amount of data for the required analysis to be conducted (e.g. a Mann-Kendall analysis on long term trends in concentrations should only be carried out where there are at least five year's worth of data (with >75% data capture in each year). The tools need to incorporate suitable warnings where robust analyses cannot be undertaken;

- The software is particularly powerful at analysing air quality data in relation to wind speed and wind direction (e.g. bivariate pollution roses). It would not be possible to perform these analyses unless the data were downloaded and processed off-line with separately acquired wind data. It would therefore be extremely useful if wind speed and direction data could be incorporated in the Archive, so that users could select the nearest site with wind data and carry out the appropriate analyses on-line.
- Provision of dynamic support showing the available and valid options related to the data selected for analysis.

Although the Archive performs its designed functions adequately there will be future requirements[20] to provide a service which improves the accessibility and reduces the ambiguity of air quality data in the UK. These are considered below.

7.2 Future Development: Integrating INSPIRE and SEIS Compliant Data from Different Providers.

It is recommended that the Archive provides a more encompassing "one-stop-shop" for air quality data and be able and ready to interact fully with other SEIS and INSPIRE compliant datasets as they become available. To do this, the architecture of the Archive will need to be extended. Development of a Service Oriented Architecture should be considered as described in sections 4, 5 and 6 of the Air Quality Data Management and Integration System Scoping Study[21]. This extended architecture would enable the Archive to act as a "Hub" and to manage data registration, support data discovery, analysis and extraction for data held within and outside of the archives own managed database systems.

Examples of the datasets that the Air Quality Archive should consider integrating include:

Air quality monitoring networks

- Local Authority Air Quality monitoring networks e.g.
  - *London Air Quality Network (LAQN)*
  - *Herts and Beds Air Quality Network*
  - *Sussex Air Quality Partnership*
  - *KentAir*
  - *Calibration Club*
  - *Nitrogen dioxide diffusion tube data*

- Devolved Administration networks in Scotland, Wales and Northern Ireland;
- The Highways Agency operates a small network of monitoring stations, at sites located to major trunk roads and motorways;

[20] Through SEIS and INSPIRE and following recommendations arising from the survey (see Annex4) and from the recent review of the Local Air Quality Management process, carried out on behalf of Defra by the In House Policy Consultancy (IHPC).

[21] Air Quality Data Management and Integration System - Scoping Study. AEA Technology Report for Defra. Andrew Monteith, Ollie Cronk, Rachel Yardley, Paul Willis, Xingyu Xiao, March 2010.

- The Joint Environmental Programme (JEP) A number of the electricity-generating companies operate networks of automatic monitoring stations that provide information that feeds into the JEP, and is also used from compliance monitoring purposes for the permits;
- Operators of major airports maintain small air quality networks at sites in and around the airport. The Heathrow data are already in the public domain via a dedicated website[22];

Modelled future air quality predictions

- A range of data are available from several modelling teams in the UK, including AEA Technology's PCM team, CEH's deposition modelling, the IAM modelling undertaken by Imperial College, and several other modelling groups.

Relevant information on the impacts of poor air quality

- Population exposure data[23]
- More on medical statistics e.g. asthma statistics, COPD, hospital admissions etc.

Relevant information on the drivers for poor air quality

- Economic indicators;
- Traffic information from the Highways Agency and various other sources;
- Emissions data from the National Atmospheric Emissions Inventory ;
- Local land-uses.

Relevant information on the response (actions to tackle poor air quality)

- Information on action to tackle poor air quality at a national and local level (e.g. LAQM, LEZs etc.);
- Information on air quality regulations and where they apply.

The Archive platform will need to maintain data dictionaries and registries for the different services it requires. The Archive platform will need to implement appropriate registration, discovery and data access services for INSPIRE and SEIS compliant datasets. In addition, the platform will also need to provide for additional metadata and classifications that will enable users to understand the quality and classification of datasets coming from third parties. Examples include: site classification, data capture, calibration and independent auditing. These are all necessary to provide a minimum standard that would allow a robust use of the data from some sources.

7.3 Future Development: Providing a Mapping Interface to UK Air Quality Data:

A map based interface, as recommended by this project team and survey responses (see Annexes 1, 4 and 7) should be implemented on the Archive and would provide a user friendly entry point for most user groups concerned with air quality data. This service could be developed by drawing on existing good practise, for example the Scottish, Welsh and

[22] www.heathrowairwatch.co.uk

[23] It has been suggested that this is already held by AEA Technology, but we have not confirmed this.

Northern Ireland websites, which are PHP/MYSQL and Google Maps API based and would be compatible with the current Archive systems.

7.4 Future Development: Public Data Analysis and Data Extraction using OpenAir

The review team agreed that the experimental OpenAir functionality for analyzing Air Quality data is a useful addition to the Archive. The OpenAir services embedded within the current PHP/MYSQL based Archive platform could provide the following functionality:

3. A tool for online analysis (with further development and refinements as indicated in Box 1 above);
4. A tool for managing data extraction/export queries and export of data for offline analysis by users.

This Data analysis and extraction functionality could be embedded within the main map based user interface to provide detailed data and analysis for single sites (e.g. under the "Statistics" tab in http://www.scottishairquality.co.uk/#site_info). This would allow users to drill gently into the analysis tools for a specific site and extract Excel or other formatted data tables and plots.

In addition there would need to be a more advanced statistics page/tab where multiple site statistics can be analysed and extracted by experts as per the experimental Archive OpenAir site.

7.5 Future Development: The Use of Third Party Software

There is a range of software for enhancing interaction with websites. Examples include: Silverlight (Microsoft), Motion Chart (Google) and Google Earth. Whilst these can provide additional functionality that is useful, there are significant drawbacks with using them.

First, many IT systems do not give users the rights to install software themselves. For example Defra members of staff are not able to install Google Earth on their computers.

Secondly, most software of this kind is provided with no guarantee of on-going support. So whilst it may be appealing to use the functionality provided, organisations such as the European Commission have chosen not to rely on such software, because the degree to which continuity can be secured is considered too unsafe.

As a consequence, it is recommended that the Archive does not heavily invest in these types of software, and the associated functionality. As observed above, sufficient levels of functionality can be provided by other routes.

7.6 SEIS

Policy-makers depend on reliable and increasingly on real-time information to determine the most appropriate course of action. At the moment, European countries collect environmental

data and report them to international organisations such as the European Environment Agency (EEA), the Organisation for Economic Cooperation and Development (OECD) and the United Nations Environment Programme (UNEP). Data are delivered at intervals set by relevant legislation and commitments.

SEIS is a collaborative initiative of the European Commission, the EEA and the member countries of the Agency. It aims to:

- Improve the availability and quality of information needed to design and implement the European Union's environment policy;
- Streamline data handling by connecting existing information systems and providing online information services;
- Modernise environmental reporting to reduce the administrative burden both at national and international level; and
- Foster the development of information services and web-based applications.

Many countries have already started connecting their local and national databases and are publishing their data online. A good example is the German environmental portal PortalU. A number of European initiatives are also contributing to the creation of SEIS. Examples include:

- The initiative to build an infrastructure for spatial information in Europe (Inspire);
- The global monitoring for environment and security (GMES) initiative;
- The water information system for Europe (WISE); and
- The EEA portal for sharing ozone information (OzoneWeb).

Such national and international initiatives will be important building blocks for SEIS.

Much like INSPIRE (as INSPIRE is a component of SEIS) each Member State is required to implement network services that conform to the Implementing Rules (IR), which specify the general architecture, security, multilingualism, compliance modes, technical architectures and end user needs.

The SEIS is the resulting geospatial information sharing service, comprising a prescribed technical architecture and rules for:

- Data transport, based on HTTP, SMTP & FTP;
- Metadata & XML messaging, based on SOAP, Dublin Core;
- Services, based on Web Service Description Language (WSDL);
- Publication and discovery, using UDDI (online business yellow pages);
- Web service composition, with options of BPELWS, XLANG and WSFL.

Relevant SEIS specification that may come into force as early as 2010 include the Environmental Monitoring Facilities data specification---- Proposed Harmonized Data Specification Profile for Reporting 2008/50/EC Under 2007/2/EC, 27 March 2009,European Commission, Joint Research Centre, Institute for Sustainable Development.

7.6.1 Road Map for Implementation

The European Commission's Communication *Towards a Shared Environmental Information System* (February 2008) outlines the SEIS approach. Later in the year, the Commission will

present a detailed implementation plan. This will be developed in collaboration with the EEA and the European environmental information and observation network (Eionet). The Commission also intends to update the Standardised Reporting directive to bring it in line with the SEIS principles.

7.7 INSPIRE

Directive 2007/2/EC of the European Parliament and of the Council came into force on 14 March 2007. This directive established an Infrastructure for Spatial Information in the European Community (INSPIRE) and creates the underlying rules for exchanging data and services across national boundaries in Europe. Historically national borders have hindered the development of cross-boundary data services across many diverse sectors including transport, planning, emergency services, natural resources, environmental monitoring, business enterprises and provision of utilities. These barriers range from, language and regulations, to the less availability and format of data and in particular data that relate to location. Today we have the capability to remove these barriers and reap the benefits, through the development and implementation of a Europe-wide infrastructure for spatial information. This would support the integration and harmonisation of huge quantities of spatial (location) data from multiple sources in each of the Member States into a single framework. INSPIRE requires MS to:

- Build infrastructures and network services for spatial information, made compatible by common Implementing Rules (IR) and Community Measures, that allow data exchange at EC and transboundary level;
- The data must be stored at the most appropriate level, but data collected at one level of public authority must be available to all others;
- Access rules must not unduly restrict data use, but charges for Rights Managed (RM) data is permitted, and Intellectual Property (IP) is protected;
- The directive applies to all spatial data held electronically by or on behalf of public authorities and subject to certain conditions – spatial data held by other natural or legal persons if they request it;
- Practically all data that has a spatial component is affected (see next page);
- To speed data discovery, Member States must provide metadata on the data stored;
- Member States must provide free public data discover and viewing services;
- The Member States' infrastructure should be accessible through the EU INSPIRE geoportal.

The Directive includes metadata regulation, data specification regulation, network service regulation, data & service sharing regulation and monitoring & reporting regulation. Member States will be expected to follow these regulations when they are published. The INSPIRE initiative is currently in its final phase – preparing for implementation.

Different time schedules are linked to the data in the three annexes I, II and III. Air quality monitoring stations fall within the 'Environmental monitoring facilities' in Annex III, alongside meteorological stations. The scope of this theme is defined as follows:

"Environmental monitoring facilities are facilities for observations and measurements of emissions, status and effects of environmental media (e.g. air, forest, marine water) and/or other environmental aspects (e.g. biodiversity, human health. The concept of monitoring may relate to systematic and hierarchical structures, including monitoring networks, monitoring stations, monitoring site and subsites. The monitoring sites may be permanently located at a site or can be temporal, only used for a certain time. Continuous moving monitoring facilities, e.g. on ships, may be a kind of monitoring facility. Monitoring sites in the form of locations and areas can be reported as georeferenced points, lines and polygons. In cases where data are classified or confidential, aggregation to grids may be a possibility."

The implementation of the services will occur over the period 2010 - 2019 in the following order: metadata, discovery and view data services, download and transformation services, a map feature service and interpretative services. Metadata available for spatial data corresponding to Annex III (which includes Air Quality related data should be implemented by December 2013 with Newly collected and extensively restructured Annex II and III spatial data sets available by January 2015.

7.8 UK Location Strategy

The UK Location Programme is the vehicle through which the UK will implement the UK Government's Location Strategy, and the INSPIRE Directive.

The Location Programme provides the immediate driver for the potential integration of the UK's air quality data. It has been designed, not only to meet the regulatory requirements of European Directives and initiatives, but also to reduce costs of delivery by cutting duplication of effort, and to improve and add value to our existing datasets. The Location Programme encompasses a diverse range of sectors, of which environmental monitoring is one. The integration of air quality datasets is a small part of this large programme and as such care must be taken to ensure that the integration is undertaken within the guidelines of, and in collaboration with the UK Location Programme.

8 Annex 4A: Responses to User Questionnaire

The following provides a summary of the questionnaire replies. These will be included as an Annex to the main project report, but are provided here for convenience and transparency.

The results are presented separately for LA representatives and other users. This is to allow the different needs to be highlighted.

8.1 User Groups and Responses

The questionnaire replies were collated on the 7th April 2010, and there were a total of 104 replies. This was subsequently reduced when duplicate and blank entries were removed.

The questionnaire has been left open to capture any late responses. At the time of writing there have been further responses, and these will be captured and included in the final report.

