

# **Swindon Air Quality Needs Assessment, 2017**

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## Background

### ***What is air pollution?***

Air pollution is a mixture of particles and gases that can have adverse effects on human health. The most important pollutants are oxides of nitrogen (NO<sub>x</sub>)<sup>1</sup> and particulate matter (PM)<sup>2</sup>. Other important pollutants are; sulphur dioxide, ammonia, non-methane volatile organic compounds (NMVOCs) and ozone (O<sub>3</sub>). The proportions of different pollutants vary depending on location.

### ***What are the sources of air pollution?***

Road vehicles are the main pollution source that people are exposed to in the most populated urban environments and the pollutants they cause and emit have the greatest health impacts. Combustion for heating, farming activities and certain industrial processes also contribute to air pollutant emissions, but these tend to be more dilute contributing to background levels of air pollution. Small changes in distance from the source, street layouts and physical barriers can make a big difference to exposure because air pollution levels can decrease over very short distances depending on the sources and the local situation. In addition the traffic speed and flow of traffic effects emissions.

On average around 80% of NO<sub>x</sub> emissions in areas where the UK is exceeding nitrogen dioxide (NO<sub>2</sub>) limit values is due to transport, although urban and regional background non-transport sources are still considerable (see figure 1). The largest source is emissions from diesel light duty vehicles (cars and vans) and there has been significant growth in these vehicle numbers over the last ten years in the UK.

Between 2000 and 2015 in Great Britain:

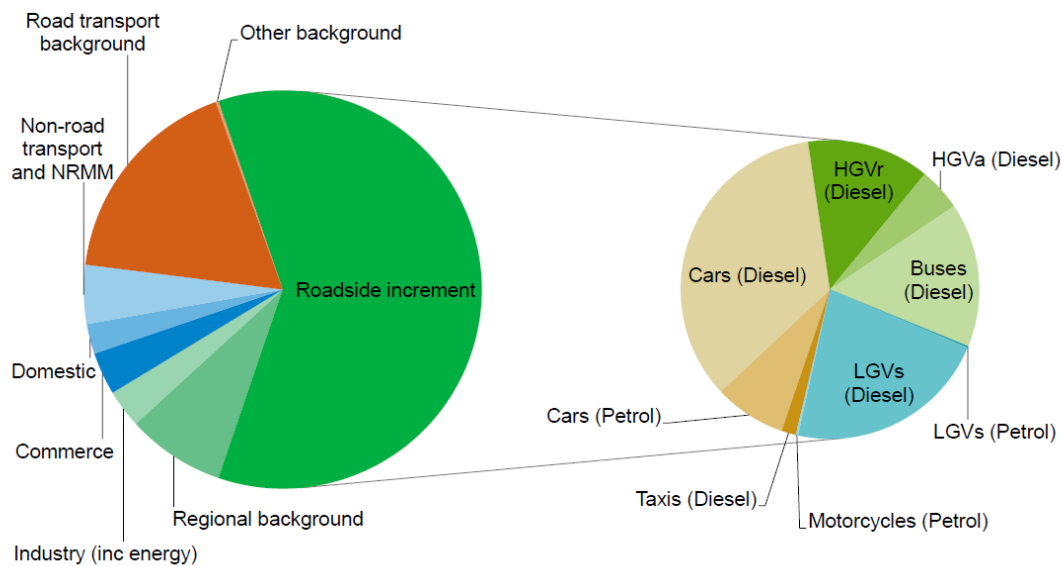
- The number of licensed cars increased from 24.4 million to 30.3 million.
- The percentage of diesel cars increased from 12.9% (3.2 million) to 37.8% (11.4 million).
- The number of licensed light goods vehicles (LGVs) increased from 2.4 million to 3.6 million.
- The percentage of diesel LGVs increased from 76.9% (1.8 million) to 95.9% (3.5 million).

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<sup>1</sup> The gaseous pollutant nitrogen dioxide (NO<sub>2</sub>) is a gas produced along with nitric oxide (NO) by combustion processes and together they are often referred to as oxides of nitrogen (NO<sub>x</sub>).

<sup>2</sup> PM comprises micron sized particles (a micron is 1000<sup>th</sup> of a millimetre) and is studied in three main size fractions; PM10, PM2.5 and PM0.1. PM10 includes all particles smaller than 10 microns (i.e. PM2.5 and PM0.1) and PM2.5 comprises all particles smaller than 2.5 microns (including PM0.1).

Figure 1: Breakdown of UK national average roadside concentration of nitrogen oxides into sources, 2015.



Source: Defra, Department for Transport

Much of the PM in urban environments, particularly that close to roads, can come from traffic sources. However domestic burning of wood and coal is also a significant source of PM. In addition a large proportion of PM is not from local sources, with 45-50% of total annual average PM<sub>2.5</sub> coming from Europe. There is large variation in PM levels and proportion of each component depending on location.

### ***Why is air pollution important?***

Air pollution is a serious public health challenge. In 2010 the Department of Health's (DH) Committee on the Medical Effects of Air Pollutants (COMEAP) estimated the burden of particulate air pollution in the UK in 2008 to be equivalent to nearly 29,000 deaths and an associated loss of population life of 340,000 life years lost.<sup>3</sup>

EU and UK limit values are in place to protect human health (see table 1). There is no safe level for PM, while NO<sub>2</sub> is associated with adverse health effects at concentrations at and below the legal limits. Studies have shown that for PM there is a 15% decrease in the risk of heart disease deaths with every particulate matter decrease of 10ug/m<sup>3</sup>.<sup>4</sup> Any improvement in air quality will have positive health consequences.<sup>5</sup>

<sup>3</sup>

[https://www.gov.uk/government/uploads/system/uploads/attachment\\_data/file/304641/COMEAP\\_mortality\\_effects\\_of\\_long\\_term\\_exposure.pdf](https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/304641/COMEAP_mortality_effects_of_long_term_exposure.pdf)

<sup>4</sup> <http://www.bathnes.gov.uk/services/your-council-and-democracy/local-research-and-statistics/wiki/air-quality>

<sup>5</sup> [http://apps.who.int/iris/bitstream/10665/69477/1/WHO\\_SDE\\_PHE\\_OEH\\_06.02\\_eng.pdf](http://apps.who.int/iris/bitstream/10665/69477/1/WHO_SDE_PHE_OEH_06.02_eng.pdf)

There is clear evidence that long-term exposure to air pollutants contributes to cardiovascular disease (CVD), lung cancer and respiratory disease. The heaviest burden is borne by those with greatest vulnerability and/or exposure. The elderly, children and those with CVD and/or respiratory disease are more susceptible to air pollution than others. Those who spend more time in highly polluted locations will be more affected. Since air pollution levels are typically as high within vehicles as just outside, this is likely to include not only those who live or work near busy roads, but also those who drive for a living.

Deprived communities are more likely to be situated near polluted busy roads, and are more likely to experience adverse health impacts. “*Analysis of environmental quality and social deprivation carried out for the Environment Agency (2003) looked at the social distribution of the wards with the highest pollutant concentrations, and concluded that more than half of the most exposed 5% of the population (2.5 million people) were resident in the 20% most deprived wards.*”<sup>6</sup>

PM2.5 has the strongest epidemiological link to health outcomes and is used for the Public Health Outcomes Framework indicator 3.01.<sup>7</sup>

Table 1: Air quality objectives in England

Pollutant	Air quality objective	
	Concentration	Measured as
Nitrogen Dioxide (NO <sub>2</sub> )	200 µg/m <sup>3</sup> not to be exceeded more than 18 times a year	1-hour mean
	40 µg/m <sup>3</sup>	Annual mean
Particulate Matter (PM)	50 µg/m <sup>3</sup> not to be exceeded more than 35 times a year	24-hour mean
	40 µg/m <sup>3</sup>	Annual mean
Sulphur Dioxide (SO <sub>2</sub> )	350 µg/m <sup>3</sup> not to be exceeded more than 24 times a year	1-hour mean
	125 µg/m <sup>3</sup> not to be exceeded more than 3 times a year	24-hour mean
	266 µg/m <sup>3</sup> not to be exceeded more than 35 times a year	15-minute mean

The units are in microgrammes of pollutant per cubic metre of air (µg/m<sup>3</sup>).

