



Department  
for Environment  
Food & Rural Affairs

# UK Report on measures for 2018 exceedance of the Target Value for Nickel

December 2020



Llywodraeth Cymru  
Welsh Government



© Crown copyright 2020

You may re-use this information (excluding logos) free of charge in any format or medium, under the terms of the Open Government Licence v.3. To view this licence visit [www.nationalarchives.gov.uk/doc/open-government-licence/version/3/](http://www.nationalarchives.gov.uk/doc/open-government-licence/version/3/) or email [PSI@nationalarchives.gov.uk](mailto:PSI@nationalarchives.gov.uk)

This publication is available at [www.gov.uk/government/publications](http://www.gov.uk/government/publications)

Any enquiries regarding this publication should be sent to us at

Air Quality  
Department for Environment, Food and Rural Affairs  
Ground Floor, Seacole Building  
2 Marsham Street  
London, SW1P 4DF

Email: [air.quality@defra.gov.uk](mailto:air.quality@defra.gov.uk)

With technical input from Ricardo Energy & Environment

[www.gov.uk/defra](http://www.gov.uk/defra)

## Contents

1. Introduction .....	4
1.1 This document.....	4
1.2 Background and Context.....	5
About Nickel .....	5
UK Assessment .....	6
Reporting requirements for the exceedance of a target value .....	7
2. Overview of Affected Zones .....	8
2.1 General information on zones .....	8
2.2 Assessment details .....	11
Monitoring.....	11
Modelling .....	11
3. Measures .....	13
3.1 Overview of Measures.....	13
Industrial Measures .....	13
4. Next steps.....	14
Annex A: Zones .....	16
Annex B: Acronyms .....	17

# 1. Introduction

The Government recognises the impact that poor air quality can have on human health and the environment. Tackling air pollution is a priority. A cleaner, healthier environment benefits both people, the economy, crops and wildlife. Clean air is vital for people's health and the environment, essential for making sure our cities, towns and villages are welcoming places for people to live and work now and in the future, and for our prosperity.

That is why in 2019 the UK Government produced a new Clean Air Strategy for England and in Wales the Welsh Government have recently published their Clean Air Plan for Wales. The documents set out how Government will work towards our international targets to significantly reduce damaging emissions.

Through improving air quality, we can reduce both the short-term and long-term effects on people's health. It will have benefits to those who may find their conditions are made worse through exposure to air pollution, for example people with heart or lung conditions or breathing problems as well as reducing longer term impacts on everyone.

## 1.1 This document

This report provides an overview of the measures being taken to address the exceedances of the pollutant nickel (Ni) in the United Kingdom (UK) for the compliance year 2018, including updates on the measures for exceedances in the compliance years 2013, 2014, 2015, 2016 and 2017<sup>1</sup>, as reported to the European Commission in September 2014, 2015, 2016, 2017 and 2018 respectively.

The UK was a Member State during the period this overview covers, and the Directive requirements apply to the UK as part of its obligations during the Transition Period.

Defra also publish an annual *Air Pollution in the UK* report alongside the compliance assessment submission which can be found here: <http://uk-air.defra.gov.uk/library/annualreport/index>. More detailed information on these

---

<sup>1</sup> <https://uk-air.defra.gov.uk/library/bap-nickel-measures>

exceedances and measures being taken to address them can be found in the individual zonal reports provided as an Annex to this document.

Copies of previous annual air quality submissions can be found on the Commission website: <http://cdr.eionet.europa.eu/gb/eu/annualair> and <http://cdr.eionet.europa.eu/gb/eu/aqd/>.

## 1.2 Background and Context

The EU Directive<sup>2</sup> 2004/107/EC aims to improve and maintain air quality by setting target values for the concentration in ambient air of metals cadmium, arsenic and nickel and for benzo[a]pyrene. The target value for nickel is an annual mean concentration of 20 nanograms (one billionth of a gram ( $10^{-9}$ )) per cubic metre ( $m^{-3}$ ) in ambient air or lower.