The following table provides a summary of the user groups:

User Group	Replies
A Consultant	17
A Member of the General Public	1
A Regulatory Authority representative	7
A Student/Teacher	1
An Academic/Research Scientist	12
Other	8
Subtotal	**46**
Local authority officer (EHO or similar)	**43**
TOTAL	**89**

It is important to note that the number of replies for individual questions can be considerably lower than the total number of respondees. Where this is considered an issue, it is mentioned in the text.

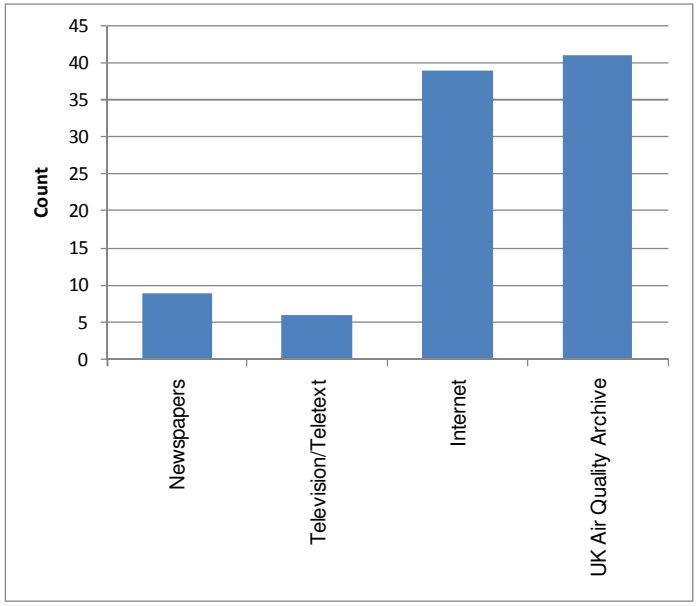
The following analysis data does not included detailed quantitative scrutiny. This is because the most significant trends and opinions can easily be identified without this, and the sample size does not warrant this type of analysis.

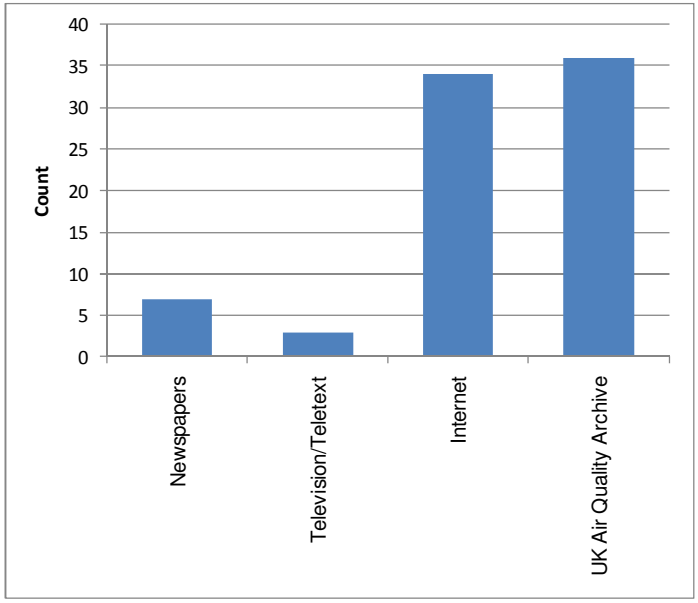
Summary plots are provided to indicate the main messages, but it is the individual text comments which can provide very useful and detailed feedback. This is time consuming to process fully, and therefore only an overview of the text comments is provided at this stage. A more thorough analysis will be undertaken in due course and incorporated into the final report.

LOCAL AUTHORITY OFFICER RESPONSES

OTHER USER GROUP RESPONSES

8.2 What Sources Do You Use to Access Information on Air Quality?





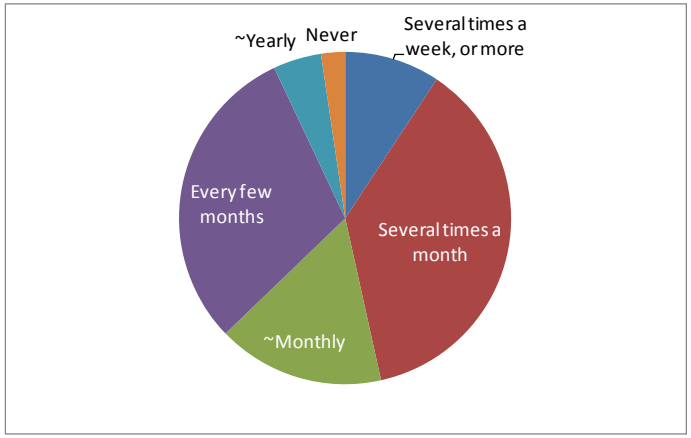
A number of "Other" sources were also specified by numerous respondees across the two groups:

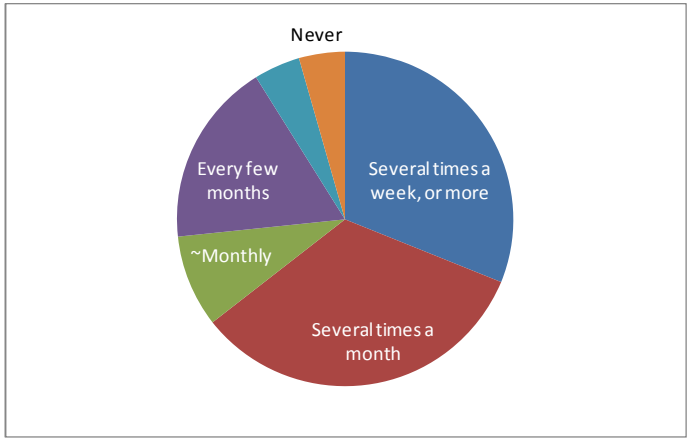
- Journals, periodicals and other publications
- Websites at LA, Regional and International scales
- Other EHO's and LA representatives
- Datasets held internally by a range of organisations.

LOCAL AUTHORITY OFFICER RESPONSES

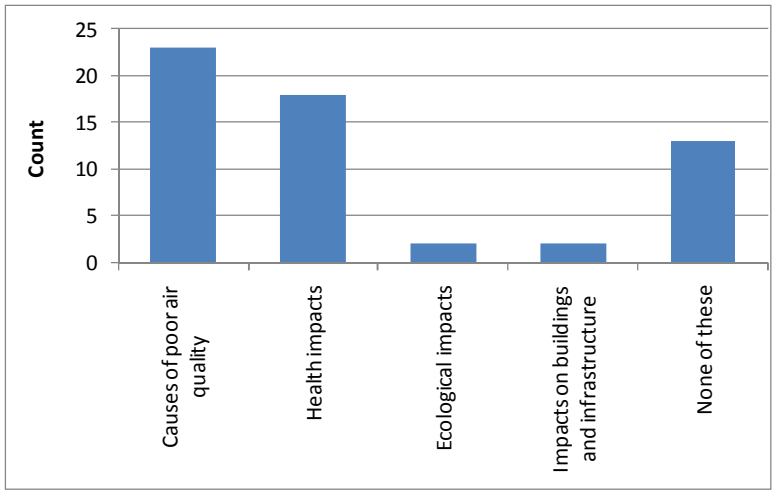
OTHER USER GROUP RESPONSES

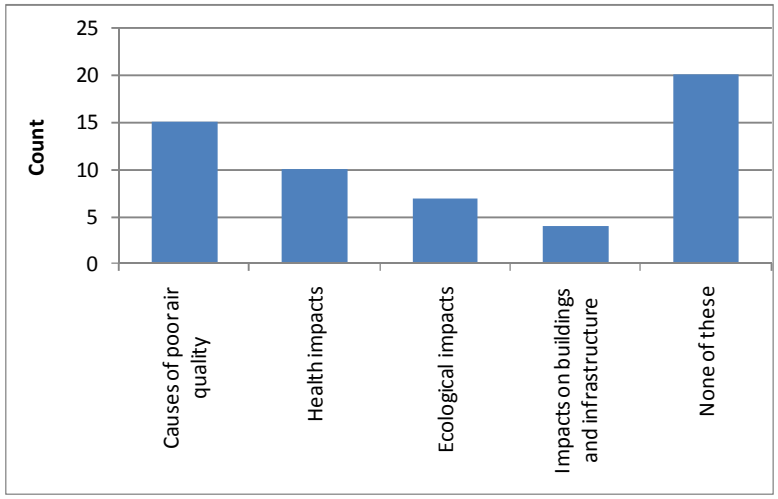
8.3 How Often Do You Visit the Air Quality Archive?





8.4 When you Visit the Archive, What Background Information Do You Look For?





Whilst LA representatives visit the Archive less frequently than many of those in the other user groups, there are still nearly half who visit several times a month or more frequently. Approximately two thirds of the other user groups visit several times a month or more frequently. This is an excellent example of how frequently the Air Quality Archive is used by all user groups.

Many users visiting the site are sourcing data (included in “None of the above”). However the Local Authority representatives are also sourcing background information on air quality and health impacts. Relatively few users source information on ecological impacts, as information is available from other sources. Information on impacts on building and infrastructure is not often sought, because this is a smaller subject area.

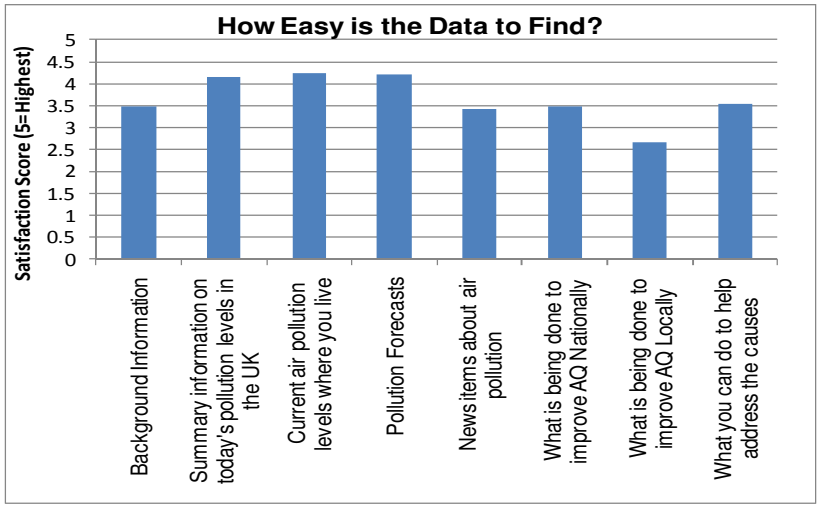
Comments

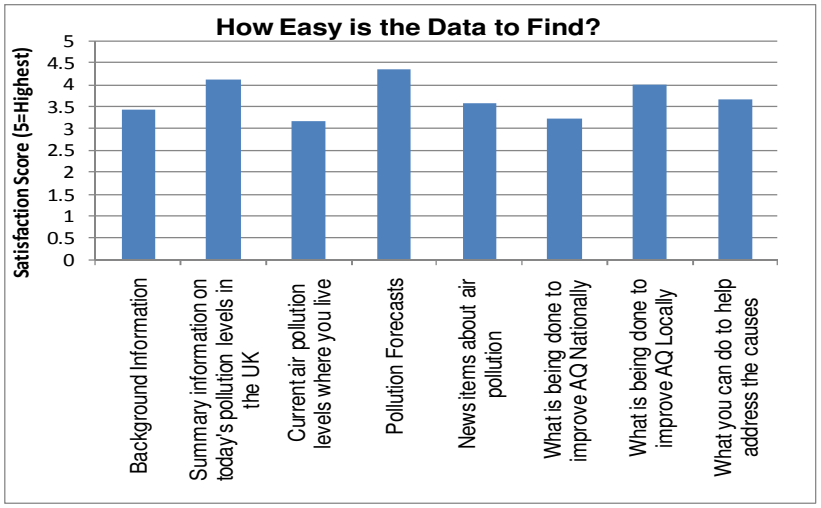
One point of discussion which is now needed relates to what the boundaries of the Archive should be. Should it be a data repository with background information and tools for Local Authorities? Or should it also include a wide range of information on health impacts, ecological impacts, impacts on buildings and infrastructure etc.? These will be considered in some detail in the final report. Consideration will need to be given to the wide range of different users, and the information that they wish to access from the site.

