Institute for Public Policy Research

IPPR North

ATMOSPHERE

TOWARDS A PROPER STRATEGY FOR TACKLING GREATER MANCHESTER'S AIR POLLUTION CRISIS

"Walk in silence

Don't walk away,
in silence

See the danger

Always danger"

Joy Division

Ed Cox and
Dom Goggins

June 2018

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SUMMARY

The levels of air pollution in Greater Manchester are lethal and illegal.

In groundbreaking new analysis, King's College London (KCL) has estimated that **1.6 million life years will be lost in Greater Manchester** in the coming century due to its poisonous air. This is equivalent to each of us having our life expectancy reduced by six months. Using the 2011 baseline, NO_2 pollution alone was estimated to have caused up to 1,781 premature deaths in Greater Manchester and particulate matter pollution up to 1,906 premature deaths.

Devolution allows the Greater Manchester mayor to take responsibility for this clean air agenda and do more, much more quickly, but national government must act urgently too to give the mayor the tools necessary to save lives and the **£1 billion annual cost to the Greater Manchester economy.**

KEY FINDINGS

While so much attention is given to air pollution in London, **Greater Manchester (GM) in fact has the highest rates of emergency admissions to hospital for asthma in the whole country** – Central Manchester and North Manchester NHS trusts have emergency admissions at double the national average. And evidence shows that the most vulnerable people and those living in disadvantaged areas are at greater risk from air pollution.

A recent World Health Organization (WHO) study shows **Manchester to be the second-worst council in England for PM_{10} pollution** (London lies 22nd). Three out of five sites in Greater Manchester monitoring the more worrying $PM_{2.5}$ pollution currently exceed WHO 'safe limits'.

The cost to the Greater Manchester economy is huge. The KCL study shows that air pollution is costing between £1 billion and £1.2 billion with every single local authority area affected.

Although government and the Greater Manchester combined authority recognises the general problem and is taking incremental steps to be legally compliant, **there is little recognition of the scale or urgency of Greater Manchester's crisis**.

Government modelling – based on just five monitoring sites for the whole city region – badly underestimates the extent of the problem and the prevalence of local hotspots. Greater Manchester's Clean Air Plan is focusing on a handful of congested road 'links', but **more extensive analysis shows a much wider problem across the whole city**.

Despite government predictions of a steady reduction in NO_2 emissions, local authority data shows **NO_2 levels in Greater Manchester are relatively static** with nine out of 10 Greater Manchester council areas having monitoring sites showing annual averages above legal limits of 40 micrograms per cubic metre ($\mu g/m^3$) with some reaching over $65\mu g/m^3$.

There are also **notorious hotspots with staggering exceedances which are not captured by annual average figures**. At the Manchester Oxford Road monitoring station, levels of $200\mu g/m^3$ were exceeded no fewer than 90 times during 2016.

Local snapshot monitoring over two- to four-week periods also reveals the fact that annual averages are masking the extent of NO_2 pollution on busy shopping streets, outside schools and in other densely populated areas.

In Greater Manchester a Low Emissions Strategy and an Air Quality Action Plan have identified a wide range of activities to address air quality problems including measures to reduce congestion, encourage electric vehicles and the use of public transport, and make changes to the bus and local authority vehicle fleet. But current measures seem too little too late. IPPR North analysis suggests that **current measures being considered are unlikely to reduce NO_2 emissions by more than 7.5 per cent**.

Urgent action needs to be taken concerning Greater Manchester's heavily polluting bus fleet. **In GM over 20 per cent of all buses fall into the most polluting Euro 2–3 emission standard** – in London this figure is just 12 per cent. In London 37 per cent of all buses are electric or meet Euro 6 standards, in Greater Manchester this is just 10 per cent.

Even to achieve legal compliance Greater Manchester will need to begin restricting access to the city centre or introducing some form of charging clean air zone in the immediate future. But **legal compliance alone will do little to save many lives and reduce the costs to the public purse and the wider economy**.

KEY RECOMMENDATIONS

Devolution allows the Greater Manchester mayor to take responsibility for the clean air agenda and do more, much more quickly. With the clear objective of achieving legal compliance by 2020, **this report calls on the mayor to speed up the introduction of already planned measures and introduce a charging zone for buses and HGVs and a workplace parking levy scheme by June 2019**.

Beyond this, **this report urges the mayor to pledge to transform Greater Manchester into one of the UK's cleanest cities by 2024** introducing a wider Charging Clean Air Zone and other temporary traffic restrictions with a view to reducing emissions by at least 40 per cent across the city. **These commitments would allow the mayor to pledge that by 2028 Greater Manchester will finally be able meet its commitment to be a WHO BreatheLife city.** This would include a Class D CAZ with car-free Manchester days, cycle-only streets and many car-free neighbourhoods.

In return for such pledges, the Greater Manchester mayor – together with the mayors of Birmingham, Liverpool, London and other city leaders – should demand more urgent action from central government. **This must include a Greater Manchester Clean Air Devolution Deal as part of a much more generous Clean Air Fund; a national, targeted diesel scrappage scheme; and a more robust national framework for monitoring, modelling and health impact assessment.**

Air pollution is a complicated, hidden killer and tackling it takes strong political leadership and tough choices. This report aims to show that, where progress is achieved, all sections of society are engaged in solutions. And so finally **we recommend that the mayor establishes a Clean Air Taskforce**, with representation from public services, business, civil society and most importantly citizens. The taskforce would advise and support the mayor with the long-term goal of making Greater Manchester's air among the cleanest in Europe.

1. INTRODUCTION

Air pollution is now one of the greatest causes of global public health concern as its impact has become more widely known and understood. According to the World Bank, globally air pollution accounts for around 1 in 10 deaths (WB & IHME 2016).

It is an uncontested fact that many parts of the UK suffer from illegal levels of air pollution. The annual mortality burden is equivalent to 40,000 deaths, while the economic cost is estimated to be over £20 billion every year (RCP 2016).

Despite the widespread incidence of air pollution, the overwhelming focus of attention in the UK has been in the capital, London. As the biggest and most congested city in the UK this is hardly surprising. Air pollution in the capital has been estimated to cause the equivalent of up to 9,000 deaths – nearly one quarter of the national estimate (Walton et al 2015). There is a rich and varied literature on London's air quality crisis ranging from academic studies, thinktank reports, government reports, and local strategies and tools such as the London Atmospheric Emissions Inventory place the city at the cutting edge of research and policymaking in attempting to cut harmful emissions.

Air pollution, however, is a significant problem in many other UK cities too. In a recent World Health Organization (WHO) report on ambient air pollution, 31 towns and cities across the UK have been identified as exceeding WHO limits for particulate matter with Salford and Manchester ranked third and fifth worst respectively, compared with London which lies 22nd. The UK government has identified 80 local authority areas where nitogen dioxide (NO_2) emissions are above legal limits and demanded that 45 of these should take urgent action to achieve compliance with EU law. Each of these places is now in the process of developing a clean air plan, with some going further than others in recognising the scale and significance of their local problems as well as attempting to comply with the letter of the law. In comparison with London, however, few have the data analysis, the strategic thinking and coordination or the public leadership and awareness seen in the capital. This has to change.

Greater Manchester, England's largest economic region outside London, suffers from similar air pollution challenges to the capital. Citizens are exposed, some die prematurely and the health of many more is affected. Along with the human cost, this creates a significant economic impact both in terms of costs to public services and damage to the wider economy.

But unlike London, Greater Manchester lacks the strategies and a system to tackle air pollution. The Air Quality Action Plan and it's emerging Clean Air Plan have much to commend them, but, overall, air pollution data in Greater Manchester is not as complete or as well understood as in the capital. This has affected public awareness and, in turn, the extent to which tackling air pollution is seen as a local priority. More radical and urgent action is necessary.

In this report we set out the size and scale of Greater Manchester's air pollution problems with a new analysis of its devastating impact on the health of its residents all around the city region. We consider both national and local approaches to tackling this emergency and explore proposed measures to reduce air pollution levels and bring them within legal limits. However, we also set out a more radical

package of measures that will not only achieve legal compliance, but might put Greater Manchester on the map as a leading city on the international stage with some of the cleanest air in any city across the whole of Europe.

We have written this report not because it is our job, but because Greater Manchester is our home. We love it, we live here, it's in our blood. Our own government knows that the air we breathe is dangerous, but not enough is being done to raise awareness of this or to tackle it with sufficient urgency. We don't think ths is good enough for us or for our own children. We think people in Greater Manchester deserve better, and we think the institutions that govern us – both locally and nationally – can do more. We hope that this report can be part of inspiring them to act.

2. AIR QUALITY IN GREATER MANCHESTER

CHAPTER SUMMARY

- The main forms of air pollution (PM_{10}, $PM_{2.5}$ and NO_2) come from road transport and have a serious impact on human health – 'safe limits' are therefore regulated by the European Commission and the World Health Organization and adopted into UK law.
- Air quality policy in England is currently based upon 'pollution climate mapping' (PCM) which suggests NO_2 levels in Greater Manchester will fall within UK legal limits by 2022 with no 'additional' action – however, the PCM model depends upon limited data sources and typically underestimates pollution levels.
- Even using PCM modelling, the predicted 'life years lost' (mortality impact) of current levels of air pollution is 1.6 million life years lost by 2134 costing the Greater Manchester economy approximately £1 billion per annum.[1]
- More detailed local authority monitoring shows NO_2 levels in Greater Manchester are relatively static with nine out of 10 Greater Manchester council areas having monitoring sites showing annual averages above legal limits for micrograms per cubic metre ($\mu g/m^3$) with some reaching over $65\mu g/m^3$–$25\mu g/m^3$ above the legal limit.
- A recent WHO study shows Manchester to be the second-worst council in England for PM_{10} pollution (London lies 22nd). Three out of five sites in Greater Manchester monitoring the more worrying $PM_{2.5}$ pollution currently exceed WHO 'safe limits'.
- Given the poor air quality, it should not be a surprise that Central Manchester and North Manchester NHS trusts have the two highest rates for emergency admissions for asthma in the whole of the UK.

2.1 WHAT IS AIR POLLUTION?

Air pollution is the general term given to a wide range of airborne substances that can lead to adverse environmental effects and can have severe health impacts both at the local level but also over much wider areas.

There are two broad types of air pollutant: particulate matter in the form of minute particles of dust and liquid droplets suspended in the air; and a wide range of gases including nitrogen oxides, sulphur dioxide, ozone, carbon monoxide and benzene.

The focus of most public health debate at the present time lies with nitrogen oxides and particulate matter as these present the greatest cause for concern due to their high levels in many towns and cities around the world. Table 2.1 describes their main sources and health impacts.

1 2134 is a lifetime after the final figure for projected pollution concentrations in 2030.

