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How Car Emissions Are Affecting Air Quality in the UK



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01

Introduction

Air quality has been a global concern for the past 40 years, however in recent years scientific research has allowed us to gain a much greater insight into the health and environmental impacts of poor air quality. The results of recent studies now show air pollution to be the single largest environmental health risk in Europe.

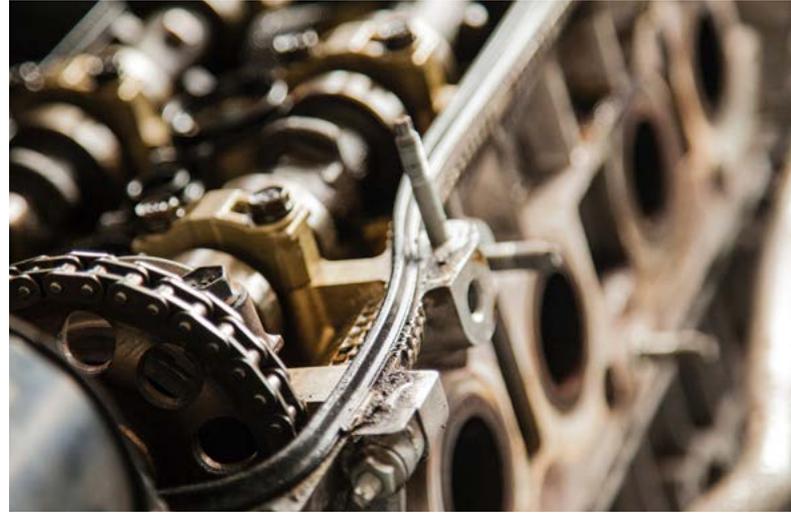
In this report we examine the latest evidence and statistics from the UK government and The World Health Organisation (WHO), exploring how car emissions are affecting the quality of the air we breathe in the UK, and what action is being taken to tackle this crisis.

Health Impacts of Car Emissions

There have been a large number of studies conducted over recent years examining the effects of air pollutants on the human body. The results have shown that tiny particles, less than 10 microns in diameter (\leq PM10), are absorbed into our respiratory and circulatory system. This is proven to cause major damage to our lungs, heart and brain, which can lead to strokes, lung cancers and heart disease. According to these studies, a third of deaths from these illnesses are a result of poor air quality. In London, the estimated economic costs of health impacts from exposure to fine particulate matter (PM2.5) and nitrogen oxide range, from £1.4 billion to £3.7 billion per year and it's estimated long-term exposure is responsible for 3,500 deaths per year.

It's worth noting that these figures take into account all sources of air pollution, including pollution from industrial facilities, incineration sites and agricultural waste disposal, however emissions from transport is reported as the biggest source of pollution and therefore considered the greatest threat to human health.

Further studies have revealed that children are more susceptible to health problems



from breathing polluted air, increasing the likelihood of babies being born underweight, or with poor cognitive development and restricted lung growth. WHO director of public health and environment, Dr Maria Neira told The Guardian "Air pollution is stunting our children's brains, affecting their health in more ways than we suspected,".

A study from The Lancet examined the association between exposure to nitrogen oxides and lung function of children aged 8-9 years old, attending primary schools in central London between 2009 – 2010 and 2013 – 2014. The results confirmed that long-term exposure to urban air pollution is linked to a reduced lung capacity in children. Over the 5 years in which the study was conducted, the children were exposed to an average of 40.7 micrograms of NO₂ per cubic metre of air, which equaled to approximately a 5% reduction in lung volume.

Car Emissions and Greenhouse Gases

Global warming has been on many people's radar for the past 50 years, however it is now an issue that cannot be ignored. Towards the end of 2018, UN scientists warned that levels of greenhouse gases have not been this high in over 3 million years, and unless rapid action is taken to significantly reduce the input of greenhouse gases, climate change will have an "increasingly destructive and irreversible impact on life on earth".

Since 1990, the input of greenhouse gas emissions has been slowly declining, and in 2016 greenhouse gases were reported to be 41% lower, with carbon dioxide emissions down by 36%.

However, 2017 figures from the Department for Business, Energy and Industrial Strategy (BEIS) revealed while emissions from energy supplies were down 60 per cent between 1990 and 2017, transport emissions were only down 2% over the same period. As a result, the transport sector has been criticised for "failing to play its part".

The report also revealed that the transport industry is the largest emitting sector of the UK's greenhouse gas emissions in 2017, generating 27 per cent of emissions, making transport the worst performing sector.

