Llywodraeth Cymru
Welsh Government

Air Pollution in Wales 2016

Welsh *Air Quality* Forum
Fforwm Ansawdd Awyr Cymru

RICARDO
Ricardo Energy & Environment

This report has been produced by Ricardo Energy & Environment on behalf of the Welsh Government and Welsh Air Quality Forum

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Introduction

This is the 14th annual report on air quality in Wales to be produced by Ricardo Energy & Environment under the auspices of the Welsh Air Quality Forum (WAQF) for the Welsh Government. It aims to provide Welsh citizens and the air quality community with a user-friendly summary of information on local air quality monitoring, and pollution levels and their impacts throughout Wales during 2016. It also details the WAQF's activities alongside major policy, technical and scientific developments.

More detailed information, analysis and data covering air quality in Wales can be found on the WAQF's website (www.welshairquality.co.uk). All data used in this report are freely available through the website, which has been improved and developed over recent years. The website is used by 22 local authorities to submit monitoring data and by thousands more individuals to download data and learn about monitoring sites and measurements that take place. It contains comprehensive data, graphs and information on health effects from a continually increasing number of monitoring stations, together with local forecasts of air quality over the next 5 days. This provides people in Wales with access to reliable and accurate information on the quality of the air they breathe. openair data analysis tools provide a free and open-source tool to analyse, interpret and understand air pollution data. The user-friendly, interactive Google Map™ interface allows users to access and analyse data at a glance.

Chapter 2 presents the WAQF's activities in 2016. Chapter 3 summarises important policy developments that took place in 2016. Chapter 4 presents key air quality statistics from all monitoring networks in Wales and summarises the data from them. The networks include air quality monitoring stations run by Welsh local authorities; and the national monitoring networks run by the Department for Environment, Food and Rural Affairs (Defra) and the Welsh Government. Chapters 5 and 6 discuss long-term trends and the spatial distribution of air pollutants across the country. Chapter 7 reports on topics of special interest – this year it looks at 'Does vegetation reduce air pollution?' Chapter 8 discusses air pollution and health inequalities. Finally, for readers wanting to find out more, additional web-based and published sources of information are summarised in Chapter 9.

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The WAQF and its Activities in 2016

The Welsh Air Quality Forum (WAQF) represents the 22 unitary authorities in Wales and is made up of representatives from local authorities, the Welsh Government, Public Health Wales, Natural Resources Wales and several academic institutions. WAQF members direct the operation of the Welsh Air Quality Website and Database; the collection, quality assurance, quality control and dissemination of all data; and the provision of support and training to local authorities. The WAQF provides expertise and guidance to ensure that Local Air Quality Management (LAQM) statutory requirements are met and air quality in Wales is reported in an accurate, transparent and timely manner.

WAQF Highlights from 2016

- The Air Quality in Wales website continued to improve and provide real-time updates and information to over 2,000 unique visitors per month.
- The Welsh Government grant scheme for its Tidy Towns and Tranquil, Greener Cleaner Spaces project has been absorbed in the Single Revenue Grant Scheme.
- Peter Oates from Torfaen County\Borough Council was elected as the new Chair of the WAQF.
- Invited expert speakers continued to provide relevant additional training for local authority officers. The WAQF provides a useful platform for dialogue to enable a more consistent approach to implementing LAQM requirements across Wales.
- The website discussion forum continues to enable debate and promote best practice.

WAQF Meetings 2016

21 April: Peter Oates was elected as the new Chair of the WAQF. A presentation was delivered by from Jonathan Steel (CEO Delivering Change/Change London), which provided information on the Airsensa monitoring system being installed by various LAs across London. Spring episodes in March and April were discussed, with levels described as 'moderate'. There had been three monitoring station closures in the previous quarter and one new station opened on Anglesey – meaning there were 41 stations in the network.

7 July: The number of sites in the monitoring network remains at 41. The Tranquil, Greener, Cleaner Places grant scheme has been absorbed into the Single Revenue Grant Scheme. Members of the WAQF were informed that the Welsh Government was to launch a consultation on the scope and reporting format for LAQM. Discussions took place on the role of Public Services Boards and the requirement under the Well-being of Future Generations (Wales) Act 2015 to have regard to the Air Quality Indicators in producing their Well-being Assessments.

24 November: The WAQF received a presentation from Jim Chappell on the ECO Stars Fleet Recognition Scheme. It was reported that two monitoring stations had closed during the period, which bring the network total down to 39 sites. The WAQF forum members were given an update on the schools project which will be on the new Air Quality in Wales website, which is anticipated to be launched during 2017.

The Annual Welsh Air Quality Forum Seminar took place on 6 October at the Caerphilly Council Chamber at Penallta House. A total of 55 WAQF members and delegates attended the event, at which the 2015 Annual Report was circulated. The topics presented were:

- State of Natural Resources Report.
- Air Quality and the Well-being of Future Generations (Wales) Act 2015.
- Air Quality Research using telematics data.
- Non-bias review of different types of small air sensors.
- Sources of nickel in Pontardawe.
- Catalytic paints to reduce nitrogen oxides (NOx).
- Traffic impact on ecology.

