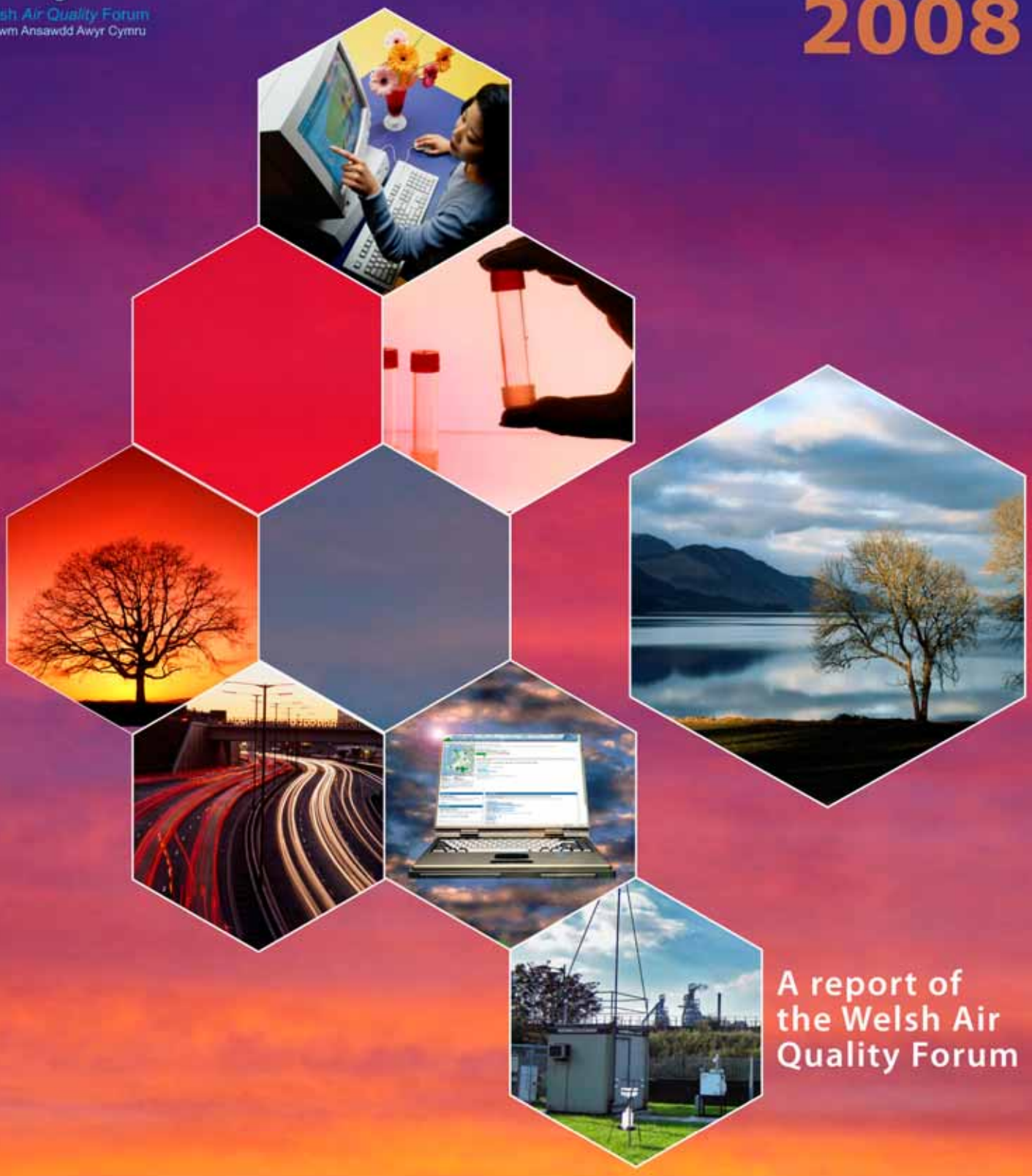
Air Pollution in Wales 2008

Welsh Air Quality Forum
Fforwm Ansawdd Awyr Cymru



A report of the Welsh Air Quality Forum

AEA

1 Introduction

This is the sixth annual report on air quality in Wales to be produced by AEA. It provides user-friendly information on air pollution levels and impacts throughout Wales during 2008. For the interested or more technical reader, a comprehensive range of detailed air quality analyses, statistics, data summaries and graphs is included on the enclosed CD.

In a new addition to the report, Section 2 examines the activities of the Welsh Air Quality Forum during the year. In Section 3 of this report, we review the status and continuing developments in air quality legislation affecting Wales, in particular focusing on the new policy and technical guidance. Section 4 then summarises the major national air quality monitoring programmes and highlights the notable pollution events for Wales in 2008. In Sections 5 and 6, we review long-term trends in air quality and the spatial patterns of pollution observed across the country.

Section 7 has, for the past two years, reported on topics of special interest. This year, it addresses a range of issues connected to a particle analyser that has been recently introduced to monitoring sites in Wales - the Filter Dynamic Measurement System (FDMS). This section shares best practice in relation to the use of this instrument, demonstrates novel approaches and solutions, and highlights specific research and broader monitoring issues. Finally, for readers wanting to find out more, additional web-based and published sources of information on Welsh air quality issues are summarised in Section 8.

This report has been produced under the auspices of the **Welsh Air Quality Forum** for the Welsh Assembly Government (WAG) and the people of Wales. Established in 1994, the Forum represents the 22 Unitary Councils of Wales and its primary aims are to:

- Facilitate the collection, interpretation, dissemination and co-ordination of air quality monitoring information in Wales to a range of stakeholders, including the public
- Provide advice and assistance in the response of local authorities to the UK National Air Quality Strategy in assessing and managing air quality in Wales
- Improve reliability, accuracy and intercomparison of Local Authority data by evaluation, improvement and development of quality control procedures
- Establish closer links with European research developments, other agencies, transport planners and industry, and for promoting indicators of the state of the environment, sustainability and public health for air quality
- Promote air quality at local level and regularly report to the Society of Directors of Public Protection Wales.