To try and reduce transport emissions, the government have announced plans to ban the sales of all petrol and diesel cars by 2040. However, the government's official climate advisers The Committee on Climate Change (CCC), have expressed concerns that this would not be enough for the UK to meet its legally binding climate targets. According to the committee, transport emissions must be lowered by 44% by 2030 to ensure these targets are met, and for this to happen the committee has called for 60% of new cars and vans to be ultra-low emission by 2030, in addition to taking further action to make conventional vehicles cleaner.

Air Quality Standards

Sadly, air quality is not just a problem within the UK, but rather a global issue and countries world-wide are being forced to act.

In an attempt to improve the air quality across Europe, The European Union introduced the EU Air Quality Standards, which depict the legal limit values for pollutants which are considered to have the most damaging health and environmental impacts. All EU countries are legally required to ensure they meet these standards, yet the UK has been in breach of EU limits since 2010.

As a result, the UK currently faces millions of pounds worth of fines and latest government

statistics reveal that this will continue until 2030. What's more concerning is while the UK is struggling to meet the EU pollution limits, WHO advised limits are even stricter and it will be a long time before pollution levels in the UK will fall within these parameters. However, the EU court has addressed this issue and in a recent audit declared these standards should be aligned.

The data in the following tables are taken from The European Environment Agency (The EEA), publication of Air Quality in Europe 2018 and compares EU pollution limits compared with the WHO air quality guidelines.

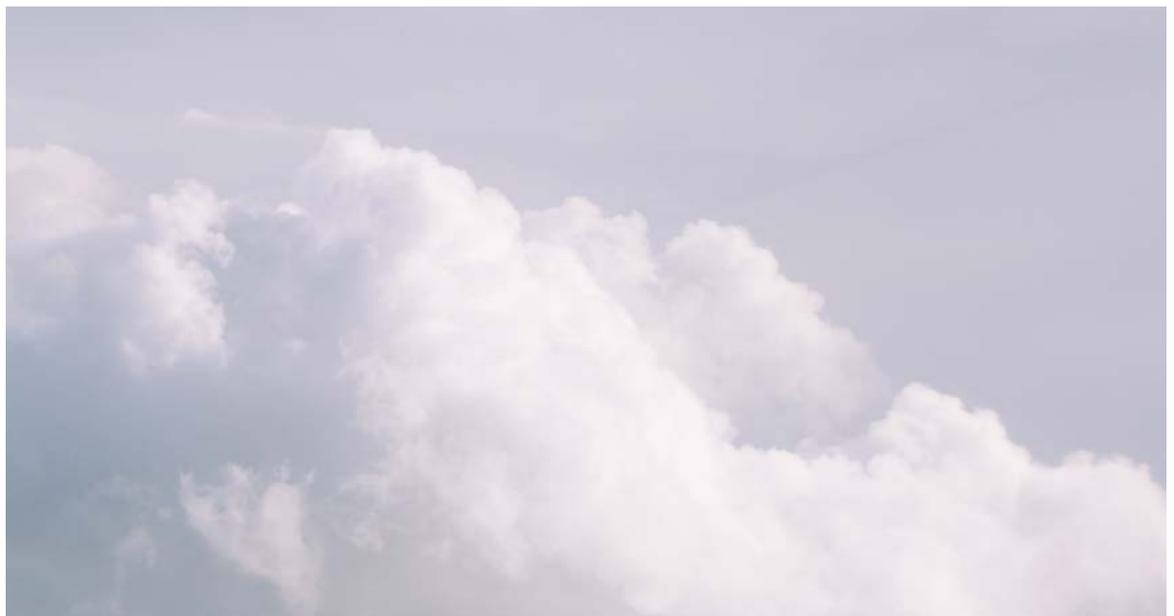


Table 1.1 Air quality standards for the protection of health, as given in the EU Ambient Air Quality Directives