3

Welsh Government policy update

Public bodies in Wales need to carry out air quality and noise management in accordance with the five ways of working set out in the Well-being of Future Generations (Wales) Act 2015 (the WFG Act). This means:

- Looking to the long term when making decisions so the ability of future generations to meet their own needs is not compromised.
- Taking an integrated approach, such as by joining up actions to reduce air and noise pollution with actions to improve road safety, make transport more sustainable, reduce greenhouse gas emissions, and enhance the built environment with appropriately sited trees and hedgerows.
- Taking every opportunity to talk to the public, including businesses, about the challenges associated with air and noise pollution, listen to their concerns, and seek their views on potential solutions and their involvement in delivering them.
- Collaborative working between environment, public health, transport and planning professionals, and others to find shared sustainable solutions to air quality and noise problems.
- Keeping exposure to air and noise pollution as low as reasonably practicable across the whole of the population. In particular, looking out for areas where the national air quality objectives might be at risk of being breached, a nuisance is created or a critical load for wildlife may be exceeded at some point in the future – and acting pre-emptively to prevent those situations from occurring.

The Welsh Government amended the Local Air Quality Management (LAQM) regime in Wales in 2017 by issuing new statutory policy guidance to bring the system into line with the WFG Act. Key points from the new guidance are:

- The Welsh Government expects local authorities in Wales to follow the five ways of working set out in the WFG Act when carrying out LAQM.
- The long-term goal for air quality should be twofold – to achieve compliance with the national air quality objectives in specific hotspots and to reduce exposure to pollution more widely, so as to achieve the greatest public health benefit.
- The purpose of LAQM is to improve human health and quality of life. This improvement to health and quality of life will be greater if improved soundscapes are achieved alongside reductions in air pollution.
- The Welsh Government is prioritising the delivery of nature-based solutions to improve social, ecological and economic resilience. Such solutions should be given due consideration in the development of any plan or strategy to address air and/or noise pollution at a local or regional level.
- Local authorities' climate change and air quality plans and policies should be closely aligned and integrated where appropriate to maximise any potential synergies and avoid any potential conflicts.
- Alongside integrating air quality with other environmental policies, interdepartmental policy integration is absolutely essential, particularly in relation to land use and transport planning.
- Local authority air quality officers should work with health and public health professionals to integrate LAQM effectively with other local initiatives aiming to reduce health risks and inequalities in affected communities.
- Local authorities or regional groupings of local authorities should produce a draft annual air quality progress report by the end of September each year. It should be written for the general public and follow a template issued by the Welsh Government. The final report should be published before the end of the years.

- Local communities should be involved from the outset in the development of a local air quality action plan. Local authorities should not wait until the plan exists in draft form before seeking input from local communities. Within 18 months of declaring or extending an Air Quality Management Area, a draft action plan informed by local community engagement should be submitted for inspection by the Welsh Government.
- In working towards the well-being of future generations, local authorities should give special consideration to the long-term risks posed to babies and children by exposure to air pollution, whether in their homes, school or nursery, or travelling between the two.
- Any new or updated local air quality action plan from 2017 onwards should state how actions are being taken forward. This should not be solely with a view to achieve technical compliance with the national air quality objectives, but also with a view to maximise their contribution to reducing overall levels of nitrogen dioxide, particulate matter and environmental noise pollution for the population as a whole, so as to achieve the greatest public-health benefit.

4

Monitoring Networks and Data Highlights

The Welsh Government and the Welsh Air Quality Forum (WAQF) work closely with air quality experts and the Department for Environment, Food and Rural Affairs (Defra) to monitor and reduce air pollution in Wales. Figure 4.1 illustrates the long-term trends for nitrogen dioxide (NO_2), particulate matter up to 10 µm in size (PM_{10}) and ozone concentrations in Wales. Apart from ozone, this shows a steady improvement in pollutant concentrations since the 1990s. As ozone is a regional pollutant that is transboundary in nature, it is outside the direct control of the Welsh Government and local authorities.

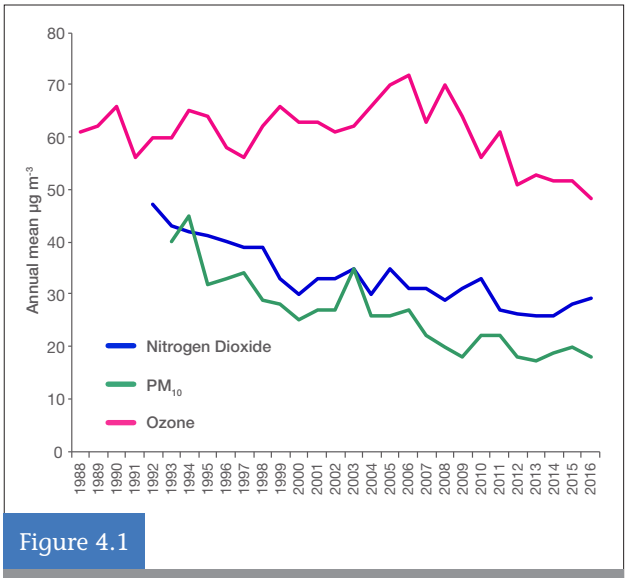


Figure 4.1

Ambient Pollutant Trends in Wales 1990-2016.