TABLE 2.1

The main source of pollutants and their impacts on public health

Pollutant	Main source	Health impact
Particulate matter Typically referred to as particles under 10µm in diameter (PM_{10}) and fine particles less that 2.5µm in diameter ($PM_{2.5}$).	Transport (exhaust, tyre and brake wear), combustion, industrial processes, construction, demolition, natural sources. Also created by the interaction of other pollutants.	Linked to asthma, lung cancer, respiratory and cardiovascular diseases, infant mortality and low birth weight. PM exposure can also lead to growth stunting and mortality in plants and certain forms contribute to global warming. $PM_{2.5}$ is a more serious health concern since smaller particles can travel more deeply into the lungs and cause more harmful effects.
Nitrogen oxides Generally referred to as NO_X but includes nitric oxide (NO) and nitrogen dioxide (NO_2)	Transport, combustion.	NO_2 exposure can lead to lung irritation, decrease lung function and increase chances of respiratory infection. Long-term exposure is associated with low-birthweight babies and excess deaths. NO and NO_2 are precursors to the formation of ozone and acid rain. NO_X can also be deposited into fresh water and land harming biodiversity in sensitive sites.

Adapted from Howard, *Up in the Air* **(Howard 2015)**

Sources of air pollution

There is relatively little accurate data on the sources of air pollution in different towns and cities outside London, although it comes mainly from road transport. Perhaps the most detailed data comes from a 2010 analysis of the London Atmospheric Emissions Inventory (LAEI). This showed that while 82 per cent of NO_X pollution in London was generated within London, 75 per cent of PM pollution came from outside the city. Road transport was responsible for almost half of NO_X and PM pollution, although the modelling is likely to underestimate this source. Buses, HGVs and taxis play a significant role in NO_X emissions with vans contributing especially to PM_{10}. Around 60 per cent of PM_{10} pollution from road transport can be attributed to tyre and brake wear and tear. Domestic and non-domestic gas combustion also make significant contributions to NO_2 emissions. Non-road mobile machines (NRMM) contribute about 10 per cent of NO_X and PM_{10} emissions in Greater London.

In the absence of any more accurate data, it can probably be assumed that there will be a similar pattern in similar monocentric cities such as Greater Manchester.

It is important to note that the impacts of air pollution are not equally distributed. There is evidence to show that health impacts fall disproportionately on children due to schools often being located near busy roads (Howard 2015). There is also evidence to show that air pollution exposure is disproportionately high for deprived communities and particular ethnic minorities (Vaughan 2016).

In response to the negative consequences of air pollution, the World Health Organization (WHO) has published air quality 'guideline values' for concentrations

of these main pollutants. In turn, the European Commission has issued a number of directives which establish standards for key air pollutants.

TABLE 2.2

World Health Organization and European Commission air pollution concentration limits

Pollutant name	Averaging period	Limit	Permitted exceedances (per year)	Deadline	WHO 'safe limits'
NO_2	1 hour	200 µg/m^3	18	January 2010	As per EU values
	1 year	40 µg/m^3	N/A	January 2010	As per EU values
PM_{10}	1 day	50 µg/m^3	35	January 2005 extended January 2011)	As per EU values
	1 year	40 µg/m^3	N/A	January 2005	20 µg/m^3
$PM_{2.5}$	1 year	25 µg/m^3	N/A	January 2015	10 µg/m^3
	1 year	20 µg/m^3	N/A	January 2020	10 µg/m^3

Source: European Commission, 'Air Quality – Existing Legislation' (EC 2016)

Notes: concentration limits are expressed either in the form of an annual average concentration or as a restriction on the number of 'exceedances' over shorter time periods in a whole zone.

It is important to note, however, that in the case of particulate matter (PM), the EC concentration limits are not as stringent as those of the World Health Organization, because both WHO and the Royal College of Physicians have cautioned that as even the very tiniest concentrations of PM can have adverse health impacts, 'no threshold has been identified below which no damage to health is observed' (WHO 2014).

In the UK, the 2008 EC directive was transposed into English law by the Air Quality (Standards) Regulations 2010, with equivalent regulations then adopted in Scotland, Wales and Northern Ireland. At present, it is unclear how air quality standards in the UK will be set and scrutinised after Brexit, but an Environmental Protection Agency, independent of government, has been proposed (HoC 2018).

In general, air pollution in the UK is falling, particularly as regards PM – although both WHO and the RCP suggest there are no 'safe limits' for PM. There has been much slower progress, however, in reducing concentrations of NO_2 largely due to the growth in the number of diesel vehicles during the 2000s. In many parts of the UK, NO_2 levels remain above legal limits, although forward projections suggest that many areas will improve substantially by 2020 as vehicle emissions standards improve. However, as shown later in this report, questions remain about the accuracy of current modelling, and other trends might counteract any vehicle improvements. For example, it is unclear how different forms of decentralised combined heat and power (CHP) generation might affect air quality, and there are significant uncertainties around non-road mobile machinery (Howard 2015). A recent paper in the *Lancet*, however, has suggested that predicted reductions in NO_2 could be offset in some areas by the growth in bioenergy CHP stations (Markandya et al 2018).

2.2 AIR QUALITY STATISTICS IN GREATER MANCHESTER

A growing number of cities across the developed world now have good-quality data on air pollution, much of which is made available to the public in real time and open source for the purposes of analysis and public awareness. In London, for example, the London Atmospheric Emissions Inventory[2] contains datasets on a wide range of pollutants at 20m grid scale, emissions by vehicle type at link level, concentration maps, methodological details and even GIS files.

In Greater Manchester air quality data is very much more limited. In part this is due to a lack of effective monitoring – a vital subject we will address later in this report – but even the data that does exist is not easily available or held in an accessible way. The GreatAir Manchester website[3] carries relatively recent data[4] on various pollutants from 14 monitoring sites across Greater Manchester, but its data archive has no data since 2013 and the most recent report of the Greater Manchester Emissions Inventory (EMIGMA) dates back to 2010. Transport for Greater Manchester (TfGM) and some local authorities do make some data available to interested parties, but the most up-to-date information tends to be available only after freedom of information requests from campaigning groups.

Government PCM modelling

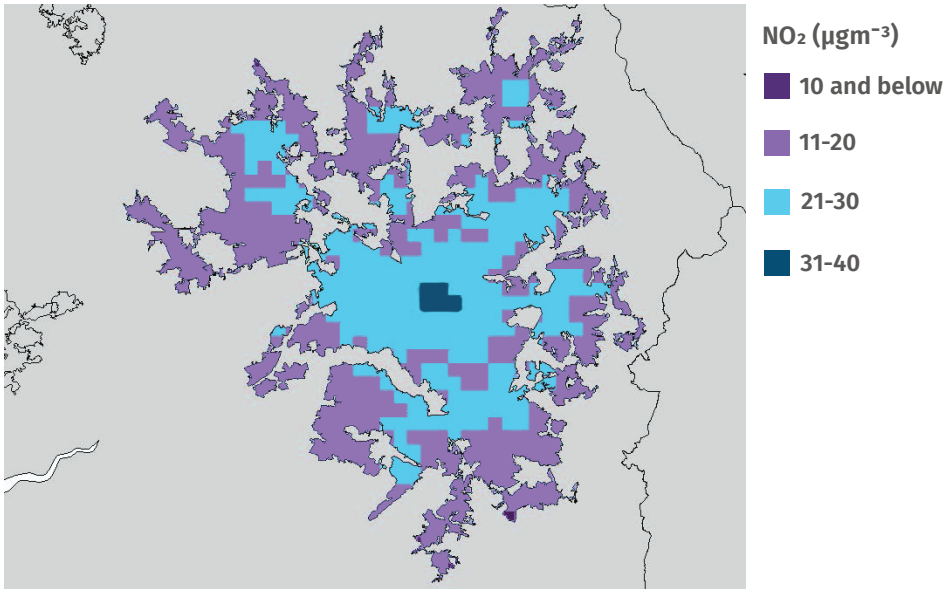
Official government statistics focus exclusively on NO_2 emissions and their most recent assessment is set out in a report published in July 2017 called *Air Quality Plan for tackling roadside nitrogen dioxide concentrations in Greater Manchester Urban Area* (DEFRA/DfT 2017). This assessment was based on 2015 data from five monitoring sites located in Manchester Piccadilly, Bury, Shaw, Salford (Eccles) and Manchester South (Cheadle). Data was then modelled to calculate roadside emissions on major roads across Greater Manchester.

This modelling shows that 'there were no *measured* exceedances of the annual limit value in this zone in 2015' and 'there were no *modelled* background exceedances of the annual limit value' as shown in figure 2.1 (ibid, authors' emphasis).

2 See https://data.london.gov.uk/dataset/london-atmospheric-emissions-inventory-2013
3 See http://www.greatairmanchester.org.uk/default.aspx
4 In some cases there is data for the past 24 hours but it depends on the monitoring site.

FIGURE 2.1

Map of modelled background annual mean NO_2 concentrations 2015

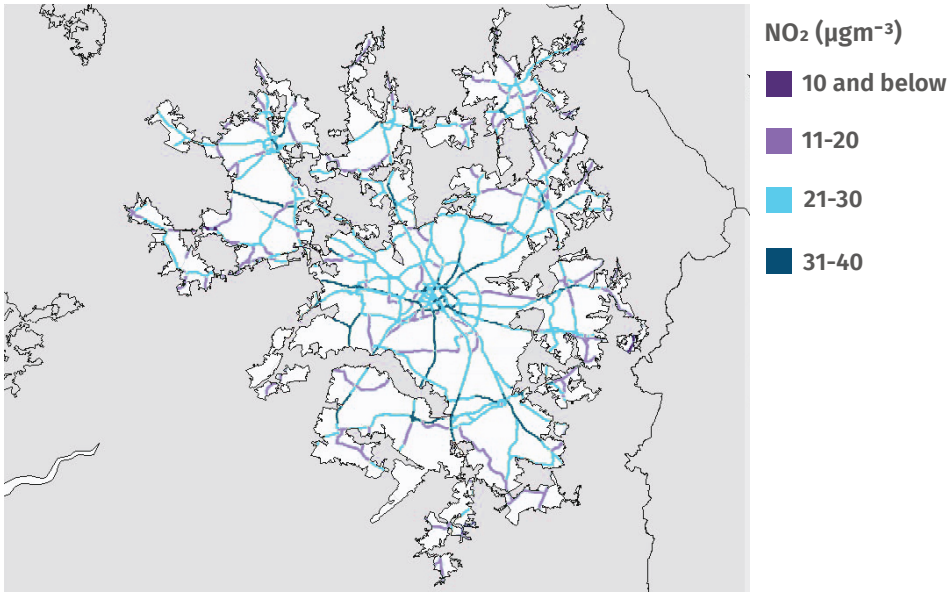


Source: Department for Environment, Food & Rural Affairs and Department for Transport, *Air Quality Plan for tackling roadside nitrogen dioxide concentrations in Greater Manchester Urban Area* (DEFRA/DfT 2017)
Note: Modelled exceedances of the annual limit value are shown in orange and red.

However, the modelling did indicate that '90.8 km of road length was modelled to exceed the annual limit value' as shown in figure 2.2.