LOCAL AUTHORITY OFFICER RESPONSES

OTHER USER GROUP RESPONSES

8.5 How Easy is the Data to Find?





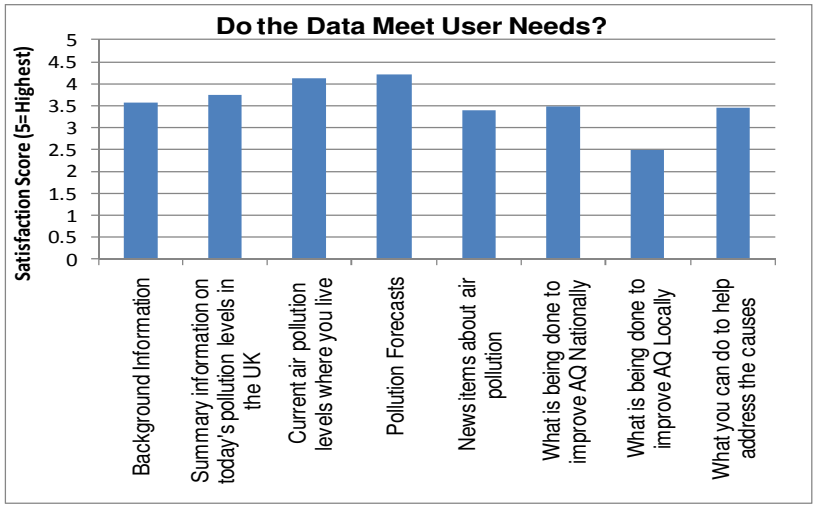
These plots require some explanation. The question was posed with a possible answer rating from 1 (Poor Service) to 5 (Good Service). The plots represent the average reply (note that a notional minimum here is therefore 1, and not 0).

Almost all aspects score reasonably well (between 3 and 4) in terms of how easy the information or data is to find. Interestingly there are some differences between the different user groups, and this is perhaps a reflection of the fact that most respondees are generally regular users of the Archive, and therefore familiar with accessing information on particular technical areas.

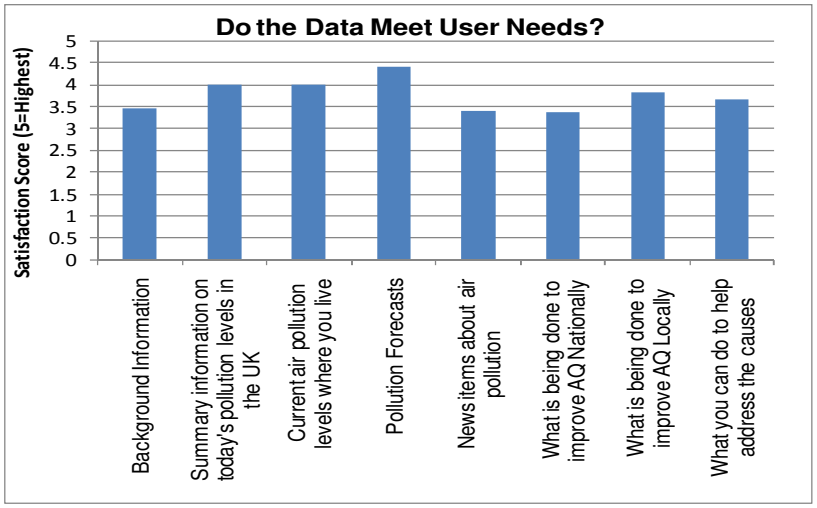
Pollution forecasts and summary information on current levels of air pollution score well. Other aspects are more varied. Only one area (What is being done to improve AQ locally) is scored lower than average by the LA representatives.

LOCAL AUTHORITY OFFICER RESPONSES

8.6 Do the Data Meet the Users Needs?



OTHER USER GROUP RESPONSES



The analysis of whether data/information meets the user needs gives very similar results to the accessibility assessment. The most significant difference between the two datasets is that the "Current Air Pollution Where you Live", rated by the Other user groups, scores higher in meeting needs, than accessibility.

Comments

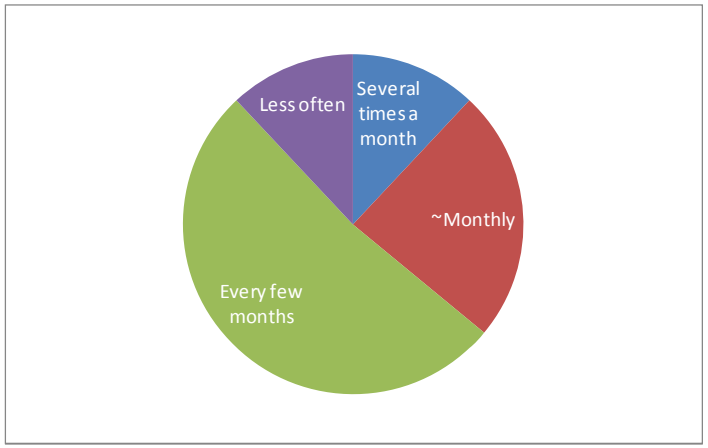
Many of the comments indicated that navigation around the Archive is not intuitive, there is too much text on many pages, and it is not easy to find relevant sections (unless you are a regular user). The reports were noted to be particularly difficult to find (presumably because this is a part of the archive which is not accessed as frequently as other areas- see below).

These comments agree with our own review of the Archive website. It was also suggested that the site might be re-arranged to group different pages for different user groups. This is also an idea which we have arrived at.

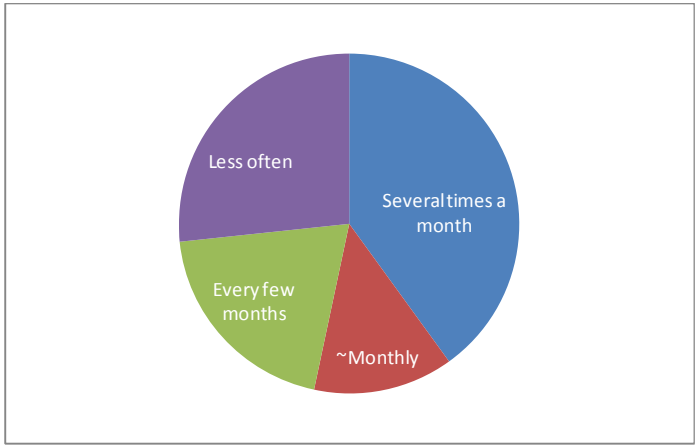
There are a number of interesting comments from Local Authority Officers who note that local information is often best held on local websites, and that the focus should be on better linking and integration, rather than replacing these services. This is also relevant for the London sites.

LOCAL AUTHORITY OFFICER RESPONSES

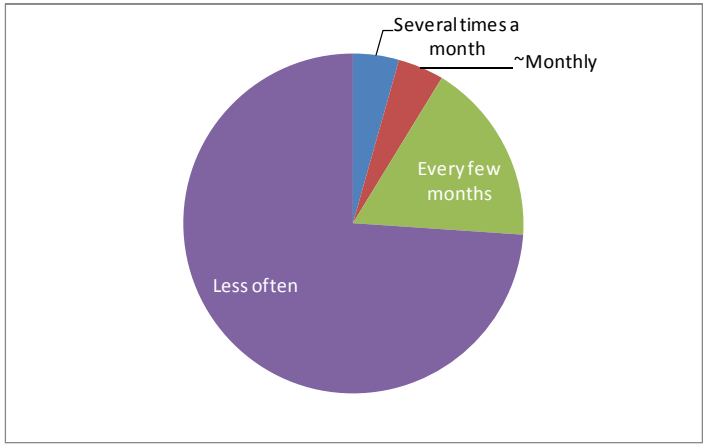
8.7 How Often Do You Access Simple Summary Statistics for NOx,NO_2 and/or PM?

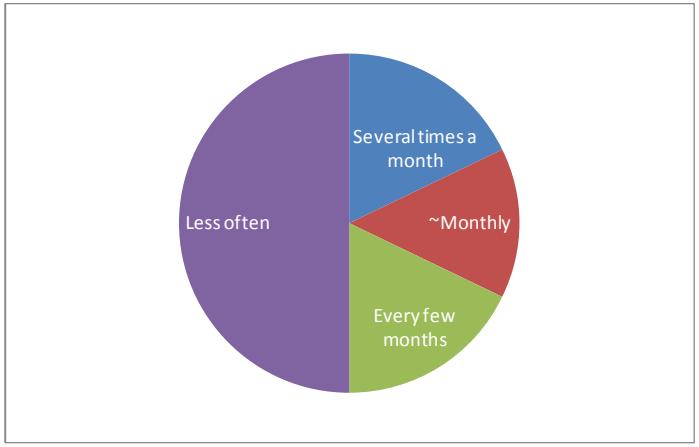


OTHER USER GROUP RESPONSES



8.8 How Often Do You Access Simple Summary Statistics for Other Pollutants?

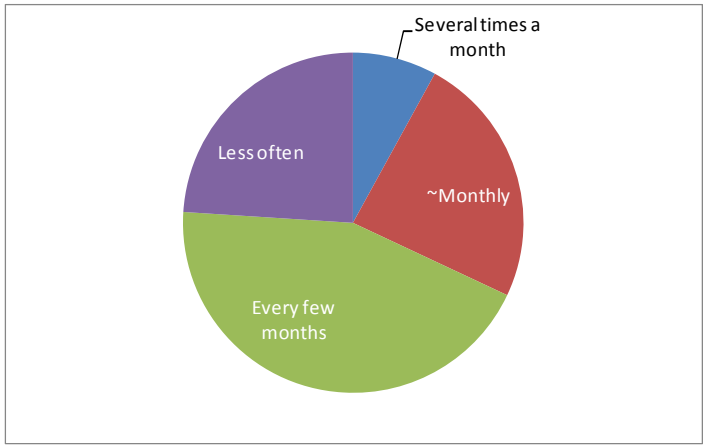




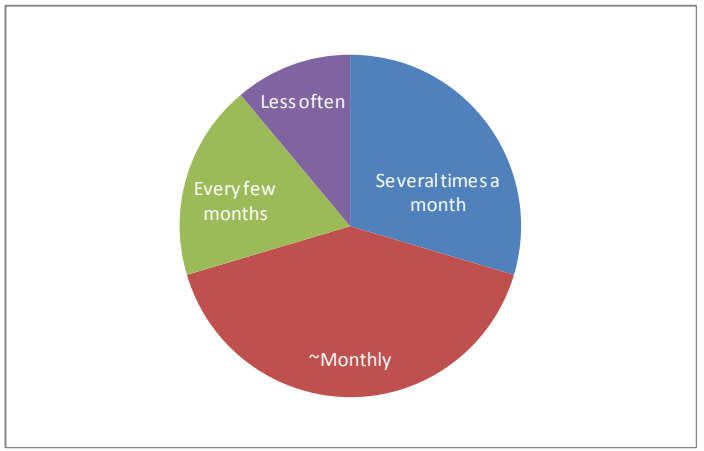
These plots provide a useful illustration of how much more frequently summary NO_X and PM data are accessed, compared to other pollutants, and that consultants and academics are accessing summary data on a more frequent basis than Local Authority representatives.