POLLUTANT	AVERAGING PERIOD	LEGAL NATURE AND CONCENTRATION	COMMENTS
PM₁₀	1 day	Limit value: 50 µg/m ³	Not to be exceeded on more than 35 days per year
	Calendar year	Limit value: 40 µg/m ³	
PM₂₅	Calendar year	Limit value: 25 µg/m ³	Average Exposure Indicator (AEI) ^(a) in 2015 (2013-2015 average)
		Exposure concentration obligation: 20 µg/m ³	
		National Exposure reduction target: 0-20% reduction in exposure	
O₃	Maximum daily 8-hour mean	Target value: 120 µg/m ³	Not to be exceeded on more than 25 days/year, averaged over 3 years ^(b)
		Long-term objective: 120 µg/m ³	
	1 hour	Information threshold: 180 µg/m ³	
Alert threshold: 240 µg/m ³			
No₂	1 hour	Limit value: 200 µg/m ³	Not to be exceeded on more than 18 hours per year
		Alert threshold: 400 µg/m ³	To be measured over 3 consecutive hours over 100 km ² or an entire zone
	Calendar year	Limit value: 40 µg/m ³	
BaP	Calendar year	Target value: 1 ng/m ³	Measured as content in PM10
SO₂	1 hour	Limit value: 350 µg/m ³	Not to be exceeded on more than 24 hours per year
		Alert threshold: 500 µg/m ³	To be measured over 3 consecutive hours over 100 km ² or an entire zone
	1 day	Limit value: 125 µg/m ³	Not to be exceeded on more than 3 days per year
CO	Maximum daily 8-hour mean	Limit value: 10 mg/m ³	
C₆H₆	Calendar Year	Limit value: 5 µg/m ³	
Pb	Calendar Year	Limit value: 0.5 µg/m ³	Measured as content in PM10
AS	Calendar Year	Target value: 6 ng/m ³	Measured as content in PM10
Cd	Calendar Year	Target value: 5 ng/m ³	Measured as content in PM10
Ni	Calendar Year	Target value: 20 ng/m ³	Measured as content in PM10

Table 1.2 WHO air quality guidelines (AQG) and estimated reference levels (RL) (°)

POLLUTANT	AVERAGING PERIOD	AQG	RL	COMMENTS
PM₁₀	1 day	50 µg/m ³		99th percentile (3 days per year)
	Calendar Year	20 µg/m ³		
PM₂₅	1 day	25 µg/m ³		99th percentile (3 days per year)
	Calendar year	10 µg/m ³		
O₃	Maximum daily 8-hour mean	10 µg/m ³		
No₂	1 hour	200 µg/m ³		
	Calendar year	40 µg/m ³		
BaP	Calendar year		0.12 ng/m ³	
SO₂	10 minutes	500 µg/m ³		
	1 day	20 µg/m ³		
CO	1 hour	30 mg/m ³		
	Maximum daily 8-hour mean	10 mg/m ³		
C₆H₆	Calendar Year		1.7 µg/m ³	
Pb	Calendar Year	0.5 µg/m ³		
AS	Calendar Year		6.6 ng/m ³	
Cd	Calendar Year	5 ng/m ³ (d)		
Ni	Calendar Year		25 ng/m ³	

05 UK Regions Facing Poor Air Quality

Latest reports have revealed that more than 40 towns and cities in the UK are at, or have exceeded, WHO pollution limits of 10 micrograms per cubic metre.

30 UK areas exceeding the limit:

Scunthorpe	15	Eccles	12	Coventry	11
Manchester	13	Nottingham	12	Hull	11
Swansea	13	Plymouth	12	Londonderry	11
Gillingham	13	York	12	Middlesbrough	11
Carlisle	12	Prestonpans	12	Norwich	11
Chepstow	12	Royal Leamington Spa	12	Southend-On-Sea	11
Leeds	12	Sandy	12	Stockton-On-Tees	11
Leicester	12	Sheffield	12	Storrington	11
Liverpool	12	Stone-On-Trent	12	Wigan	11
Grays	12	London	11	Prestonpans	12

17 UK areas at the limit:

Armagh	10	Harlington	10	Salford	10
Birmingham	10	New Castle	10	Saltash	10
Brighton	10	Newport	10	Southampton	10
Bristol	10	Oxford	10	Stanford-Le-Hope	10
Cardiff	10	Portsmouth	10	Port Talbot	10
Eastbourne	10	Preston	10		

What is Being Done to Reduce Car Emissions?

Government Plans and Incentives to Reduce Car Emissions

The government is aware of the environmental and health impacts caused as a result of transport emissions, and their 2019 Clean Air Strategy states the most immediate air quality challenge is to reduce nitrogen oxides to the legal limit in the shortest possible time. To tackle this, the government have requested local authorities to develop plans, as part of their Clean Air Zone scheme.

This framework outlines plans to target a wide range of areas to improve air quality, including the development of services and infrastructures. This includes improving public transport through investments in low emission park and ride schemes, and potentially partnering with local businesses. Another aim is to change behaviours and attitudes to alternative transport measures, including active travel (either walking or cycling). To encourage this behavioural change, the government has outlined measures to improve the safety and accessibility of active travel, through improving traffic signs, providing route planning apps and encouraging cycle hire schemes.