### About Nickel

Nickel is a toxic metallic element found in ambient air as a result of releases from oil and coal combustion, metal processes, manufacturing and other sources. The main source of emissions to air of nickel in the UK is the combustion of heavy fuel oil and solid fuels derived from petroleum.

Nickel compounds are human carcinogens by inhalation exposure. They can cause irritation to the nose and sinuses and allergic responses and can lead to the loss of the sense of smell. Long-term exposure may lead to respiratory diseases and cancers<sup>3</sup>. Nickel can also pollute soil and water, thus having environmental impacts as well as impacts on human health.

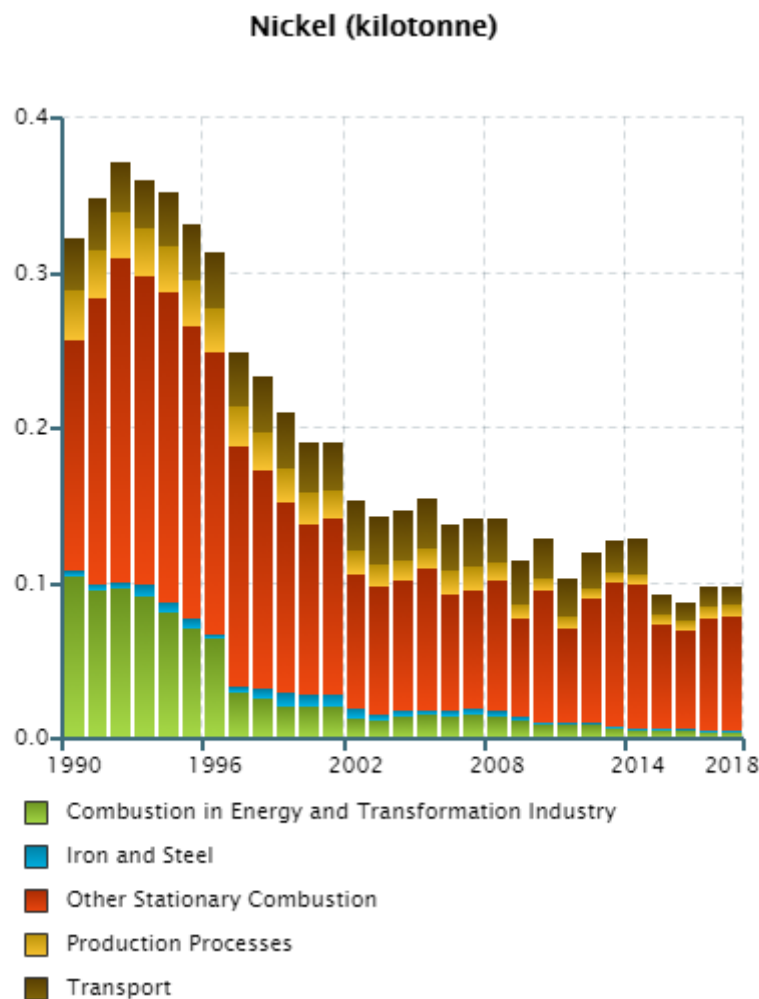
Figure 1 shows the levels of nickel emissions in the UK and the main contributory sources. This shows that nickel emissions have reduced significantly since 1990.

---

<sup>2</sup> <http://eur-lex.europa.eu/legal-content/EN/TXT/PDF/?uri=CELEX:32004L0107&rid=1>

<sup>3</sup> WHO AQG 2000, PHE Compendium of Chemical Hazards

**Figure 1. Nickel emissions by sector (1990-2018)**



## UK Assessment

Assessment of levels of nickel in the UK with regards to the EU target value are made through a combination of fixed monitoring supplemented by modelling. There is a requirement to undertake monitoring at a fixed number of locations to assess key emissions sources, particularly near to large industrial emission sources. Undertaking modelling alongside monitoring enables the UK to calculate concentrations at locations where monitoring is not conducted providing a fuller picture of nickel concentrations across the UK. National assessment is carried out each year for the previous calendar year and results are reported to the Commission on an annual basis (submitted by 30<sup>th</sup> Sept for the previous calendar year). Once the Transition Period ends on 31 December 2020, the UK will continue to meet its

reporting obligations through making this data available to the public to the same timescales.