LOCAL AUTHORITY OFFICER RESPONSES

8.9 How Often Do You Access Detailed Data for NO_X,NO_2 and/or PM?

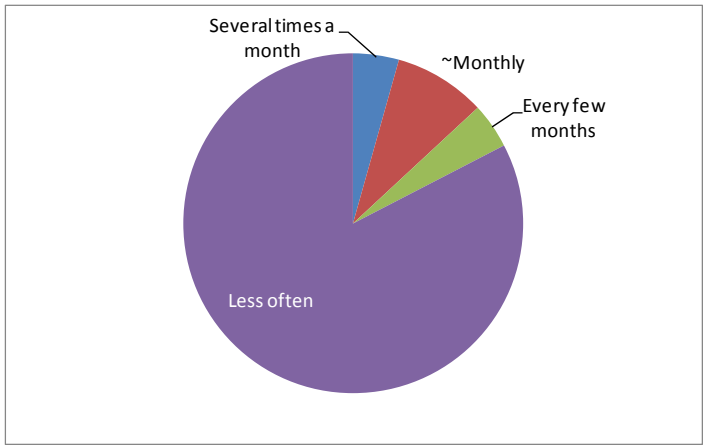


OTHER USER GROUP RESPONSES

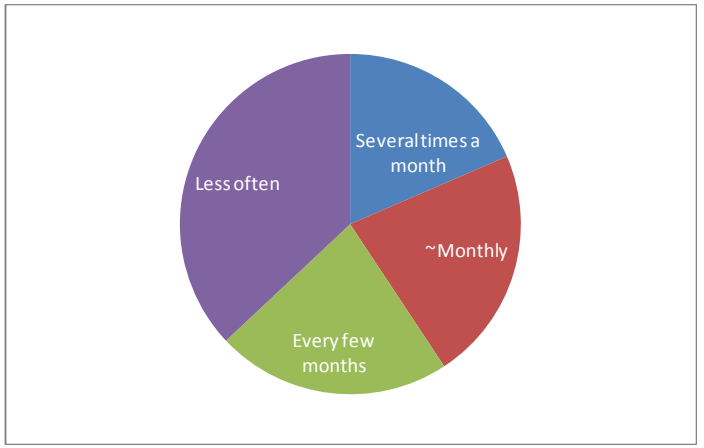


LOCAL AUTHORITY OFFICER RESPONSES

8.10 How Often Do You Access Detailed Data for Other Pollutants?



OTHER USER GROUP RESPONSES

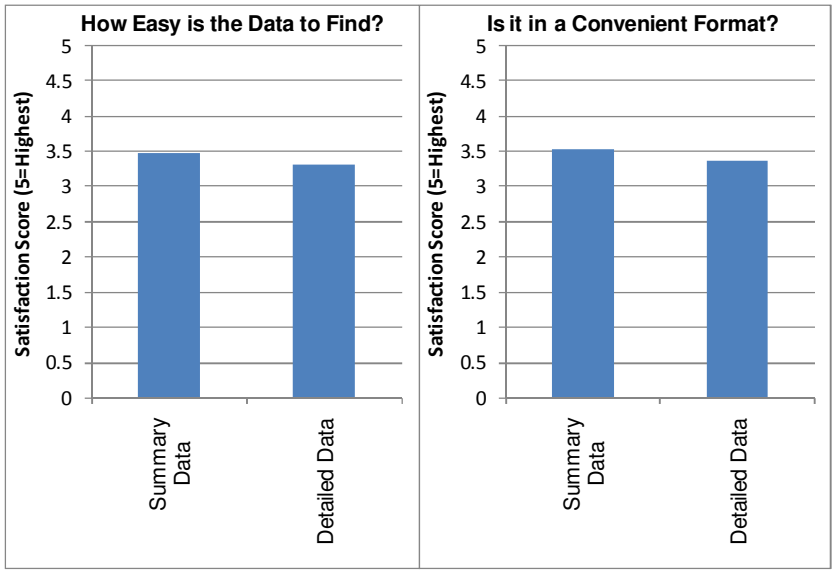


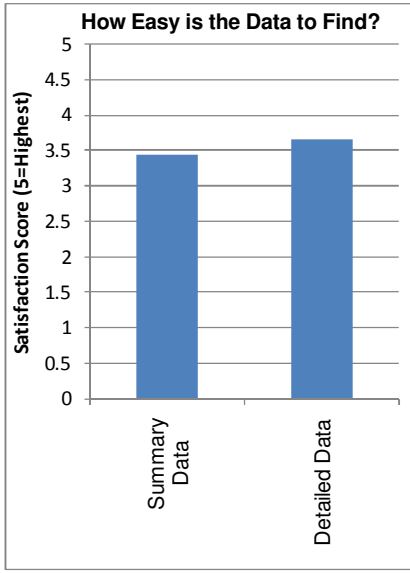
These plots confirm that detailed data for NO_X and PM are the most frequently accessed datasets. There is also a striking difference between the frequency with which Local Authority representatives and other user groups access the detailed datasets.

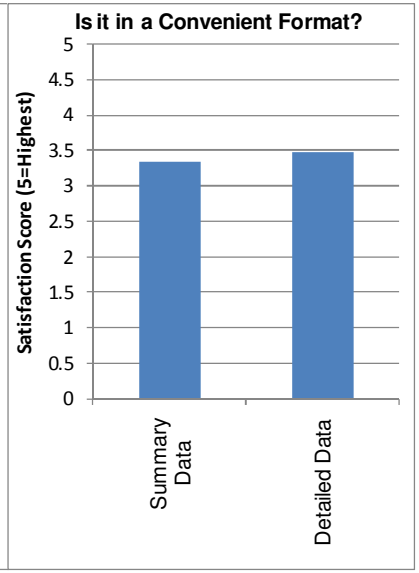
LOCAL AUTHORITY OFFICER RESPONSES

OTHER USER GROUP RESPONSES

8.11 How Easy is the Data to Find, and is it in a Convenient Format?







These plots indicate that in assessing ease of access, and formats, there is very little variation between the summary and detailed datasets, and between the different user groups. A score of 3 to 3.5 is a little over average, and can therefore be regarded as satisfactory, but not hugely positive.

Comments

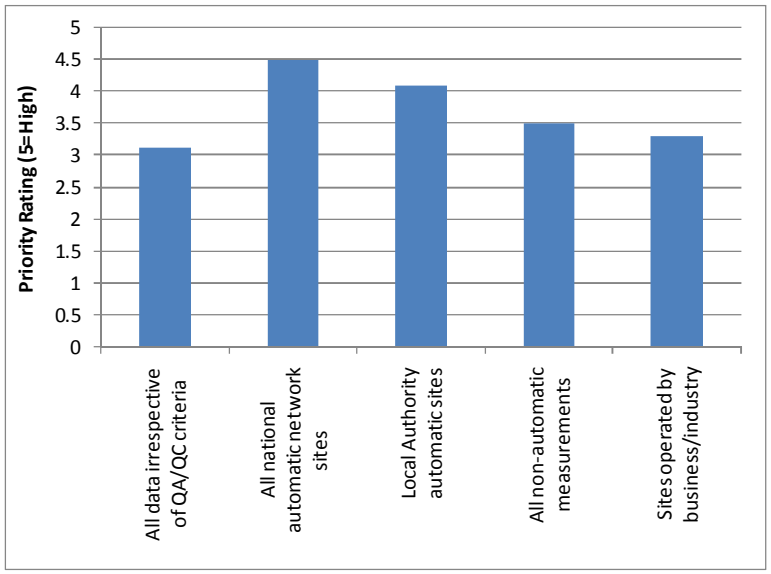
There are extensive comments on the way in which data is accessed from the archive. Generally there appears to be some frustration about the limitations of the data downloader with respect to accessing data for more than one year, multiple sites, and the fact that it resets after running a query. Also, it is possible to step through several options, and then find that there is no data which matches your selection criteria. More, detailed, information on the PM data is also considered essential.

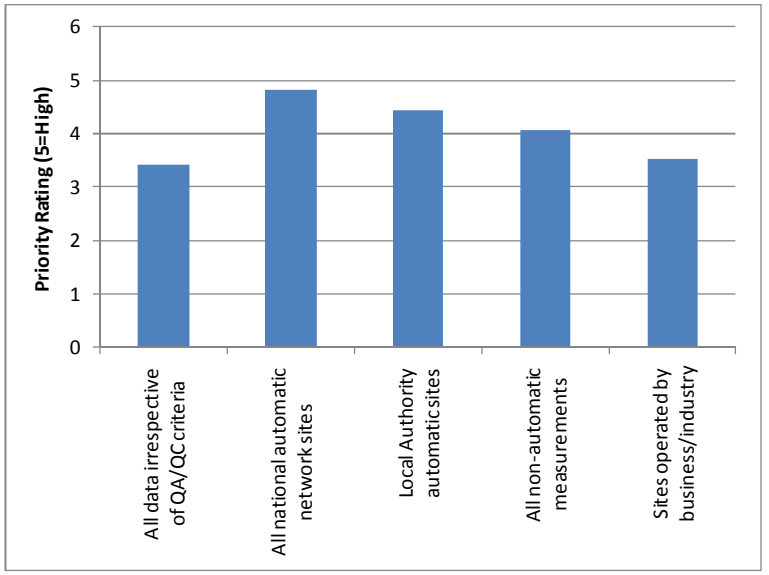
There are numerous other suggestions, such as post code or map searches, incorporation of other datasets etc. These are all points which we are already considering, and will be addressed in the final report.

LOCAL AUTHORITY OFFICER RESPONSES

OTHER USER GROUP RESPONSES

8.12 What Measurement Datasets Do You Think Should Be Included in the Archive?





Comments

There is considerable support for including the data from LA operated automatic monitoring stations in the Air Quality Archive. There is also support for including data from diffusion tubes, as this provides a considerable improvement to the spatial coverage. However the main driver needs to be to make information available from the diffusion tubes surveys available quickly. A number of respondees also flagged the value of including data from automatic monitoring stations managed by industry. Data from other networks were also flagged as an important inclusion.

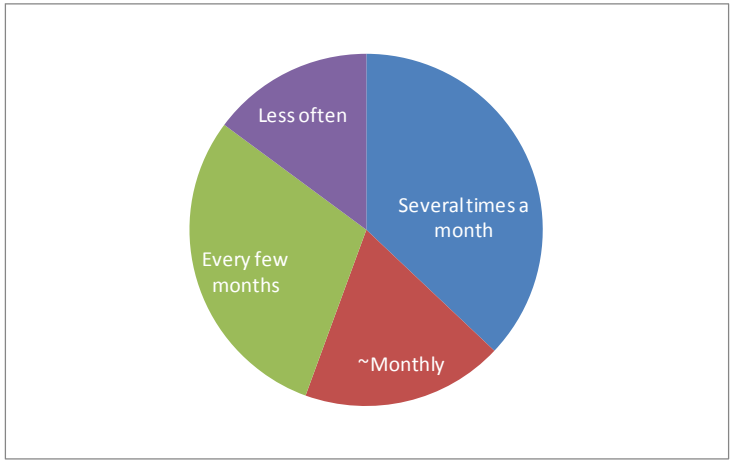
Most comments associated with increasing the scope of the data held on the archive noted that this would also need improved transparency regarding the quality of data.

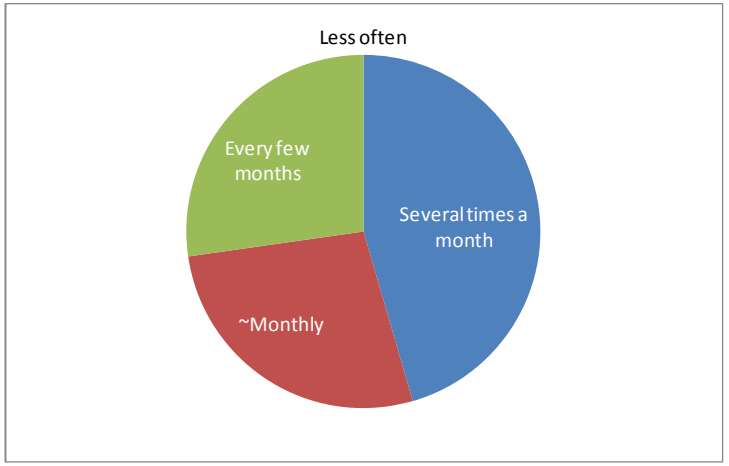
Some of these points are being addressed by the Scoping Study being conducted by AEA, which is looking at improving the integration of data.

LOCAL AUTHORITY OFFICER RESPONSES

OTHER USER GROUP RESPONSES

8.13 How Often Do You Visit the Archive to Access the LAQM Pages?





Interestingly the LAQM pages are visited more frequently by consultants and academics than the Local Authority officers themselves. This may be because the Local Authority Officers are familiar with the contents of these pages, or because there are a number of consultancies undertaking work for the Local Authorities. As can be seen, this part of the Archive is used extensively.

Comments

Users noted that sometimes it is necessary to go to one of the helpdesk sites (comments suggest that these are regarded as being of a poor standard). The LAQM pages are considered to be very wordy, and specific information/tools often difficult to locate.

Worked examples of using the tools is viewed as being helpful. It was also commented that the site is not updated particularly frequently, and when this is undertaken, it is not well publicised.

8.14 Do You Visit the Archive to Access Reports?

There were very few replies to this question. However, considerably more people did indicate the frequency with which they accessed report. Accessing reports on a monthly basis was noted to be the most common practice. The ease of finding reports, and their usefulness was broadly in line with other replies, scoring 3.5 to 4 on the satisfaction rating.

The most common way of access the reports was to download the files, and read on screen (twice as common as viewing directly with a web browser).

Comments
Comments note that the reports are difficult to locate, not up to date, overly dominated by AEA work, and that the search function is poor. Some consideration will need to be given as to how this is maintained going forward. One suggestion was that all final project reports for Defra should be included here as a standard practice.

8.15 Do You Visit the Archive to Access Information on Government Research Contracts?

Approximately a quarter of respondees indicated that they do visit the Contracts database. But limited numbers indicated a frequency, suggesting that it is less commonly used. Local Authority Officers found this part of the Archive relatively easily accessible and useful (satisfaction scores over 4), and other users rated it as satisfactory (scores of approximately 3.5).