The Forum offers a one-stop source of information and guidance on all aspects of air quality and its management within the country.

All measurements summarised and analysed in this report are derived from The **Air Quality Monitoring Database for Wales**, which was first established in July 1995. Technical responsibility for operation and development of the database was assumed by AEA in 2003. The last few years have seen rapid developments to the database, related services and reporting systems. The database is linked to a public website, www.welshairquality.co.uk through which air quality monitoring data and other information are disseminated to the public. More information on the recent developments to the website can be found in Section 2 of this report.

Air quality in Wales has been slowly but steadily improving over the last twenty years, due primarily to legislation governing emissions from industry and road transport. Despite these improvements, however, there remain a number of important challenges facing us.

This series of Air Quality Reports for Wales is part of our effort to inform and empower the public through access to reliable, accurate and comprehensive information on:

1) The quality of the ambient air we all breathe, and
2) How air pollution can affect our environment and quality of life.

2 WAQF activities this year

The Welsh Air Quality Forum (WAQF) was established in 1994 and reports to the Directors of Public Protection for Wales. Its membership comprises a wide range of stakeholders, including:

- Local Authorities
- Welsh Assembly Government
- National Public Health Service for Wales
- Environment Agency
- Academic Institutions
- LACORS.

This chapter outlines the recent activities of the Forum.

Web Discussion Tool

AEA is in the process of implementing an advanced web-based system that will allow WAQF members to interact with each other; this will foster member involvement in consultation, discussion and knowledge transfer on all matters pertaining to air quality monitoring and management in Wales. The discussion forum will be open to all existing and accepted future members of the WAQF and will consist of two main functional areas:

- A structured discussions area, which will be proactively managed to aid the production of responses to formal consultations and WAQF Science and Innovation Reports.
- An informal discussion area, which will provide an open 'chat' facility to enable Forum members to freely and interactively discuss air quality topics.

The informal discussion area will be steered by topic managers; these designated air quality specialists, who will establish discussion topics and highlight key issues, as well as guiding and managing the discussion process.

Pembrokeshire County Council gives lessons on air quality

Tavernspite Primary near Narberth is helping Pembrokeshire County Council's Public Protection Division monitor the quality of the County's air. After discussions with the Council, children have now become part of the Council's monitoring network. The pupils set up a diffusion tube sampler near the school's entrance to measure nitrogen dioxide levels. The head teacher, Kevin Phelps, said the school had recently submitted a Travel Plan to the Welsh Assembly Government, with the aim of decreasing the number of cars brought to school each day.

Fig 1 The children of Tavernspite Primary with Councillor Ken Rowlands and Sarah Johns of Pembrokeshire County Council

Annual WAQF Seminar

The 2008 Seminar of the Welsh Air Quality Forum was held on Wednesday September 17th at the Council Chamber, County Hall, Cwmbran. Around 50 Forum Members attended to listen to the presentations and to debate the issues. Presentations were given on the new Local Air Quality Management technical and policy guidance, and several sessions focused on the process for Updating Screening Assessments, Progress Reports and Action Plans. All presentations from the seminar are available on the Welsh Air Quality Archive website at www.welshairquality.co.uk.

Google enhancements to the Welsh Air quality website

As part of the ongoing programme to improve the usability and appearance of the Welsh Air Quality website, it has recently been substantially upgraded to include a user-friendly interactive Google Map™ interface (Figure 15); this allows users to access and analyse data at a glance, zoom into monitoring site locations, and to swap between map and satellite views. Simply by clicking on any site, users can obtain detailed information including graphs, current pollution levels and monitoring site pictures. A similar, interactive Google Earth ™ interface is also provided for users preferring this (Figure 2).

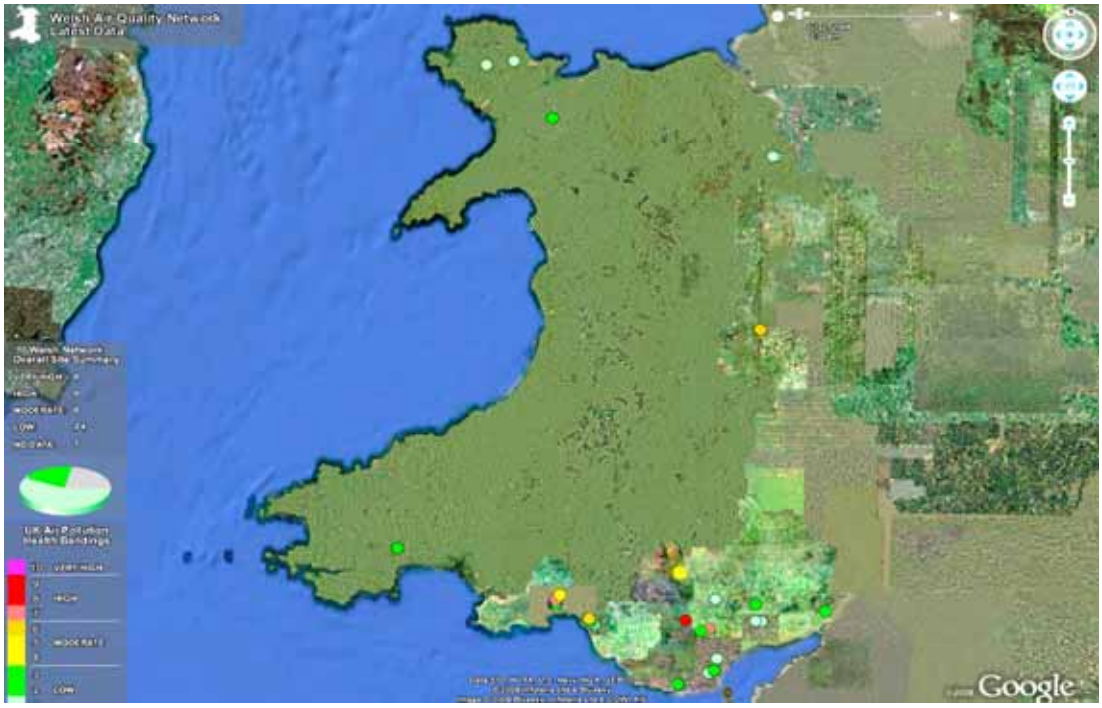


Fig 2 The new, interactive Google Earth ™ interface to the website

New business plan and terms of reference

The WAQF's business plan for 2009-2012 defines its common purpose, outlines key objectives and identifies priorities for the next three years. These include:

- Responding to consultations issued at European, UK, Wales or local levels
- Preparing reports and presentations on topics based on the experience of the Forum members
- Maintaining a secure database of local air quality monitoring data
- Providing and updating a dedicated Welsh Air Quality web site - containing the database of air quality monitoring data - which is accessible to forum members and other stakeholders
- Organising an air quality training seminar each year for Forum members
- Providing other air quality information of use to Local Authorities and others
- Producing an annual report of local air quality monitoring in Wales, to be made available on the Welsh Air Quality website.

Environment Agency Air Quality in Emergencies

The Welsh Air Quality Database will be used to provide data to the Environment Agency as part of its new **Air Quality in Major Incident** response capability, which is planned to commence at the end of 2009. The database was identified as the most easily and quickly accessible comprehensive data source in the event of an air quality incident in Wales. Data for many of the sites are updated on an hourly basis and are accessible to the authorities and the public 24 hours a day. The data will feed into the decision-making process during any incident, as well as forming part of any post-incident analysis.

3 Legislation and Policy

Air quality in Wales is managed on three different levels. 1) At the top of this hierarchy is the Welsh Assembly Government (WAG), which oversees all aspects of legislation and policy originating from European, UK and Welsh strategies and statutory measures. 2) Environment Agency Wales is an independent, public authority that works closely with the WAG at a national level, to ensure that environmental regulation is properly carried out and enforced. 3) On a local level, Local Authorities are responsible for ensuring that national and European objectives and limit values are met in each of the 22 local areas.

Cleaner Air For Europe

Air quality in Europe is governed by directives that set limit and target values for both the emissions of pollutants from industrial sources and for the concentrations of pollutants in ambient air. A major new directive came into force in June 2008: the Directive on Ambient Air Quality and Cleaner Air for Europe (2008/50/EC) – available from http://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=OJ:L:2008:152:0001:0044:EN:PDF. This consolidates the older Air Quality Framework Directive and the 1st - 3rd Daughter Directives. It recommends methods for the assessment of air quality in member states, including target values for PM_{10}, $PM_{2.5}$, ozone, lead, benzene, carbon monoxide, nitrogen dioxide and sulphur dioxide.

Air Quality Strategy for England, Scotland, Wales and Northern Ireland

The latest Air Quality Strategy, published in July 2007, establishes the overall framework for achieving air quality improvements across the UK. Measures agreed at national and international level are the foundations on which the strategy is based. It also sets out the UK's Air Quality Standards and Objectives, which have been set primarily in order to protect human health. The full Air Quality Strategy and the detailed objectives can be found at: http://www.defra.gov.uk/environment/airquality/strategy/index.htm

i) Local Air Quality Management

The Welsh Assembly Government has issued revised guidance to all local authorities in Wales on managing air quality. Under Part IV of the Environment Act 1995, all Local Authorities have a duty to manage air quality. The guidance is intended to support authorities in their efforts to tackle poor air quality and to fulfill their statutory duties under the Act. The guidance should be taken into account by all local authority departments involved in Local Air Quality Management (LAQM), including environmental health, corporate services, planning, economic development and transport planning. There is no change to the Progress Report Guidance LAQM. PRG(03).

ii) Local Air Quality Management Policy Guidance for Wales (LAQM. PG(09))

The new Policy Guidance provides advice and recommendations for integrating air quality issues into the planning and transport processes, and focuses on formulating joined-up plans for tackling air quality alongside the issues of health, environment and climate change (http://wales.gov.uk/topics/environmentcountryside/epq/airqualitypollution). The Guidance sets out the statutory background and the legislative framework within which local authorities have to work, and outlines the principles behind the review and assessment process. It also makes suggestions on how Local Authorities can develop their local air quality strategies, through liaison with other stakeholders. The Policy Guidance is accompanied by four Practice Guidance documents, which provide advice on:

- Establishing low emission zones.
- Encouraging the uptake of low emission vehicles.
- Fostering the increased usage of retrofitted abatement equipment on vehicles

Local Air Quality Management Technical Guidance (LAQM. TG(09))

This Technical Guidance has been updated and improved following stakeholder feedback, simplifying both the documentation and the technical processes. It draws together several older documents, and reflects the changes and improvements in our understanding of the science of air quality measurement and modelling. The Guidance covers the review and assessment process, and gives detailed technical advice on monitoring, estimating emissions and the selection and use of dispersion models, on a pollutant-by-pollutant basis. There is a set of new and revised tools to accompany the Guidance.

4 Monitoring networks and data highlights

The primary purpose of air pollution monitoring is to assess the exposure of the population and protect human health and the ecosystems in Wales. There are seven national monitoring networks currently in operation throughout the country:

1. Partisol Research Network
2. Welsh NO_2 Diffusion Tube Network
3. Welsh O_3 Diffusion Tube Network
4. Welsh SO_2 Diffusion Tube Network
5. Welsh Automatic AURN (Automatic Urban and Rural network)
6. Welsh Metals Network
7. Welsh Black Smoke network

These programmes have been established to meet statutory requirements and provide information for submission to the European Commission. Additionally, the networks provide information on air quality for a variety of purposes:

- For medical research and epidemiology/toxicology studies
- For air quality forecasting, broadcast widely in the interests of sensitive individuals
- To support Local Authority Review and Assessment
- To measure improvements made in air quality and assess future issues facing Wales
- To allow informed and sound science-based policy-making for Wales.