Source: Defra<sup>8</sup>

<sup>6</sup> <http://www.adph.org.uk/2017/03/air-quality-a-briefing-for-directors-of-public-health/>, p22

<sup>7</sup> <http://www.phoutcomes.info/public-health-outcomes-framework>

<sup>8</sup> [https://uk-air.defra.gov.uk/assets/documents/National\\_air\\_quality\\_objectives.pdf](https://uk-air.defra.gov.uk/assets/documents/National_air_quality_objectives.pdf)

A report by WHO, Health risks of air pollution in Europe (HRAIE)<sup>9</sup> estimated that the relative risk of all-cause mortality increased by 6.2% per 10 µg/m<sup>3</sup> increase in PM<sub>2.5</sub>. Short-term exposure to PM<sub>2.5</sub> is also associated with small increases in hospital admissions for cardiovascular and respiratory conditions.

WHO HRAPIE summarised that there is evidence that PM<sub>10</sub> increases the:

- Post neonatal (1- 12 months) all-cause infant mortality (long-term exposure).
- Prevalence of bronchitis in children 6-12 years (long-term exposure).
- Incidence of chronic bronchitis in adults (long-term exposure).
- Incidence of asthma symptoms in children with asthma (short-term exposure).

A systematic review and meta-analysis<sup>10</sup> of the association between short term exposure to nitrogen dioxide and mortality and hospital admissions found that a 10 µg/m<sup>3</sup> increase in 24 hour NO<sub>2</sub> was associated with increases in:

- Mortality
  - All age, all-cause mortality: 0.71%
  - Cardiovascular mortality: 0.88%
  - Respiratory mortality: 1.09%
- Hospital admissions
  - Cardiovascular disease: 0.66%
  - Respiratory: 0.57%
    - Asthma in children: 1.27%

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<sup>9</sup>

[http://www.euro.who.int/\\_\\_data/assets/pdf\\_file/0006/238956/Health\\_risks\\_air\\_pollution\\_HRAPIE\\_project.pdf](http://www.euro.who.int/__data/assets/pdf_file/0006/238956/Health_risks_air_pollution_HRAPIE_project.pdf)

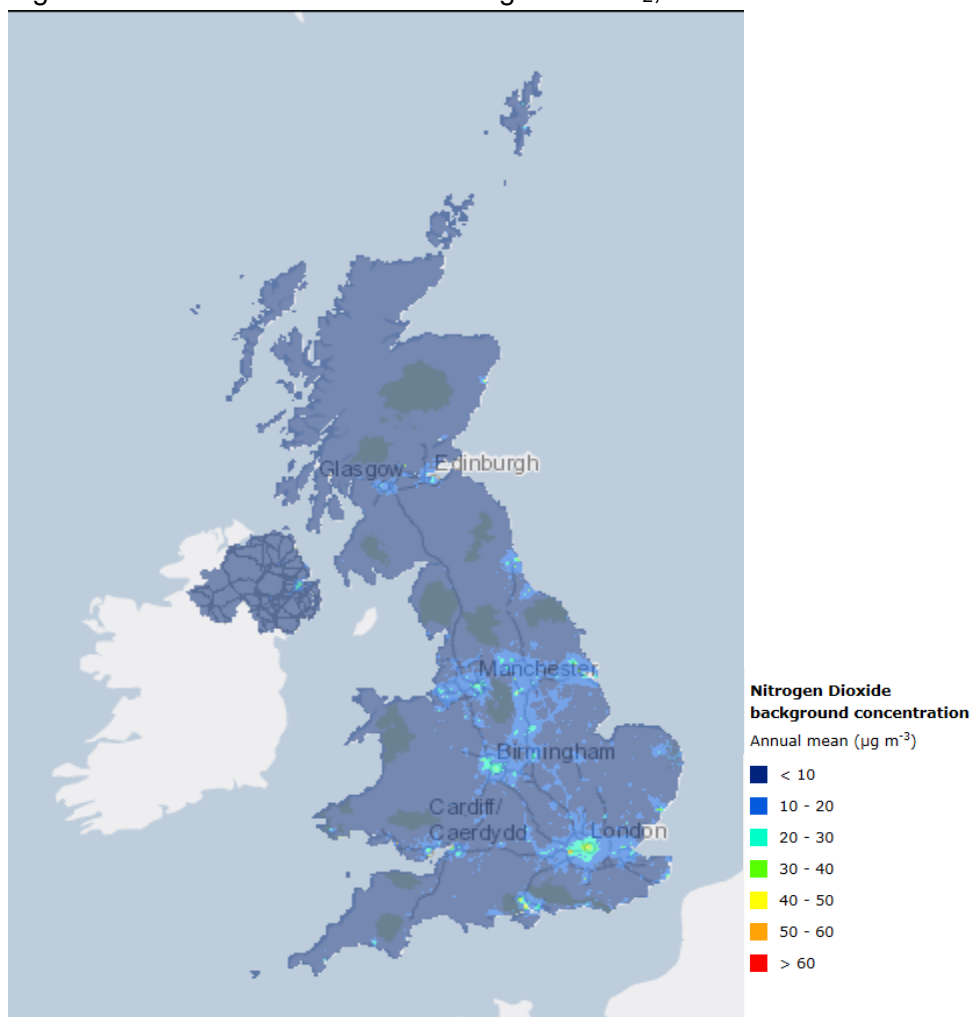
<sup>10</sup> <http://europepmc.org/articles/PMC4452753/>

## Air Quality in the UK

The recent draft revised UK air quality plan states:

*“Over recent decades, UK air quality has improved significantly thanks to concerted action at all levels but there is more to do. Poor air quality is the largest environmental risk to public health in the UK and investing in cleaner air and doing even more to tackle air pollution are priorities for the UK Government..... The most immediate air quality challenge is tackling the problem of nitrogen dioxide (NO<sub>2</sub>) concentrations around roads - the only statutory air quality obligation that the UK is currently failing to meet.”<sup>11</sup>*

Figure 2: Modelled annual mean background NO<sub>2</sub>, 2015.

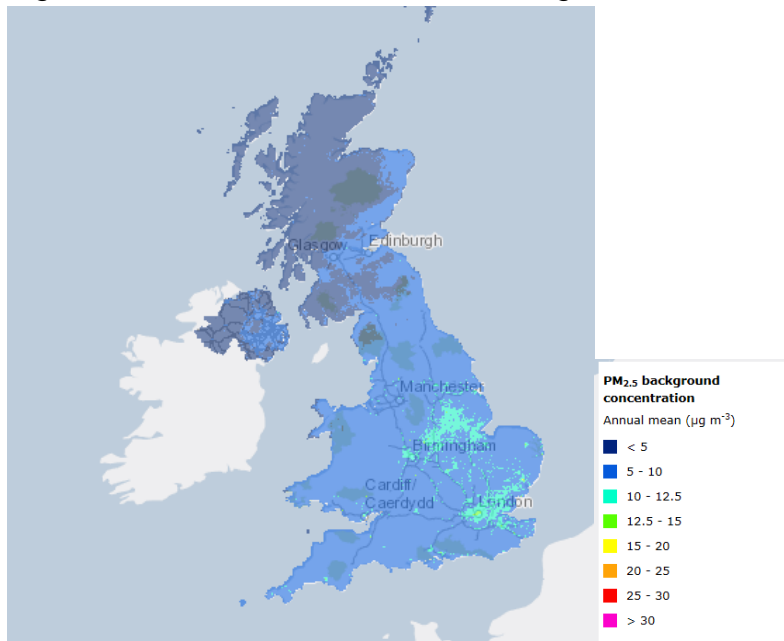


Source: DEFRA<sup>12</sup>

<sup>11</sup> [https://consult.defra.gov.uk/airquality/air-quality-plan-for-tackling-nitrogen-dioxide/supporting\\_documents/Draft%20Revised%20AQ%20Plan.pdf](https://consult.defra.gov.uk/airquality/air-quality-plan-for-tackling-nitrogen-dioxide/supporting_documents/Draft%20Revised%20AQ%20Plan.pdf)