Local Authority Monitoring

Air quality monitoring in Wales is undertaken by local authorities and through national networks managed by the Welsh Government. There are two main types of air pollution monitoring – automatic monitoring and passive sampling. Automatic monitoring uses continuous analysis techniques to measure and record ambient concentrations of a range of air pollutants. Passive samplers (such as diffusion tubes) contain a chemical reagent that adsorbs the pollutant from the air. Samplers are exposed for a period of time and analysed in a laboratory. At the start of 2016, there were a total of 43 automatic monitoring sites distributed across Wales that were operated by local authorities, by the end of 2016 this fell to 39 sites. These sites contain equipment that automatically measures carbon monoxide (CO), nitrogen oxides (NOx), sulphur dioxide (SO_2), ozone (O_3), PM_{10} and particulate matter up to 2.5 µm in size ($PM_{2.5}$). In addition to these, there were several hundred diffusion tubes measuring monthly mean NO_2 levels. Overall, data capture for the automatic instruments operated by local authorities during the year was 94%.

In 2016, ambient concentrations of PM_{10} were 'moderate' on 42 days, 'high' on 66 days and 'very high' on 1 days (as defined by the Daily Air Quality Index bandings). For NO_2, there were 70 days with 'moderate' concentrations, 1 day with 'high' levels and no days recorded as 'very high'. For SO_2, there were no 'moderate', 'high' or 'very high' levels recorded. For O_3, there were 39 days with 'moderate' levels and no days recorded as 'high' or 'very high' – as measured by the monitoring sites operated by local authorities. Overall, pollution levels in Wales were low for 224 days, moderate for 134 days, high for 7 days and very high for 1 days. So, for 62% of the time, pollution levels were low across the whole of Wales. Details of the Daily Air Quality Index banding system used to describe pollution levels for the public during 2016 can be found at http://uk-air.defra.gov.uk/air-pollution/daqi

Summary of Exceedances

Exceedance statistics generated from the Air Quality in Wales website show that no monitoring sites in Wales exceeded any Air Quality Strategy (AQS) Objectives (or corresponding EU limit values) for CO, SO_2, benzene (C_6H_6) or lead during 2016.

Five Welsh monitoring sites (Rhondda Mountain Ash, Caerphilly Hafodyrynys, Newport M4 Junction 25, Swansea Hafod DOAS and Swansea Station Court High Street) exceeded the annual mean objective of 40µg m^{-3} for NO_2. Caerphilly Hafodyrynys also exceeded the AQS Objective for hourly mean nitrogen dioxide concentration on more than the permitted 18 occasions in 2016.

Four sites in Wales exceeded the AQS Objective for O_3 (100µg m^{-3} as a maximum daily 8-hour mean) on more than the permitted 10 occasions. These were Aston Hill, Cwmbran, Marchlyn Mawr and Narbeth.

The National Air Quality Monitoring Networks Operating in Wales

There are several national air quality monitoring networks operating across Wales. These report air pollution levels in Wales that can assessed against regulatory requirements and to provide information for air quality researchers, the medical community and members of the public.

Automatic Urban and Rural Network

There are 10 air quality monitoring sites in Wales that are part of the UK Automatic Urban and Rural Network (AURN). The techniques used for monitoring the gaseous pollutants in the AURN are the reference methods of measurement defined in the relevant EU directives. For particulate matter, the AURN uses methods that have demonstrated equivalence to the reference method, but which (unlike the reference method) allow continuous monitoring and provision of this information in 'real time'.

Urban and Industrial Metals Network

There are six UK Urban and Industrial Metals Network monitoring sites located in Wales.

PAH Monitoring Network

Wales has four polycyclic aromatic hydrocarbon (PAH) network sites. These monitor compliance with Directive 2004/107/EC (the 4th daughter directive), which includes a target value of 1ng m^{-3} for the annual mean concentration of benzo[a]pyrene ($C_{20}H_{12}$) as a representative PAH, not to be exceeded after 31 December 2012. This network uses the PM_{10} 'Digitel™' sampler. Ambient air is sampled through glass fibre filters and polyurethane foam pads, which capture the PAH compounds for later analysis in a laboratory.

Black Carbon Network

Black carbon is fine, dark carbonaceous particulate matter produced from the incomplete combustion of materials containing carbon (for example coal, oil and biomass (such as wood)). It is of concern due to possible health impacts and as a suspected contributor to climate change. There is one monitoring site in Wales that measures this parameter. The site, in Cardiff, is part of the Black Carbon Network. This uses an automatic instrument called an aethalometer that measures black carbon directly using a real-time optical transmission technique.

Heavy Metals Network

There is one monitoring site in Wales for heavy metals and this belongs to the UK Heavy Metals Network. Airborne particulate matter is sampled and analysed for metals concentrations in PM_{10}. The metal concentration data are then combined with the local meteorological data (such as rainfall) to calculate values for wet deposition (from precipitation), dry deposition (such as dust settling) and cloud deposition (condensation of cloud droplets).