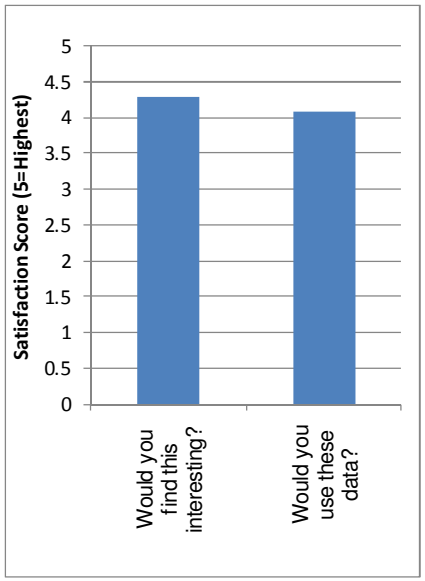
There was interest from all users for the inclusion of current and planned projects, and even suggestions that ITTs should be placed here.

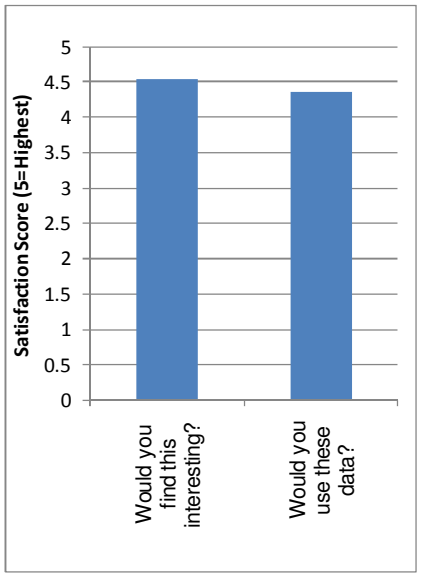
Comments
Some comments indicated that users didn't know this information existed, but that (if it was maintained) it would be a useful resource.

LOCAL AUTHORITY OFFICER RESPONSES

OTHER USER GROUP RESPONSES

8.16 If Links Were Provided To Other Key National Datasets[24], Would You Find This Interesting and/or Useful?





Comments

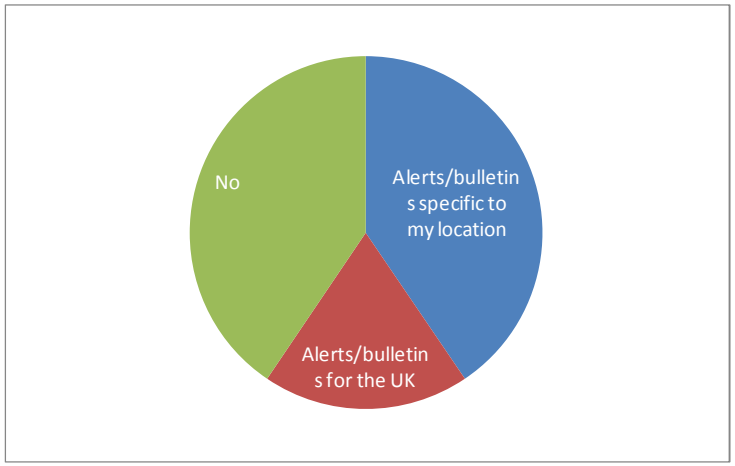
This question received the most positive feedback, with all user groups scoring both interest and usefulness over 4. A wide range of additional data was flagged as being useful, and a general improvement on the integration of information was welcome.

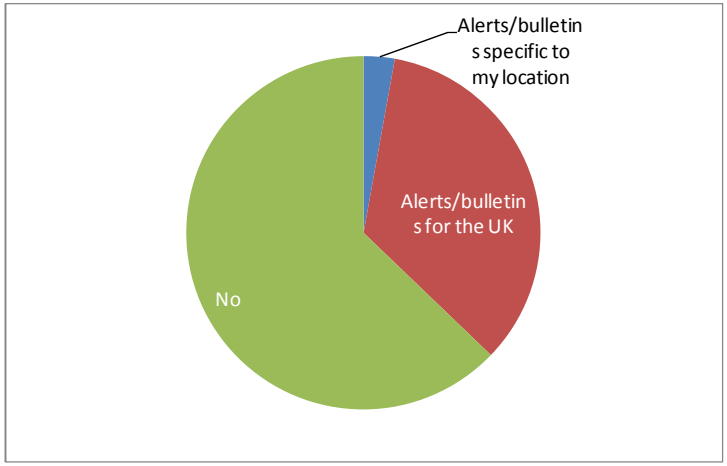
Three datasets featured heavily in this section: improved integration with the emission estimates, readily available traffic count data (perhaps linked from monitoring station location information), and access to meteorological data. There is considerable frustration that access to the latter requires payment.

[24] , The following were provided as examples: Air Pollution Emissions, Economic Indicators, Traffic Count Data, Traffic Fleet Data, Population Statistics etc.

LOCAL AUTHORITY OFFICER RESPONSES **OTHER USER GROUP RESPONSES**

8.17 Do You Subscribe to Air Quality Automatic Bulletins and Alerts (E-Mail Or Text)?





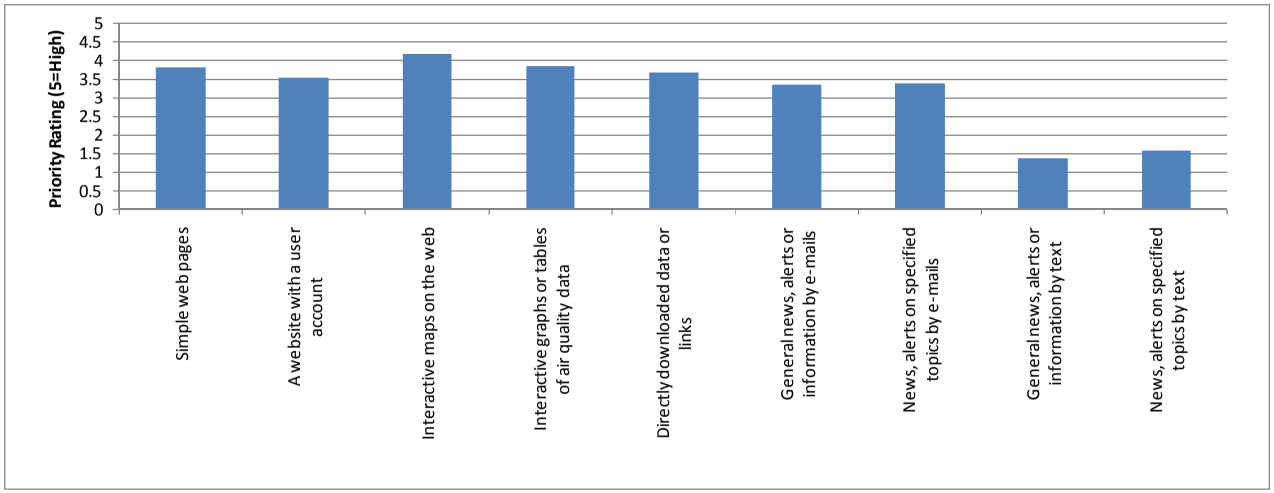
Not surprisingly the alerts/bulletins are dominated by location specific alerts going to Local Authority Officers.

Comments
One user noted that “Bulletin” isn’t necessarily the most useful term for the automated information system.

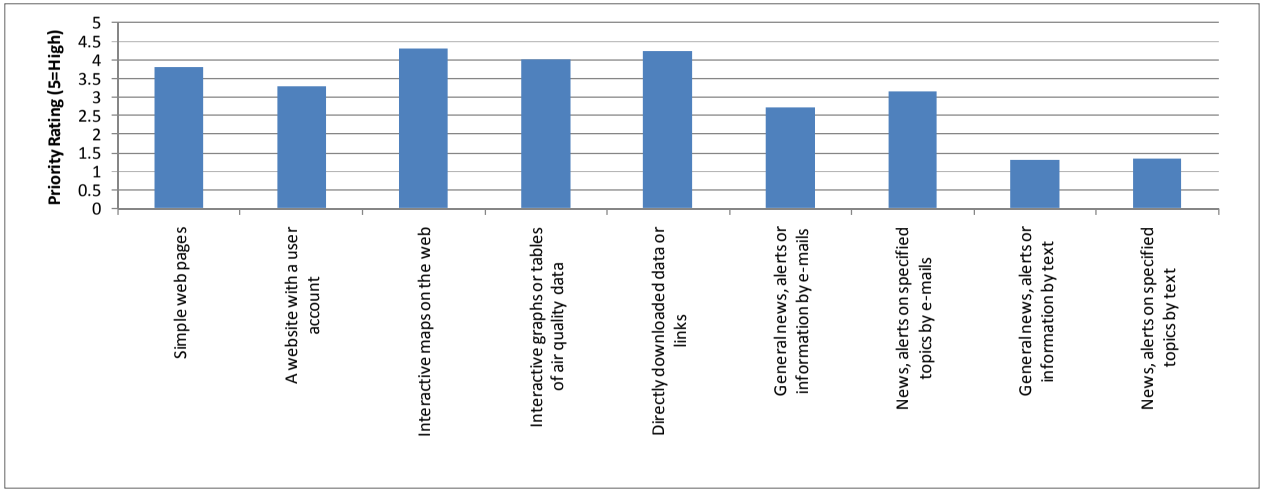
Teletext Pages and Phone Helpline
Approximately a third of Local Authority Officers didn’t know that air quality information was available on Teletext, and nearly a half were unaware of the telephone helpline. For other user groups it was approximately a third for both Teletext and the phone helpline.

8.18 How Would You Like to Interact With Air Quality Information?

LOCAL AUTHORITY OFFICER RESPONSES



OTHER USER GROUP RESPONSES



For most users, information by text is seen as being too limited. Information by e-mail is generally considered useful, particularly for automated alerts and bulletins. However the options flagged as being of highest priority relate to developing the web interface. Interactive maps and graphs/tables of data are considered to be an area of high priority for future development. Interestingly more people preferred a "simple" website, rather than one with a user account which could be customised (the caveat being that the tools are in place to efficiently access data to the detail levels required).

Comments
There were numerous suggestions for improved interfaces. These ranged from zoomable maps with links (rather than the current static pictures etc.) to detailed suggestions regarding accessing data (OpenAir featured in several comments). It was also considered helpful to receive alerts regarding updates to reports/data etc.

All of these comments will be considered in more detail in the final report.

8.19 Please Comment on the Three Best Things About the Way Air Quality Information is Made Available in the UK.

There were a range of different comments, but the three points which were most commonly reported were that:

- The Archive, and relevant information, is readily/easily accessible through the web
- The information is free to access
- The Archive is a comprehensive site (and regarded as a "one-stop shop" for many applications).

8.20 ... and the Three Things that You Would Most Like to See Improved.

There were a wide range of comments, with no particularly dominant themes. A number of observations related to the low public profile of Air Quality (e.g. "Always low priority, rarely a headliner."), the view that there needs to be improved dissemination to the general public, and that this is best achieved by explaining information in the context of impacts on health.

The comments will be presented in more detail in the final report, along with suggested ways in which they can be addressed.

8.21 Any Final Comments or Suggestions?

Many comments related to topics covered under previous sections of the questionnaire.

It was suggested that “Having such facilities run by one large organisation can stifle innovation”. We will consider whether the Communications Contract should have more regular input from users, as with other large government contracts.

It is also worth noting that Duncan Whyatt has offered to help test new developments/data tools etc.

9 Annex 4B: Sounding Board Responses

Following on from the Questionnaire, a short-list was drawn up to act as a Sounding Board. Telephone interviews were conducted, and the following provides a summary of the responses to either different topics that were raised[25].

	1. User Types: The archive has a number of different user types. Do you think restructuring the pages (and the way information is presented) around these user groups would be helpful?
Beth Conlan	Yes, Beth is involved in migrating the LAQM pages, and sees this overall step as being very helpful.
David Carslaw	It would be very helpful if the various functions of the Archive could be more clearly separated e.g. into the provision of data, information on current levels/forecasting etc.
Dick Derwent	Dick does see this as a sensible change, but is concerned that significant changes may make it more difficult for him to access the data that he currently uses.
John Stedman	John agreed that one site trying to be all things to all users causes difficulties.
Michael Bull	Michael tends to have very clearly defined uses for the Archive (monitoring data, background maps, LAQM resources etc) and knows what information is there and how to find it. He has little interest in the other resources, and would not find restructuring to be necessarily helpful.
Rachel Conti	Rachel principally uses the Archive to access monitoring data and the LAQM pages. If these tools could be made more prominent it would be useful.
Simon Birkett	Yes, by user group, use etc i.e. please be 'customer-led'. Simon commented that he is not a regular user of the site, relying instead on the very user friendly 'London Air Quality Network'. Simon uses the Archive primarily for exceedence statistics, AQMA information and ad hoc reports if referred to them by others.
Tim Chatterton	This would not necessarily be useful. If you know what you are looking for it is straightforward to access information. There is a danger in making things too simplistic, such that information is used inappropriately. The tabs provide easy access to information. The information could be much better presented rather than the large blocks of very small text with same size titles
Tony Dore	Yes, this would make sense.