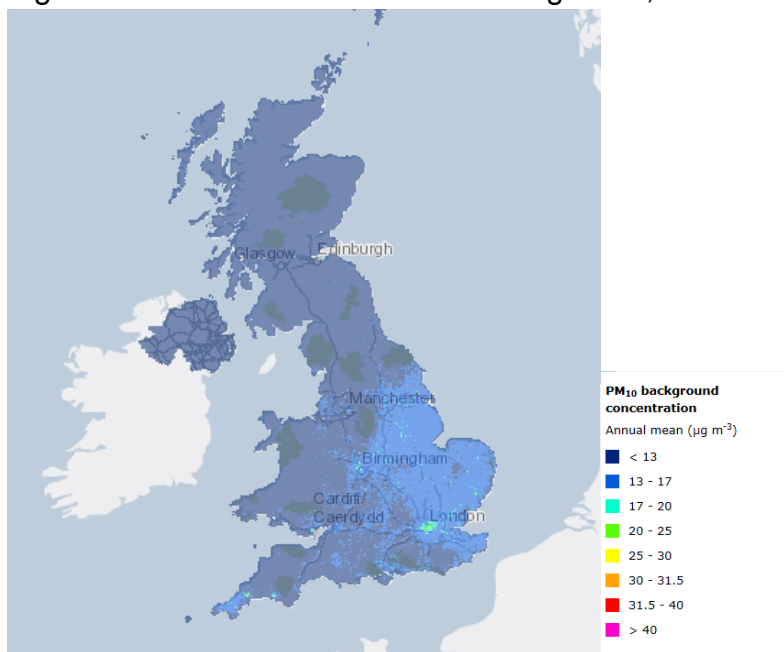
<sup>12</sup> <https://uk-air.defra.gov.uk/data/gis-mapping>

Figure 3: Modelled PM2.5 annual background, 2015



Source: DEFRA<sup>13</sup>

Figure 4: Modelled PM10 annual background, 2015



Source: DEFRA<sup>14</sup>

<sup>13</sup> <https://uk-air.defra.gov.uk/data/gis-mapping>

<sup>14</sup> <https://uk-air.defra.gov.uk/data/gis-mapping>



## ***Air Quality Management Areas (AQMA)***

Since December 1997 each local authority in the UK has been carrying out a review and assessment of air quality in their area. This involves measuring air pollution and trying to predict how it will change in the next few years. The aim of the review is to make sure that the national air quality objectives will be achieved throughout the UK by the relevant deadlines. These objectives have been put in place to protect people's health and the environment.

If a local authority finds any places where the objectives are not likely to be achieved, it must declare an Air Quality Management Area there. This area could be just one or two streets, or it could be much bigger. Then the local authority will put together a plan to improve the air quality - a Local Air Quality Action Plan.

The National Planning Policy Framework references AQMA;

*“Planning policies should sustain compliance with and contribute towards EU limit values or national objectives for pollutants, taking into account the presence of Air Quality Management Areas and the cumulative impacts on air quality from individual sites in local areas. Planning decisions should ensure that any new development in Air Quality Management Areas is consistent with the local air quality action plan.”<sup>15</sup>*

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<sup>15</sup> <https://www.gov.uk/government/publications/national-planning-policy-framework--2>

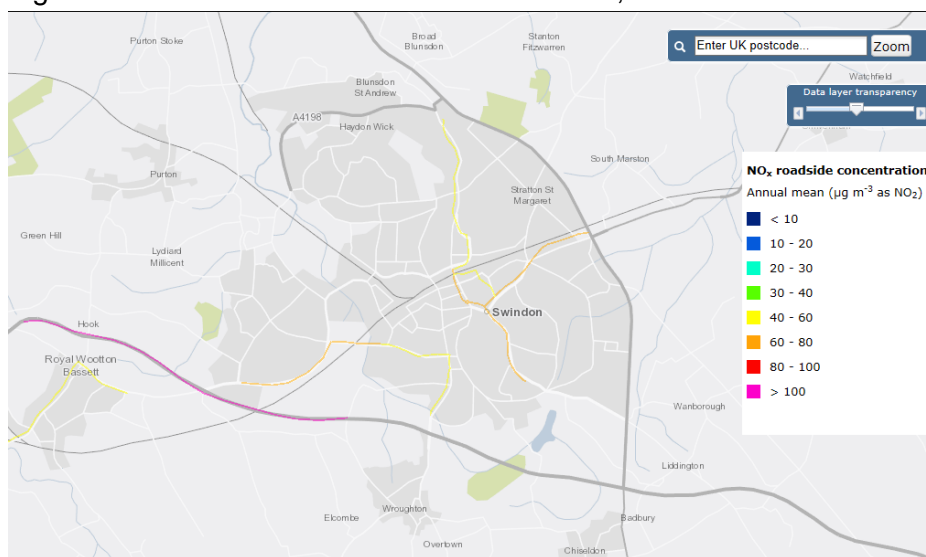
## Air Quality in Swindon

### Modelled data

Air quality in Swindon is relatively good. In Swindon, in common with other urban authorities, our chief concern is that of Oxides of Nitrogen (NOx). In Swindon transport is the main contributor to air pollution. Figure 5 and 6 shows Defra modelled roadside NOx and background PM. Modelled data is used as local measurement only gives data for a very specific area, and therefore to understand the broader picture of air quality modelling is required.

These show that modelled levels are highest around main roads, but relatively the modelled background levels are not as high as some other urban areas.

Figure 5: Modelled roadside NOx annual mean, 2015\*

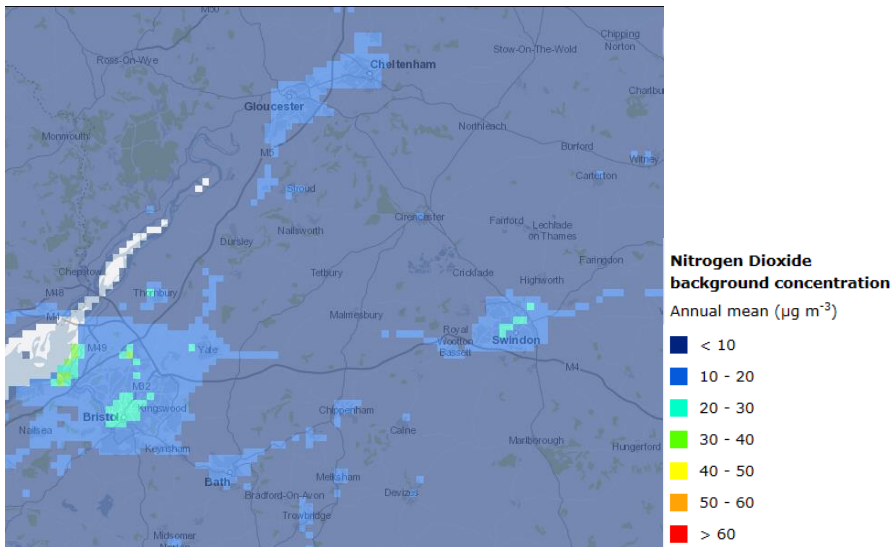


\*not all roads included in modelling, only includes A roads, motorways and some urban link roads (approximately 9,000 roads across UK).

Source: DEFRA<sup>16</sup>

Figure 6: Modelled annual mean background NO<sub>2</sub>, 2015.

<sup>16</sup> <https://uk-air.defra.gov.uk/data/gis-mapping>



Source: DEFRA<sup>17</sup>

## ***Air Quality Annual Statement Report***

The Council is regularly monitoring monthly average Nitrogen Dioxide using passive devices (diffusion tubes), and other recently commissioned monitors which can monitor over shorter time frames. In recent years, the overall decline in measured concentrations of Nitrogen Dioxide, as was previously predicted, has been confirmed, but this year the trend is more mixed. The Council's monitoring has also identified some discrete areas where NO<sub>x</sub> levels are close to or above EU limit values.

The Air Quality Annual Statement Report 2016 identified four areas where measured concentrations of nitrogen dioxide are close to or exceeding screening levels. In these four areas close monitoring of air quality and traffic flow has been undertaken, to understand the situation and make appropriate plans for improvements.

Although concentrations of nitrogen dioxide exceeded the Air Quality Standards when data is adjusted for distance to the receptor (the point of exposure) and averaged, all sites remained within the objective level, except one location. However, as the monitoring had, to March 2016, only been conducted for 5 months and a further 7 months across the road (where the traffic conditions are different), the decision has been made to continue monitoring at this location, allowing further data to be collected to verify whether Air Quality Management Area (AQMA) should be declared.