It also outlines plans to introduce low emission standards in taxi licences with neighbouring authorities, as well as highlighting issues around engine idling, and requesting authorities to take action to prevent idling on public roads within the zones.

Further to the Clean Air Zone scheme, in July 2018 the government published their industrial strategy The Road to Zero, outlining their goal for all new cars and vans to be effectively zero emission by 2040. As previously mentioned, this target has received criticism from The CCC for being “too little too late”, however the strategy outlines some encouraging actions which will hopefully achieve some positive outcomes.

The government have said they will continue to offer grants for plug-in electric cars, vans, taxis and motorcycles until at least 2020, with some form of consumer incentives continuing to play a role past 2020. This includes tax incentives for ultra-low emission cars, with no vehicle excess duty (VED) and longer zero emission ranges incentivised through the company car tax system. There will also be no fuel benefit charge, as battery powered electric cars do not require the use of fuel. With these combined benefits, the government has advised individuals could save thousands of pounds.

Electric and Hybrid Vehicle Production

The demand for electric vehicles is steadily increasing, and between January and December 2018 pure electric and plug-in hybrid vehicle sales reached a total of 59,945. Almost 15,500 units were pure electric vehicles, while the remaining 45,000 units were plug-in hybrid models. Following the government's plans to make it a requirement for all new cars and vans to be effectively zero emission by 2040, we can expect to see an even larger increase in electric vehicles over the next five years. Already we are seeing a significant increase in the number of EVs and hybrids hitting the market, with full-electric cars from many leading manufacturers including Peugeot, Mercedes, BMW, Audi and Jaguar to name a few. Honda have even announced that by 2025, it will only sell electric cars within Europe.

Of course, the issue that is preventing many drivers from upgrading to an electric vehicle is the initial cost of purchase. In an effort to make EVs affordable for a wider market, the government introduced the plug-in car grant which has been available for the past seven years to help offset the higher upfront purchase price of ultra-low emission cars, but this grant will not be available for much longer.

In the government's Road to Zero plan they state, "We will continue the plug-in car grant until at least 2020 and will continue current



plug-in car grant rates until at least October 2018. By 2020, we will have supported this market for almost a decade." They add "We have already supported the purchase of more than 150,000 vehicles. In the coming years, we expect sales will increasingly be driven by tougher global emission regulations, and accelerating consumer demand thanks to longer vehicle ranges and greater vehicle choice. With rising sales, the long-term continuation of the plug-in car grant will become unviable in terms of cost to the taxpayer. We therefore expect to deliver a managed exit from the grant in due course and to continue to support the uptake of ultra-low emission cars through other measures."

07 Conclusion

Air pollution caused by car emissions is clearly an issue that cannot be ignored, and while the government has laid out their plans to tackle the issue, the UK has a long way to go to ensure it reaches its legally binding targets with the CCC and the EU.

Electric vehicles will undoubtedly play a key role in the reduction of emissions and the improvement of air quality, thus helping to improve human health and the state of the environment.

As stated in the government's Road to Zero report, if the UK is to meet its target of making all new vehicle sales electric by 2040, it is reliant on an increase in customer demand. A greater choice of electric vehicles will no doubt generate higher demand, however the expensive upfront cost of an electric vehicle is arguably the main factor which is currently restricting EVs from reaching a wider market. The continued support from government grants until 2020 will hopefully help the EV

market to continue expanding, and once a substantial market has developed, the cost of purchase should fall, and electric vehicles will become available to the wider market.

So, what is the message for drivers currently financially unable to make the transition to an electric vehicle, but looking to reduce their carbon footprint? The best way for individuals to reduce emissions is to choose alternative transport methods where possible. The government's clean air zone scheme aims to make active travel and public transport safer and more accessible, to encourage individuals to engage in greener transport. Ultimately the government is responsible for ensuring air quality and emission targets are met, however if all individuals are willing to accept a greener lifestyle and way of thinking, we should hopefully see improvements of quality of air in the UK before it's too late.

(a) AEI: based upon measurements in urban background locations established for this purpose by the Member States, assessed as a 3-year running annual mean.

(b) In the context of this report, only the maximum daily 8-hour means in 2016 are considered, so no average over the period 2014-2016 is presented.

(c) As WHO has not set an AQG for BaP, C6H6, As and Ni, the reference level was estimated assuming an acceptable risk of additional lifetime cancer risk of approximately 1 in 100 000.

(d) AQG set to prevent any further increase of Cd in agricultural soil, likely to increase the dietary intake of future generations.

Resources

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