



Department  
for Environment  
Food & Rural Affairs

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## UK Report on Measures for 2013 exceedance of the Target Value for Nickel

November 2015



Llywodraeth Cymru  
Welsh Government

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Any enquiries regarding this publication should be sent to us at

Air Quality  
Department for Environment, Food and Rural Affairs  
Area 2C  
Nobel House  
Smith Square  
London  
SW1P 3JR  
Email: [air.quality@defra.gsi.gov.uk](mailto:air.quality@defra.gsi.gov.uk)

With technical input from Ricardo Energy & Environment

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# 1. Introduction

A cleaner, healthier environment benefits people and the economy. 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 to our prosperity. Our ambition is to make the UK a country with some of the very best air quality in the world.

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 nickel (Ni) in the UK for the compliance year 2013 and reported to the European Commission in September 2014. More information on the compliance assessment for 2013 can be found in the document *Air Pollution in the UK*<sup>1</sup>. More detailed information on these 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>. Defra also publish an annual Air Pollution in the UK report alongside the compliance assessment submission and these can be found here: <http://uk-air.defra.gov.uk/library/annualreport/index>

## 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, nickel (Ni) and for benzo[a]pyrene. The target value for Ni is an annual mean concentration of 20 nanograms per cubic metre (ngm<sup>-3</sup>) of ambient air or lower.

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<sup>1</sup> [http://uk-air.defra.gov.uk/assets/documents/annualreport/air\\_pollution\\_uk\\_2013\\_issue\\_1.pdf](http://uk-air.defra.gov.uk/assets/documents/annualreport/air_pollution_uk_2013_issue_1.pdf)

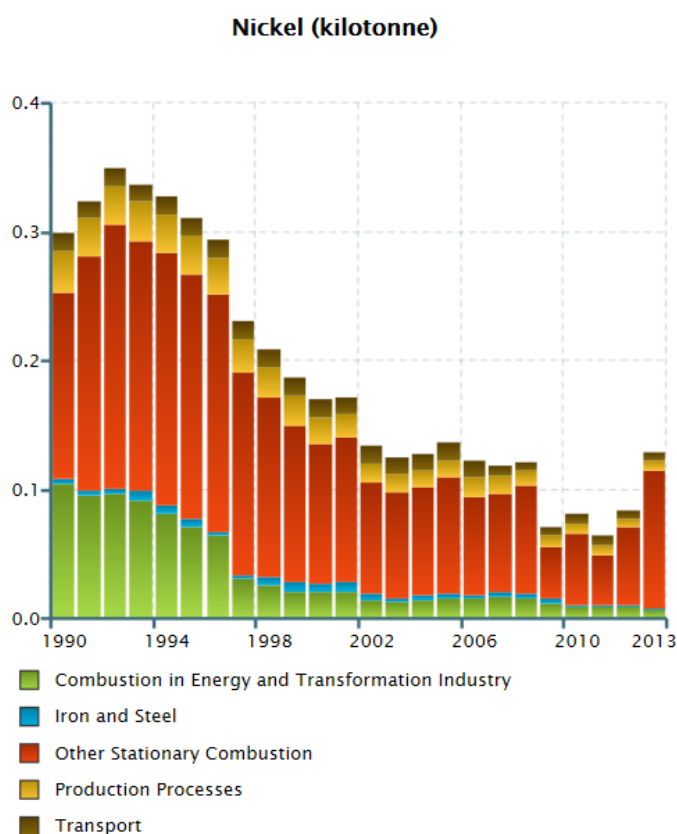
<sup>2</sup> <http://eur-lex.europa.eu/legal-content/EN/TXT/PDF/?uri=CELEX:32004L0107&rid=1>

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 sources of emissions to air of Nickel in the UK is the combustion of heavy fuel oil, the use of coal having declined.

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 health impacts.

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.

**Figure 1.** Ni emissions by sector (1990-2013)



Assessment of levels of nickel in the UK with regards to the EU Target Value are made through a combination of modelling and fixed monitoring. 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

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

monitoring enables the UK to calculate concentrations at locations where monitoring is not conducted providing a fuller picture of Ni 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. The 2013 compliance assessment reported that the UK exceeded the target value for Ni in two zones both in Wales.

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

Where a target value is exceeded, Member States shall specify the areas of exceedance and the sources contributing to it.<sup>4</sup> Following this report of exceedance Member States must submit a report (this 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 Directive 96/61/EC this means the application of best available techniques (BAT) as defined by Article 2(11) of that Directive (see industrial measures below) 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 2015 for 2013 compliance year – see Table 1). This report on Ni is the first such report that the UK has produced.

**Table 1.** Reporting timetable

Compliance year	“Year” (e.g. 2013)
Compliance assessment reporting	Sept 30 <sup>th</sup> “Year”+1 (e.g. 2014)
Report on Measures	Dec 31 <sup>st</sup> “Year”+2 (e.g. 2015)

In the UK, 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 has responsibility for meeting the target values in England. The Welsh Government has produced this report in cooperation with the Department for Environment, Food and Rural Affairs (Defra).