FIGURE 2.2

Map of modelled roadside annual mean NO_2 concentrations 2015



Source: Department for Environment, Food & Rural Affairs and Department for Transport, *Air Quality Plan for tackling roadside nitrogen dioxide concentrations in Greater Manchester Urban Area* (DEFRA/DfT 2017)
Note: Modelled exceedances of the annual limit value are shown in orange and red.

The report goes on to project NO_2 levels for each year from 2017 to 2030 based upon traffic activity projections to 2020 and beyond. The report states 'the model results suggest that compliance with the NO_2 annual limit value is likely to be achieved by 2022 under baseline conditions' (ibid). As a result of this, in a report to the Manchester City Council Executive in January 2018 the city council stated:

> *"Further joint work is currently underway between Greater Manchester and the Government to clarify the extent of the road network where specific actions will be required to meet legal requirements. The published Plan forecasts that a stretch of the Mancunian Way and a stretch of the M60 close to Princess Parkway close to the M60 will fail to comply with legal limits by the required date."*
> MCC 2018

A further nine road 'links' in the rest of Greater Manchester were also identified as likely to fail to comply. But to deduce from this that Greater Manchester's air pollution problem is confined to a handful of small stretches of road would be ill-advised. It is important to note that in its recent Strategic Transport Plan, Transport for the North predicts that in a 'transformed north scenario', road traffic could increase by as much as 54 per cent by 2050 (TfN 2018). Clearly, not all of this will be heading into Greater Manchester, but even in lower-growth scenarios road traffic is predicted to increase by as much as 25 per cent. Furthermore, pollution climate mapping (PCM) modelling notoriously underestimates levels of air pollution (see box) as it draws upon limited data and, by modelling at large scales and only for major roads, it fails to pick up the fine grain of pollution hotspots. For this reason it is important to complement national data with that collected by local authorities.

The problems of PCM modelling

There is wide-ranging concern that the pollution climate mapping model that government uses to measure air pollution in the UK significantly underestimates the problem. At the simplest level, it depends upon too little data from too few monitoring sites. For example, the PCM model uses data from just five monitoring sites for the whole of Greater Manchester. More technically, government predictions about reductions in NO_2 over time would appear to be overestimates compared with other studies and the emerging reality (AQC 2016) and more significantly, the model has a greater tendency to underpredict for high concentrations close to 40µg/m^3 (35–45µg/m^3) than it does overall (McHugh and Karyampa 2016). Oxford city council, for example, has demonstrated that its own local monitoring and mapping shows significantly higher than the government's PCM model[5] and there is increasing academic evidence of widespread flaws in the Local Air Quality Management (LAQM) approach (see Barnes et al 2018).

Local authority air pollution data

Local authorities collect air pollution data from over 250 monitoring sites around Greater Manchester. The monitoring sites vary in terms of their type (automatic/non-automatic), function (urban traffic, urban background, suburban, rural, etc), and the different pollutants they monitor but it is possible to build up a far more comprehensive picture of air pollution in the city region using their data than that used by the government's more limited PCM model.

5 See https://www.oxford.gov.uk/downloads/file/4004/letter_on_air_quality_05102017

Nitrogen oxide pollution

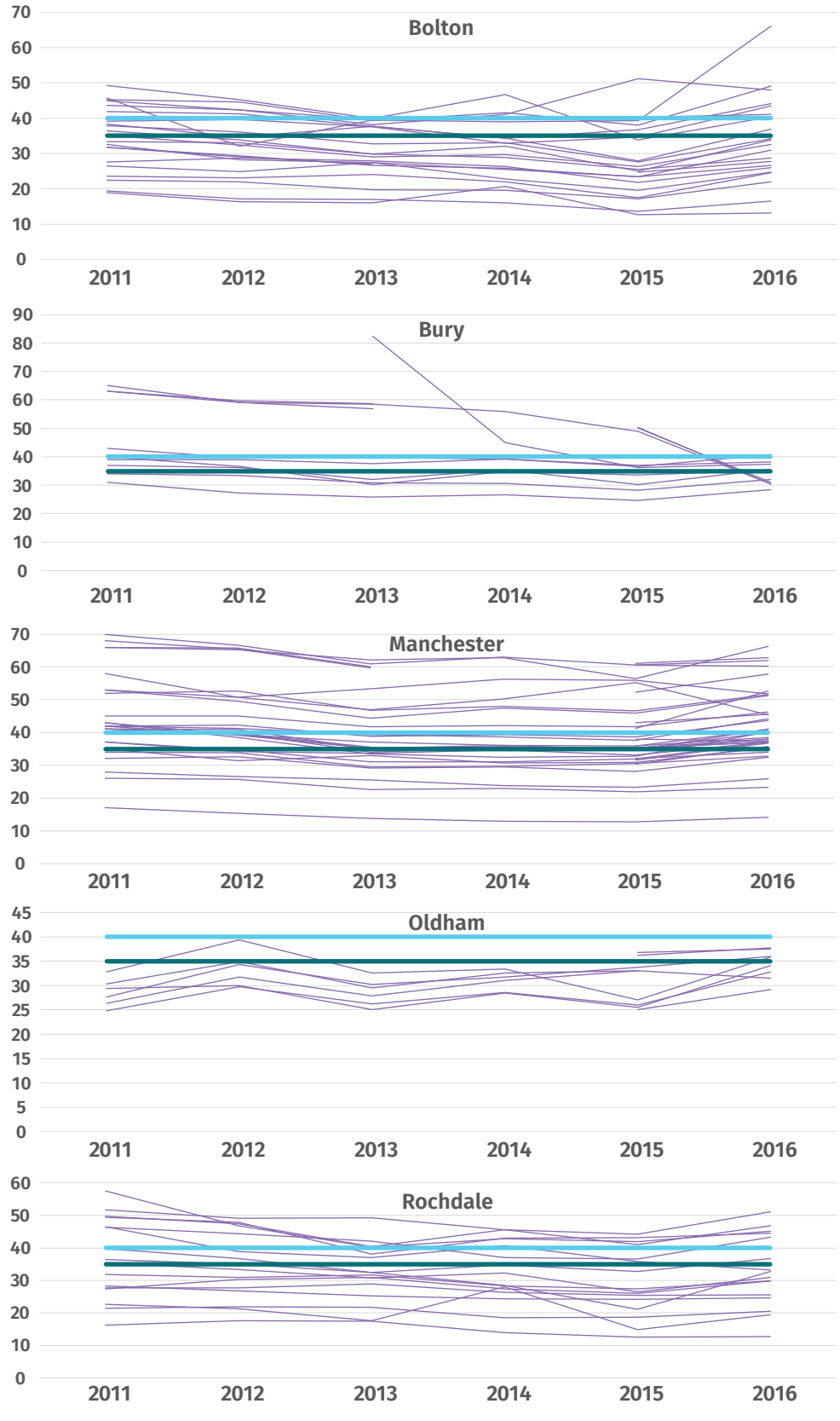
Figure 2.3 shows the annual mean concentrations of NO_2 pollution in each of the 10 local authority areas between 2011 and 2016. Each is marked to show the 40µg/m^3 legal limit and the 35µg/m^3 'precautionary limit' set in the Greater Manchester Air Quality Action Plan. A number of observations can be made from these charts.

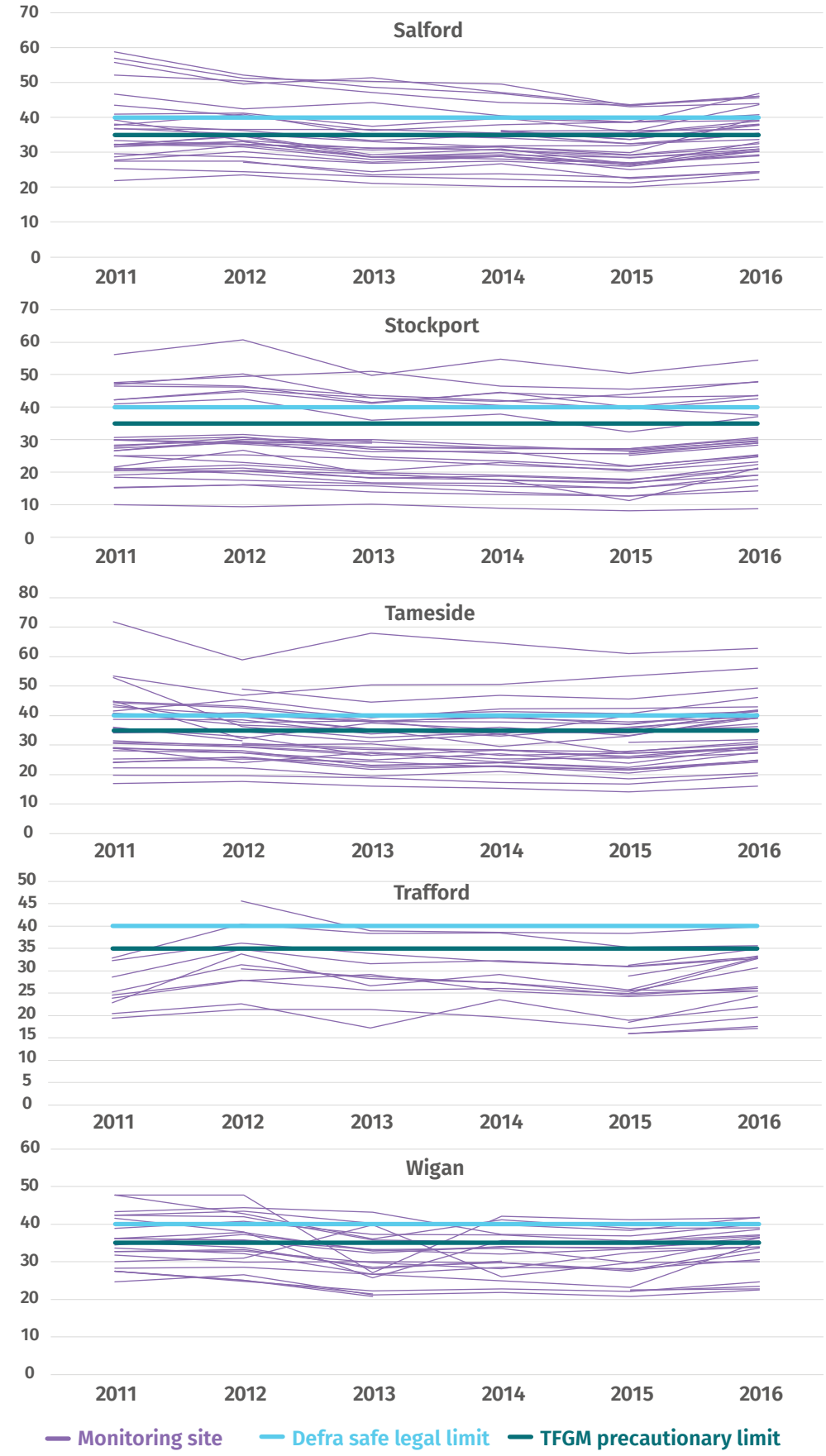
- There are 63 monitoring sites across Greater Manchester where in 2016 NO_2 emissions were **above the legal limit.**
- In local authorities like Manchester and Salford – but also Rochdale, Stockport and Tameside – more than one-third of monitoring sites are above legal limits. **Nine out of the 10 local authority areas had at least one site with annual averages higher than legal limits**. Trafford is the only local authority area which has no monitoring site with an illegal annual average for 2016.
- Despite reductions in a few places, **NO_2 concentrations across Greater Manchester are largely static and** the **predicted reductions are much less than might be expected**.
- Between 2011 and 2016 the maximum annual average is 64.5µg/m^3 but 17 sites across four different local authorities have 2011–16 averages of over 50µg/m^3. Using the most recent data from 2016, the maximum average annual mean is 66.2µg/m^3, but eight separate sites have annual averages higher than 60µg/m^3 and 17 higher than 50µg/m^3.
- **Of the 149 'urban traffic' monitoring sites over one-third (58) exceed the legal limits and two-thirds (97) exceed the precautionary limit** set out by the Greater Manchester combined authority (see figure 2.4).