UK Eutrophying and Acidifying Pollutants Network

The UK Eutrophying and Acidifying Atmospheric Pollutants (UKEAP) network provides information on the deposition of eutrophying and acidifying compounds in the UK and assesses their potential impacts on ecosystems. Other measurements – including SO_2, NO_2 and particulate sulphate – have also been made within the programme, to provide a more complete understanding of precipitation chemistry in the UK.

5

Air Quality Trends

The number of automatic monitoring sites in Wales has increased greatly in recent years. While this helps to improve our understanding of air quality across the country, it potentially complicates the investigation of how air quality has changed over time. If such investigations are based on all available data, discontinuities and false trends may be introduced because of changes in the composition of the network. Therefore, in this report, investigation of changes has been based on subsets of long-running sites rather than on every site in the network. This should lead to a more robust assessment.

Nitrogen Dioxide

In Wales (and the rest of the UK), the most widely exceeded limit value is the annual mean nitrogen dioxide (NO_2) concentration (40µg m^{-3}). Figure 5.1 shows how annual mean NO_2 concentrations have varied with time.

Urban background sites are represented by the longest running site of this type (Cardiff Centre (since 1992)), and a subset of four long-running sites that have all been in operation since 2003, with annual data capture of at least 50% – Cardiff Centre, Cwmbran, Newport St Julians and Port Talbot (replaced by the nearby Port Talbot Margam site in 2007 – the two Port Talbot sites are treated as one for the purpose of the graph). Cardiff Centre shows a clear decrease from 1992 to around 2000, after which the downward trend appears to level off. The mean for the long-running sites shows a slight decrease through the 2000s, although 2010 was a higher year.

Urban traffic sites (those within 10m of a major road) are represented by the longest-running roadside site (Swansea Morriston (since from 2001)), and a subset of two long-running sites that have been in operation since 2002 – Swansea Morriston and Wrexham. Neither Swansea Morriston nor the mean of the two long-running sites shows any clear pattern of increase or decrease in NO_2 concentration in recent years.

Particulate Matter

Figure 5.2 shows how annual mean concentrations of particulate matter up to 10µm in size (PM_{10}) have generally decreased in recent years at urban background and urban traffic sites.

Urban non-roadside sites are represented by the mean of three long-running sites from 2001 (Cardiff Centre, Cwmbran and Port Talbot/Port Talbot Margam – again, the latter two are treated as one site for this purpose). Please note that Port Talbot/Port Talbot Margam is classified as urban industrial rather than urban background as it is located in the vicinity of a large steelworks. It has been included because there are few long-running urban non-roadside sites.

Cardiff Centre (which has operated for longer than any other site) is also shown individually. All sites have at least 70% annual data capture except for Cardiff Centre in 2010.

Urban traffic sites are represented by the mean of two long-running sites from 2002 –Rhondda-Cynon-Taf Nantgarw and Wrexham. Wrexham (the longest-running traffic site) is also shown individually.

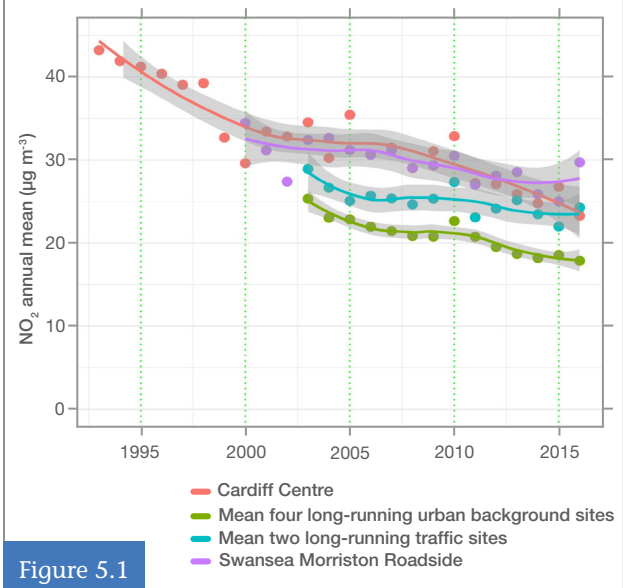


Figure 5.1

Annual Mean Nitrogen Dioxide Concentration at Long-running Sites in Wales.

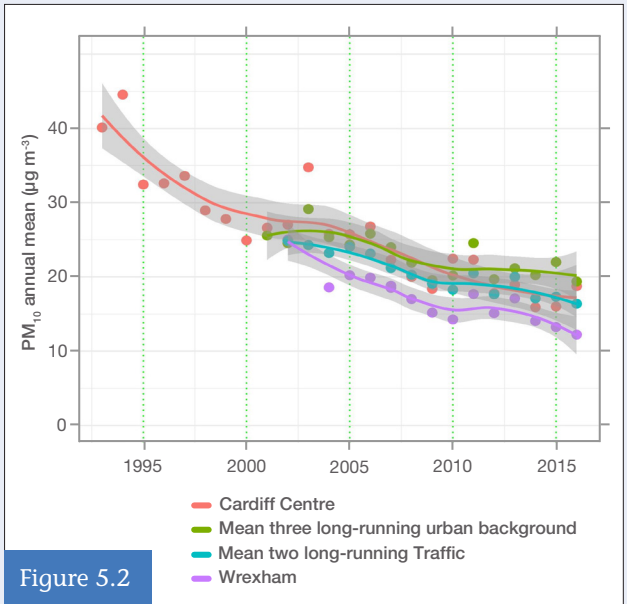


Figure 5.2

Annual Mean PM_{10} Concentrations at Long-running Sites in Wales.