Monitoring for dust found that PM<sub>2.5</sub> and PM<sub>10</sub> concentrations were well within the annual mean and 24-hour objectives, and exceedances of these objectives were considered unlikely. As a result the Council has suspended monitoring of particulate matter there.

<sup>17</sup> <https://uk-air.defra.gov.uk/data/gis-mapping>

The Air Quality Annual Statement Report 2017<sup>18</sup> may identify one area where an AQMA will need to be declared. If this is necessary then Swindon Borough Council will put together a Local Air Quality Action Plan. The report also identifies that further detailed assessment of the four areas mentioned above shows likely different underlying causes to the higher than Swindon average nitrogen dioxide levels. These range from structural issues (narrow streets) with large car/van volume to high number of buses stopping/starting.

### ***Comparison with similar areas***

Compared to similar areas Swindon has relatively good air quality. Table 3 shows that of the 17 local authorities in the cluster with Swindon, 14 have an AQMA. Of these 14, eight have more than one AQMA.

Table 3: AQMA in local authorities within cluster.

<b>LA in cluster</b>	<b>AQMA? (number)</b>
Bedford	Yes (1)
Bradford	No
Broxbourne	Yes (5)
Crawley	Yes (1)
Dartford	Yes (4)
Derby	Yes (3)
Gravesham	Yes (6)
Harlow	No
Ipswich	Yes (4)
Medway	Yes (3)
Milton Keynes	Yes (1)
Northampton	Yes (5)
Peterborough	Yes (1)
Sandwell	Yes (1)
Stevenage	No
Thurrock	Yes (4)
Wolverhampton	Yes (1)

Source: Defra<sup>19</sup>

### ***Comparison with other areas***

Plans for Clean Air Zones for tackling nitrogen dioxide are already in place in Birmingham, Leeds, Nottingham, Derby and Southampton (named in 2015 UK Air Quality Plan). Additionally local authorities in Greater Manchester and in Bristol and South Gloucestershire have secured Air Quality Grant funding to develop Clean Air Zone proposals. Further Clean Air Zones are likely to be identified in the summer of 2017 in the UK revised Air Quality plan.

<sup>18</sup> This is reported to Defra and once approved by Defra published on the Swindon Borough Council website.

<sup>19</sup> <https://uk-air.defra.gov.uk/aqma/>

## Health

Public Health Outcome Framework (PHOF) showed that for 2015 the fraction of mortality attributed to air pollution<sup>20</sup> in Swindon was 5.1 (compared to 4.7 in England). This means using modelled PM data and Swindon mortality data it is estimated that 5.1% of mortality is attributed to air pollution.

As suggested by Defra/PHE/LGA (2017)<sup>21</sup> table 2 shows a ranking of PHOF mortality indicators for Swindon local authority, including mortality attributable to PM2.5. This uses routinely reported mortality statistics within PHOF, and a converted indicator of percentage of adult mortality in a year. It is important to note that unlike the other indicators that are based on recorded mortality data for specific causes of death, the figures for air pollution are estimates of mortality attributable to a risk factor. Deaths are not individually attributed to air pollution, rather, air pollution is considered to be a contributory factor in many deaths.

Table 2: Ranking of PHOF mortality indicators for Swindon, 2013-15 (apart from PHOF 3.01 from 2015).

Indicator in PHOF	Mortality rate per 100,000
Preventable mortality (4.03)	185.2
Preventable cancer <75 (4.05ii)	88.4
Preventable CVD <75 (4.04ii)	49.9
Preventable respiratory <75 (4.07ii)	18.7
<b>Mortality attributable to PM2.5 (3.01)</b>	<b>17.2</b>
Preventable liver disease <75 (4.06ii)	14.6
Communicable diseases (4.08)	14.1
Suicide rate persons (4.10)	9.3

Source: PHE

At present, there is no Swindon specific estimate for the impact of air pollution on disease prevalence and health care utilisation.

GP asthma prevalence for all ages in NHS Swindon CCG (from primary care registers through the Quality Outcome Framework (QOF)) was 6.4% in 2015/16 which is higher than the England average (5.9%).<sup>22</sup> Asthma affects over 4,000 children in Swindon. Hospital admissions for asthma in people aged less than 19 years was 200 per 100,000 in 2015/16 which is 103 admissions. This value is similar to the England value.<sup>23</sup>

<sup>20</sup> Fraction of annual all-cause adult mortality attributable to anthropogenic (human-made) particulate air pollution (measured as fine particulate matter, PM<sub>2.5</sub>).

<sup>21</sup> <http://www.adph.org.uk/2017/03/air-quality-a-briefing-for-directors-of-public-health/>

<sup>22</sup> <https://fingertips.phe.org.uk/profile/inhale>

<sup>23</sup> <http://www.swindonjsna.co.uk/dna/child-health-profile>

A report by Energydesk (Greenpeace)<sup>24</sup> found no schools or early years setting in Swindon that were within 150m of a road breaching the legal limit of NO<sub>2</sub>.

### ***Journey planning***

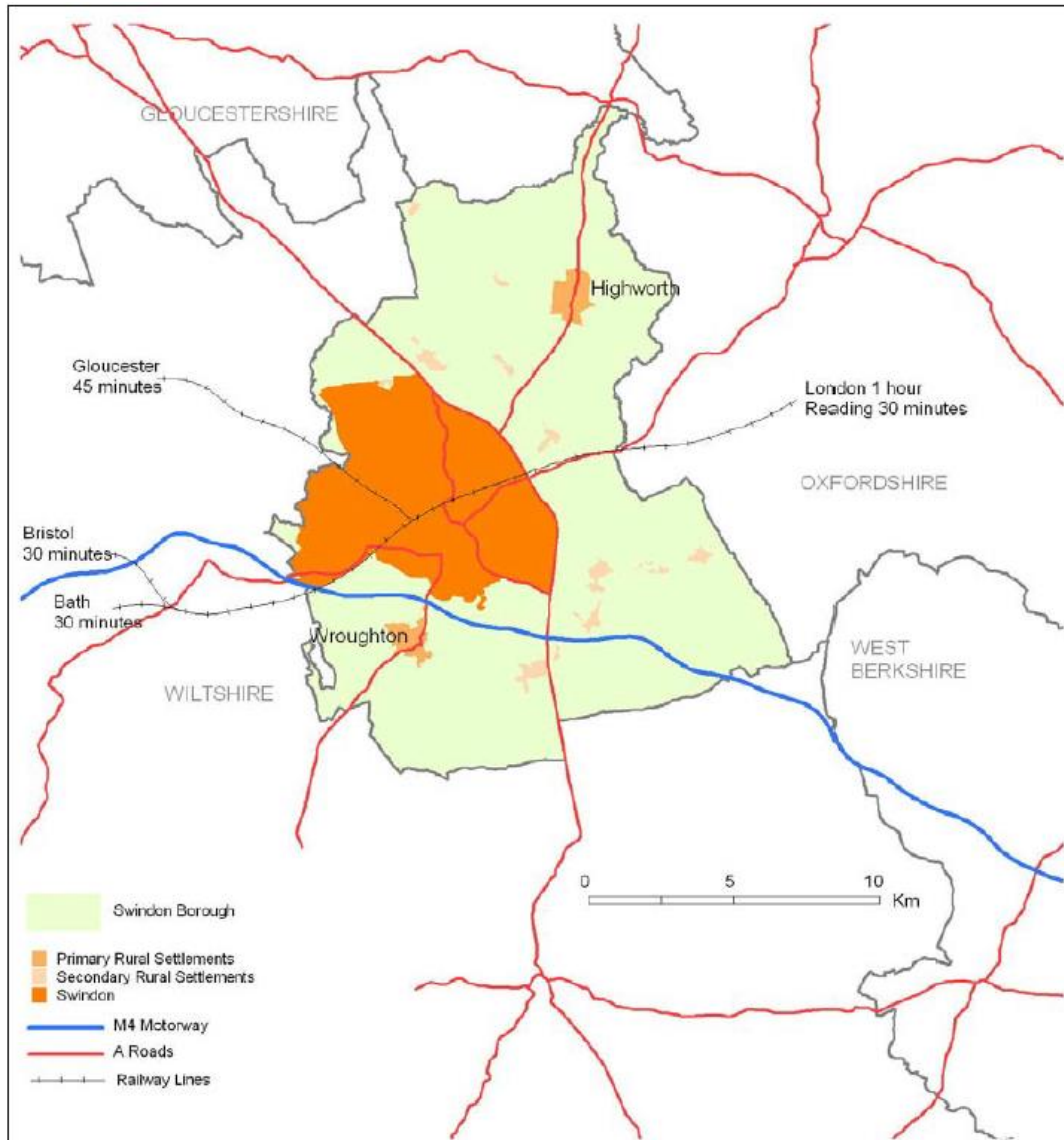
Swindon Borough Council is situated in the north-east of the South-West Region. It is midway between Bristol, 40 miles to the west and Reading, 40 miles to the east. The administrative boundaries cover an area of approximately 230km<sup>2</sup>. It is on the main railway line between London and Bristol as well as on the main M4 corridor, allowing easy access via the strategic road network to London and the Thames valley as well as the west of England and South Wales (figure 7). As a result more people work in the Borough than live in it, and Swindon Town Centre has a catchment area stretching well beyond the Borough boundaries.