[25] All members of the Sounding Board were given the opportunity to review the transcript of the discussion, and were happy for comments to be attributed to them.

	2. Navigation: Navigation has been flagged as less than ideal. One suggestion is that we have simple pages for the general public, but a more sophisticated web interface for regular users (e.g. personal accounts with individual settings). Do you think this would help you access the information that you want?
Beth Conlan	Beth thought that user accounts might be helpful for more for regular users, depending on how they were set up.
David Carslaw	The Archive is an invaluable resource, but navigation can be difficult even when one is a regular user. The ability to set up a "user-defined" home page with access to functions and applications that are of direct interest would be welcomed. However, as mentioned above, a clearer separation between data and other services would be most useful initially.
Dick Derwent	Similar comments to above.
John Stedman	John agreed that there is a need for common sense. No particular views discussed in any detail.
Michael Bull	This would potentially make access more complicated, and it is unlikely that Michael would use such a facility.
Rachel Conti	Yes – this could be very useful. Access to the various monitoring data is a priority along with the various LAQM resources.
Simon Birkett	Yes. As above, the more 'customer-led', the better.
Tim Chatterton	The use of personal accounts would be overly complicated. It is easy to navigate around, and access to the data is only one "tab" away. It might be appropriate to separate the site into a "lay" and "professional" sections
Tony Dore	Yes, navigation is not particularly good and could do with improving.
	3. Accessing Measurement Data: A number of issues with accessing data have been flagged. Have you seen OpenAir, and do you think this would be a useful addition? Or would you prefer to do your own processing? What specific functionality would you like to see added to the data selector?
Beth Conlan	AEA has an internal system (called HIS), which has the kind of functionality that is needed for the archive. Putting HIS on the web would be one simple solution to many of the issues flagged with accessing data and statistics (although note that it does have AEA IP). Beth considered OpenAir to be a good way forward, especially for academics and research consultants. Most LAs would not use the wider functionality of OpenAir – they just want simple statistics which they usually get from their own site instrument software.
David Carslaw	Improved functionality of the Archive to access data would be welcomed. [SM note: David is the principal architects of the OpenAir system as is currently working on an easier system of importing large datasets from AURN]. David agreed that there are some potential concerns with the misuse of statistical functions – a framework manual for the use of OpenAir resources is being developed – some of these issues could be flagged up to any functions installed in the Archive. Other safeguards are built in – e.g. the trend analysis includes an estimate of uncertainty, which would respond to poor data

	capture for example through wider uncertainty intervals.
Dick Derwent	Dick tends to download raw data, and undertake his own statistical analysis. This is so that he can have full control of the quality criteria that are applied to the data. Dick is entirely positive about OpenAir, and considers it as a tool that is not ready quite yet. So it is something for the future, and any changes to the current archive should bear in mind the likely need for incorporation at some point in the future.
John Stedman	John hasn't seen much of the functionality from OpenAir. He is happy to use data processed by an on-line system, as long as it is accompanied by good meta data, which ensures a suitable level of transparency. His requirements (with regards to statistical analysis) are quite specific. So we could envisage a page/interface for common stat analysis (e.g. exceedence data), and a separate page where more bespoke analysis is available for key data users. This wouldn't need to have specific user accounts, just be presented in the right way.
Michael Bull	A common requirement is to access multiple pollutants for multiple years, which currently requires the user to carry out a number of repeat tasks. A facility that would allow simple tables of statistics to be compiled (e.g. 5 sites in London, for 2004-2009, showing annual mean, No. hrs>200 µg/m^3 NO_2, No. days > 50 µg/m^3 PM_{10}, and data capture) would be extremely useful. OpenAir is used a lot with downloaded data, but there is currently a need to be fairly "computer-literate". It is a functionality that should be used more, and if it could be integrated into the Archive to allow "on-line" processing then this could potentially be very useful. Access to the non-automatic data is not so straightforward. It would be useful if an interactive map showing the locations of all monitoring sites could be included. Better information on site classifications for non-automatic sites also should be included.
Rachel Conti	Rachel has not used OpenAir, but frequently downloads datasets to produce e.g. time series plots. These datasets often have to be manipulated to remove e.g. missing data values. Statistical tools embedded into the Archive would be extremely useful to perform these types of common functions.
Simon Birkett	Simon recollects having seen OpenAir but say he does not know what he could use it for. Simon would like simple access for 'lay' users to: exceedence statistics; local authority level concentration maps and emission sources; trends; information relevant to legal duties (e.g. AQMA area); and health (e.g. exposure concentrations). He does not frequently access datasets from the archive, so this was not discussed in any detail.
Tim Chatterton	Preference to download the data and to complete processing offline. However, function to produce tables of simple statistics (e.g. multiple years and multiple sites) would be very useful. Noted that some of the non-automatic data are not easy to access (e.g. for SO_2 and NO_2). Other issues with download of data were noted (Tim accesses hourly data for all UK sites). Inclusion of additional columns on every row to show units. Ratification status etc causes problems with Excel. (put units at top of measurements column?)

Tony Dore	Tony accesses data for model verification purposes. However, he usually goes to the person responsible for creating the data, rather than the archive. This has the advantage of getting data in a convenient the format, and guaranteeing that it's the most appropriate version of the data.
	4. Range of Measurement Datasets: A number of people have requested the inclusion of LA automatic datasets and diffusion tube datasets. Would you use these? And do you see their inclusion as a priority over improving the access to the datasets which are currently on the archive? Are you concerned about the data quality levels?
Beth Conlan	Beth supports inclusion of the LA automatic sites. But, commented that LA's would request funding to cover audits and the work required to attain the required quality levels. Defra already provide grants for purchasing equipment, and will therefore need to decide whether to also fund activities associated with ensuring on-going quality of the generated data. Interestingly the calibration club data are already on HIS (see comment under 3). Diffusion tube data would be useful, but on annual basis only- to ensure that data was not used inappropriately. Beth sees the value in including data from other networks, but agreed that priority needs to be put on the data which is most frequently needed (i.e. NOx and PM).
David Carslaw	David strongly supports the inclusion of local authority data from automatic sites into the Archive, provided some form of "quality bar" is set. This is an issue that needs to be considered in tandem with improved navigation and accessibility. There is an important issue that collecting poor quality data costs basically the same as collecting high quality data. Setting a quality standard may encourage all data providers to meet minimum standards.
Dick Derwent	Whilst Dick probably uses more LAQM data than AURN data, his view was that the National Archive should hold National datasets. Providing links to LA datasets would be valuable. His reasoning for not having the inclusion of the LA datasets as a high priority is that these datasets are controlled by the LAs, and can therefore be discontinued without notice, or moved etc. So providing links would be a better approach. However he is keen that other national network data is included (see 7). We discussed accessing data, and arrived at a set up which had simple data access with stats (unified quality criteria), and then separately, sophisticated data access with a focus on raw data (so that users can choose own quality criteria). This is much like the current Archive set up.
John Stedman	John would like to see data from other Defra networks included (CEH rural, metals etc. etc.) as these have an acceptable level of quality. Similarly LA automatic sites which have been QA'd. No strong view on including all datasets vs only those reaching certain quality criteria, as long as there is transparency regarding quality (perhaps the use of bandings) and the associated meta-data.

	There are a number of examples where consistent meta-data would considerably help. For example, he noted that some sites on different networks are co-located, but have different co-ordinates and different site names!
Michael Bull	Michael frequently needs to go and source monitoring data carried out by local authorities, and so the inclusion of these data on the Archive would be very helpful. It would be important to flag these data as not being in the "national network" and to provide information on what quality standard had been applied. Reference to the site managers (e.g. AEA or ERG) or membership of the Calibration Club would be suitable indicators. Data could usefully be restricted to NOx/NO_2 and PM
Rachel Conti	Rachel currently uses London data, which are incorporated into the LAQN. From previous consultancy experience, it would be very useful if local authority monitoring data could be included. The priority pollutants are NOx, NO_2, PM_{10} and $PM_{2.5}$. Some form of quality standard needs to be applied, but the data could be marked as to being derived from an LA source.
Simon Birkett	The discussion focused on the way in which data is/could be presented, rather than the availability of different datasets. Some kind of visual distinction between kerbside/ roadside /background sites would be very helpful (different coloured dots on an interactive map??). Purpose: to see broadly comparable information. Being able to then access summary information e.g. just roadside sites, would be very useful. Simon uses exceedence data from the archive because it is regarded as the definitive source of this information. He commented that the exceedence table which is produced around mid-January is particularly helpful. However, there have been examples when the information presented on the website appears to provide a misleading picture to the lay user. For example the January exceedence table indicated ~10 towns exceeding NO2 limit values whereas the less reliable diffusion tube data for the same period suggested ~100 towns exceeding the NO2 limit value. This is very confusing for the lay user. Simon noted that NO2 diffusion tube data can be frustrating to access, and earlier this year seemed to have been reformatted following a request of his for more detail on exceedences. The reformatting seems to downgrade the significance of the data. He particularly requested that data be presented in a way which can be understood by the lay person, and which gives a fair representation of the national and local picture. He also commented that the Archive currently focuses on short-term episodes (air quality levels today, air quality forecasts, the bandings that are used), whereas the most important issue, in term of health impacts, relates to long-term exposure.
Tim Chatterton	Local authority data from automatic sites should be included, but some form of "quality bar" should be set. Noted that if the data are deemed suitable for R&A then they should be suitable for incorporation into a national database. Something like the AEA calibration Club could be used. Suggested that local authorities could ask the data managers (e.g. ERG, Calibration Club etc) to forward the data onto the Archive.

	Focus on important pollutants such as NO2 and PM (possible also include ozone and SO2)
Tony Dore	Tony only uses annual average data, but has a general view that "the more the better". He sources NH3 data from CEH and acid deposition data from Archive, and whilst he tends to discuss the data with individuals, sees the value in having one comprehensive interface. Massimo uses the automatic data for EMEP4UK, and noted that multiple downloads are needed for multiple years.
	5. Quality Information: It has been suggested that more information about the measurement data is included. For example, PM monitoring and corrections applied. This will also be important if other datasets are added. How would you like to see this presented with the data?
Beth Conlan	Yes, more transparency here would be of value.
David Carslaw	This is a particularly important issue with regard to PM data, and it is essential that suitable supporting information (on measurement method and corrections applied) is always provided.
Dick Derwent	Whilst he agrees with this point, Dick typically undertakes his own processing, so that he can select his own quality criteria.
John Stedman	John is a strong proponent of incorporating much more comprehensive meta-data, and is therefore happy to support this initiative. He mentioned that he flags the need for improve meta-data whenever he has the opportunity!
Michael Bull	It is important that information related to e.g. PM monitoring method is readily provided, and that any corrections applied are clearly stated. Simple descriptors such as "TEOM VCM" or "FDMS" would suffice. It is also very important to clearly flag where monitoring methods have changed at a site and when.
Rachel Conti	Rachel has not encountered this problem. LAQN allows the user to stipulate what type of PM data are presented (e.g. corrected or uncorrected etc).
Simon Birkett	Simon asked that the data be explained for a non-scientific lay person. A good example is the change from TEOM x 1.3 to FDMS. Why was it changed? What does the data mean? What consequences for legal compliance in normal/hot years?
Tim Chatterton	Yes – information for e.g. PM10 data must be recorded and provided for all of the measurements.
Tony Dore	Tony gets around this by sourcing data from individuals rather than the Archive itself.
	6. Associated Data: Better integration with emissions data, the inclusion of met. data, traffic count and other related datasets have been requested by many people. How much time/effort would this actually save you?
Beth Conlan	Met data- the Met Office are only able to offer a few sites . AEA have stopped using them as a source of data, and use World Geodata instead (Trinity Consultants). The data is less expensive, and bizarrely they even offer more sites in the UK with the relevant data formats than the Met Office does.