FIGURE 2.3

Levels of NO_2 pollution in Greater Manchester local authorities

Average annual NO_2 concentrations from all monitoring sites in each local authority area



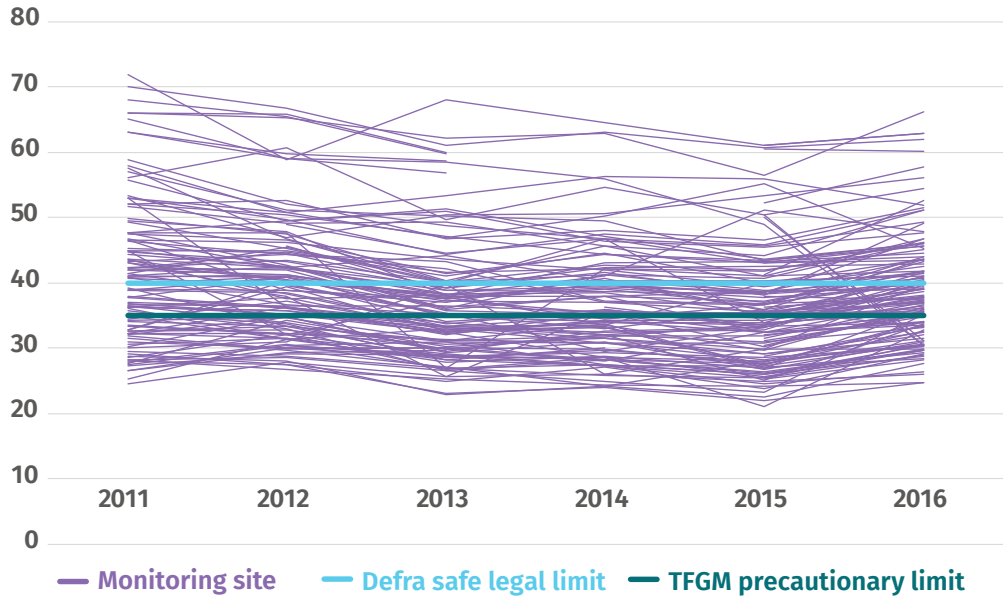


Source: Greater Manchester local air quality monitoring data

FIGURE 2.4

Levels of NO_2 pollution in more congested parts of Greater Manchester

Average annual NO_2 concentrations in urban traffic monitoring sites in Greater Manchester 2011–16



Source: Greater Manchester local air quality monitoring data

Alongside annual mean concentrations of NO_2 pollution, it is also important to assess how often particular locations have hourly mean exceedances of greater than 200µg/m³. At the Manchester Oxford Road monitoring station this legal limit was exceeded no fewer than 90 times during 2016.

Particulate matter

Levels of PM_{10} in Greater Manchester are only measured in 16 sites across Greater Manchester and they are lower than the legal limit of the annual mean concentration of 40µg/m³. In most locations they are also declining, albeit slowly.

However, as already noted, it is broadly considered that there are no 'safe limits' for particulate matter pollution and the WHO guidelines suggest a lower level of 20µg/m³. Using this measure, three different sites in Greater Manchester are at or above the WHO limit and 10 out of 16 sites had levels of 17µg/m³ or above in 2016.

WHO guidelines also suggest that there should be no more than 35 occasions per annum where the 24-hour mean concentration of PM_{10} exceeds 50µg/m³. Although nine out of 16 monitoring sites did experience >50µg/m³ exceedances, the worst places were Manchester Oxford Road (16) and Salford M60 (13).

As regards $PM_{2.5}$, across the only five sites where this is measured, levels are within the UK/EU legal limit of 20µg/m³ annual mean concentrations, but three out of these five sites exceed the WHO guidelines of 10µg/m³.

It is unsurprising then that in a recent WHO report on PM_{10} air pollution, Manchester was placed second-worst place in the UK (excluding Gibraltar), significantly above London which ranked 22nd worst in the UK (BBC 2018).

2.3 HEALTH IMPACT OF AIR POLLUTION IN GREATER MANCHESTER

In order to better understand the health impacts of air pollution in Greater Manchester on its population, IPPR North commissioned King's College London (King's) to study the mortality burdens and impacts associated with current and future pollution levels as well as the economic cost to the city region. King's has previously carried out similar studies for other cities, including London, and its methodology uses local authority data from the Department of the Environment, Food and Rural Affairs' (Defra) Local Air Quality Monitoring website (LAQM), which is then combined with relationships between concentrations and health outcomes for each local authority in the city region. This is the first time any health impact assessment has been carried out with this rigour and uses the most up to date and accurate methodology available. The full report is available separately (Dajnak at al 2018). The results are a significant cause for concern.

As air pollution can shorten lives over the long term, in this case, between 2011 and 2134 the results are expressed as life-years lost (one life year is one year for one person) across the whole population.

While the results were calculated for both NO_2 and $PM_{2.5}$, there is an overlap between them, so for pragmatic reasons we have chosen not to add them up (as has sometimes been reported about London), but instead take the higher of the two values in order to represent human exposure.[6]

- Greater Manchester past and projected air pollution concentration changes from 2011 to 2030 were estimated to lead to 0.6 to 1.6 million life years (one person living for one year) lost by 2134, if further action is not taken to reduce air pollution. At the upper estimate this could be as high as 2.2 million life years lost.
- This can also be represented as a loss in life expectancy from birth in 2011 of around two to six months for every person born in 2011 in Greater Manchester.
- Nonetheless, the impacts of the projected future changes[7] in air pollution concentrations is an improvement over 2011 concentration levels remaining unchanged with the population in Greater Manchester gaining around 930,000 life years over a lifetime when the predicted change is taken into account.

It is possible to estimate the economic costs associated with the health impacts in the first point above:

- the annualised monetary costs of the health impacts of the projected future changes in air pollution concentrations from 2011 to 2030 has been estimated to be as much as £1 billion per annum (in 2014 prices) – at the upper estimate this could be as high as £1.2 billion.

It is also possible to calculate the mortality 'burden' of air pollution in Greater Manchester. Burden calculations are a snapshot of the burden in one year; they are intended as a simpler calculation than the more detailed assessments that are given above and do not reflect the impact over many years.

- Using baseline data from 2011, the total mortality burden of anthropogenic $PM_{2.5}$ is estimated to be equivalent to 1,459 attributable deaths in 2011. At the upper estimate this could be as high as 1,906.
- In the past, for London, the results were presented as a range from $PM_{2.5}$ alone to the sum of the $PM_{2.5}$ and NO_2 results. Since then it has become clearer

6 These calculations should be regarded as alternative ways of showing the effects of the pollution mixture, with NO_2 representing the effects of traffic pollution and $PM_{2.5}$ best for representing the overall mixture including some of the traffic pollution effects. The results are thought to overlap substantially but not completely. Thus, each one alone is an underestimate to some extent. Taking the higher value follows COMEAP 2017.

7 Projected future changes use the standard PCM model predictions from 2015 and not the wider measures set out later in this report.

that the overlap is likely to be substantial, and that traffic pollutants such as $PM_{2.5}$ might account for some of the effects attributed to NO_2. For this reason, these figures should not be added as has been done in media reporting about London. Nonetheless the total mortality burden of NO_2 is provided as well for completeness and has been estimated to be equivalent to 1,132 attributable deaths in 2011.[8] At the upper estimate this could be as high as 1,781.

The King's modelling also considers each of the 10 local authorities in Greater Manchester. These results are summarised in tables 2.3 and 2.4.

TABLE 2.3

Life years lost across the local authorities and GM population for anthropogenic $PM_{2.5}$ (without cut-off)

Local authority	Concentration does not reduce from 2011 levels			Predicted concentration between 2011 and 2030		
	Central estimate	Lower estimate	Upper estimate	Central estimate	Lower estimate	Upper estimate
Bolton	236,206	159,371	311,233	162,938	109,851	214,860
Bury	156,294	105,444	205,957	101,506	68,423	133,873
Manchester	562,094	379,571	740,016	368,816	248,765	486,126
Oldham	208,696	140,850	274,903	135,801	91,563	179,061
Rochdale	188,515	127,232	248,322	122,354	82,497	161,330
Salford	243,459	164,378	320,571	160,086	107,967	211,024
Stockport	224,848	151,783	296,122	148,290	99,998	195,499
Tameside	198,516	133,903	261,642	130,292	87,819	171,854
Trafford	182,309	123,086	240,060	121,221	81,755	159,794
Wigan	256,186	172,813	337,631	186,743	125,892	246,267
GM	2,457,123	1,658,431	3,236,457	1,638,047	1,104,530	2,159,688

Source: Dajnak et al, *Greater Manchester Health and Economic Impact Assessment study*, **(Dajnak et al 2018)**

8 Note that the concentration-response function has changed from that used for calculations in London.

TABLE 2.4

Life years lost across the local authorities and GM population for anthropogenic NO_2 (without cut-off)

Local authority	Concentration does not reduce from 2011 levels			Predicted concentration between 2011 and 2030		
	Central estimate	Lower estimate	Upper estimate	Central estimate	Lower estimate	Upper estimate
Bolton	173,845	61,126	276,864	90,488	31,767	144,326
Bury	119,597	42,052	190,466	60,037	21,076	95,761
Manchester	474,071	167,008	753,631	243,068	85,410	387,358
Oldham	158,155	55,639	251,745	81,491	28,614	129,950
Rochdale	139,045	48,911	221,351	69,811	24,512	111,332
Salford	207,526	73,094	329,963	103,194	36,255	164,475
Stockport	168,046	59,133	267,433	90,573	31,810	144,404
Tameside	151,597	53,288	241,493	78,990	27,727	126,001
Trafford	142,132	50,036	226,097	72,932	25,618	116,268
Wigan	176,032	61,863	280,486	90,935	31,915	145,079
GM	1,910,046	672,150	3,039,529	981,519	344,704	1,564,954

Source: Dajnak et al, *Greater Manchester Health and Economic Impact Assessment study*, **(Dajnak et al 2018)**

As might be predicted from the air quality monitoring data in the previous section, all council areas are projecting over 100,000 life years lost at the central estimate for $PM_{2.5}$ pollution but with the three worst affected local authorities – Manchester, Salford and Wigan – together projecting nearly 1 million life years lost at their upper estimates. NO_2 pollution data shows a similar distribution across Greater Manchester.