Swindon has had two main phases of growth – one from 1841 when the Great Western Railway located its main locomotive and carriage works in Swindon, resulting in an influx of workers, the second from the 1950's when Swindon was designated as one of the towns to accommodate overspill population from London.

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<sup>24</sup> <http://energydesk.greenpeace.org/2017/04/04/air-pollution-nurseries/>

Figure 7: Location of Swindon Borough within the sub-region and major transportation links.



© Crown copyright. All rights reserved Swindon Borough Council 2017.  
Source: Swindon Local Transport Plan

## **Journey patterns**

Evidence suggests that those making short car trips (under 5 miles) are a prime target area for switching to active travel or public transport.

Swindon has around 94,000 working residents. Of these, 79,000 also work within the SBC area, a residents' workplace containment of 85%. Of the 15% of Swindon residents (14,500 people) who work outside the Borough, Wiltshire workplaces accounts for over 4,000 of these (nearly 30% of out-commuters, and 4% of all Swindon residents), with over half of these in North Wiltshire. A further 18% work in Oxfordshire (almost 2,700), with almost half of these in the Vale of White Horse, and 17% (2,500) in the former Berkshire authorities (half in West Berkshire). A further 9% (1,300) work in Gloucestershire, and around 7% (1,000) work in each of London and the former Avon authority areas (with half of the latter in Bristol).<sup>25</sup>

Less than 60% of all work journeys are regularly made by car. For people who live in Swindon and work outside the Swindon area, the proportion of trips made by car rises to over 80%. Public Transport accounts for 9% of all work trips, which is split between 1% train and 8% bus. These percentages are very similar to England. The majority of train journeys are to Reading and central London, while the vast majority (93%) of bus trips are within Swindon.

## **Walking and cycling**

Data from the 2011 census provides information on method of travel to work (residents aged 16 to 74). Of 154,080 methods of travelling to work, 7.2% were on foot and 3.0% were on bike.<sup>26</sup> These percentages are similar to England. The 2017 survey of modes of travel to school showed 5% of children travelled by bike and 57% walked. The report also shows that 62% of children live within the 'threshold' for walking to school (800m for primary school and 2000m for secondary school). Of these 9.2% use a car to get to school. There is no national comparison data for 2017.

A survey from 2014/15 showed that 84% of residents have done some walking for any purpose, at least once per month and 17% have done any cycling for any purpose, at least once per month (86.2% either walking or cycling for any purpose, at least once per month).<sup>27</sup> These values are similar to the England average values.

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<sup>25</sup> [https://www.swindon.gov.uk/downloads/file/528/swindon\\_local\\_transport\\_plan\\_-\\_main\\_strategy](https://www.swindon.gov.uk/downloads/file/528/swindon_local_transport_plan_-_main_strategy)

<sup>26</sup> <http://ukcensusdata.com/swindon-e06000030/method-of-travel-to-work-qs701ew#sthash.ptr52mGL.dpbs>

<sup>27</sup> <https://www.gov.uk/government/statistics/local-area-walking-and-cycling-in-england-2014-to-2015>



## ***Seasonality***

Levels of air pollution are seasonal due to a mix of local weather conditions, such as low wind speeds, low overnight temperatures and fog conditions as well as longer range weather conditions, which can lead to a recirculation of air over northern Europe and influxes of dust. Changes in transport patterns also contribute to pollution levels with more people driving in colder weather.

The Met Office supplies an air quality forecast based on five key pollutants: ozone, nitrogen dioxide, sulphur dioxide, PM<sub>2.5</sub> and PM<sub>10</sub> particles that can have an impact on health.

The forecasts use the Daily Air Quality Index (DAQI) that is designed to show complex air quality information on a simple 10 point scale. The DAQI uses a combination of numbers (1-10), words (low, moderate, high and very high) and colours (green/yellow/orange/red/purple) to communicate the levels of pollution expected. Each of the bands/levels of the DAQI has associated health information and advice for the general public as well as those that may be more sensitive to air pollution.

The Met Office air pollution forecast is generated from a regional model working on a 12km grid resolution. The forecast represents the background and regional air quality away from strong sources of pollution.

## What are we doing in Swindon to improve air quality?

### ***Reducing car journeys***

Swindon Travel Choices' work is aimed primarily at reducing unnecessary short journeys by car (which are the most polluting) and encouraging people to make these trips on foot or by bike. There is the Travel Choices website, producing maps and publications, working with employers to promote sustainable commuting and holding events.

Other initiatives include increasing active modes of transport (walking and cycling) and promoting physical activity, Personalised Travel Planning (PTP) such as the Wichelstowe Programme, promoting Low Emission Transport, the Cycle to Work Scheme, Swindon Health Walks and working with the schools to reduce parents' car journeys.

The Get Swindon Active Strategy<sup>28</sup> highlights a number of other programmes in Swindon to increase active travel and reduce car journeys. These include:

- Preparing for cycle training.
- Healthy schools – active travel to school.

Swindon Health and Wellbeing Strategy<sup>29</sup> also highlights the importance of sustainable environments. Within outcome 5, there are two priorities directly relevant which are:

- Promote the use of green, open spaces and activities such as walking and cycling.
- Promote effective public transport and transport networks which ensure access to services and activities and encourage permeability within communities.

### ***Local Plan***

The Council also uses its planning and transport powers to help reduce the need to travel, and support and encourage the sustainable, safe and efficient movement of people and goods within and through the Borough as highlighted in The Local Plan 2026 and in particular the Local Plan highlights the importance of minimising emissions from transport by:

- reducing the need to travel;
- promoting more sustainable travel choices;
- personal, workplace and school travel planning; and
- designing the built environment to encourage healthy lifestyles and travel choices.

*“The attractiveness of walking and cycling in Swindon will be improved to support healthy lifestyle choices but also to address climate change, congestion and improve air quality”.*<sup>30</sup>

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<sup>28</sup> <http://www.swindonjsna.co.uk/dna/healthy-weight>

<sup>29</sup> <http://www.swindonjsna.co.uk/dna/healthy-weight>

<sup>30</sup> [https://www.swindon.gov.uk/info/20113/local\\_plan\\_and\\_planning\\_policy/635/swindon\\_borough\\_local\\_plan\\_2026](https://www.swindon.gov.uk/info/20113/local_plan_and_planning_policy/635/swindon_borough_local_plan_2026)

In addition local plan policy EN7 (p130) relates to pollutions and states:

- Development that is likely to lead to emissions of pollutants such as noise, light, vibration, smell, fumes, smoke, soot, ash, dust, grit or toxic substances that may adversely affect existing development and vulnerable wildlife habitats, shall only be permitted where such emissions are controlled to a point where there is no significant loss of amenity for existing land uses, or habitats.
- Similarly; where development would be adversely affected by the emission of pollutants from an existing use; the proposal will only be permitted where the users of the future development are protected from loss of amenity from those emissions in accord with Policy DE1.

### ***Energy generation***

Much progress has been made on developing alternative energy generation via solar arrays and solar farms. Swindon Borough Council owns Public Power Solutions (PPS), a provider of innovative sustainable waste and power solutions. Its aims include development of large-scale solar power generation schemes which benefit the borough and reduce the impact of its power needs on the environment. Its major scheme, the large solar farm at the former Wroughton Airfield commissioned during March 2016, provides 41MW of renewable electricity to 12,000 residents of Swindon and is estimated to cut carbon emissions to atmosphere of around 20,000 tonnes per annum. Other major schemes are being actively developed around the Borough.