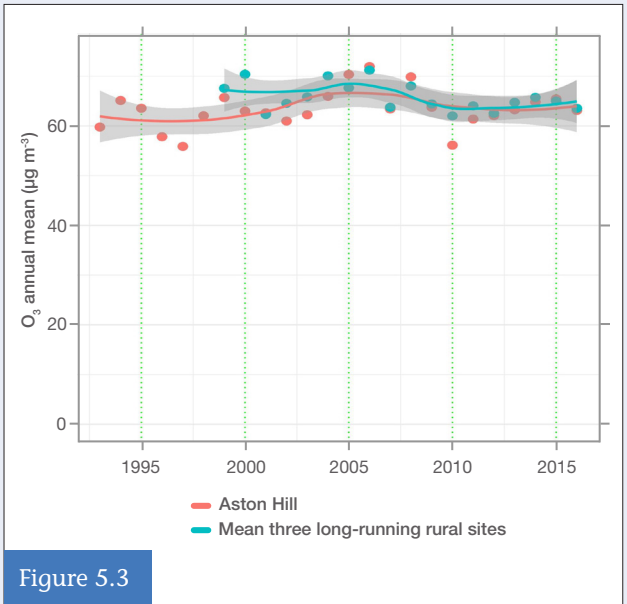


Figure 5.3

Annual Mean Ozone Concentrations at Long-running Sites in Wales.

Ozone

Ozone (O_3) concentrations tend to be highest at rural locations. Figure 5.3 shows how annual mean rural O_3 concentration has changed over time. This is based on the mean concentration measured by three long-running sites in Wales (shown by the grey line) – Aston Hill, Marchlyn Mawr and Narbeth. All have been in operation since 2003 with data capture of at least 70%. Also shown is Aston Hill alone – this site has been monitoring ozone since the late 1980s. Although there are no clear trends, concentrations vary considerably from year to year because of the variation in meteorological factors.

6

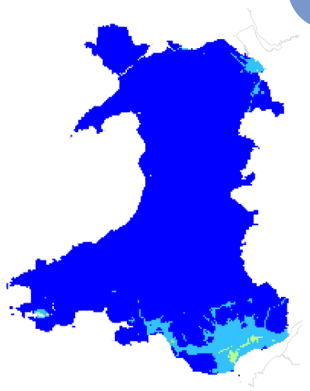
Maps of Air Quality

The maps in Figure 6.1 present 2016 background concentrations for nitrogen dioxide (NO_2), ozone (O_3), and particulate matter up to 10µm in size (PM_{10}) and smaller than 2.5µm ($PM_{2.5}$). These modelled maps of ambient concentrations were calculated from National Atmospheric Emissions Inventory (NAEI) data using a dispersion modelling approach. The model output was calibrated using monitored data from the national monitoring networks. These modelled maps were then verified against the local authority monitoring data. A more detailed report comparing the Welsh air quality monitoring data to modelled concentrations will be published in due course. In these maps, the modelled ambient concentrations are compared with EU limit values.

NO_2

Annual mean (µg m^{-3})

- <10
- 10-20
- 20-30
- 30-40
- >40

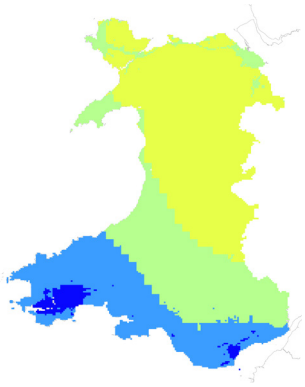


The limit value for annual mean concentration of NO_2 is 40µg m^{-3}. This background map shows elevated NO_2 levels are associated with urban areas and principal road links.

Ozone

(number of days)

- <1
- 1-2
- 2-5
- 5-15
- 15-25
- > 25

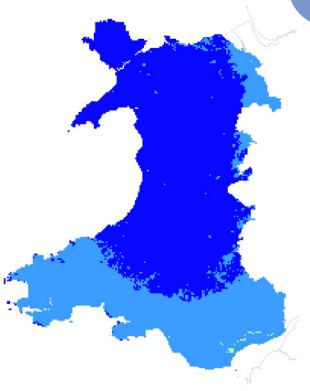


The target value for O_3 is 120µg m^{-3} as an 8-hour mean, not to be exceeded more than 25 times per year averaged over 3 years. The map shows the number of days the concentration was above the target value in 2016.

PM_{10}

Annual mean (µg m^{-3})

- <10
- 10-15
- 15-20
- 20-30
- 30-40
- >40



The PM_{10} limit value for annual mean concentration is 40 µg m^{-3}. The map shows that elevated levels of PM_{10} are associated with urban areas and major roads.

$PM_{2.5}$

Annual mean (µg m^{-3})

- <8
- 8-10
- 10-15
- 15-20
- 20-25
- > 25

The $PM_{2.5}$ target value is 25 µg m^{-3}. The map shows that elevated levels of $PM_{2.5}$ are associated with urban areas and major roads.