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

## 2. Overview of Affected Zones

### 2.1 General information on zones

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

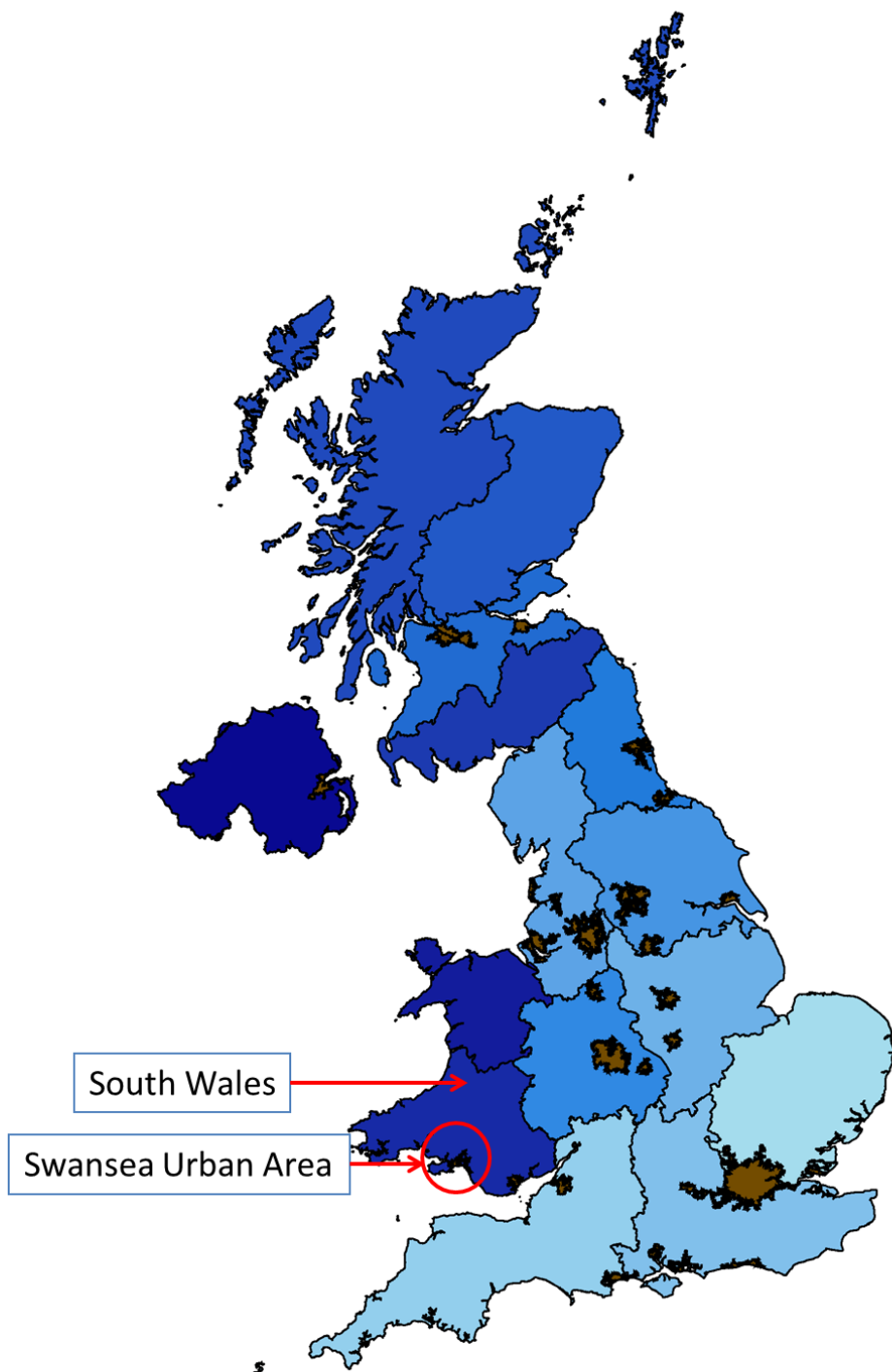
1. The boundaries of England's Government Offices for the Regions; and
2. The boundaries agreed by the Scottish Executive, National Assembly for Wales, and Department of the Environment in Northern Ireland.

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

In 2013 two of the 43 zones in the UK were reported to have exceeded the target value for Ni (1 non-agglomeration and 1 agglomeration zone). The affected zones were:

1. Swansea Urban Area (UK0027) (AZ);
2. South Wales (UK0041) (Non AZ).

**Figure 2.** Map of the UK showing location of zones and agglomerations exceeding the Ni target value in 2013 (note: the arrows are for the purposes of labelling the zone or agglomeration and do not point to the location where the exceedance occurred – see zonal reports for more detail)





Of the two exceedances reported, one was monitored (UK0027) and one was modelled (UK0041). There are detailed reports for each of the two zones above in the Annexes of this report.