### ***Local Transport Plan***

The three key objectives for the Transport Strategy are

- Deliver a vibrant local economy,
- Improve the sense of place,
- Reduce the need to travel.

A number of principles were also agreed to guide the development of the Transport Strategy:

- Encourage short distance trips by walking or cycling,
- Encourage journeys into the town centre,
- Encourage journeys around but within Swindon,
- Provide good access to the strategic transport network.

## **Public transport**

Stagecoach West is based in Gloucester, but has a depot in Swindon and is currently expanding their services within the Borough. The company has invested in new buses to operate the 66 service linking Swindon and Oxford. Stagecoach West operates a fleet of 248 vehicles, and 100% of the fleet meets at least the Euro 3 standard and 55% of the fleet meets the Euro 5 standard.

Thamesdown Transport is based in Swindon and is part of the Go Ahead group of companies. Thamesdown operate a fleet of 92 buses. 100% of the fleet meets Euro 3 standard and 36% of the fleet meets Euro 5 standard. 13 Euro 6 vehicles are due to join the fleet in September 2017 replacing the oldest buses in the fleet. This would mean 50% of the fleet meets Euro 5 standard and 15% meet Euro 6 standards. Thamesdown transport predicts that in the next 18-24 months the fleet will be 100% Euro 5-6 standard vehicles. A higher Euro standard number means that emissions are more tightly regulated. See [here](#) for more information on Euro standards.

Both companies have clear strategies for CO<sub>2</sub> reduction, as well as waste and water recycling.

The Great Western mainline is currently being electrified and Swindon is part of 'Entry Into Service Area 3' (EIS3) and is due to enter electric passenger service in December 2018.<sup>31</sup> These services will be operated by a new fleet of trains that are capable of bi-mode operation (electric traction under the wires, diesel power on sections of the line that are not electrified). These new trains will be phased into operation during 2017/18.

## **Hydrogen Hub**

There are two fuelling stations in Swindon for hydrogen fuelled vehicles (one in East Swindon and one in West Swindon).

## ***Economy***

The recommendations of the economy JSNA<sup>32</sup> also link to air quality and potential for improvements. These include:

- Work in partnership with Network Rail and GWR and other partners to deliver the Swindon Station regeneration project.
- Prepare the new Swindon Transport Strategy (STS) setting out the pipeline of future transport projects on the strategic and local transport networks required to deliver future growth.
- Ensure delivery of the new bus exchange and traffic management proposals identified in the Town Centre Movement Strategy.
- Develop Swindon as a nationally significant player in the UK's energy sector, with particular strengths in the low carbon energy generation sector and application of hydrogen technologies.

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<sup>31</sup> <http://www.railwaysarchive.co.uk/docsummary.php?docID=4895>

<sup>32</sup> <http://www.swindonjsna.co.uk/dna/Economy>

## ***Green Infrastructure***

Green infrastructure is a network of multifunctional green space, urban and rural, which is capable of delivering a wide range of environmental and quality of life benefits for local communities.

Green infrastructure is not simply an alternative description for conventional open space. As a network it includes parks, open spaces, playing fields, woodlands, but also street trees, allotments and private gardens. It can also include streams, canals and other water bodies and features such as green roofs and walls.

Green infrastructure has the possibility of improving air quality in a number of ways including encouraging active travel, a positive food environment using local produce and benefits from certain vegetation as an urban pollutant filter.

Swindon has a Green Infrastructure strategy for 2010-26.

## ***Manufacturing***

The Environment Agency issues permits for the most potentially polluting industrial activities such as large combustion plants or waste operations and scrap yards that could: pollute the air, water or land; increase flood risk; or adversely affect land drainage. Swindon Borough Council permits and regulates other smaller and medium size installations such as smaller combustion plant, solvent and paint spraying installations, and dry cleaners, along with some parts of larger industrial processes such as foundries. The permit under either regime will set out conditions including aspects such as the equipment to be used, monitoring requirements, and defining specific emission limits.<sup>33</sup> The use of permits, and the monitoring and auditing undertaken by the Environment Agency and Council ensure that these processes do not cause excessive pollution. All permitted processes are regularly inspected and audited to ensure that they comply, and significant issues are rare.

All processes are designed to limit pollution as much as is possible, and if issues are sometimes identified these are normally around amenity issues such as odour, and do not give rise to significant pollution.

Smaller processes, and those with less potential for pollution, fall outside of the permitting regime. There are other legislative provisions, such as the Statutory Nuisance regime and Clean Air Act however, which are enforced by the Council's Environmental Health Officers, to ensure that they do not emit excessive pollution.

Industrial and commercial installations in Swindon are not thought to contribute significantly to air quality issues, other than through the road traffic which is associated with their activities.

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<sup>33</sup> <https://www.gov.uk/guidance/control-and-monitor-emissions-for-your-environmental-permit#permit-conditions>

## Evidence for improving air quality – What should we be doing?

National Institute for Health and Care Excellence (NICE) guidance published in June 2017<sup>34</sup> and the Directors of Public Health report from March 2017<sup>35</sup> suggests there are many opportunities for reducing emissions and exposure to air pollution. These include:

### 1. Planning

- Providing charge points for electric vehicles.
- Supporting car sharing schemes or car clubs.
- When 'plan making' consider:
  - Siting and designing new buildings, facilities and estates to reduce the need for motorised travel.
  - Minimising the exposure of vulnerable groups to air pollution.
  - Avoiding the creation of street and building configurations that encourage pollution to build up where people spend time.
- Building energy efficiency,
- Permitting and regulation of certain types of industrial processes, factories and other activities that can cause pollution (Environmental Permitting),
- Location and enforcement of Smoke Control Areas (SCA).

### 2. Development management

- Consider ways to mitigate road-traffic-related air pollution. This could include:
  - Taking action to reduce the number of motorised trips. For instance, by:
    - incorporating air quality outcomes in travel plans,
    - developing local parking plans,
    - supporting car clubs,
    - supporting active travel.
  - Supporting the use of zero- and low-emission vehicles for instance, by providing charging facilities for electric vehicles.
  - Managing street trees and vegetation to reduce the risk of restricting street ventilation, where this may contribute to poor air quality.
- In consultation with local communities, consider including air quality monitoring and measures to reduce road-traffic-related emissions in the Regulation 123 list of funding options for using the Community Infrastructure Levy.

### 3. Clean air zones

- Consider introducing a clean air zone that:
  - includes restrictions or charges on certain classes of vehicle,
  - supports zero- and low-emission travel (including active travel),
  - includes targets to progressively reduce pollutant levels below EU limits and aim to meet World Health Organization air quality guidelines,
  - aims to reduce exposure to air pollution across the whole zone rather than focusing on air pollution hotspots.

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<sup>34</sup> <https://www.nice.org.uk/guidance/ng70>

<sup>35</sup> <http://www.adph.org.uk/2017/03/air-quality-a-briefing-for-directors-of-public-health/>

#### **4. Reducing emissions from public sector transport services and vehicle fleet**

- Driver training,
- Procuring low or zero emission vehicles for public sector fleets,
- Encouraging local bus companies to procure low or zero emission buses for their fleets,
- Encouraging taxi operators to procure low or zero emission vehicles,
- Public and school transport policies.

#### **5. Walking and cycling**

- Provide support for active travel.
- Provide a choice of cycle routes, including routes that avoid highly polluted roads. Ideally use quiet streets or segregated routes.
- Where busy roads are used consider:
  - Providing as much space as possible between the cyclist and motorised vehicles.
  - Using dense foliage to screen cyclists from motor vehicles, without stopping air pollution from dispersing or reducing the visibility or safety of cyclists near junctions. Also take into account concerns about personal safety.
  - Reducing the time cyclists spend at highly polluted sites, including some junctions, where this can be done without increasing the time that other groups spend exposed to poor air quality.

#### **6. Smooth driving and speed reduction**

- Driver training and education,
- Traffic management measures to promote smooth traffic flows
- Tackling congestion and reducing queuing traffic at key junctions.