Figure 6.1

Maps Showing Background Concentrations of Nitrogen Dioxide, Ozone, PM_{10} and $PM_{2.5}$.

7

Does vegetation reduce air pollution?

Poor air quality is a cause of illness and premature death which costs the UK around £20 billion per year. While tackling the problem at source is the best way to reduce levels of air pollution, there is also interest in the extent to which vegetation can remove pollutants from the atmosphere, particularly in urban areas.

Studies focusing on trees in cities have used a range of methods to calculate the health benefits and the economic value they provide by removing pollutants such as fine particulate matter ($PM_{2.5}$) and nitrogen dioxide (NOx). The headline numbers in terms of tonnes of pollutant removed, or the economic benefit are typically eye-catching. For example, the i-Tree London study calculated 2,200 tonnes of pollutants were removed by London trees, with an economic benefit of £126 million arising from reduced mortality and health effects. However, when the actual change in pollutant concentrations is calculated, it is often very small. A study on cities across the USA showed that urban trees only reduced air pollution concentrations by around 1%[1].

There are a number of factors behind this. One reason is that most of the approaches used to calculate pollutant removal rely on a 'static' methodology. In other words they assume that the pollutant removal in a particular location only benefits the people living in that location. This ignores the fact that pollutants are transported by wind and air mass movements, and therefore so are the benefits if some of those pollutants are removed by vegetation. What this means in practice is that areas of woodland upwind of cities will be reducing the pollutant concentrations that city-dwellers are exposed to. In the same way, trees within cities will reduce local air pollutant concentrations both in the city and downwind.

Another reason is that atmospheric chemistry is highly complex, so the amount of pollution that a particular vegetation type can remove is dependent on the weather at the time (windspeed, humidity, sun and rain) and chemical interactions between pollutants, as well as more obvious characteristics of the vegetation like the surface leaf area and whether it is deciduous or evergreen. Failure to account for these processes can lead to less robust predictions of the likely amount of pollutants removed by vegetation.

The Office of National Statistics (ONS) recently commissioned the Centre for Ecology and Hydrology (CEH) to develop a Natural Capital Account for air pollution removal by vegetation in the UK. The approach CEH took uses a dynamic atmospheric transport model called EMEP4UK which incorporates atmospheric transport as well as interactions between vegetation, meteorology to calculate changes in pollutants on an hourly timestep. CEH then worked with health economists to calculate health impacts from changes in the four pollutants (NO_2, $PM_{2.5}$, SO_2, O_3) they used the AlphaRiskPoll model to estimate health benefits directly from changes in exposure, i.e. the changes in pollutant concentration that people are exposed to. The natural capital accounts for a sequence of years from 2007-2015 and projections to 2030 have just been published by ONS[2].

In the 2017-18 capital funding was identified for the development of a Green Infrastructure Capital Grant which will support the delivery of action under the Environment Act and the implementation of the Natural Resources Policy in line with Taking Wales Forward.

If LA's have any queries or would like to discuss further please contact the ESD Grants Team (ESDgrantsmanagmentteam@gov.wales).

[1] Nowak, D.J., Hirabayashi, S., Bodine, A. and Greenfield, E., 2014. Tree and forest effects on air quality and human health in the United States. Environmental Pollution, 193, pp.119-129.

[2] Jones, L., Vieno, M., Morton, D., Cryle, P., Holland, M., Carnell, E., Nemitz, E., Hall, J., Beck, R., Reis, S., Pritchard, N., Hayes, F., Mills, G., Koshy, A., Dickie, I. (2017). Developing Estimates for the Valuation of Air Pollution Removal in Ecosystem Accounts. Final report for Office of National Statistics, July 2017. https://www.ons.gov.uk/economy/environmentalaccounts/articles/developingestimatesforthevaluationofairpollutioninecosystemaccounts/2017-07-25

Table 1. Health benefits arising from UK vegetation in 2015

Health impact	Change in no. of hospital admissions/ life years lost/deaths per year	Economic benefit £m per year
Respiratory hospital admissions	-5,856	38.9
Cardiovascular hospital admissions	-1,349	8.7
Life years lost	-27,051	946.8
Deaths	-1,899	11.4
Total		**1,005.8**

The report shows that vegetation provides a substantial benefit to the UK. It removes 1.4 million tonnes of air pollution, which saves £1 billion in avoided health costs – see Table 1. The changes in concentration ranged from a 6% decrease in PM_{10}, 10% decrease in $PM_{2.5}$ up to a 30% decrease in SO_2 in 2015. Interestingly the net change in NOx is minimal because reductions in NO_2 are offset by natural emissions of NO by the soil under trees. The greatest health benefits come from the saving in Life Years Lost due to the reductions in $PM_{2.5}$, which account for nearly 90% of the total value.

The results are not broken down into Wales-only statistics, however maps show where the highest level of pollutants are removed, with most service provided by areas of woodland in mid and south Wales (Figure 7.1a), and where the resulting changes in pollutant concentration are greatest (Figure 7.1b). The total health benefit (£million) from vegetation in Wales, by local authority is shown in Figure 7.1c.