	Traffic count data- Often poor quality, and not available in the location where it is needed. LA's are commissioning work, which is good progress. However, it often lacks information on queuing time/length etc. and is therefore of limited value. Many local traffic planners don't understand what is needed for AQ assessment. For example they may make changes to junctions to ensure improved traffic flows, without quantifying the impacts on AQ. Transport planners often only lip service to AQ issues (reference to LTP3). The AQ and traffic planning community are not talking enough, and there needs to be much improved liaison and co-ordination. There might be a role for some kind of national forum or similar, to ensure that traffic planners are considering AQ issues at a suitable priority level.
David Carslaw	The inclusion of met data is a critical issue as many of the important functions in OpenAir are reliant on this. Given that the met data are collected using public money, the data should be made freely available for research and government use. Defra should lobby strongly to have the Met Office release data free of charge for this purpose. It was also noted that the quality of the met data still leaves a lot to be desired – e.g. it is still possible to purchase the 2002 Heathrow dataset even though PSDH had concluded it was highly unreliable. If the full range of data cannot be provided, then it would be possible to build OpenAir functions on a range of "generic datasets" selected to best represent meteorological conditions across the major urban areas of the UK. In terms of other data sets, easy link to point source information (via EA) and traffic data (via DfT) would be welcomed. Defra are also encouraged to collect more local information at some monitoring sites (e.g. traffic counts at roadside sites).
Dick Derwent	Dick preferred the option of linking to relevant sites.
John Stedman	The PCM team already have other datasets set up in their GIS system, and the view is that accompanying datasets accessed through the archive would probably become out of date rather quickly. So no particular wish for these to be made available.
Michael Bull	Inclusion of met data would be useful, particularly as it would improve the functionality of OpenAir. A useful function would allow the user to enter a postcode or OS grid reference, and to then have associated information provided e.g. background pollutant concentrations, emissions data in grid square, closest monitoring sites for various pollutants, closest meteorological station etc. Not sure if traffic data would be useful. The DfT ATC counts may not be reliable for the actual location under study, and in many cases, a more detailed traffic study is being carried out.
Rachel Conti	Met data is a big issue that has been discussed many times. It would be extremely useful to include these data on the Archive (how many people have bought the 2009 met data for Heathrow as an example?). It would also be useful to access the DfT traffic information site.
Simon Birkett	This discussion focused more on different scales, rather than datasets.

	Simon commented that it is important to ensure consistency between national and local levels. He recognized that operating at the national level brings economies of scale so the more things can be done centrally the better provided the local and national information are both available.
Tim Chatterton	Strong opinion that met data should be provided free of charge to local authorities, and inclusion on the Archive would be a suitable repository. Other datasets do not necessarily need to be integrated, but links to where these data can be found would be useful.
Tony Dore	Tony noted that Met data was available for e.g. PhD students and academics etc. So presumably this is mainly a problem for consultants. He thought that it wasn't a good idea to include Met data on the archive because there would be a call for many different formats etc. He mentioned that having the reports on the Archive is useful. However , whilst some are easily found, others are best located by doing a Google search (which then points to the archive).
	7. What Would You Improve!? If you had 50 man days available to you, specifically to improve the Archive, what would you spend it on?
Beth Conlan	Improve the public facing pages of the Archive, and include information on health implications, information that could be used in education etc. The Archive also needs to have much clearer information on national planning- "Where we are now" and "Where we are going". The reports sections needs improving. Include links to DoH and DfT pages- these are surprisingly lacking on the Archive.
David Carslaw	The Archive is an excellent resource but there are significant issues with regard to access and navigation. The current site could be reorganized so that the Archive explicitly provides a repository for data, with other resources (forecasts, LAQM, reports) accessed via a different portal.
Dick Derwent	The incorporation of Defra's other AQ data- acidification measurements, aerosol data, nitrate, sulphate etc. Incorporation of baseline monitoring data such as Macehead (CO_2, CH_4, N_2O, NMVOCs etc.). This has exceptional level of QA/QC (currently held by Peter Simmons, Bristol University).
John Stedman	Including other Defra network datasets, and ensuring the availability of rigorous and complete meta-data.
Michael Bull	The ability to extract statistics for multiple pollutants and multiple years in a simple query would be a priority.
Rachel Conti	The Archive provides an enormous wealth of information, but site navigation is not straightforward and sometimes it can take a long time to find the correct data. Improved navigation with a clear flowchart showing what is available, and where it is located, would be the priority.

Simon Birkett	As a general aim, make it easier for lay people wishing to engage in the subject: 1. Communicating how good/bad the current air quality is locally and nationally (and trends over 1, 3, 5, 10, 15 and 20 years). 2. Explaining the resulting health impacts of point 1 locally and nationally. 3. Explaining the causes of poor quality ie sources. Links to health e.g. PM2.5, diesel. 4. Provide information to allow members of the public to: a. 'Mitigation': reducing the impacts of poor air quality (e.g. reducing personal exposure by selecting a route way from major roads) b. 'Adaptation': reducing the causes of air pollution (e.g. choosing public transport etc.). 5. Explain who is responsible for what, when and what legal powers/avenues citizens have to effect change e.g. Duties on the SOS, Highway Authorities, the Environment agency, local authorities. In essence, what's going on, what is non-compliant, how can people most easily affect change. People could engage then in the topic and become agents of change. Simon also noted that the 'risk' messages which are provided by Government can confuse and/or mislead the public. For example the message that: “air quality is good across 99% of the country; it has improved a lot since 1990; and it reduces the life expectancy of everyone by an average of 7-8 months" may be factually true, but suggests the problem is not serious. In reality "air quality is amongst the worst in Europe; it has got worse in the last 10 years; and causes xxxx premature deaths with each 'victim' losing up to 9 years of life". The former, government, message has the effect of downplaying perceptions of risk and confusing over 70% of Londoners (say) who are worried about poor air quality. To make significant progress with raising the profile of poor air quality, it does need to be put in the context of health impacts. Simon would like to see estimates for the number of premature deaths from long-term exposure to PM2.5, at the LA (or maybe even ward) level. Premature death data due to long-term exposure to PM2.5 has been published recently by the EC, EEA, WHO and US EPA, so why not the UK? It certainly carries more impact, and provides community leaders with useful information, when you can state that e.g. in Westminster X people dying prematurely, up to X years early etc.
Tim Chatterton	Noted that the Archive occasionally hosts “obviously erroneous data values” e.g. 1000’s µg/m3 values for PM10. The data should be more carefully screened before they are released to the Archive (this is currently a Network managers responsibility, but Tim suggests that a responsibility should also lie with the Archive managers as current arrangements do not work).
Tony Dore	Tony cited navigation as one obvious area to improve.
	8. Can you suggest ways in which Defra could improve the public awareness of Air Quality Issues, or ensure that it is suitably placed on the political Agenda?

Beth Conlan	To date national government have not been selling the health impacts of poor air quality. There are some activities happening at the local level (signs, websites etc.), but there needs to be co-ordination across national, regional and local scales. Need council led local campaigns (backed up by numbers). Road safety campaigning has used some hard hitting TV advertising, which has worked well. Someone like Simon Birkett has also done a lot to keep AQ on the public and political Agenda, particularly in London.
Dick Derwent	Communications are currently based on simple bandings. Dick suggested that he generally isn't the best person to advise on sound bites, and noted that it is difficult to put across a daily message on air quality (when the annual picture may be completely different). He noted that the Comms should be organized differently depending on whether the aim was to get the public to do something, or just inform them. He regarded the combination of the overview report & access to detailed data as a good way of meeting different users needs.
John Stedman	Not discussed.
Simon Birkett	Simon suggested that Defra should be bolder about sharing of information. He cited annual mean NO2 and PM10 contour maps (e.g. Hyde park maps) as examples of good practice, and commented that this provides community leaders/campaigners with the right type of information to allow them to take suitable actions. He also suggested that Defra play a more active role in reviewing AQMAs, and suggested that there are numerous roads in London where there are exceedences which are not currently included in AQMAs. We had an interesting discussion about the way in which obesity, alcoholism, smoking, road traffic accidents are all marketed as "voluntary" issues (i.e. people can choose to opt out of them). Air quality has been thought of as an "involuntary" issue. If the resourcing for addressing these issues was determined by number of people affected (or by health impacts), then poor air quality would be taken rather more seriously. All communications would need appropriate language, with much more transparency over the health risks. Simon encouraged Defra to advocated more actively the need and opportunity for change. Complying fully with air quality laws would save lives and show the world how to tackle air pollution and sustainability issues - not least by setting society on a trajectory to achieve climate change targets. Simon Birkett very kindly offered his time to help with communicating air quality issues to communities and other stakeholders..
Tony Dore	This isn't a field that he is particularly involved in, and he therefore didn't have any particular views or ideas. But he did appreciated that there was scope for improvement here.

10 Annex 5: Air Quality Information and the Public

10.1 Public Straw Poll

To gather information on the general publics' knowledge of the air quality services provided by Defra, a questionnaire was conducted with members of the public. None of the sample worked in the air quality field. The sample size was small (20 people), and all were from Oxfordshire.

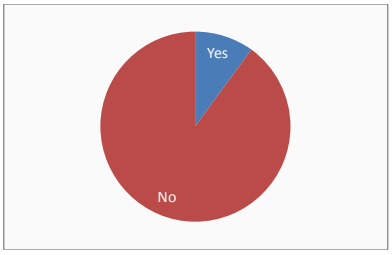
The results are not expected to provide an accurate quantitative representation of the general public, but it is nevertheless still possible to obtain some key messages from the results.

10.1.1 Questionnaire Results

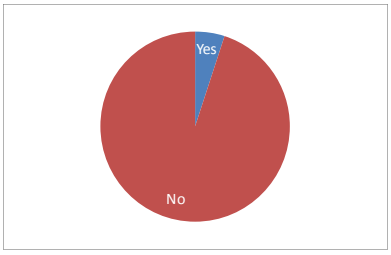
The following provides a summary of the questionnaire replies.

Are You Aware of the Information that the Government Provides on AQ Through the Web, Teletext and Phone?

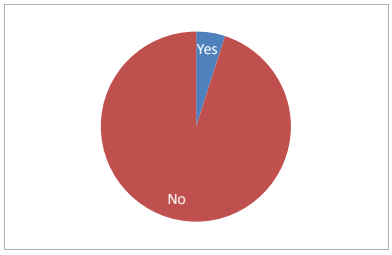
Through the Web



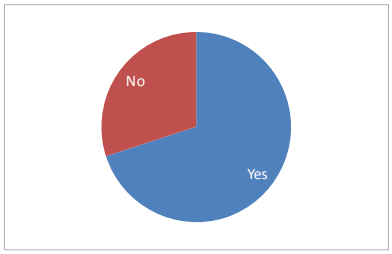
Through Teletext



Through the Phone



Are You Aware of the Activities your Local Authority are Undertaking in Relation to Air Quality?



Respondees were asked about Local Authority activities to demonstrate their positive answer to this question, and all were able to provide examples of relevant activities. However it should be noted that respondees were all from the Oxford area, where air quality is a particularly high profile subject, and there have been a number of changes to the local infrastructure.

If You Wanted Information on Air Quality, How Would You Find It?

All respondees indicated that their first step would be to undertake a Google web search. 20% of respondees suggested that Wikipedia would probably provide general reference material, and 15% specifically named Defra web pages as a source of information.

25% suggested Local Authority web pages would be a helpful source of information, although most did not know what might be available (air quality in Oxford is of particularly high profile).

10% proposed asking a friend who they knew was knowledgeable of the subject.

Where is Air Quality an Issue?
All those expressing a view considered air quality to be an issue in urban areas close to roads, some also indicated that they thought there were air quality issues associated with intensive farming. Industry was only mentioned by one person.

How Can You Contribute to Reducing the Impacts of Air Quality Issues?
Almost all respondees suggested that they could/should drive less, and cycle or use public transport as an alternative.

Most respondees also suggested that they could use less electricity in the home, and several suggested improving home insulation.

10.1.2 Observations and Conclusions

Interestingly whilst the vast majority of users were unaware of the information and services which are currently available, they are able to very quickly find the current archive site through a Google web search. It is therefore important that the Archive (or "Hub") continues to remain at, or near the top of the Google listing for searches associated with air quality.

It should also be noted that whilst most of the respondees have a reasonable grasp of air quality issues, there are some specific gaps in their knowledge e.g. Ozone episodes in rural areas. Much of the understanding associated with "pollution" is derived from information associated with climate change, and there was generally a very poor appreciation of the link between poor air quality, and health impacts. This is an area where Defra have scope to improve their dissemination, and more fully explain the health implications of poor air quality.

10.2 Review of Citizens' Jury Report

10.2.1 Introduction

Defra provided the report on the Citizens' Jury on Air Quality: Articulating Public Values in Environmental Policy Development (2006).

Whilst this report does not deal directly with the topic of air quality communications, it does provide particularly useful information on the current understanding that the general public have with regards to air quality, and the level of service and information that they expect from Government. The report was reviewed for information specifically on communications, and the following summarises the main findings:

Priorities: As an issue, air quality was not particularly high on people's agendas at the outset. However this had substantially changed by the end of the Citizens' Jury, with most

regarding it as an important issue because they were now aware of the resulting health implications.