#### **7. Raising awareness**

Improving air quality in the UK was published in 2015<sup>36</sup> and is a national document for tackling nitrogen dioxide. This sets out the UK plan for tackling nitrogen dioxide by implementing targeted Clean Air Zones. A Clean Air Zone “*defines an area where targeted action is taken to improve air quality and resources are prioritised and coordinated in order to shape the urban environment in a way that delivers improved health benefits and supports economic growth.*”<sup>37</sup>

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<sup>36</sup> [https://www.gov.uk/government/uploads/system/uploads/attachment\\_data/file/486636/air-quality-plan-2015-overview-document.pdf](https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/486636/air-quality-plan-2015-overview-document.pdf)

<sup>37</sup> [https://www.gov.uk/government/uploads/system/uploads/attachment\\_data/file/612592/clean-air-zone-framework.pdf](https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/612592/clean-air-zone-framework.pdf)

An update of the Air Quality Plan published in 2017<sup>38</sup> outlines key action to be taken locally and nationally. As set out in the Clean Air Zone Framework this could include measures such as the following:

- Exploring innovative retrofitting technologies and new fuels,
- Buying ultra-low emission vehicles (ULEVs) and encouraging local transport operators to do the same,
- Encouraging private uptake of ULEVs via ensuring adequate chargepoints,
- Encouraging use of public transport, cycling, walking, park and ride schemes, and car sharing,
- Improving road layouts and junctions to optimise traffic flow,
- Working with local businesses and neighbouring authorities to ensure a consistent approach,
- Charging certain types of vehicles to enter or move within the zone.

The 2017 Air Quality Plan also includes information on current or proposed government initiatives, including:

- Cycling and walking investment strategy.
- Targeted infrastructure investment to increase travel choices. These might include interventions such as:
  - the redesign of local roads to improve traffic flow and reduce idling traffic,
  - the creation of park and ride services,
  - the promotion of infrastructure for electric vehicles,
  - bus and rail improvement measures,
  - the promotion of car clubs,
  - infrastructure improvements for cycling and walking.
- Evaluation of retrofitting initiatives and likely further bus retrofitting grants.
- Targeted scrappage scheme for cars and vans.
- Funding for uptake of electric taxis.
- Energy Saving Trust training on driving styles.

The government will work with Highways England on improving air quality around strategic roads and introducing new measure to tackle NO<sub>x</sub> emissions from medium combustion plants and generators.

The 2017 Air Quality Plan highlights the importance of ULEV given the evidence that Euro Standards to reduce nitrogen dioxide emissions have not reduced levels as much as anticipated.

*“These Euro Standards should have led to major reductions in emissions of NO<sub>2</sub> from vehicles. However, this has proved not to be the case, particularly for diesel vehicles, whose “real world” emissions have proven to be many times higher than lab tests. Diesel vehicles on our roads are causing harmful emissions far above what was assumed and contributing to pollution levels that continue to be damaging to public health. Additionally, the Volkswagen scandal showed that deliberate cheating of the emissions tests was built into some vehicles.”*

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<sup>38</sup> [https://consult.defra.gov.uk/airquality/air-quality-plan-for-tackling-nitrogen-dioxide/supporting\\_documents/Draft%20Revised%20AQ%20Plan.pdf](https://consult.defra.gov.uk/airquality/air-quality-plan-for-tackling-nitrogen-dioxide/supporting_documents/Draft%20Revised%20AQ%20Plan.pdf)



The 2017 Air Quality Plan also includes suggestions to improve wider air quality and these include:

- Farming ammonia grant reduction scheme,
- Reducing emissions from stoves and open fire.

In November 2016 Dr Thérèse Coffey (Defra Minister of State for the Environment and Rural Life) wrote to the leaders, chief executives and directors of public health for 230 local authorities with longstanding air quality challenges across England to better understand the circumstances each authority faces on tackling air pollution and to highlight the need for further action. A total of 163 (71%) of the recipients provided responses either in part or fully.

Themes that emerged in terms of things that have worked well have included:

- Working in partnership with other local authorities, joint-local groups, and at County level.
- Taking forward measures in their air quality action plans, including the development of local and joint-local strategies as having a positive impact on improving air quality in their area.
- Implementation of traffic management initiatives that have contributed towards improving local air quality.
- Locally-developed or improved air quality planning guidance for new developments.

The report highlighted the following key challenges:

- Funding availability, including limited investments and resource.
- Road transport related emissions (particularly from diesel powered vehicles) cited by all respondents, some specifically highlighting poor transport/traffic infrastructure including highways.
- Strategic Road Network/motorways (Highways England).
- Need for redevelopment, including planning issues.
- Conflicting/ competing priorities (balancing economic growth with protecting air quality).
- Limited or no coordinated partnership working particularly among 2 tiered local authorities, also with Highways England.
- Population growth.
- Need for clearer guidance and support from central government.
- Topography/ geography (rural or small).
- Need for behavioural change and modal shift.
- Increase in domestic wood burning and open fires.
- Industrial and other non-road sources of emissions.

## ***Spatial planning***

A recent report from PHE<sup>39</sup> reviewing the evidence between spatial planning and health identified the following key aspects:

- Healthy neighbourhoods
  - Enhance neighbourhood walkability,
  - Build complete and compact neighbourhoods,
  - Enhance connectivity with safe and efficient infrastructure,
- Housing
  - Improve quality of housing,
  - Increase provision of affordable and diverse housing,
  - Increase provision of affordable housing to groups with specific needs.
- Food environment
  - Healthy, affordable food for the general population,
  - Enhance community food infrastructure.
- Natural and sustainable environments
  - Reduce exposure to environmental hazards,
  - Access to and engagement with the natural environment,
  - Adaptation to climate change.
- Transport
  - Provision of active travel infrastructure,
  - Provision of public transport,
  - Prioritise active travel and road safety,
  - Enable mobility for all ages and activities.

The benefits seem from a number of these areas mainly relate to health but for some areas there is a joint benefit of improvement in air quality. These are especially around: healthy neighbourhoods; quality of housing by improving energy efficiency and heating methods; and transport. In relation to these the review identified that compact neighbourhoods (i.e. neighbourhoods with higher connectivity) with diverse land uses mixes and greater residential densities are more conducive to non-motorised transport. For air quality these benefits need to be considered with other evidence-based suggestions for improving air quality to ensure housing is not being situated near roads with high levels of air pollution.<sup>40,41</sup>

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<sup>39</sup>

[https://www.gov.uk/government/uploads/system/uploads/attachment\\_data/file/625568/Spatial\\_planning\\_for\\_health\\_an\\_evidence\\_resource.pdf](https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/625568/Spatial_planning_for_health_an_evidence_resource.pdf)

<sup>40</sup> <https://www.nice.org.uk/guidance/ng70>

<sup>41</sup>

[https://www.gov.uk/government/uploads/system/uploads/attachment\\_data/file/625568/Spatial\\_planning\\_for\\_health\\_an\\_evidence\\_resource.pdf](https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/625568/Spatial_planning_for_health_an_evidence_resource.pdf)

## ***Heating***

A report by WHO<sup>42</sup> into residential heating with wood and coal in Europe and North America concluded that there was evidence linking emissions from wood and coal heating to serious health effects. The results presented in the report indicate that it will be difficult to tackle outdoor air pollution problems in many parts of the world without addressing this source sector. A better understanding of the role of wood biomass heating as a major source of globally harmful outdoor air pollutants (especially fine particles) is needed among national, regional and local administrations, politicians and the public at large.

The report concluded that encouraging fuel switching (away from coal and other solid fuels) and use of more efficient heating technologies (such as certified fireplaces or pellet stoves) can reduce the emissions from residential wood and coal heating devices. Filters may reduce health effects from indoor air pollution. Educational campaigns may also be useful tools to reduce emissions from residential solid fuel heaters. Regulatory emission limits could reduce PM and CO<sub>2</sub> emissions.

Ecodesign directive is an EU regulation, which will become legal in the UK in 2022. It sets much tougher minimum emissions requirements for energy-related products which have an environmental impact, such as wood burning and multi fuel stoves. This means that stove designers and manufacturers will have to make sure that their stoves meet critical limits on a much wider range of PM and emissions, including NO<sub>x</sub> and OGC (Organic Gaseous Carbon) which are derived from incompletely burned combustion gases. The new standards will be much higher than the current levels for Defra Smoke Exempt stoves and apply to all stoves.