The 2018 compliance assessment reported that the UK exceeded the target value for nickel in two zones in Wales and two zones in England.

## **Reporting requirements for the exceedance of a target value**

Where a target value is exceeded, Member States are required to specify the areas of exceedance and the sources contributing to it<sup>4</sup>.

The United Kingdom exited the European Union on 31 January 2020. Upon exit, the UK entered a Transition Period which will end on 31 December 2020. The UK was a Member State during the period this report covers, and the Directive requirements apply to the UK as part of its obligations during the Transition Period.

Once the Transition Period ends on 31 December 2020, the UK will continue to meet its reporting obligations through making this data available to the public to the same timescales

Following an exceedance Member States must submit a report detailing the measures already taken or that will be taken, to reduce levels of this pollutant. Particularly those directed at the main emission sources in order to attain the target value. In the case of industrial installations covered by the Industrial Emissions Directive 2010/75/EU (IED)<sup>5</sup> this means the application of the Best Available Techniques Conclusions (BATCs) Implementing Decisions. It is required that all reasonable measures should be taken that do not entail disproportionate cost. The report must be submitted no later than 2 years after the end of the year in which the exceedance triggering the measure was observed (i.e. the end of 2020 for 2018 compliance year – see Table 1).

This report on nickel is the sixth such report that the UK has produced and updates the Report on Measures produced for the exceedances reported for 2013, 2014, 2015 and 2016<sup>1</sup>.

---

<sup>4</sup> Further detail on the reporting requirements can be found in the Commission Implementing Decision 2011/850/EC

**Table 1. Reporting timetable**

Compliance year	“Year” (e.g. 2018)
Compliance assessment reporting	Sept 30 <sup>th</sup> “Year” +1 (e.g. 2019)
Report on Measures	Dec 31 <sup>st</sup> “Year” +2 (e.g. 2020)

In the UK, the responsibility for meeting air quality target values is devolved to the national administrations in Scotland, Wales and Northern Ireland. The Secretary of State for Environment, Food and Rural Affairs (Defra) is responsible for meeting the target values in England. Defra has co-ordinated the production of this report in conjunction with the Welsh Government.

## 2. Overview of Affected Zones

### 2.1 General information on zones

For the purposes of the compliance reporting against EU Directive 2004/107/EC, the UK is divided into 43 zones, termed agglomerations (large urban areas) and non-agglomeration zones (regional areas). There are 15 non-agglomeration zones (Non-AZ) and 28 agglomeration zones (AZ). The 15 non-agglomeration zones match:

1. The boundaries of England's former Government Offices for the Regions; and
2. The boundaries agreed by the Scottish Executive, Welsh Government, and Department for Agriculture, Environment and Rural Affairs in Northern Ireland.

An agglomeration is defined as any urban area with a population greater than 250,000.

In 2018, four of the 43 zones in the UK were reported to have exceeded the target value for nickel (two non-agglomeration (non-AZ) and two agglomeration zones (AZ)). The affected zones were:

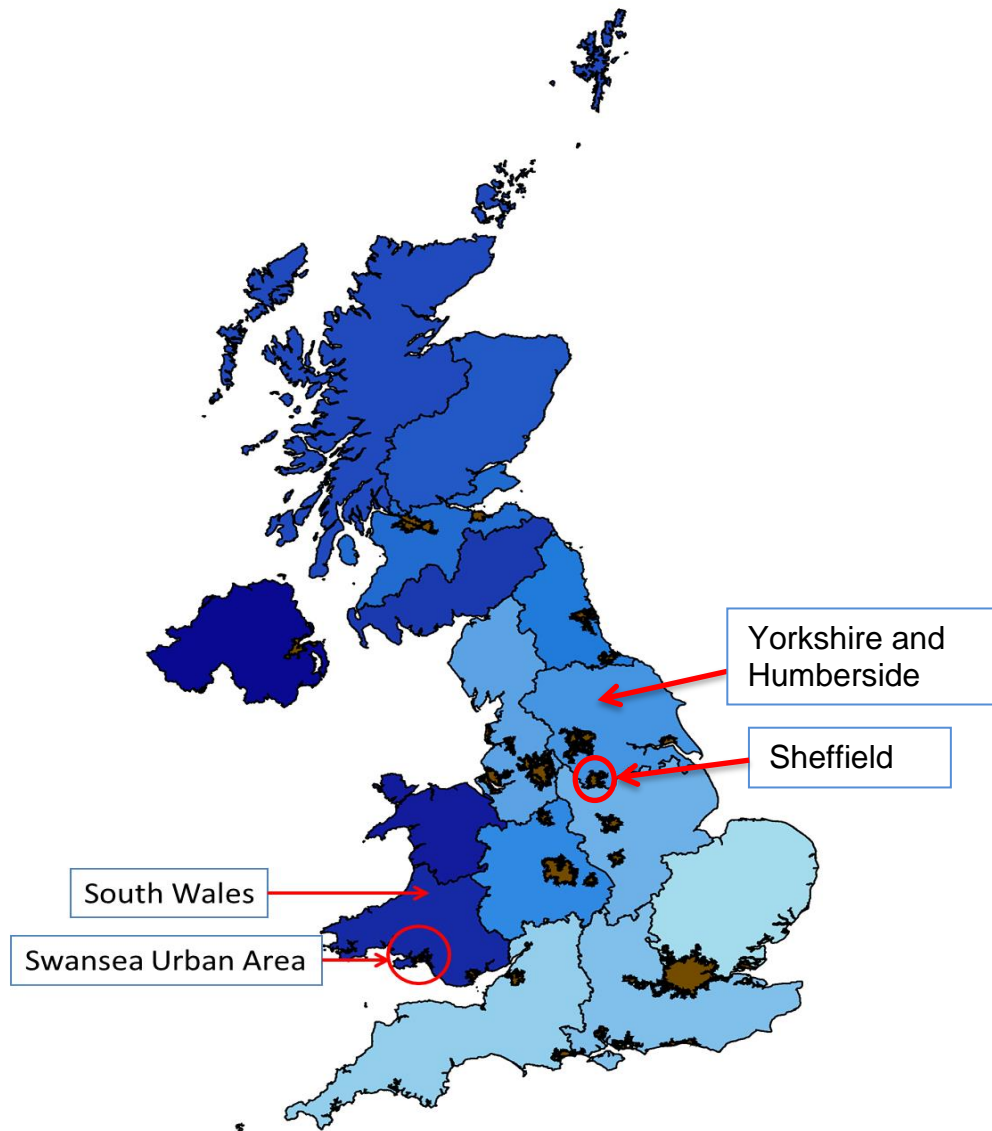
1. Sheffield Urban Area (UK0007) (AZ)
2. Swansea Urban Area (UK0027) (AZ);
3. Yorkshire and Humberside (UK0034) (Non-AZ);
4. South Wales (UK0041) (Non-AZ).



The locations of these zones are indicated on the map shown in Figure 2. Of the four exceedances reported, one was monitored ([UK0027](#)) and three were modelled ([UK0007](#), [UK0034](#) and [UK0041](#)). There are detailed zonal reports for each of these exceedances.

The exceedances in both zones in Wales are attributed to emissions from the same industrial sources, which are located close to the zone boundary. The exceedances in the two zones in England are associated with industrial sources that are close to the zone boundary. The zonal reports provide a detailed breakdown of the affected area in each zone, including information about where the exceedance occurs, how it was assessed, information on sources of the exceedance and location maps.