Finally, table 2.5 shows the estimated annualised economic impact for different local authority areas. This shows that in Manchester, for example, the economic cost of $PM_{2.5}$ pollution could be more than £250 million per annum at the upper estimate.

TABLE 2.5

Lower and upper annualised economic impact estimate (in 2014 prices) across the local authorities and GM population for anthropogenic $PM_{2.5}$ and NO_2 (without cut-off)

Zone	Anthropogenic $PM_{2.5}$		NO_2	
	Predicted concentration between 2011 and 2030		Predicted concentration between 2011 and 2030	
	Lower estimate	Upper estimate	Lower estimate	Upper estimate
Bolton	£71,629,372	£119,293,195	£40,915,722	£68,141,979
Bury	£45,017,051	£74,972,427	£27,421,362	£45,668,163
Manchester	£155,796,302	£259,466,727	£105,043,816	£174,942,375
Oldham	£59,284,381	£98,733,565	£36,486,809	£60,765,966
Rochdale	£53,988,953	£89,914,438	£31,672,210	£52,747,624
Salford	£69,247,961	£115,327,139	£45,957,433	£76,538,560
Stockport	£66,790,243	£111,233,999	£41,918,527	£69,812,074
Tameside	£57,856,692	£96,355,859	£35,991,016	£59,940,262
Trafford	£53,842,802	£89,671,035	£33,339,469	£55,524,315
Wigan	£83,775,621	£139,521,836	£42,009,734	£69,963,972
GM	£717,229,378	£1,194,490,220	£440,756,097	£734,045,290

Source: Dajnak et al, *Greater Manchester Health and Economic Impact Assessment study*, **(Dajnak et al 2018)**

2.4 AIR POLLUTION AND ASTHMA

According to Asthma UK, more than 5.4 million people in the UK are receiving treatment for asthma. More than 1 million of those in treatment are children. There is an asthma attack every 10 seconds in the UK and on average, three attacks per day are fatal. Two in every three of these deaths are preventable.[9]

Air pollution is an asthma trigger. Two-thirds of people with asthma say poor air quality makes their asthma worse. The particles found in fumes are small enough to enter the lungs quickly, easily irritating asthmatic lungs and triggering asthma symptoms. Pollution also makes those with asthma more sensitive – and more likely to react – to conventional asthma triggers such as pollen and dust. These factors significantly increase the chances of those with asthma suffering an attack because of air pollution.[10]

Alongside increased risk of emergency for existing asthmatics, there is a growing body of work linking air pollution to the development of asthma, especially in children. A recent study from the University of Leeds' Institute for Transport found that as many as 38 per cent of new child asthma cases each year could be attributable to air pollution, with 24 per cent directly linked to vehicle emissions (University of Leeds 2018).

The correlation between air pollution hotspots in Manchester and asthma emergencies are too strong to ignore and are a significant cause for concern.

Of all the clinical commissioning group (CCG) areas in England, Central Manchester is the worst in the country for asthma emergencies by a considerable distance. Emergencies in Central Manchester in 2015–16 (the latest available figures) were more than double the national average and significantly higher than any other area.

North Manchester is second worst in England, more than 35 per cent higher than the national average. Three of the worst 10 CCG areas in England for emergency asthma admissions are in Greater Manchester. In fact, all but three of the CCG areas covering Greater Manchester are above the national average.

2.5 SNAPSHOT MONITORING AROUND GREATER MANCHESTER

The problem with all of the analysis above is that it works on 'average concentrations' and modelling over relatively broad areas or zones such as 1km by 1km grids, wards or even local authority areas. Although PCM modelling identifies important road 'links' where pollution is estimated to be high and certain monitoring sites are located in key locations, the averaging or modelling of data fails to take sufficient account of the prevalence of air pollution hotspots.

This is recognised by the European Commission and in its 2008 directive it states, 'compliance should not be determined nor assessed as an "average" of concentrations measured in different locations within the same zone' (EC 2016).

Very little is being done to monitor hotspots in Greater Manchester, although voluntary groups have undertaken a series of neighbourhood-based studies. Friends of the Earth in Manchester has carried out extensive snapshot analysis at a range of sites in Manchester and Stockport using the same rigorous methodology as most local authorities.[11] This work has identified 33 locations which were above legal limits including two sites that had more than double the legal limit.

9 Facts and stats from Asthma UK: see https://www.asthma.org.uk/about/media/facts-and-statistics/

10 See https://www.asthma.org.uk/advice/triggers/pollution/

11 NO_2 monitoring tubes are located on lampposts at a height of 2–2.5m for 2–4 weeks. They are analysed and bias adjusted by Gradko International – the laboratory that processes NO_2 monitoring tubes from many local authorities.

TABLE 2.6

Manchester Friends of the Earth snapshot studies data[12]

Location	NO_2 snapshot value ($\mu g/m^3$)	Month	Year
Stockport: St Mary's Way	106.24	March	2015
Manchester: Fairfield Street	96.1	April	2017
Rusholme: Oxford Road	77.7	March	2015
Levenshulme: 709 Stockport Road	72.41	July	2017
Manchester: Stephenson Square	70.31	May	2017
Levenshulme: 847 Stockport Road	70.16	July	2017
Rusholme: Oxford Road/Claremont Road	68.55	March	2015
Manchester: Rochdale Road/Swan St	68.34	May	2017
Fallowfield: Birchfields Road	64.74	March	2015
Fallowfield: Wilsmlow Road/Furness Road	64.57	March	2015
Manchester: Newcastle Street (2 week NO_2 tube)	62.90	Oct	2016
Levenshulme: 256 Broom Lane	61.57	July	2017
Stockport: St Mary's Way / Hall Street	59.84	March	2015
Manchester: Deansgate/Quay St Near Sainsburys Local	58.76	May	2017
Didsbury: Princess Rd, by St Ambrose School	58.69	Jan	2018
Openshaw: Ashton Old Road / Falconwood Way	58.68	March	2015
Manchester: Deansgate (LP15) Opp Kendals/Waterstones	56.41	May	2017
Openshaw: Ashton Old Road/Rylance Street	55.36	March	2015
Stockport: St Mary's Way/Carrington Rd	53.87	March	2015
Stockport: St Mary's Way/Hall Street	52.13	March	2015
Manchester: New Wakefield Street	51.60	May	2017
Levenshulme: Albert Road – Littleways	51.50	July	2017
Stockport: St Mary's Way	50.05	March	2015
Manchester: Deansgate opp BetFred/Lloyd St (LP25)	49.87	May	2017
Fallowfield: Wilsmlow Road/Brighton Grove	47.22	March	2015
Openshaw: Ashton Old Road/Alan Turing Way	46.56	March	2015
Manchester: Sandy Lane/Barlow Moor Rd by Chorlton Church	45.15	Jan	2018
Openshaw: Ashton Old Road/Pottery Lane	44.32	March	2015
Rusholme: Oxford Road/Great Western St	44.24	March	2015
Manchester: Stretford Rd opp cafe (new development) Lampost 13	43.87	April	2017
Stockport: St Mary's Way	43.41	March	2015
Manchester: 114 Barlow Road	42.24	July	2017
Manchester: Grange School	40.16	Jan	2018

Source: Adapted from Manchester Friends of the Earth data

12 A map setting out all of the Manchester Friends of the Earth data – together with 2016 local authority LAQM data – is available here: https://www.google.co.uk/maps/@53.4978615,-2.4449994,11z/data=!3m1!4b1!4m2!6m1!1s14R3SOBXbd2WtKVNnWsbttH-ZBXs?hl=en&authuser=0

It is interesting to compare a number of locations where snapshot surveys and local authority monitoring sites are very closely located. In many of these the snapshot levels are significantly higher than the annual average figures. Table 2.7 sets out a number of examples.

TABLE 2.7

Comparison of snapshot monitoring and LAQM annual average NO_2 concentrations

Location	FoE Snapshot	LAQM Annual Average		
		2017	2016	2015
Levenshulme: Stockport Road (75)	72.41	48.33	51.54	46.52
Didsbury (by St Ambrose School) (37)	58.69	43.11	46.25	41.78
Ancoats: Angel Street / Rochdale Road (85)	68.34	58.54	57.78	52.21

Source: Adapted from Manchester Friends of the Earth data

Significantly, none of these examples are identified as 'PCM links' requiring urgent action by Defra to bring below legal limits.

Although such studies are 'unofficial' they add weight to the argument that PCM modelling and local authority averages are likely to be underestimating the scale of air pollution problems in many hotspots around the city region. If nothing else, they demonstrate the urgent need for more effective and comprehensive monitoring than currently exists.

3.
AIR QUALITY POLICY AND ITS CRITICS

CHAPTER SUMMARY

- The UK government is required by the European Commission to produce a national air quality plan which sets out the UK's air quality objectives and recognises that action at national, regional and local level may be needed, depending on the scale and nature of the air quality problem.
- The government's 2017 Air Quality Plan delegates responsibility for preparing air quality plans to 23 local authorities, including Greater Manchester, which will deliver compliance with legal limits for NO_2 in the shortest possible time but asks them to first consider whether there are other equally effective options which don't involve Charging Clean Air Zones.
- Greater Manchester had adopted a commendable Air Quality Action Plan in 2016, but this has been superseded by urgent action to develop a Clean Air Plan to deliver legal compliance. A 'strategic outline case' has been submitted to the Joint Air Quality Unit (JAQU) but this has not been released to the public.
- During his election campaign, Greater Manchester mayor Andy Burnham appeared to rule out the possibility of a Charging Clean Air Zone for Greater Manchester, but more recently conceded that there may need to be certain vehicle restrictions in the city in return for greater support from central government.

3.1 NATIONAL POLICY CONTEXT

Air pollution rules in the UK date back to 1273, when the use of coal in London was limited because excessive winter use was deemed to be 'prejudicial to health'. It is only since 2010, however, that better science, policy developments and lengthy legal battles have combined to build greater urgency around the issue.

EU legislation

Action to manage and improve air quality is largely driven by EU legislation. The 2008 ambient air quality directive (2008/50/EC) sets legally binding limits for concentrations in outdoor air of major air pollutants that impact the public – this includes PM_{10}, $PM_{2.5}$ and NO_2.