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<sup>42</sup> <http://www.euro.who.int/en/health-topics/environment-and-health/air-quality/publications/2015/residential-heating-with-wood-and-coal-health-impacts-and-policy-options-in-europe-and-north-america>

## **Costs**

The King's Fund (2013) found "*The cost-benefit evidence for investing in air quality is substantial. .... The overall benefit-to-cost return was £620 in benefits for every £100 spent.*"<sup>43</sup> Cost-beneficial options for reducing air pollution include measures to encourage people to make more journeys by bike or on foot, and other studies have produced similar findings.

NICE guidance 70 provides a resource impact report and template.<sup>44</sup> These provide estimates for costs and benefits for the recommendations. Economic modelling has been done for some of the recommendations and suggests:

- Low-emission zones could be cost effective; with modelling estimating for every £1 spent potential benefit of £27 may be received.
- Estimated a cost-benefit ratio of £1 for every £14 spent on off-road cycle paths.
- Costs and benefits of other recommendations (planning, development management, reducing emissions from public sector transport services and vehicle fleet, smooth driving and speed reduction, raising awareness) will vary by local area depending on current service provision, design of new interventions and levels of air quality.

The NICE resource impact template gives some indicative costs:

- Standard charge point £1,400-£1,800.<sup>45</sup>
- Bus conversion £18,325.
- Expert testimony suggests that driver training costs £25-30 per driver, with annual fuel saving of £96.

## **Euro emission standards**

Euro emission standards set limits for emissions (PM, NO<sub>x</sub>, CO) for different vehicles. Figure 8 shows the estimated emissions of NO<sub>x</sub> by Euro emission standards. The latest standard, 'Euro 6', applies to new type approvals from September 2014 and all new cars from September 2015.

The Euro 6 standard imposes a reduction in NO<sub>x</sub> emissions from diesel engines (a 67% reduction compared to Euro 5) and establishes similar standards for petrol and diesel vehicles.

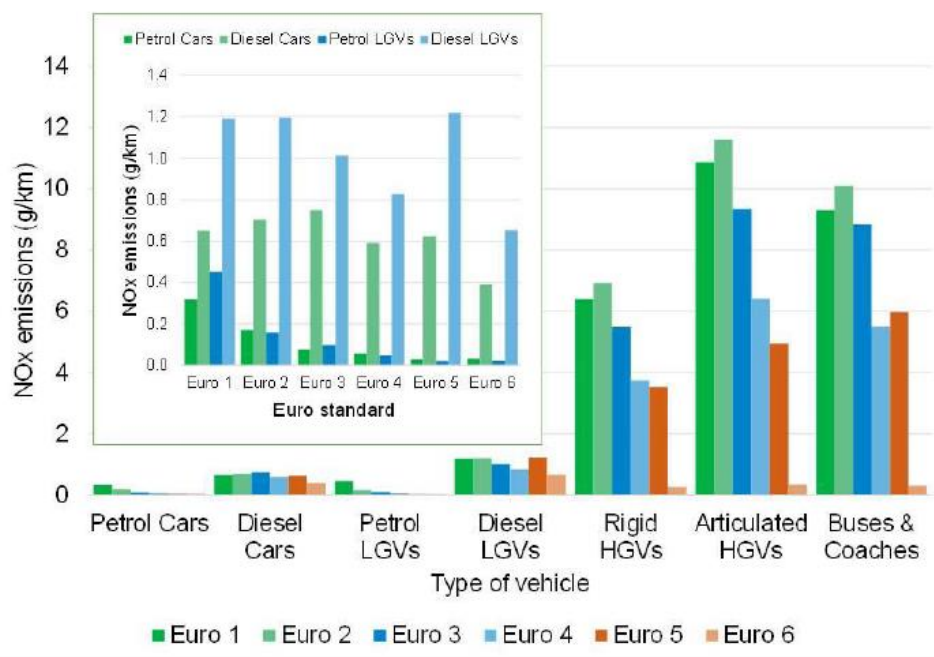
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<sup>43</sup> <https://www.kingsfund.org.uk/publications/improving-publics-health>

<sup>44</sup> <https://www.nice.org.uk/guidance/ng70/resources>

<sup>45</sup> The cost of charge points varies depending on the type. Fast and rapid charge points, which can provide a full charge in 30 minutes), are more expensive (£15,000-20,000).

Figure 8: Estimated emissions of NOx by Euro emission standards (grams per kilometre)



Source: Defra, DfT<sup>46</sup>

Table 3: Euro standard emission levels, g/km.

Standard	Date	Petrol			Diesel		
		Carbon monoxide (CO)	Oxides of nitrogen (NOx)	Particular Matter (PM)	Carbon monoxide (CO)	Oxides of nitrogen (NOx)	Particular Matter (PM)
Euro 3	January 2000	2.3	0.15	no limit	0.64	0.5	0.05
Euro 4	January 2005	1.0	0.08	no limit	0.5	0.25	0.025
Euro 5	September 2009	1.0	0.06	0.005	0.5	0.18	0.005
Euro 6	September 2014	1.0	0.06	0.005	0.5	0.08	0.005

<sup>46</sup> [https://www.gov.uk/government/uploads/system/uploads/attachment\\_data/file/486636/aq-plan-2015-overview-document.pdf](https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/486636/aq-plan-2015-overview-document.pdf)

### ***What has worked in other areas?***

- A number of councils have retrofitted some or all of their vehicles to run on gas fuels. These emit as little as 1/30<sup>th</sup> of the PM as diesel and can have positive impacts of NO<sub>2</sub>. It is also cheaper to run as the fuel costs less.
- Plymouth Hospitals Travel Plan resulted in a reduction in staff arriving by car (from 90% to 54%). The plan included restricted and charged parking permit allocation, supplemented with improved public transport services, discounted public transport tickets and promotion of car sharing.
- City of York Council is retrofitting all the sightseeing buses from diesel to electric. This will not only provide significant improvement in air quality but also reduces fuel costs by £15k a year. The council has also paid to retrofit some passenger service buses, as part of the council's Low Emissions Strategy.
- Oxford City Council and Oxfordshire County Council have implemented a Low Emission Zone for buses in Oxford city centre. A LEZ encourages uptake of less polluting vehicles by banning highly polluting vehicles from highly polluted areas, usually a city centre. In Oxford this has targeted the highly polluting local buses.
- Wandsworth Council reviewed all its Smoke Control Area, merged them into a single borough-wide Smoke Control Area, and put in place a communications campaign locally to raise awareness of the rules.

### ***Grants and funding***

The government draft air quality plan highlights the following possible grants/funding:

- Additional funding to accelerate uptake of hydrogen vehicles and infrastructure through OLEV/DfT.
- Further investment in retrofitting alongside additional support for low emission buses and taxis (DfT/OLEV/Defra).
- Additional funding to accelerate the uptake of electric taxis.
- Regulatory changes to support the take up of alternatively fuelled light commercial vehicles (vans) – within 12 months dependent on outcome of consultation.

There are also some small grants already available to assist with costs around electrical charging points, and some tax incentive for businesses. This is alongside Highways England rolling out electric charge points at all service stations across its network.

## Recommendations

1. Prioritise active and sustainable methods of transport to reduce air pollution from a variety of pollutants. This will lead to improvements in health and wellbeing through increased physical activity and improved air quality. Key elements are to:
  - a. Make sure that walking and cycling are prioritised across the Borough.
  - b. Continue to promote Swindon Travel Choices.
  - c. Apply for funding or grants for active transport when available.
2. Make sure that the vehicles that are travelling through and around Swindon are as clean as possible. To do this there needs to be a move towards zero- and low-emission vehicles. One way to assist with this transition is through applying for available funding and grants to:
  - a. Encourage the switch to ultra-low emission passenger and fleet vehicles.
  - b. Ensure development of electric vehicle infrastructure.
3. Make sure any specific local solutions in areas of higher nitrogen dioxide as identified within the Air Quality Annual Statement report take place.
4. Ensure air quality, including zero- and low-emission travel, is included within key policies such as; Local Plan, Swindon Local Transport Plan, parking standards, Green Infrastructure strategy and Site Masterplans for major developments.
5. Form a multi-agency working group to ensure a focus on priorities in Swindon and a consistent approach which maximises opportunities to improve air quality across the Borough.