**Figure 2. Map of the UK showing location of zones and agglomerations exceeding the Nickel target value in 2018 (note: the arrows are for the purposes of labelling the zone and do not point to the location where the exceedance occurred – see zonal reports for more detail)**



Map of the UK showing location of non-agglomeration zones (blue) and agglomeration zones (brown). Zones exceeding the nickel target value in 2018 are indicated

Note: the arrows are for the purposes of labelling the zone and do not point to the location where the exceedance occurred – see zonal reports for more detail

## 2.2 Assessment details

The UK's annual assessment of compliance is based on a combination of information from the UK national monitoring network and the results of modelling assessments. The level of fixed monitoring is strictly defined by European Directives. The use of models, alongside monitoring, allows for a reduction in the number of monitoring stations required and has the added benefits of enabling air quality to be assessed at locations without monitoring sites. Modelling also provides additional information on source apportionment (understanding which sources are the main contributors to the concentrations observed) and projections (predicting future concentrations) required for the development and implementation of air quality plans as well as this report on measures.

### Monitoring

Monitoring situated near to large industrial sources is important for assessing the impact of industrial emissions on concentrations where there is relevant public exposure. In 2018 there were 24 monitoring sites measuring nickel concentrations in the UK. These monitors collect samples of particulate matter from the air (PM<sub>10</sub> – Particulate Matter of size fraction up to 10 microns). Samples are analysed to determine the concentrations. More information on the UK monitoring of metals covered by the Fourth Air Quality Daughter Directive (EU Directive 2004/107/EC) can be found on UK-Air<sup>5,6</sup>.

### Modelling

The UK's modelling for compliance assessment is undertaken using a national-scale model known as Pollution Climate Mapping (PCM)<sup>7</sup>. PCM has been designed to assess compliance with environmental objectives at locations defined within EU Air Quality Directives. Modelling is undertaken for 11 air pollutants each year, including nickel and completed each year in time for compliance assessment submission at the end of September. The model performs an annual calculation covering the whole of the UK and outputs concentrations on a 1km square grid. These grid squares are assigned to each of the 43 zones and agglomerations for the purposes of assessing compliance status with respect to limit and target values in the Directives.

---

<sup>5</sup> [http://uk-air.defra.gov.uk/assets/documents/annualreport/air\\_pollution\\_uk\\_2018\\_issue\\_1.pdf](http://uk-air.defra.gov.uk/assets/documents/annualreport/air_pollution_uk_2018_issue_1.pdf)

<sup>6</sup> <http://uk-air.defra.gov.uk/networks/network-info?view=metals>

<sup>7</sup> <http://uk-air.defra.gov.uk/data/gis-mapping>

Modelling calculates concentrations based on estimates of emissions of nickel from all known sources. The model calculates the background concentration of nickel from all area sources (e.g. domestic fuel use, commercial and traffic sources).

Large and small point sources (e.g. from industrial activity) are modelled separately and added to the background concentrations from all other sources.

Exceedance situations established either by national scale modelling or fixed monitoring are further examined using additional modelling (outside of the PCM model) carried out at a more detailed spatial resolution in order to understand the scope of the exceedance. Such assessments can help validate or refine the national scale PCM assessment.

Additional information input into the finer scale models includes more detailed emissions source information (with up to date information on emission amount and release characteristics obtained from the process operators and regulators) and local meteorological data. Such assessments enable a more detailed assessment of the exceedance situation helping to establish the key sources and reasons behind an exceedance. Depending on the conclusions of such finer scale modelling, additional understanding may then be incorporated into the PCM model for future year assessments. Such fine scale assessments are only conducted where exceedance situations are identified.

During 2017 King's College London were commissioned to undertake an hourly measurement campaign to measure the concentrations of nickel and other metals in the Tinsley area and provide further evidence on nickel sources in the area. This study identified sources to the south (Outokumpu) and north east, plus additional sources to the west with a smaller contribution to nickel concentrations. Sources could be apportioned between point and fugitive type sources.