In addition to these national networks, many monitoring sites in Wales are operated by Local Authorities in order to meet specific local objectives. These all feature on the Welsh database and website. During 2008, there were 33 active automatic monitoring sites throughout Wales (Figure 3), together with several hundred sampler-based sites. In addition to these stationary sites, Environment Agency Wales provides Local Authorities and the Welsh Assembly Government with a mobile monitoring service.

Highlights

On the morning of 23 January 2008, people in parts of south Wales woke to find their cars and houses covered in yellow dust.

Incidents were reported in spots as far apart as Milford Haven, Burry Port, Port Talbot, Cardiff and parts of England.

The source was identified as a massive Saharan sandstorm that sent large quantities of dust into the atmosphere, where it was trapped in air masses rotating around a high-pressure system centred over Europe. This clockwise flow brought the dust-laden air from western Africa, over the Atlantic and into westerly airstreams hitting the UK. Light rain may well have then helped the dust deposit to ground level (Figures 4,5)

Many sites recorded Moderate and High levels of PM_{10} during the episode, as shown in the graphs of particulate matter in North and South Wales, Figures 6 and 7 shown overleaf.

Figure 3: Automatic monitoring sites in Wales, 2008 *Welsh Assembly Government OS license number - 100017916*

Figure 4: Satellite image of the Saharan dust blowing from Northern Africa towards the UK

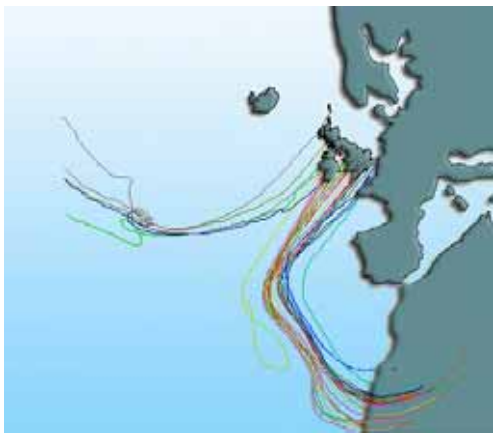
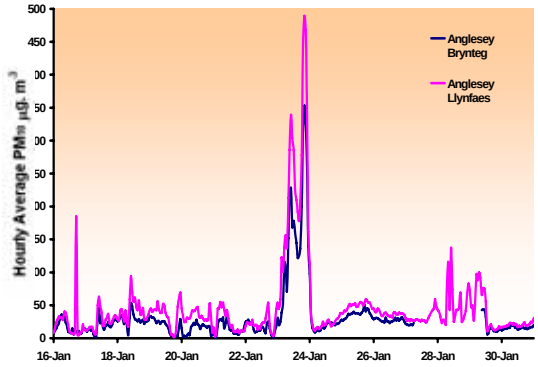


Figure 5: 96-hour airmass back trajectory for Saharan episode



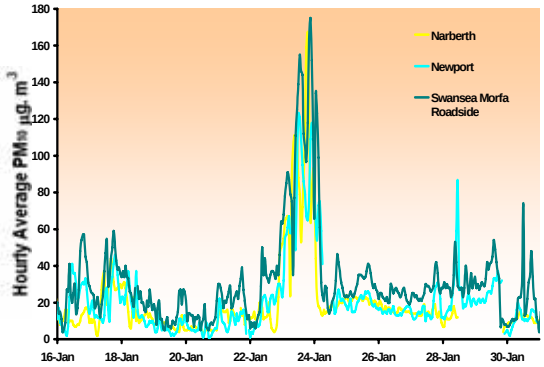


Figure 6 and 7: PM_{10} concentrations recorded at sites in North and South Wales during the episode ($\mu g m^{-3}$)

Such air pollution episodes are not uncommon in Wales. Similar deposits of coarse dust were reported on Sunday 4 May 2008. In this case, following chemical and optical analysis, the samples were determined to be a mixture of sand, road dust and plant matter. The Met Office suggested that the dust may on this occasion have originated from Spain or the Sahara, been transported to the UK and deposited through rainfall.

On 28 September 2008, reports were received of dust deposits in Pembrokeshire. Investigations identified the source of the dust as likely to be from tropical storms in the southern USA. It is possible that dust generated by the storms was blown into the upper atmosphere and was carried across the Atlantic in the jet stream.

Neither of these events was recorded by ground-level air quality monitoring networks. The most common size fractions of particulate matter measured by local and national networks are $PM_{2.5}$ and PM_{10} (respectively, these are dust particles which are less than 2.5 and 10 micrometres in diameter). The coarse dust particles observed during these episodes were much larger than this and were therefore not captured by most particulate analysers. The worst health effects are associated with smaller particles, which can penetrate deeper into the lungs; such coarse particle episodes do not, therefore, present cause for alarm. They are a nuisance rather than harmful to health.

Traffic –related pollution

Many of the pollutants monitored by the Welsh air quality networks are generated by road transport; these are directly emitted from vehicle exhausts or created though chemical processes involving primary pollutants. For this reason, Welsh – and other - air quality networks often specifically locate monitoring equipment at roadside locations.

The formal definition of a roadside site is: *"A site sampling between 1m of the kerbside of a busy road and the back of the pavement*'. Typically this will be within 5m of the road, but could be up to 15m."

The Swansea Roadside monitoring station is housed within a self-contained, air-conditioned housing located 4 metres from the A463. The road records an average weekday daily traffic count of 24,500 vehicles.

Figure 8: Photograph of Swansea Roadside AURN monitoring station reproduced with kind permission from Bureau Veritas UK Ltd in its role as Central Management and Co-ordination Unit of the AURN

Roadside sites are typically representative of the worst-case population exposure and are used by researchers and Local Authorities to- 1) evaluate the impacts of the vehicle emission controls ands 2) determine the impacts of traffic planning and calming schemes that have been implemented by local Air Quality Action Plans.