Current levels of Air Quality: There was a general awareness that air quality had improved across the last several decades. Most were not aware of current issues in any detail. However, there was a general recognition that there must still be some air quality problems, the rise in cases of asthma being cited.

Level of understanding: The report indicates that the "Levels of knowledge about the causes and effects of poor air quality were very low, beyond the obvious that industry and traffic cause pollution."

Schools-based education was noted to be good. However in addition to this, the jurors were concerned that there should be education for adults, perhaps phrased as a 'public awareness' campaign.

10.2.2 Raising Public Awareness:

The jurors thought that a public awareness campaign should have two strands:

- information that enables individuals to better understand the causes and implications of poor air quality; and
- information on what individuals could do to make a difference and how they personally would benefit as a result.

There was a strong emphasis on enabling people to make informed choices, and in particular providing the link between air quality and poor health. But it was recognised that the impetus to change personal behaviour fades very quickly. As a result it was suggested that information was best imparted in *"bite sized chunks"* on a continual basis.

A celebrity-led campaign was found to be a popular idea (Jamie Oliver's campaign for better school food was much quoted as a good example of a positive impact being made).

It was also seen to be important to provide information in the right way, with indicators and measurements that were understandable to the general public.

11 Annex 6: Overview of Archive and Telephone Usage Statistics

The Archive website includes comprehensive information on the usage of the various web pages, and AEA Technology also collate data relating to the usage of the telephone helpline service. A short summary of the information is considered below.

11.1 Archive Usage Statistics

A comprehensive range of usage statistics can be found on the Archive at:
http://www.airquality.co.uk/cgi-bin/awstats.pl?config=www.airquality.co.uk

The parameter which provides the best indicator of general use is the Number of Visits. This broadly represents the number of times that users access the Archive (i.e. it makes a single count for a user who visits the site, even if they visit may browse a number of pages before leaving). Figure 10.1 below provides a timeline of all available data for the Number of Visits.

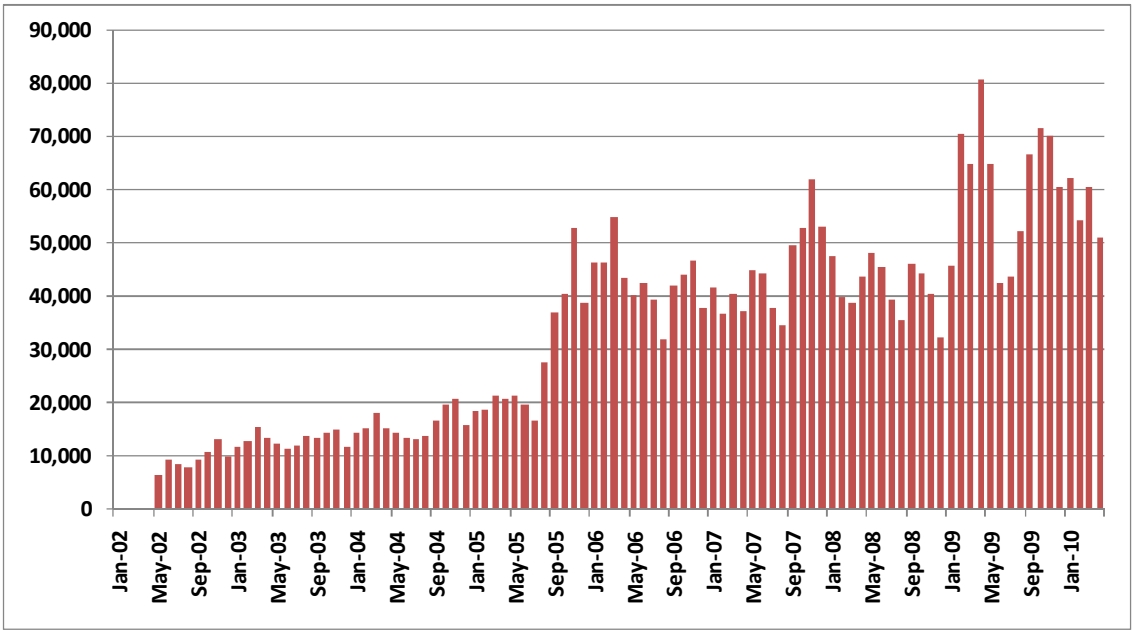


Figure 10.1 Air Quality Archive: Number of Visits[26]

As is expected there is an upwards trend. The large increase in 2005 appears to be driven by an increase in the number of different people visiting the archive rather than existing users making more regular visits. So it is reasonable to conclude that the Archive became more widely used.

The usage statistics provide information on the number of times different pages are accessed. Information on some topics is spread across different pages, so it is difficult to make direct comparisons. However, the LAQM pages and pages associated with obtaining

[26] Data was extracted on the 28th April 2010, and therefore the statistics for April do not represent a complete month.

monitoring data are some of the most frequently accessed. In addition, the current levels of air quality also feature in the most frequently visited pages.

These observations are consistent with the results from the questionnaire (Annex 4).

The usage statistics also include a breakdown by user type. Whilst it is not possible to obtain detailed information about the user, it is possible to gain some information from their user domain.

Typically 10-15% of the users have a .uk domain name. However, there will also be many UK based users included in the .com and unknown domain categories- which account for typically 33% and 40% respectively. The .org and .net domains account for typically 1% each.

11.2 Freephone Usage Statistics

AEA Technology hold usage statistics for the Freephone service. The number of calls is presented in Figure 10.2 below.

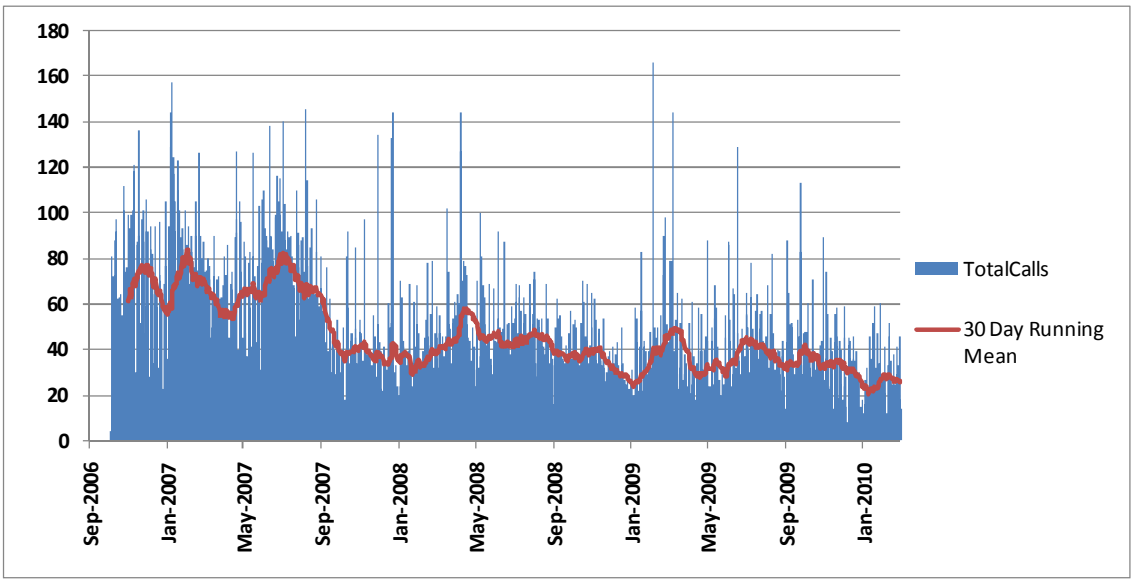


Figure 10.2 Number of Calls (per day) to the Freephone Service

It is apparent that the number of calls being made to the service have been falling with time. Current volume represents approximately a third of the volume in 2006. This is presumably because more access to information on the internet has become considerably more widespread across this timeframe.

It is important to note that the decreased use of this service is not necessarily a reason for discontinuation. The demographics which use the phone service are likely to be those who have less readily available access to the internet, and providing a phone service ensures that information can be obtained by almost all adults in the UK.

In fact with the change to digital TV, access to air quality information on Ceefax and Teletext has become rather more difficult. It may therefore be sensible to consider improving information dissemination to those without internet access. This could include the use of a "text back" service, or something similar.

Suggestions relating to the future of the phone service are included in the main body of the report in more detail.

11.3 Ceefax and Teletext Usage Statistics

It is not possible to gather usage statistics on the information made available through this medium without conducting household surveys (considered to be prohibitively expensive for the information gathered).

Future services could draw on digital TV functionality such as the "red button". More details are provided in the main body of the report.

12 Annex 7: Good Practice from International Consultation

Under Directive 2008/50/EC on ambient air quality and cleaner air for Europe, Member States shall ensure that the public as well as appropriate organisations are informed adequately and in good time of ambient air quality. The information shall be made available free of charge using any accessible media including the internet. Therefore, air quality websites are provided by Country's throughout Europe. In addition, the Devolved Administrations of the UK also have their own air quality websites.

The following provides a summary of key points arising from a review of the systems used by the Devolved Administrations and a number of other countries (primarily European). In addition, the European Environment Agency website services were reviewed as they are considered to be both comprehensive, and draw on recently available technology. Review of these websites has allowed us to capture the web site layouts and innovative tools currently being used, and from this we can make the following observations and recommendations:

12.1 Clear Presentation

The Scottish, Welsh and Northern Ireland air quality websites (www.scottishairquality.co.uk , www.welshairquality.co.uk and www.airqualityni.co.uk) have recently been developed by AEA and the presentation of information is much clearer than the UK Archive.

For example, the home page is simple with limited amounts of text, which means that it is easier to find the information you are looking for. A similar approach has been followed by Cyprus (http://www.airquality.dli.mlsi.gov.cy/Default.aspx)

12.2 Catering for Different Users

The Cyprus website has a "kid's corner" and a section on regulations (outlining the Country's and EU legal air quality requirements). This information could be useful to add to the UK air quality website too. The Kid's corner in particular could help broaden the appeal of the website to a wider range of people.

The USEPA website takes a similar approach. Visitors can select which user type they are, and they are presented with information that is tailored to the particular user type. They have a particularly good section for children, called the Environmental Kids Club (http://www.epa.gov/kids/)

12.3 Interactive Maps

The Devolved Administration sites, France (www.atmolor.org), Finland (http://www.ilmanlaatu.fi) and the EEA's ozone site (http://www.eea.europa.eu/maps/ozone/welcome) all allow the user to view the monitoring sites on a map of the country / region. The users can then zoom in and see the locations in

more detail. The DA sites also provide a description of the monitoring sites and provide photos. It would be useful for this functionality to be added to the UK archive site.

12.4 Interactive Graphs and Tables

Some of the sites provide a graphing facility, whereby users can view measurement data obtained over various time periods including the last 24 hours. This could be a useful facility on the UK website and meets the requirement of the Directive in terms of Member States ensuring that up to date information on ambient concentrations is made available to the public.

The Finland site provides a list of all the monitoring sites in the Country and when they last showed an exceedence of the daily / hourly average objective. This information is useful as it allows you to put the site of interest in perspective and provides an overview of how the Country is doing in terms of meeting air quality objectives. Providing this information also allows the requirement in Directive 2008/50/EC of providing information on actual exceedences of thresholds to be satisfied. The Cyprus site also provides comparisons in that air pollutant concentrations are presented for sites across Europe too, which also helps put the data into perspective.

The German website (http://www.env-it.de/umweltbundesamt/luftdaten/index.html) provides a map of the latest hourly measurements extrapolated for the surrounding region.

The EEA have developed an impressive interface to accessing data. These are called “data viewers” and can be used to graph or tabulate a wide range of different datasets. Whilst this provides a very effective way of accessing data, a substantial amount of investment has been required to develop the system. See:
http://www.eea.europa.eu/data-and-maps/data#c5=all&c0=5&b_start=0&c11=air

12.5 Information on Behavioural Change

A number of sites provide information on what individuals can do to reduce air pollution. This is a requirement of Directive 2008/50/EC as it states that information on preventative action to reduce air pollution and / or exposure to it should be included. This information is not clearly visible on the UK air quality archive.

12.6 Use of Wiki’s

The use of collaboration tools (such as wiki’s) could be of great value in engaging the Air Quality community. This service could be especially valuable if the Air Quality website is to become a Service Oriented Architecture where many third parties will be making datasets available for incorporation. Wiki pages could be developed as part of the Air Quality Website to support a wide range of activities around the Air Quality website including:

- Measurement methods and methodologies support.

- Technical support on becoming a data provider.
- Support on accessing data from the site (e.g. Air Quality APIs etc)
- Support in using the data analysis tools and using e.g. OpenAir
- Pages with more detail on the causes, impacts and policies and measures to address poor air quality.