The 2018 modelling for nickel in the exceedance area in Sheffield suggests a shortfall in terms of emissions from sources for which reported emissions estimates are available. Additional sources terms were included in the modelling in order to account for the observed concentrations at Sheffield Tinsley (local monitoring site). Work has been carried out to address this issue and is set out in Section 4 (next steps) below.

Fine scale modelling for nickel in the vicinity of the exceedance areas in Swansea and South Wales showed good agreement with measured concentrations at nearby monitoring stations in 2018.

## 3. Measures

### 3.1 Overview of Measures

The UK has a number of measures that are being taken to address emissions of nickel from industrial sources.

#### Industrial Measures

Industrial emissions of nickel are regulated under the Environmental Permitting (England and Wales) Regulations 2016, as amended (EPR). Scotland and Northern Ireland have similar legislation in place which performs the same function. In particular, the EPR transpose a number of EU Directives on industrial emissions. Foremost amongst these, and most relevant for nickel emissions, is the Industrial Emissions Directive (IED) EU Directive 2010/75/EU<sup>9</sup>. This Directive sets stringent requirements for the purposes of minimising potentially polluting emissions from industry. This includes maximum allowable Emission Limit Values (ELVs) for pollutants emitted from certain industrial sectors, such as incinerators. The IED also requires that the operators of industrial facilities use 'best available techniques' (BAT) to reduce their emissions and to meet BAT-associated emission limits (BAT AELs). BAT and BAT-AELs are set out in BAT reference documents (BREFs), and in BAT Conclusions which, once adopted, are binding in Member States.<sup>10</sup> There are 32 BREFs/BATCs, covering a wide range of industrial sectors, all of which are due to be reviewed by mid-2020. BAT adopted prior to the end of the Transition Period will be retained in UK law. After this there will be a new process for BAT within the UK.

The Non-Ferrous Metals BREF, for example, was reviewed and a new BREF and BAT Conclusions were adopted in 2016. Those BAT Conclusions will need to be reflected in environmental permits for existing installations by 2020. Depending on the size and location of the plant, the regulator for these sites is either Natural Resources Wales (when in Wales), the Environment Agency (in England) or the relevant local authority.

All necessary measures not entailing disproportionate costs have been applied through the environmental permitting process through the implementation of the requirements of the Industrial Emissions Directive.

## 4. Next steps

A further assessment was undertaken for the annual compliance assessment for 2019 and this was submitted in September 2020. The next compliance assessment for levels of nickel in 2020 will be published in September 2021.

### Zones in Wales

The Welsh Government continues to invest in a number of activities to further understand the key sources of emissions and enable industry and regulators to implement measures to ensure compliance with the target value in future years. The Welsh Government has undertaken further detailed assessments to help improve the confidence in the source apportionment and further confirmation/identification of the predominant sources, and to confirm the spatial extent of the exceedance.

Exceedances in both the South Wales (UK0041) and Swansea (UK0027) zones in 2018 can generally be attributed to abatement/equipment failures at the Wall Colmonoy site during the year, which is likely to have lasted a number of months, leading to significant exceedances for monitored nickel levels. The observed breaches were not, however, representative of normal operations.

Significant work was undertaken by the regulator and site operator to understand and rectify the increase in emissions during 2018. Ambient monitoring data and internal nickel monitoring results were used to try to identify possible areas for improvement. An action tracker was used to identify, prioritise and track possible improvements, with further effort being put into maintenance activities.

A comprehensive programme of maintenance and improvement activities were carried out and it is believed that these interventions have had a significant impact on nickel concentrations in the area.

### Zones in England

Work has been undertaken to better understand the emissions sources contributing to measured concentrations in the Sheffield exceedance area. Higher time resolution measurements at daily time resolution were undertaken to provide evidence to identify emissions sources contributing to nickel concentrations in the Tinsley area. The study identified sources to the south (likely Outokumpu) and unknown sources to the north east of Tinsley. There is population exceeding TV in Sheffield (9987) but not in Yorkshire and Humberside

The regulator and the operators of industrial sites in the Tinsley area of Sheffield have continued to work closely to understand, assess and address the sources of nickel originating from their process.