Slow moving traffic, street canyons and the weather all play a part in exacerbating the air pollution problem around busy roads but, of course, the main cause is the sheer volume of traffic on our roads. Peak traffic flow times can easily be identified in the graphs of PM_{10} and NO_2 at Swansea Roadside (Figures 9 and 10).

Clearly these graphs show elevated concentration of both PM_{10} and NO_2 during normal weekday commuted peak traveling times. In fact, this is the major cause of poor air quality in our cities.

The school run and commuters travelling to and from work all add to the mix of public transport, commercial and delivery vehicles on roads throughout Wales to elevate concentrations of some traffic pollutants above acceptable levels at peak times.

Everybody has the power to tackle this problem and improve air quality by making simple everyday decisions to travel by bus or train, share a car with a friend or colleague, or better still, by walking or cycling to school or work.

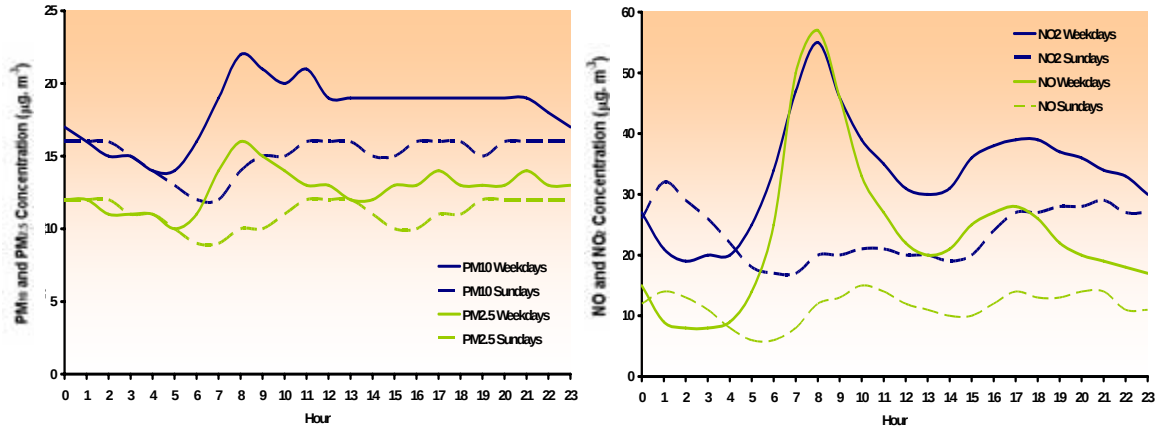


Figure 9 and 10: Diurnal graphs showing the variation of concentration of PM_{10} and NO_2 at Swansea Roadside by hour of the day (μgm^{-3})

5 Air quality trends

The Welsh Assembly Government published the Environment Strategy for Wales in May 2006. It provides the framework within which the rich and diverse environment of Wales will be maintained, protected and managed. The Environmental Hazards theme of the Strategy sets out objectives for managing air quality and reducing pollution, and identifies a key set of indicators by which to measure progress. The Environment Strategy is available to download from http://wales.gov.uk.

Outcome: A reduction in air pollution leads to increased life expectancy and ecological protection

Timeline: By 2020 reduction in life expectancy due to air pollution cut by 2010, for enhancing ecological protection

A yearly bulletin presents the progress made against the indicators. The State of the Environment 2008 report informs that the following indicators are 'improving':

- Number of Air Quality Management Areas within Wales
- Level of emissions from Wales of Sulphur Dioxide
- Level of emissions from Wales of Ammonia
- Level of emissions from Wales of Nitrogen Oxides
- Level of emissions from Wales of Fine Particulates
- Level of emissions from Wales of Non Methane Volatile Organic Compounds
- Level of emissions from Wales of Carbon Monoxide
- Area of natural and semi-natural habitat where deposition of (a) acid and (b) nitrogen compounds exceeds critical loads

There is 'no clear trend' , however, in the air concentrations of heavy metals, nor in the number of days air when pollution is moderate or higher (Figures 11, 12).

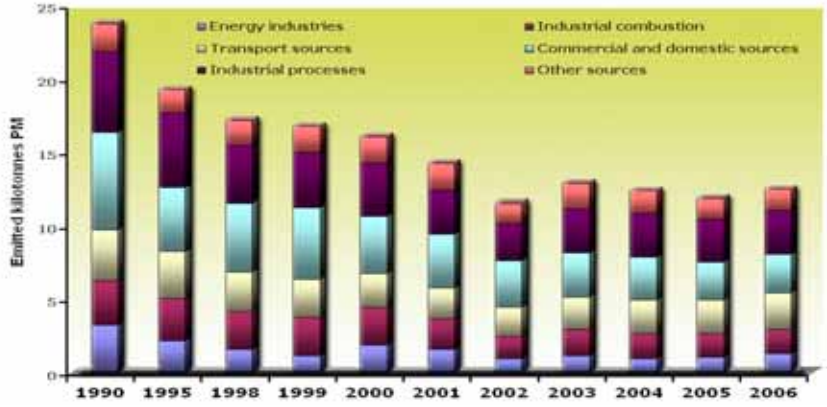


Figure 11

Trend in the emissions of fine particulates from Wales, split by emission sources, from 1990 to 2006