The 2008 directive replaced nearly all the previous EU air quality legislation and was made law in England through the Air Quality Standards Regulations 2010, which also incorporates the 4th air quality daughter directive (2004/107/EC) that sets targets for levels in outdoor air of certain toxic heavy metals and polycyclic aromatic hydrocarbons. Equivalent regulations exist in Scotland, Wales and Northern Ireland.

UK policy and legislation – national and local

The environment secretary has responsibility for meeting the limit values in England. The same department coordinates assessment and air quality plans for the UK as a whole, even though day-to-day responsibility for meeting air quality limits is devolved to the national administrations in Scotland, Wales and Northern Ireland.

The UK government and the devolved administrations are required under the Environment Act 1995 to produce a national air quality strategy. A draft Clean Air Strategy has been published for consultation in May 2018 (Defra 2018). This complements the plan for tackling roadside emissions of NO_2 published in July 2017 (see below). The strategy sets out the UK's air quality objectives and recognises that action at national, regional and local level may be needed, depending on the scale and nature of the air quality problem.

Part IV of the Environment Act 1995 and Part II of the Environment (Northern Ireland) Order 2002 requires local authorities in the UK to review air quality in their area and designate air quality management areas if improvements are necessary. An air quality action plan describing the pollution reduction measures must be put in place. These plans contribute to the achievement of air quality limit values at local level.

Legal interventions

In 2010 the formal deadline passed for EU member states to comply with legal limits for NO_2 concentration levels set under the directive to protect human health. Thereafter, any breach of the limits must be met by air quality plans designed to achieve compliance 'in the shortest time possible'.

For the purposes of the directive, the UK is split into 43 zones and clusters. Eight years on from the deadline, the UK continues to breach legal limits in 37 out of 43 zones.

Since 2011, environmental law organisation ClientEarth has been on a lengthy journey through every level of the UK courts seeking to secure clean air across the UK. In April 2015 the Supreme Court found the environment secretary to be in breach of the directive and ordered an updated Air Quality Plan be prepared to achieve NO_2 limits as soon as possible.

In December 2015, Defra published an updated plan, but it had a range of problems and in November 2016 – following a judicial review challenge again brought by ClientEarth – the High Court ordered Defra to publish a modified Air Quality Plan. This judgment gave a detailed and definitive ruling on the proper interpretation of the obligations flowing from the EU directive and, in particular, the requirement in Article 23 that air quality plans must be prepared to achieve compliance 'in the shortest time possible'.

A final revised Air Quality Plan for tackling roadside emmissions of NO_2 was published in July 2017. Defra's own evidence indicates that implementing Clean Air Zones (CAZs) – in which vehicles that do not meet minimum emissions standards are charged to enter, is likely to be the quickest route to compliance. However, the 2017 Air Quality Plan delegates responsibility for preparing air quality plans to 23 local authorities (LAs) - in addition to the five mandated in 2015 - and asks LAs to first consider whether there are other equally effective options which don't involve CAZs. Defra, therefore, directed 23 LAs to undertake feasibility studies 'in accordance with the HM Treasury's Green Book approach', to identify the option which will deliver compliance with legal limits for NO_2 in the shortest possible time.

The 2017 Air Quality Plan did not require action to be taken in 45 additional local authorities, which are currently in breach of the NO_2 limit values. Their reasoning was that it will take up to three years to put in place a CAZ, so in these 45 LAs where compliance is predicted to be achieved by 2021, no further action is needed.

On 21 February 2018, following another judicial review by ClientEarth, the High Court declared the 2017 Air Quality Plan unlawful in that, in its application to the 45 local authority areas, it did not contain measures sufficient to ensure substantive compliance with the EU directive or the information necessary to

comply with the directive (that is, the measures and timelines for bringing about compliance). The High Court granted a mandatory order requiring the urgent production of a supplement to the 2017 Air Quality Plan to ensure that feasibility studies and plans to address NO_2 exceedances are developed in an additional 33 local authority areas. The measures identified in these areas are likely to be quicker to implement and more localised than CAZs.

Brexit

UK policy and legislation to tackle air pollution originates in Europe, and is still underpinned by European institutions. Only the threat of action – and sanction – under European law allowed Client Earth to take the UK government to court. It is inconceivable that Brexit will not have an impact in this area. Allowing policy, legislation, funding or accountability mechanisms to weaken would wilfully expose the public to greater risk. That cannot be allowed to happen. It is vital that government releases sufficient powers and resources for local and combined authorities to reduce human exposure to air pollution, with the country's new environmental watchdog equipped with the right powers to ensure this is achieved. This includes legal mechanisms, which would best be delivered through comprehensive environmental protection legislation that establishes the right governance and institutions that will enforce existing EU law and new targets in any future UK environmental law.

Joint select committee report

ClientEarth's litigations, highlighting the overall cost of air pollution in terms of public health and public money, brought four parliamentary select committees together to launch an inquiry into improving air quality during 2017 (HoC 2018). The chairs of the transport, health, environment and environmental audit committees conducted a comprehensive, cross-departmental review of air quality data, legislation, policy, expertise and civil society views. Citing the UN Special Rapporteur's alarm that 'the UK government continues to flout its duty to ensure adequate air quality and protect the rights to life and health of its citizens' – they described air pollution as a national health emergency and called for national leadership and consensus-building to bring about a step change in how the problem of air quality is tackled.

The joint committee's central recommendation was to place the protection of public health and the environment, rather than technical compliance or political convenience, at the centre of air quality policy. The committee also called for a properly resourced national air quality support scheme available to all local authorities struggling with air pollution, and the introduction of a new Clean Air Act to improve existing legislation and enshrine in UK law the right to clean air.

3.2 AIR QUALITY POLICY IN GREATER MANCHESTER

In April 2017, Greater Manchester became the UK's first WHO and UN Environment BreatheLife city region. This has committed the city to being a forerunner in the global movement to tackle air pollution and meet WHO targets by 2030. A number of the local authorities in Greater Manchester have also signed up to the UK100 Cities movement – this involves them pledging to devise plans to achieve 100 per cent clean energy at city/local level by 2050 that are ambitious, cost effective, and take the public and business with them.

These commitments came on the back of a significant Low Emission Strategy and a more detailed Air Quality Action Plan 2016–2021 both published in 2016. The latter cited its primary objectives as:

- air quality across Greater Manchester will improve
- low-emission behaviours will have become embedded into the culture of our organisations and lifestyles by 2025
- we will support the UK government in meeting and maintaining all EU thresholds for key air pollutants at the earliest date to reduce ill-health in Greater Manchester (GMCA 2016).

The strategy identifies a series of 'key priority areas' based on dispersion modelling where annual mean concentrations of NO_2 exceed legals limits. Further analysis identifies key priority areas for cars, buses and HGVs.

The strategy also identifies three key performance indicators (KPIs): reducing traffic; increasing efficiency (reducing congestion); and improving fleet; however, no particular targets are set against these KPIs or key priority areas.

The majority of the action plan then details nearly 40 separate action areas against the following themes:

- development control and planning regulation – including a full appraisal of options for a Clean Air Zone
- freight interventions – including provision for urban distribution centres and alternative fuels
- bus interventions – including bus priority programmes and a trial of low emission vehicles
- car interventions – including a 'Plugged-in-Places' programme for rolling out electric vehicle charging points
- travel choices and cycling initiatives
- information and resources – including awareness-raising schemes and a database of air quality monitoring data and information.

(Further details of many of these measures are set out in the following chapter).

However, since July 2017 and the publication of Defra's Air Quality Action Plan, most policy attention has turned to the urgent development of the government-mandated Air Quality Plan. Technically, legal complicance is the responsibility of each of Greater Manchester 10 local authorities, but Defra has instructed Greater Manchester combined authority (GMCA) that its Air Quality Plan must be developed in three stages – the first stage being a 'strategic outline case' (SOC) which identifies measures to reduce the NO_2 concentrations to below legal levels at least as quickly as a charge-based Clean Air Zone.

The SOC was submitted to the Joint Air Quality Unit at the end of March 2018, but at the time of writing GMCA would not place the submission in the public domain. However, some details of the short list of measures being considered for the SOC

are set out in a report to the Manchester City Council Executive Committee on 31 January 2018. These are detailed in the following chapter.

The level of sensitivity about air pollution in Greater Manchester is related strongly to the 2008 referendum on whether to introduce a congestion charge in the city. The idea was rejected by 79 per cent of voters (53 per cent turnout) but was also the source of significant tensions between council areas. For this reason, Greater Manchester mayor Andy Burnham pledged to 'publish a new plan to tackle congestion and commission an urgent review of the condition and configuration of our busiest roads', but ruled out the possibility of a congestion charge.[13]

However, in more recent weeks, he has mooted the possibility of placing some restrictions on the most polluting vehicles in Greater Manchester. He has stated that:

> *"We had a debate about a congestion charge here, and we are not going back to a debate about a mass charge for the public. Could we begin to restrict the movement of certain vehicles in the areas where the air quality is unacceptably poor and damaging people's health? I certainly feel we should. Maybe starting with the most polluting HGVs, but then perhaps moving to other vehicles"*
>
> **Andy Burnham, Moving North conference 12 April 2018**[14]

Significantly though, in the same speech, the mayor highlighted the importance of the role of national government in supporting local authorities to take the necessary action:

> *"This is where the partnership with the government comes into play, because I don't want to punish people who have bought diesel cars and vehicles in good faith. A few years ago everybody was being told that that was an environmental move, but I think if we are going to be bold at this level it needs to be matched by government to give people the incentives to move to the vehicles that wouldn't be banned from a clean air zone"*
>
> **Andy Burnham, ibid**

Economic growth in Greater Manchester

Air pollution causes damage to the population that carry direct financial costs – both in terms of lost GDP associated with shorter lives, and the health and social care costs associated with treatment (see table 2.5, section 2.3). However, the causes and consequences are part of a wider economic story. Congestion – which is a major factor in air pollution levels breaching legal limits – makes journeys in Greater Manchester on average 38 per cent longer than they should be, with drivers losing an average of eight working days per year sitting in traffic. Congestion costs for local businesses run into the hundreds of million pounds each year, even before factoring in data showing that more unhealthy workers are less productive. These figures relate to 2018 – by 2040, there will be 800,000 more journeys each day across Greater Manchester. Failing to tackle air pollution and its causes now will cause significant long-term damage to Greater Manchester's economic potential.

13 Technically there is a significant difference between a congestion charge and a Clean Air Zone but these are regularly confused (this will be considered in more detail in chapter 4).