Laurence Jones, Centre for Ecology & Hydrology

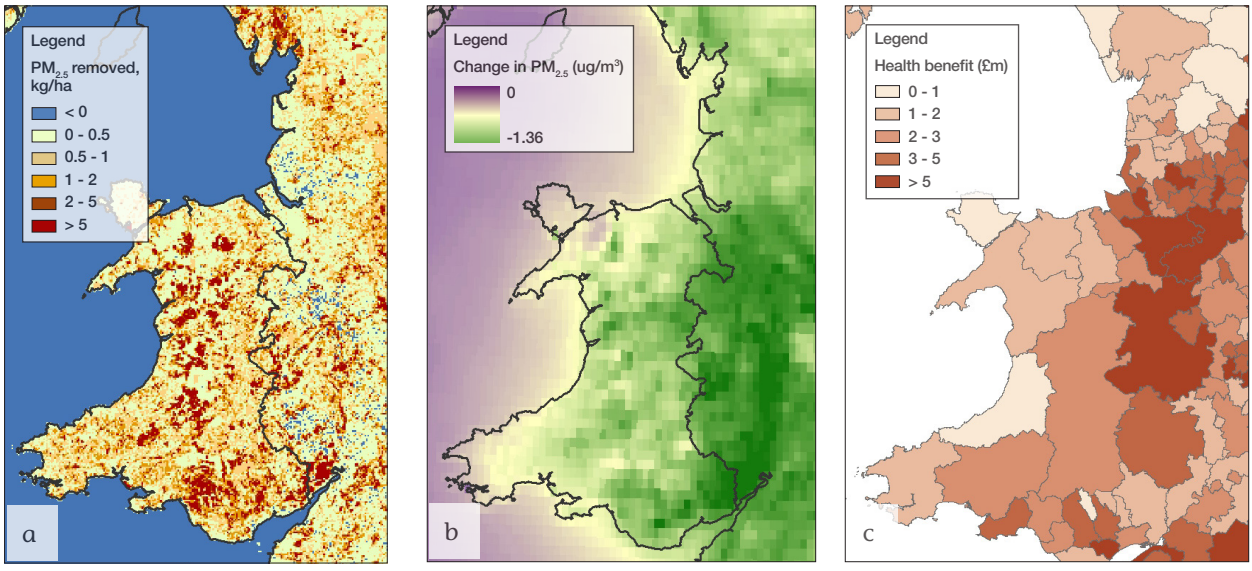


Figure 7.1

Maps of a) $PM_{2.5}$ removal, b) Change in $PM_{2.5}$ concentration, c) Resulting health benefit in Wales.

8

Air pollution and health inequalities

The mortality burden associated with exposure to air pollution in Wales has been described in previous reports. While there remains some uncertainty around such health impact estimates, the significance of outdoor air pollution as a public health priority is unequivocal; evidence linking poor health outcomes with exposure, even low pollutant concentrations, only continues to strengthen. It is therefore plausible that everyone is affected by air pollution to some extent.

However, not everyone is affected in the same way by air pollution exposure. Most healthy people will notice little to no adverse health effects over time, but children, older people and those with long-term limiting illnesses such as chronic lung or heart diseases are considered more vulnerable[3]. Others such as those regularly commuting to work through heavily congested urban areas may also be at a higher risk.

It is also well documented that people living in the deprived areas may also be more susceptible to air pollution than those who live in least deprived areas[4]. This is of concern given that research analysing local air pollution, multiple deprivation and health data in Wales showed that annual average air pollution concentrations are consistently highest in 'most' deprived areas (Fig.8.1)[5]. Interestingly, the next highest annual average air pollution concentrations are found in 'least' deprived areas.

The triple jeopardy concept – where air pollution, impaired health and deprivation interactions can strengthen associations and create disproportionate disease burdens between and within communities (inequalities) – appears to be at play in Wales. For example, in the context of PM_{10} pollution, research in Wales found that: compared with 'low' pollution and 'least' deprived areas, rates of respiratory mortality were twice as high in 'low' pollution and 'most' deprived areas, but increased to 2.4 times as high in 'high' pollution and 'most' deprived areas.[3]

Evidence suggests it's a mistake to consider air pollution in isolation. Understanding air pollution and its complex relationships with wider health determinants is essential; acting on a limited understanding of these relationships or ignoring them altogether, could compound problems through ill-informed decisions and ineffective or poorly-targeted intervention. Considering air pollution in the broadest possible public health context can improve collective knowledge, and inform actions that reduce variations in risks and impacts.

Reducing health inequalities is a public health priority and one of Wales' wellbeing goals (to achieve a more equal Wales). There is a need for public health and air quality management professionals to work together in more synergistic, innovative and effective ways to connect policy and drive change.