The stainless steelmaking site which was identified as the largest single source contribution for the Tinsley area, continues to control emissions from its stationary sources working with Best Available Techniques (BAT) or beyond and meeting the BAT-associated emission levels defined in their environmental permit. Significant investment was made during the course of 2018 to improve primary source emission control. Following the completion of a modelling study, the operator also focused on tackling less-known fugitive emissions on their site, targeting the raw materials reception and stockyard areas which were estimated to account for 12% of the emissions arising from their site. Emissions from these areas may be due to vehicle movements and wind-whip from stockpiles and exposed surfaces, including re-suspension of dust on haul routes. As a result, they are developing a risk assessment tool based on a three-day weather forecast, directing bowser and sweeper activities to respond to these conditions and prevent dust resuspension.

Another major industrial contributor to the ambient nickel load in Tinsley, a stainless steel scrap handling plant, made significant capital expenditures to upgrade their process and install a metal shearing machine. As a result, they have reduced by half in 2019 the need to use oxy-propane cutting which was identified as a significant source of nickel-containing fugitive fumes. There is however scope for further improving understanding of these emissions and activity levels which would focus attention on the main nickel emitters.

The exceedance situation in Yorkshire and Humberside [Ni\_UK0034\_2018\_1] shares common industrial sources with Sheffield agglomeration zone, and no additional sources of nickel have been identified for the exceedance situation in Yorkshire and Humberside. We will continue to investigate the undefined and scaled source contributions.

Over the next twelve months Defra convene quarterly with regulators to agree on a proportional and coordinated plan to tackle exceedances, working closely with site operators to identify sources and review implemented measures.

The regulator and the operators of industrial sites in the Tinsley area of Sheffield will collaborate to assess to what extent the newly implemented control measures have been effective. Further work will focus on identifying other potential sources of fugitive emissions and determining appropriate abatement technologies in order to prevent nickel exceedances.

## Annex A: Zones

Zone or agglomeration	Zone code	Link to zonal report
Sheffield Urban Area	UK0007	<a href="https://uk-air.defra.gov.uk/assets/documents/reports/bap-nickel-measures/ni_sheffield_UK0007_report_onmeasures_2018.pdf">https://uk-air.defra.gov.uk/assets/documents/reports/bap-nickel-measures/ni_sheffield_UK0007_report_onmeasures_2018.pdf</a>
Swansea Urban Area	UK0027	<a href="https://uk-air.defra.gov.uk/assets/documents/reports/bap-nickel-measures/ni_swansea_UK0027_report_onmeasures_2018.pdf">https://uk-air.defra.gov.uk/assets/documents/reports/bap-nickel-measures/ni_swansea_UK0027_report_onmeasures_2018.pdf</a>
Yorkshire and Humberside	UK0034	<a href="https://uk-air.defra.gov.uk/assets/documents/reports/bap-nickel-measures/ni_yorkshireandhumberside_UK0034_reportonmeasures_2018.pdf">https://uk-air.defra.gov.uk/assets/documents/reports/bap-nickel-measures/ni_yorkshireandhumberside_UK0034_reportonmeasures_2018.pdf</a>
South Wales	UK0041	<a href="https://uk-air.defra.gov.uk/assets/documents/reports/bap-nickel-measures/ni_southwales_UK0041_reportonmeasures_2018.pdf">https://uk-air.defra.gov.uk/assets/documents/reports/bap-nickel-measures/ni_southwales_UK0041_reportonmeasures_2018.pdf</a>



## Annex B: Acronyms

AZ	Agglomeration Zone
BAT	Best Available Techniques
BAT-AEL	BAT-associated emission limits
BREF	BAT Reference Documents
EPR	Environmental Permitting (England and Wales) Regulations
IED	Industrial Emissions Directive
Ni	Nickel
Non- AZ	Non- Agglomeration Zone
PCM	Pollution Climate Mapping