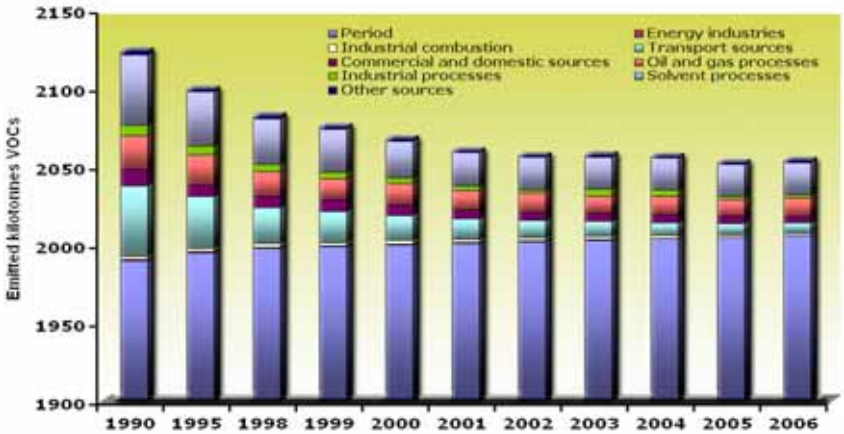


Figure 12

Trend in the emissions of Non Methane Volatile Organic Compounds from Wales, split by emission sources, from 1990 to 2006

The information for these indicators was collected in 2008 through the National Atmospheric Emissions Inventory programme. The full bulletin and progress against indicators can be viewed at www.statswales.wales.gov.uk/index.htm.

6 Maps of Air Quality

Levels of air pollutants vary markedly across Wales, as well as over time. Measurements clearly show that these patterns differ for each pollutant, depending on how they are formed and where their major sources are located.

Data from the air quality monitoring networks in Wales have been combined with pollutant emissions data from the UK's National Atmospheric Emissions Inventory (NAEI) to produce detailed maps (at 1km resolution) of average or peak pollutant concentrations across the country (Figure 13). These maps – calibrated and validated against UK and Welsh monitoring data- provide a powerful tool for identifying pollutant 'hot-spots' and managing air quality problems in the most direct and cost-efficient manner.

Concentrations of ***primary pollutants***, those emitted directly into the atmosphere, tend to be highest around their sources; these are usually located in urban and industrial areas. Motor vehicles are a major source of primary pollution throughout the UK. In particular, traffic is an important source of carbon monoxide, nitrogen dioxide and volatile hydrocarbons (VOCs) such as benzene and 1,3-butadiene and primary particles (PM_{10} and $PM_{2.5}$). Concentrations of all these pollutants are therefore usually highest in built-up urban areas.

This pattern is readily apparent from Figure 13; it shows levels of traffic and industrial pollutants such as nitrogen dioxide and PM_{10} particles higher in the built-up parts of the country.

In general, patterns of ***secondary pollutants*** such as ground-level ozone, secondary $PM_{10,}$ and $PM_{2.5}$, which are formed by chemical reaction in the atmosphere, are markedly different from those of primary pollutants; they are characteristically less dependent on emission patterns, and tend to be more strongly influenced by meteorology and atmospheric chemistry. As a result, they also change more from year to year than those of primary pollutants.

The patterns of ozone concentration in Figure 13 are therefore highly complex, showing some topographic-dependence. In general, it can also be seen that ozone concentrations tend to be lower in the parts of Wales where NO_2 ,PM_{10} and $PM_{2.5}$ are higher.

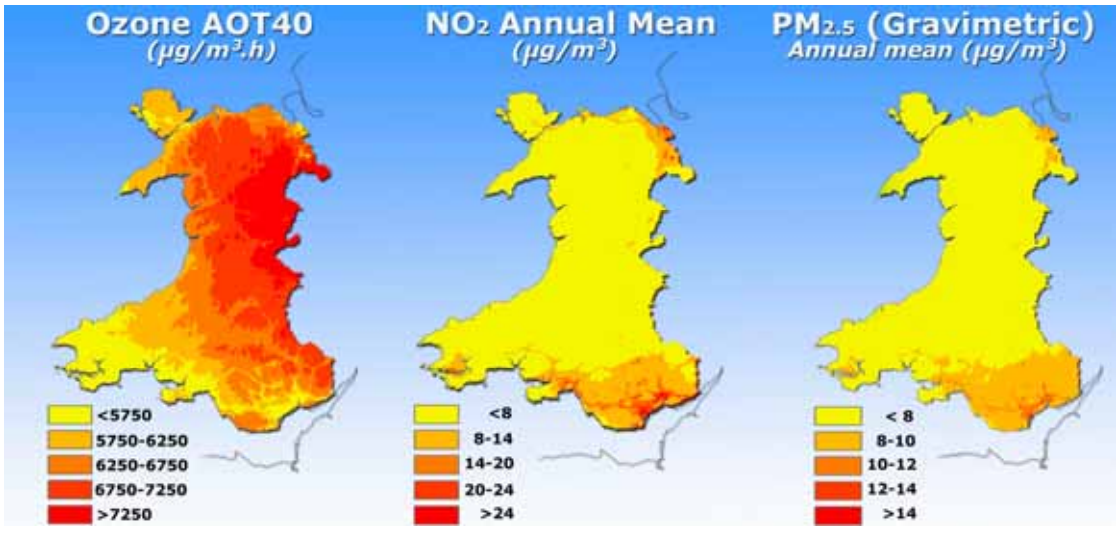


Figure 13 Maps of the distribution of Ozone, Nitrogen Dioxide and $PM_{2.5}$ particles in Wales during 2008

The Ozone AOT40 statistic is the sum of the differences between hourly concentrations greater than 80 $\mu g.m^{-3}$ (≈40ppb) and 80 $\mu g.m^{-3}$, over a given period using only the 1-hour averages measured between 08:00 and 20:00.

7 Focus on: FDMS

This year we introduce a new chapter to the report, with the aim of highlighting topics and issues, sharing best practice and demonstrating novel approaches implemented in Wales. In this 2008 annual report, we discuss the Filter Dynamic Measurement System (FDMS). We introduce experiences and issues with the implementation of FDMS analysers into the Welsh Networks over the past two years.