Huw Brunt
(Lead Consultant in Environmental Public Health)

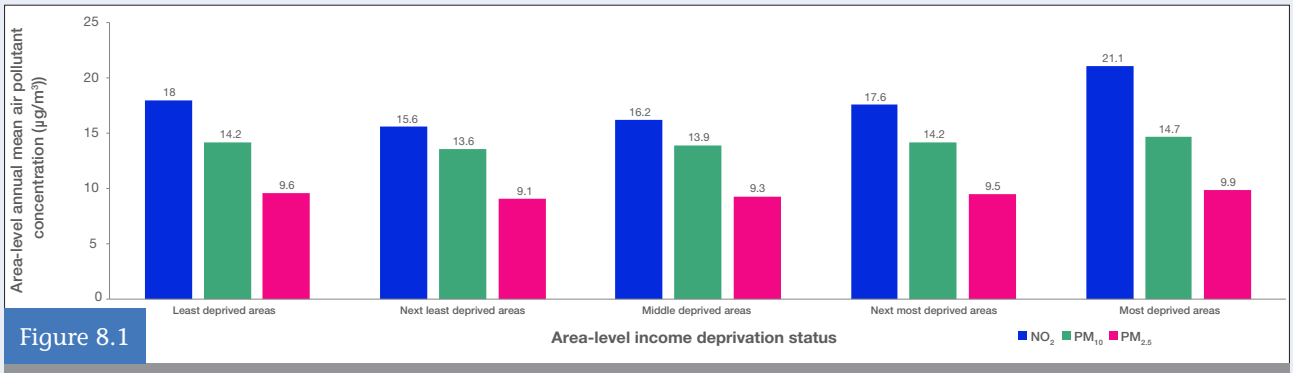


Figure 8.1

Wales' local-level annual mean air pollutant concentrations (and ranges) by income deprivation status, 2011-13

[3] Fann N, Roman HA, Fulcher CM et al. (2011). Maximising health benefits and minimizing inequality: incorporating local-scale data in the design and evaluation of air quality policies. Risk Anal; 31(6):908-22.

[4] Goodman A, Wilkinson P, Stafford M et al. (2011). Characterising socioeconomic inequalities in exposure to air pollution: a comparison of socioeconomic markers and scales of measurement. Health Place; 17: 767-774.

[5] Brunt H, Barnes J, Jones SJ, Longhurst JWS, Scally G, Hayes ET (2016). Air pollution, deprivation and health: Understanding relationships to add value to local air quality management policy and practice in Wales, UK. J Public Health; p. 1-13, doi:10.1093/pubmed/fdw084.

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More information

The Air Quality in Wales Website

Figure 9.1

The Air Quality Website

The Air Quality in Wales website (www.welshairquality.co.uk) is available in English and Welsh. It provides information on all aspects of air pollution in Wales. The site is one of a family of air quality websites produced by Ricardo Energy & Environment, which includes air quality websites for the UK, Northern Ireland, Scotland and England.

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

- A colour-coded Google Map™ showing the overall pollution situation at sites across Wales.
- Latest data from all automatic monitoring sites in Wales, accessible from this map.
- Air pollution forecasts for the whole of Wales.
- Information on the latest news, developments and publications.
- Detailed information on automatic monitoring sites.
- A wide range of background information on air pollution sources, health impacts, monitoring techniques, standards and policy issues.
- Access to air quality data and statistics – for 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 modelled future scenarios.
- Links to national and global information resources on air quality.
- A password-protected area for members of the Welsh Air Quality Forum (WAQF).
- Overview of the data ratification and verification procedures.

To access data used in this Annual Report, follow these simple steps:

- From the home page, select ‘Data’ from the main menu.
- Click ‘Download/Submit Data’.
- Click ‘Download Data’.
- Select ‘Parameter Group’ (type of data required).
- Select ‘Pollutant Species’.
- Select ‘Local Authority Region’.
- Select ‘Statistic Type’ (for example, daily mean).
- Select ‘Date Range’.
- Select ‘Specific Monitoring Site(s)’.

Then, provide your email address and the data will be emailed to you with a few seconds.

Current and Forecast Air Quality (National and Local)

In addition to the Air Quality in Wales website, current and forecast air quality is rapidly available in a user-friendly form from:

- The Air Pollution Information Service on freephone 0800 556677.
- The UK Air Information Resource (http://uk-air.defra.gov.uk/).

Health Effects of Air Pollution

Information on the health effects of air pollution and the UK pollution banding system can be found on the Department for Environment, Food and Rural Affair's (Defra) website (http://uk-air.defra.gov.uk/air-pollution/daqi).

General Information on Air Quality

- The Welsh Government Environment and Countryside links (http://wales.gov.uk/topics/environmentcountryside/?lang=en).
- The UK Air Information Resource (http://uk-air.defra.gov.uk).
- The National Atmospheric Emissions Inventory (http://naei.defra.gov.uk/).
- The Defra Air Quality Information Web Resource (http://uk-air.defra.gov.uk).
- The Northern Ireland Air Quality website (www.airqualityni.co.uk).
- The Scottish Air quality website (www.scottishairquality.co.uk).
- The English Air quality website at (www.airqualityengland.co.uk).
- The Pollutant Release and Transfer Register (http://prtr.defra.gov.uk).
- The Environment Agency (www.environment-agency.gov.uk).
- Natural Resources Wales (www.naturalresourceswales.gov.uk).

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 on:

- The Defra website at (http://aqma.defra.gov.uk).
- The local authority support site (http://laqm.defra.gov.uk).

Figure 9.2

Welsh Automatic Monitoring sites in 2016