14 See https://www.airqualitynews.com/2018/04/13/burnham-outlines-ambition-for-manchester-caz/

4.
WHAT CAN BE DONE?
AIR QUALITY MEASURES AND THEIR IMPACT

CHAPTER SUMMARY

- There is much to be learned from the bold initiatives taken in cities all around the world. In almost all cases these have involved strong leadership from a mayor or national political leader.
- There is a wide range of measures that could be introduced to mitigate air pollution in Greater Manchester, ranging from: Charging Clean Air Zones and other restrictions on road transport; to changes to vehicle types to reduce emissions; to secondary measures such as encouraging the use of public transport and other public awareness campaigns.
- Despite the lack of hard evidence for the impact of any particular primary or secondary measures, it is estimated that the measures currently being considered in Greater Manchester Air Quality Plan are unlikely to reduce air pollution by much more than 10 per cent. This will barely achieve legal compliance let alone the level of reductions necessary to significantly improve public health.
- Greater Manchester's bus fleet is a particular cause for concern with nearly 40 per cent of the worst polluting types (compred with 10 per cent in London) and with less than 1 per cent of buses conforming to Euro 6 or electric vehicle standards (compared with nearly 40 per cent in London).
- If Greater Manchester is to take seriously its air pollution crisis and seek to halve its current emissions then it will need to introduce a Charging Clean Air Zone and other more radical measures.

4.1 APPROACHES FROM ELSEWHERE

There is much to be learned about tackling air pollution from cities around the world that have recognised the scale of their problems and started to take action to reduce its impact. This section highlights a few notable examples.

London – a comprehensive, mayor-led approach

London has been the primary focus of commentary and initiatives focused on reducing human exposure to air pollution. Air pollution is certainly better understood in London than in other parts of the UK, including Greater Manchester. Monitoring, and live resident-focused reporting is dramatically better in the capital, with an associated package of measures owned by the mayor and being delivered by City Hall. These measures include:

- from 2018, all new double ducker buses will be hybrid, hydrogen or electric – the entire bus fleet will be emission free by 2037
- from 2019, 12 new low emission bus zones and the world's first Ultra Low Emission Zone
- a new Toxicity ('T') Charge of £10 for the most polluting vehicles
- a massive rollout of cycling and walking infrastructure

- initiatives to help Londoners make better choices, including a Cleaner Vehicle Checker for those buying new cars and a Clean Air Route Planner to help find residents find the least-polluted journeys
- London is also working with Siemens to use 150 new monitoring sites across the city as a smart forecasting tool, providing residents with early warnings for periods of up to three days – with an error range of less than 10 per cent.

Paris – changing transport

Paris bans cars in many historic central districts at weekends, imposes odd-even bans on vehicles, makes public transport free during major pollution events and encourages car- and bike-sharing programmes. A long section of the Right Bank of the river Seine is now car-free and a monthly ban on cars has come into force along the Champs-Elysées.

Copenhagen – active transport

Copenhagen prioritises bikes over cars and now has more cycles than people. The city calculates that one mile on a bike is worth 27p ($0.42) to society, while one mile in a car is a 15p ($0.20) loss. Large parts of the Danish capital have been closed to vehicles for decades and the city plans to become carbon neutral by 2025.

Beijing – rapid transition

Beijing has a long way to go, but a four-year, $120 billion drive has reduced air pollution in the Chinese capital by as much as 40 per cent.[15] This is a reduction three or four times faster than measures in the United States under the 1970 Clean Air Act. Shifting from coal to natural gas in industrial and domestic settings has been a major driver of progress.

New York City – clean heat

A 2008 study found that oil-based heating systems in buildings across New York created more dangerous air pollution than the combined number of cars and trucks. The NYC Clean Heat programme helped 2,700 buildings convert to cleaner fuels. As a result, over 250 tons of particulate matter ($PM_{2.5}$) has been removed from New York City's air since fall 2011, which is the equivalent of removing over 800,000 vehicles from the road for an entire year. The NYC Department of Health and Mental Hygene estimates that these save 780 lives per year and prevent 1,600 emergency room visits each year. This is a 25 per cent reduction in all health incidents attributed to air pollution.

There are good case studies from cities and regions all over the world. The common denominator in delivering progress on reducing air pollution in different places has been that decisions that are owned at the highest political levels shape strategies and initiatives that are based on good quality data. In London, Paris and New York, mayors have become activists – prioritising progress of a hidden killer, placing information in the hands of citizens, putting in place ambitious and imaginative solutions, and making themselves accountable for progress. In China, the president is the figurehead of the country's 'war on pollution'. Greater Manchester can learn from these examples of activist leaders. In order for progress to be sustainable, it is vital that the Greater Manchester mayor recognises this and has a unique opportunity to bring all sections of society together with urgency to tackle a problem that harms us all.

15 See http://www.greenpeace.org/eastasia/campaigns/air-pollution/solutions/

4.2 MEASURES FOR TACKLING AIR POLLUTION IN CITIES

Section 3.1 set out the legislative and policy responses by both the European Commission and by national government. Alongside these, the EU has introduced emissions standards known as 'Euro Standards' to regulate emissions from new petrol, diesel and gas vehicles with a progressive tightening of limits for emissions of both PM_{10} and NO_x. The highest standards (Euro 6 for cars and Euro VI for heavy-duty vehicles) were intended to help bring emissions within legal limits and represent a key reason why there is a predicted fall in concentrations of NO_2 and PM_{10}. But the switch to diesel vehicles since 2001, together with manipulation of emissions testing by vehicle manufacturers, means that vehicle emissions standards have been systematically undermined. King's College London has demonstrated that Euro 5 diesel cars in practice emit more than five times the Euro 5 emissions limit and more even than the Euro 1 limit (Howard 2015).

At the local level, there is a wide range of measures that can be taken to tackle air pollution including both primary and secondary measures. Table 4.1 sets out some of the most commonly cited interventions.

TABLE 4.1

Primary and secondary interventions to reduce air pollution

Primary measures	
Clean Air Zones (a defined area for targeted action to reduce air pollution) and parking charges	
Charging Clean Air Zone	Vehicles are charged for entering a particular zone through automatic number plate recognition (ANPR). Levels of charging are determined locally, but government has proposed a framework for different types of zone with restrictions on different types of vehicle as follows: • Class A – Buses, coaches, taxis and private hire vehicles (PHVs) • Class B – Buses, coaches, taxis, PHVs and heavy goods vehicles (HGVs) • Class C – Buses, coaches, taxis, PHVs, HGVs and light goods vehicles (LGVs) • Class D – Buses, coaches, taxis, PHVs, HGVs, LGVs and cars
Non-charging Clean Air Zone/ Low Emissions Neighbourhoods	These tend to be areas where there is a focus for action in a designated area in order to raise local awareness and introduce other primary and secondary actions set out below. Specific schemes can include campaigns for parking and charging infrastructure; car pooling schemes; specific grants for innovative projects; and geofencing (zone which activates the electric mode of hybrid vehicles).
Parking Charges	These can range from differential charges for different vehicle types or at different times of the day through to an extensive workplace parking levy (WPL) scheme whereby businesses are charged for the number of parking places they provide to employees. A successful WPL scheme has been introduced in Nottingham.
Vehicle Interventions	
Retrofitting and replacing vehicles	Measures can be taken to replace or retrofit the most polluting vehicles with cleaner alternatives. From a public policy perspective there are three obvious targets for such an approach: • bus fleets – replacing or retrofitting older vehicles with hybrid and fully-electric buses through setting stringent targets for emissions standards in bus contracts • taxis and private hire vehicles – again, replacement or retrofitting can be enacted through tightening licensing, but also through promotions, grants and other incentive schemes • public sector vehicle fleets – the public sector (police, NHS, local authority) can lead by example in replacing its own vehicles and potentially making requirements on sub-contractors to sign up to local accreditation schemes (see below).

Depot fuelling	There are a number of lower-emission fuel types, including electricity, hydrogen, gas and liquid air, where fuelling infrastructure could be provided in strategic locations particularly for commercial and public sector vehicle fleets.
Incentivising electric vehicles	Alongside the retrofitting measure above, there is a range of measures that can encourage the uptake of electric vehicles: • EV charging infrastructure is vital to support public adoption of EVs and requires strategic investment and coordination • EV car sharing clubs can also transform car usage and reduce the amount of driving as well as overall car ownership • Diesel scrappage schemes – providing grants to motorists to replace diesel vehicles with lower-emission alternatives – can provide a powerful incentive but may be best exercised at a national scale.
Secondary Measures	
Traffic management	
Road capacity/ junction improvements/flow optimisation	This involves changing road space allocation, junction operations or traffic signal timing in order to suppress latent demand and reduce congestion in particular hotspots.
Access restrictions	This very simply involves reducing or prohibiting access to particular roads or areas through time-limited closures, pedestrianisation, yellow and red lines, or through other forms of restriction.
Travel choices	
Use of public transport	The provision of better public transport is key to reducing dependency on private vehicles. Measures to increase public transport usage might include improvements to services; subsidised fares; bus stop and station accessibility improvements; and a public awareness campaign.
Active travel options (walking & cycling)	As with public transport, active travel can be increased by improvements to cycling and walking infrastructure and public campaigns to promote healthy travel options.
Smarter driving	Emissions can be reduced by 'smarter driving' – for example, to reduce engine idling or excessive acceleration or braking. Such schemes can be introduced as part of training for fleet drivers but also as part of public awareness campaigns.
Freight and delivery campaigns	Voluntary recognition schemes can be run to encourage freight operators to seek the most clean and efficient routes and vehicles. Such schemes could also incentivise out-of-hours deliveries which can involve win–win gains for local businesses.

4.3 MODELLING THE IMPACT OF POLLUTION REDUCTION MEASURES

There have been very few studies which have attempted to model the effectiveness of local measures to reduce air pollution in the UK. Most have focused on the impact of the Ultra Low Emission Zone (ULEZ) – London's name for a clean air zone. Transport for London has published estimates of NO_X reductions delivered through other measures (TfL 2014). These vary for different parts of the city and are summarised in table 4.2.

TABLE 4.2

Estimated reductions in NO_x emissions in London

Measure	Per cent NO_x reduction		
	Central	*Inner*	*Outer*
Existing ULEZ (equivalent to Class A CCAZ)	51	16	10
Future LEZ (Class A plus)	0	1	0
Smarter traffic management and regulation	1	2	2
Behaviour change campaigns	Captured in smarter traffic measures above		
Driving the uptake of low emission vehicles	1	2	2
Transforming the bus fleet	0	6	5
Zero-emissions taxi fleet	Captured in ULEZ calculations		
Zero-emissions public vehicle fleet	Captured in ULEZ calculations		
Low emission neighbourhoods	1	1	1

Source: Adapted from TfL 2014

To date, however, there is very little systematic methodology in the UK for calculating the impact of different measures on reducing air pollution and the government is expecting that those authorities developing Clean Air Plans will each carry out local modelling as they develop their 'outline business cases' later this year.

4.4 MEASURES FOR GREATER MANCHESTER

In the Greater Manchester Air Quality Action Plan 2016–21 there is a very comprehensive list of 'Air Quality Actions' including:

- development control and planning regulations
- car, bus and freight interventions
- travel choices and cycling initiatives
- information and resources.

Many of these are commendable and will deliver significant benefits in the medium–long term; very few, however, will have the urgent, transformational effect required to tackle the immediate air pollution crisis.