Introduction to FDMS

Until 2006, the most widely used particulate analyser in the Welsh and UK national networks was the Tapered Element Oscillating Microbalance (TEOM). In 2006, the Department for Environment Food and Rural Affairs (Defra) commissioned a trial to determine which analysers on the market were equivalent to the EU reference method, a gravimetric measurement following collection of particulates by low volume sampler. The resulting report, 'UK Equivalence Programme for Monitoring of Particulate Matter' is available to download from www.airquality.co.uk/reports. It was found that the existing TEOMs were not equivalent, even when used with correction factors. The FDMS units, however, were found to be equivalent to the reference method and could easily be field deployed nationwide by retrofitting the existing TEOMs.

When fitted to TEOMs, the FDMS unit (Figure 14) allows measurement of both non-volatile and volatile components of particulate matter (PM). In order to measure both volatile and non-volatile components of PM, the FDMS uses a switching valve to switch between a 'base' measurement and 'reference' measurement every six minutes.

During the 'base' measurement, the FDMS samples as a normal TEOM and weighs the PM. During the 'reference' measurement, the FDMS diverts the flow through a purge filter in order to remove all PM from the airstream and the filter is weighed again. During the 'reference' measurement, any volatiles collected on the sensor unit filter evaporate, giving a negative mass concentration. This concentration is subtracted from the 'base' measurement concentration to give the total PM present. The FDMS system thereby accounts for volatile PM that may not be detected by earlier TEOM models.

Fig 14 FDMS in Swansea

In 2008, a major new air quality directive came into force in Europe, the Directive on Ambient Air Quality and Cleaner Air For Europe (2008/50/EC). As well as consolidating a number of older air quality directives, it set new objectives for monitoring $PM_{2.5}$. This initiated the UK-wide upgrade of TEOMs to FDMSs and highlighted a need for additional monitoring for PM_{10} and $PM_{2.5}$.

FDMS installations in Wales

Site Name	PM_{10}	$PM_{2.5}$
Cardiff Centre	x	x
Narberth	x	
Newport	x	x
Port Talbot docks	x	
Port Talbot Dyffryn School	x	
Port Talbot Margam	x	x
Port Talbot Tyll-yn-y-wal Park	x	
Swansea Morfa Roadside	x	
Swansea Morriston Roadside	x	
Swansea Roadside	x	x
Vale of Glamorgan Fonmon	x	

FDMS data ratification

Data ratification procedures involve a critical review of all available information relating to a particular data set, in order to verify, amend or reject the data. A wide range of inputs needs to be considered in the ratification process, including:

- Instrument history and characteristics
- Calibration factors and drift
- Negative or out of-range data
- Rapid excursions or "spikes"
- Characteristics of the monitoring site
- Effects of meteorology
- Time of day and year
- The relationship between different pollutants
- Results from other sites in the network
- QA Audit and Service reports.

The TEOM FDMS instruments introduce two new pollutants to ratify: volatile and non-volatile particulate matter. A PM concentration can only be reported if both valid volatile and non-volatile measurements are made. Similarly, if the total PM measurement is judged unreliable, then both the volatile and non-volatile are invalidated. The ratification analysis undertaken is based on the principle that volatile fractions of particulate matter are relatively constant over a reasonable distance. Data from Swansea Roadside and Port Talbot Margam FDMSs, for example, are compared with those from analysers installed across the whole of South Wales.

There are occasional circumstances where data flagged as 'ratified' could be subject to further revision. This may happen, for example, where subsequent investigation indicates that new or tighter QA/QC criteria are required. Because these instruments have only been used on a large scale fairly recently, we can expect that research into FDMS analysers will be ongoing for at least the next couple of years.

Dryers

A fundamental feature of FDMS is the removal of moisture in the sample, which might otherwise give artificially high readings. To implement this, FDMS analysers are fitted with dryer units that remove moisture by diffusion through a semi-permeable membrane. The original dryers fitted to FDMS units were known as 'Type B'. The equivalence trials were conducted with type 'B' dryers, which successfully demonstrated equivalence with the reference method.

Shortly after this, however, the 'B' dryers became unavailable, and the manufacturer switched to an alternative design, known as type 'C'. Several months after their first installations, problems started to be identified. From that point, new FDMSs and TEOM upgrades were installed with type 'C' dryers. In response, the network Equipment Support Unit sourced a supplier of dryers almost identical to the original 'B' types - these are known as type 'C/B'. The equipment support engineers began a programme of upgrades to national network sites, which is ongoing. A comprehensive programme of equivalence testing is currently being undertaken.

Currently, it is recommended that, when dryers routinely need replacement, C/B types should be installed; however, this advice may change as the results of national equivalence testing become available. Operators of FDMS units are also reminded that the dryers ought to be replaced at least every 18 months. As seen by operators in Neath Port Talbot (see below), the efficiency of the dryer is critically reliant on the atmosphere inside its enclosure, so the installation and regular maintenance of an air conditioning unit will improve data quality and prolong the life of the dryer.

Case Study: Port Talbot Margam

Installation date: FDMS $PM_{2.5}$ - April 2008; FDMS PM_{10} - July 2007

Neath Port Talbot County Borough Council has installed its FDMS units in air conditioned, lockable cabinets, and further increased their security by fitting padlocks to allow them to be used at the sites, which are otherwise freely accessible to the public.

Widespread issues with the default dryer units fitted as standard with the FDMSs were experienced at Port Talbot Margam and other local sites. These issues were identified by the Local Site Operator, in conjunction with the contractors responsible for the supply, maintenance, management and quality control of the FDMS units; the dryers have subsequently been upgraded to the 'C/B' model in January 2009.

Top tip from Port Talbot. *"To establish if your dryer performance is degrading, see if the difference between the sample and ambient dew points is at least 10°C. This will signify either that the dryer or the pump are not performing adequately."*

A simple guide to understanding TEOM and FDMS data can be downloaded from http://www.airmonitors.co.uk/fdms_pm_monitor, courtesy of Air Monitors. Any problems or questions regarding your FDMS analyser can always be referred to your equipment support engineer or network management unit for advice and support as required.