For this reason, the Greater Manchester Air Quality Plan strategic outline case (SOC) has shortlisted a more limited list of measures focused upon reducing roadside emissions of NO_2. There is as yet no modelling in the public domain concerning the impact that any of these measures will have; although based on the work carried out by Transport for London it is possible to put very rough estimates on many of the measures. It is also important to note that with some measures the benefits are likely to be captured by others.

TABLE 4.3

Estimated impact of emissions reduction measures in Greater Manchester

SOC measure	Type	Estimated emission reductions in worst-affected areas
Differential parking charges	Primary	1%
Retrofit/upgrade of public transport fleet	Primary	2%
Increased capacity of public transport	Secondary	1%*
Depot fuelling stations (gas to liquid fuels)	Primary	Captured by SOC measures 2 and 6
Electric vehicle charging points	Primary	1%
Improve local authority fleet	Secondary	<0.5%
Congestion plan – traffic management including signal optimisation	Secondary	1%*
Taxi incentives to change to EV/ULEV	Primary	0.5%*
LPG refuelling infrastructure for taxis	Secondary	Captured by SOC measure 8
Communications campaign	Secondary	Captured by SOC measures 1, 3 and 12
Travel choices/active travel programme	Secondary	Captured by SOC measures 1, 3 and 12
Active travel infrastructure	Primary	0.5%*
TOTAL IMPACT		**7.5%**

Note: *There are significant questions as to how quickly these benefits could be achieved.

Source: Adapated from Transport for London, *Transport Emissions Roadmap* (TfL 2014) with authors' estimations

Greater Manchester's bus fleet

Greater Manchester has one of the most polluting bus fleets of any city in the UK. According to TfGM data gathered by Manchester Friends of the Earth, GM's bus fleet comprises vehicles with the following diesel engine standards:

Engine Standard	Number of Buses	Percentage of GM bus fleet (2017)	Equivalent percentage for London bus fleet (2017)
Euro 2–3	887	20.0	11.8
Euro 4	344	17.6	16.5
Euro 5	946	52.0	35.2
Euro 6 & eev	15	10.4	36.5

Since 2013, new buses have been required to have engines that meet the Euro 6 standard. This has a nitrogen oxide (NO_x) limit 80 per cent lower than for Euro 5 engines and is therefore better for air quality. However, in 2016, only 10 per cent of the Greater Manchester bus fleet were fitted with Euro 6 engines with just three buses being fully electric compared with over 500 in London.

Our informed estimate then of the sum total of these measures is that they are likely to reduce NO_x emissions by a meagre 8 per cent. This could possibly ameliorate air pollution in the two problematic 'PCM Link' routes, but it is unlikely to mitigate air pollution across Greater Manchester and may even fail to comply with any new 'target determination' likely to be applied by Defra later in the year.

For this reason, Greater Manchester must consider a range of other measures to go further and faster. Table 4.4 sets out a series of more radical proposals together with a further estimation of their potential impact.

TABLE 4.4

Further proposals for NO_x emissions reduction measures in Greater Manchester

Measure	Description	Ambition for NO_x emissions reduction measures in Greater Manchester (central – outer areas)
Charging Clean Air Zones		
Class A	Buses, coaches, taxis and private hire vehicles (PHVs)	15%–10%
Class B	Buses, coaches, taxis, PHVs and heavy goods vehicles (HGVs)	20%–15%
Class C	Buses, coaches, taxis, PHVs, HGVs and light goods vehicles (LGVs)	30%–20%
Class D	Buses, coaches, taxis, PHVs, HGVs, LGVs and cars	40%–30%
Bespoke GM CCAZ	Based upon known vehicle movements in and out of the city centre and/or other zones	40%–30%
Other more radical measures		
Car-free Manchester days	A ban on private cars entering the city centre on weekends and/or high-pollution days and/or particular days of the week – linked to free/subsidised public transport on such days	15%–10%
Temporary access restrictions	For example, closing Deansgate or Portland Street from 7–10am and from 4–7pm. Each local authority could consider its own local hotspots.	15%–15%
Cycle-only streets	Extending Oxford-Road type pedestrianisation & cycle schemes into other parts of the city centre and/or other local authority hotspots.	10–5%
Car-free streets/ neighbourhoods	Scheme offering free public transport passes, cycles and 'nearby' car parking facilities to a whole street or neighbourhood prepared to forego on-street parking	5–5%
Workplace parking levy	Additional levy for businesses with 5 or more parking places in city centre and other parts of the city region	10–5%

5.
A ROADMAP FOR GREATER MANCHESTER

5.1 A TIMETABLE FOR CHANGE

If the Greater Manchester mayor, together with the public authorities responsible for transport, health and other public services in this city, take seriously the health of Greater Manchester's citizens, then they cannot be satisfied with achieving compliance with the limited approach being adopted by the UK government to tackle roadside NO_2. Greater Manchester deserves better.

Our analysis of the measures currently being considered for Greater Manchester's Clean Air Plan suggests that a 9.5 per cent reduction of NO_2 on key routes is not enough, particularly when taking into account the legal stipulation that compliance must be 'likely', not just possible. Greater Manchester needs to go further and faster.

If we are to take seriously the mayor's pledge to become a WHO BreatheLife city region, Greater Manchester must take more radical steps not only to bring NO_2 down to within safe limits, but also to tackle PM_{10} and $PM_{2.5}$ both in the city centre and beyond. To this end we propose a phased approach, as set out in table 5.1.

TABLE 5.1

A phased approach to tackiling air pollution in Greater Manchester

Phase	Benchmark	Goals	Measures	Outcome
1. 2018–20	Defra Air Quality Plan compliance	Reducing NO_2 to below legal limits at least as quickly as a CCAZ1*	As set out in the GMCA Air Quality Plan SOC and Air Quality Action Plan 2016–21** plus Class B CAZ and workplace parking levy	15–20% reduction in NO_2 emissions – c.0.3m life-years saved and £200 million benefit to the economy
2. 2020–24	UK100 front-runner	In top quartile of UK100 cities for NO_2 and PM_{10} emissions	As Phase 1 plus: Implementation of a Class C CAZ and some additional temporary access restrictions	30–40% reduction in all air pollution – c.0.75m life-years saved and £500 million benefit to the economy
3. 2024–30	WHO BreatheLife City	In top 10% of global cities for $PM_{2.5}$ emissions	As phases 1 and 2 plus: Class D CAZ with car-free Manchester days, cycle-only streets and car-free neighbourhoods	55–65% reduction in all air pollution – c.1m life-years saved and £750 million benefit to the economy

Notes: *The Defra 'Primary Critical Success Factor'; **This includes a full CAZ appraisal.

5.2 OUR RECOMMENDATIONS FOR URGENT ACTION

In order to deliver this ambitious approach we recommend that the Greater Manchester mayor not only recommits to achieving legal compliance with the UK government's air quality legislation by 2020, but also to the WHO and UN Environment BreatheLife city region objectives and achieving the more stringent WHO 'safe limits' by 2030 or before.

We also recommend that he assumes overall personal responsibility for air quality in Greater Manchester, and asserts a stronger leadership role in demanding urgent action from Transport for Greater Manchester and the 10 councils and in increasing awareness of the health impact of air pollution among the general public.

And we recommend that he makes three practical pledges.

1. To speed-up the review of Charging Clean Air Zone schemes, vehicle access restrictions, car-free days and other more radical measures with a view to introducing restrictions on HGVs and some buses by June 2019, the implementation of a Class C CAZ during the next mayoral term from 2020–2024, and even more radical measures thereafter.
2. To take urgent and radical action to address the terrible state of Greater Manchester's bus fleet with a commitment to ensuring one-third of the fleet meets Euro 6 standards or is Euro 6-hybrid or electric-only by 2021 and that Greater Manchester will only procure zero-emission buses by 2025 in accordance with the commitment of the C40 group of cities.
3. To take urgent action to improve the monitoring and modelling of air pollution in Manchester by putting all data into the public domain in a timely fashion through a reinvigorated Greater Manchester Air Emissions Inventory by the end of 2018.

In order to support him in this work, we recommend that the mayor establishes a Greater Manchester Air Pollution Taskforce, chaired by the mayor, to coordinate a massive programme of engagement with citizens, public services, business and civil society to design the most ambitious, inclusive and collective air pollution strategy drawing upon best practice from across the world.

In return for such pledges, the Greater Manchester mayor should demand urgent action on the part of central government. In particular central government should make the following four commitments.

1. Agree a Greater Manchester Clean Air Devolution Deal, drawn from a much increased Clean Air Fund, committing to Greater Manchester it's fair share of all funding earmarked for tackling air pollution together with hypothecated funds from reformed vehicle excise duty and company car tax receipts.
2. Adopt a targeted national diesel scrappage scheme which is part-funded by the car industry, means-tested and only funds the purchase of ultra-low/zero-emission vehicles (not petrol or diesel) or public transport season tickets, car club memberships, or bicycles.
3. Develop a more robust national framework for monitoring, modelling and health impact assessment which brings the most polluted local authority areas in line with the standards of analysis and reporting currently only afforded to London by 2020 and the rest of the UK by 2025.
4. All of this must be part of a more robust and ambitious national strategy that mandates national agencies such as Highways England to work closely with local transport authorities to take action; recognises the importance of rail electrification to reduce pollution in stations; and forms part of comprehensive environmental protection legislation that establishes the right governance and institutions that will enforce existing EU law and new targets in any future UK environmental law.

6. CONCLUSIONS
GOING TO THE TOP OF THE LEAGUE

Our lives are shorter because of the dirty air we breathe, there is more pressure and cost to our public services because of the air we breathe, and we are less productive because of the air we breathe. Inaction is no longer an option.

Slowly but surely, because of better understanding, court rulings and more campaigning, action on air pollution is becoming inevitable. Greater Manchester is required – both by law and government policy – to show what more can be done locally. The question is simple – do we settle for an approach, led by TFGM, that ticks the government's boxes? Or do we demand more concerted, urgent action to deal with a problem that is endangering the Greater Manchester population as a whole, with a disproportionate impact on those already suffering from lung conditions, and costing us all money?

The prize is simple – by putting public health at the centre of policymaking and cleaning up the air we breathe we can live longer, healthier, happier and more productive lives. In doing so, we would take pressure off stretched services and increase the wealth of Greater Manchester as a whole. The measures needed to adequately reduce air pollution will help to prepare Greater Manchester for the challenges of population growth, which will require 800,000 more journeys every day by 2040, by easing the congestion that costs businesses hundreds of millions of pounds each year and increases all of our journey times by more than a third.

Greater Manchester is a natural leader. Whether in science, sport, industry, the arts or social justice, we understand the value of moving first and moving decisively. It should be no different on tackling air pollution – we just have to come together and decide to do things differently. The mayor is perfectly placed to galvanise this agenda, and this report is written in the hope that he will choose to do so.

Our failure would consign the next generation to lives that are shorter and poorer. Our success on the timescales outlined by this report would improve the health, wealth and happiness of Greater Manchester in a way that would resonate around the world.

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