Case Study: Swansea Roadside

Installation date: FDMS $PM_{2.5}$ - September 2006; FDMS PM_{10} - September 2006

The two FDMS analysers at Swansea Roadside were installed with type "B" dryers in 2006, and these started to exhibit errors shortly after installation. Problems here are ongoing, even following the upgrade of the $PM_{2.5}$ unit to the "C/B" dryer in July 2009. Dryer status errors are common and sample dew points are well above the –2°C recommended. The Morfa and Morriston FDMS PM_{10} stations have the later type "C" dryer, but these are still not 100% reliable. All Swansea FDMSs will undergo an annual replacement of the dryer units, in accordance with advice from the AURN Quality Assurance and Quality Control Unit.

Top tip from the Welsh Air Quality Forum *"It is useful for operators to compare the PM concentrations, volatile and non-volatile fractions between units which are co-located or at nearby sites. This also presents a useful opportunity for working with other Local Authorities to compare results and performance parameters from different analysers; the new WAQF web discussion area provides an ideal forum for doing this."*

One of the more common problems experienced with the FDMSs at these sites, and more widely across the Automatic Urban and Rural Network, is related to the sample dew point. Specifically, if the sample dew point is greater than 2°C, or delta dew point (the difference between ambient dew point and that of the dried sample) is less than 4°C, the data is invalidated. Where the sample dew point is not sufficiently below that of ambient, it is likely that the dryer is inefficient and therefore moisture is affecting the readings.

Despite initial problems with the FDMSs installed at both of these sites, the data capture achieved for these analysers during 2008 was remarkably high; this can be attributed to the experience and competence of the local site operators, rapid identification of problems by the Central Management and Control Unit, and the response of the supporting engineers. The teams who operate, manage and support these analysers have invested considerable effort to investigate issues and identify solutions to the problems raised.

Monitoring site	Data Capture during 2008	
PM fraction	**$PM_{2.5}$**	**PM_{10}**
Port Talbot Margam	97.4%	92.5%
Swansea Roadside	95.5%	98.1%

The issues experienced by these sites are not uncommon and there has been a settling-in period for all FDMS units installed across the UK. These problems are gradually being ironed out, and as the experience of all those involved in the maintenance and operation of the units increases; the data quality and data capture of FDMS-equipped continues to improve.

8 More information

The Air Quality in Wales Website

The Welsh air quality website at www.welshairquality.co.uk remains your best 'one stop shop' - in both English and Welsh language versions - for information covering all aspects of air pollution in Wales (Figure 15). This site is part of a family of web-based air quality websites produced by AEA for the UK, Northern Ireland and Scotland.

Figure 15 The new active home page, powered by Google Maps ™, of the Welsh Air Quality Website

The website has been designed to be a user-friendly and interactive resource containing comprehensive information on all aspects of air pollution, presented in a user-friendly way:

- A colour-coded Google map, showing - at a glance - the overall current pollution situation in Wales
- Latest data from all automatic monitoring sites in Wales, accessible from this map
- Air pollution forecasts for South and North Wales
- Information on latest news, developments and publications
- 7 and 30-day graphs of pollution levels
- Detailed information on, and photos, of automatic monitoring sites
- A wide range of background information on air pollution sources, impacts, monitoring techniques, standards and policy issues
- Access to historic air quality data and statistics – for both automatic and sampler sites- going back to 1986
- Provision to submit data via innovative web forms to the Archive
- Headline air quality indicators, trends and modeled future scenarios
- Links to national and global information resources on air quality
- A password-protected area for members of the Welsh Air Quality Forum

The attached CD

Due to space limitations, this annual report provides only an overview of the vast amount of air quality data collected and analysed for Wales in 2008. For those readers who wish to access a more detailed range of analyses, statistical tables and maps of air quality, please see the CD enclosed over the page. The CD contains summary statistics for all pollutants at all sites, hourly data presented both numerically and graphically, long term trend plots, and much more.

Current and forecast air quality (national and local)

In addition to the Air Quality in Wales website, this information is rapidly available in a user-friendly form from:

- Teletext page 156
- The Air Pollution Information Service on freephone 0800 556677
- The UK Air Quality Archive on www.airquality.co.uk

General information on Air Quality

- The Welsh Assembly Government Environment and countryside links at http://wales.gov.uk/topics/environmentcountryside
- The UK Air Quality Information Archive on www.airquality.co.uk
- The National Atmospheric Emissions Inventory at www.naei.co.uk
- The Defra air quality information web resource at www.defra.gov.uk/environment/airquality
- The Scottish Executive Air Quality pollution pages at www.scotland.gov.uk/Topics/Environment/waste-and-pollution
- The Northern Ireland Air Quality website at www.airqualityni.co.uk
- The Scottish Air quality website at www.scottishairquality.co.uk
- The Pollutant Release and Transfer Register at http://prtr.defra.gov.uk/

Health Effects of Air Pollution

Information on how the UK's air pollution banding system works is given in the Welsh Assembly Government leaflet *'Air Pollution - What it means for your health'* at: http://new.wales.gov.uk/docrepos/40382/epc/epg/1136006/1136009/air_pollution_document_e.pdf?lang=en

Local Air Quality Issues

For further information on air quality issues in your area, please contact the Environmental Health Department at your local District Council office. Further information on Local Air Quality Management may also be found at:

www.defra.gov.uk/environment/airquality/local/index.htm - The Defra website
www.airquality.co.uk/archive/laqm/laqm.php - The UK Archive LAQM home page
http://www.laqmsupport.org.uk - The Local Authority support site

This report and CD have been produced by AEA on behalf of the Welsh Assembly Government and Welsh Air Quality Forum. Its principal authors and editors this year are Rachel Yardley and Jon Bower.

What's on this CD?

This CD contains an extensive range of statistical, tabular and graphical analyses of air quality measurements in Wales during 2008. Included are a range of data summaries, pollution maps, times series and other detailed analyses. These are intended primarily for technical end-users, and are packaged accordingly.

The CD will autoplay on loading. Please follow the simple instructions and links provided to access its contents.