The exceedances in both zones are attributed to emissions from the same industrial sources, which are located close to the zone boundary. The annexes to this report 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.

## 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 2013 there were 26 monitoring sites measuring Ni concentrations in the UK. These monitors collect samples of particulate matter from the air (PM10 – 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

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<sup>5</sup> [http://uk-air.defra.gov.uk/assets/documents/annualreport/air\\_pollution\\_uk\\_2013\\_issue\\_1.pdf](http://uk-air.defra.gov.uk/assets/documents/annualreport/air_pollution_uk_2013_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>

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 grid square. These 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.

Modelling calculates concentrations based on estimates of emissions of Ni from all known sources. The model calculates background concentration of Ni from all area sources (e.g. domestic solid 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) to understand the scope of the exceedance. Such assessments can help validate or refine the national scale PCM assessment. Additional information that may be input into the finer scale models might include more detailed emissions source information as well finer spatial information regarding local topography or localised meteorological data. Additional monitoring data could help undertake this finer scale modelling by providing greater spatial or temporal resolution or additional measurement points. 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.

Currently the modelling for nickel suggests a shortfall in terms of known emissions as the model cannot account for the measured concentrations at Tawe Terrace (a local monitoring site) without assuming an additional unknown fugitive emission source from the industrial site adjacent to the monitoring site. Further work is planned to explore this issue and is set out in section 4 (next steps) below.

## **3. Measures**

### **3.1 Overview of Measures**

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

## Industrial Measures

Industrial emissions of Ni are regulated under the Environmental Permitting (England and Wales) Regulations (EPR). (Scotland and Northern Ireland have similar legislation in place which performs the same function). In particular, the EPRs transpose a number of EU Directives on industrial emissions. Foremost amongst these, and most relevant for Ni emissions, is the Industrial Emissions Directive (IED) EU Directive 2010/75/EU<sup>8</sup>. This Directive sets stringent Emission Limit Values for pollutants emitted from a number of industrial sectors such as Large Combustion Plants and incinerators. The IED also requires that the operators of industrial facilities use the 'best available techniques' (BAT) to reduce their emissions and that they demonstrate this by complying with BAT-associated emission limits (BAT AELs). BAT and their BAT-AELs are set out in BAT reference documents (BREFs)<sup>9</sup>. There are 42 BREFs, covering a huge range of industrial sectors, all of which are due to be reviewed by 2020. BREF documents for many of the processes regulated under IED are being rewritten and there is a published timetable for their review and update. The Non-Ferrous Metals BREF is currently published as a final draft. The iron and steel and Large Combustion Plant BREFs are also relevant.

All necessary measures not entailing disproportionate costs have been taken by the local industrial operators with emissions of Nickel to air, and in some cases measures beyond this have been taken.

## 4. Next steps

A further assessment was undertaken for the annual compliance assessment for 2014 and this was submitted in September 2015. The exceedance detailed in this report remains. The next compliance assessment for levels of Ni in 2015 will be submitted to the European Commission in September 2016.

As indicated in section 2 (modelling), as current modelling is suggesting a shortfall in terms of known emissions contributing to measured concentrations at Tawe Terrace it is planned to undertake further detailed assessments to help improve the confidence in the source apportionment and provide further confirmation or identification of the predominant sources, and the spatial extent of the exceedance.

In order to understand the concentrations being observed, with regards to industrial activity in the area, the frequency of measurements has been increased at the Tawe Terrace measurement site to daily sampling. This will help assessment of the relationship of Ni concentrations with the concentrations of other metals and local meteorological conditions.

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<sup>8</sup> <http://ec.europa.eu/environment/industry/stationary/ied/legislation.htm>

<sup>9</sup> <http://eippcb.jrc.ec.europa.eu/reference/>

For example, when levels of Ni are raised, a correlation with other metals may indicate the predominance of a specific industrial process upwind of the monitor. Alternatively additional sources other than those already modelled may be identified such as disturbances of brown field sites in the vicinity.

In addition the Welsh Government is funding a project by King's College London to deploy current state-of-the-art, high time resolution, metals monitoring equipment to measure concentrations of Ni and other metals in Pontardawe, combined with novel methods of assessment to strengthen the confidence in the identification of the predominant sources of nickel.

These actions will facilitate the ongoing review of known sources that have a significant impact, and the further mitigation of impacts from any newly identified sources.

## Annex A: Zones

Zone or agglomeration	Zone code	Link to zonal report
Swansea Urban Area	UK0027	<a href="http://uk-air.defra.gov.uk/assets/documents/reports/bap-nickel-measures/ni_swansea_UK0027_reportonmeasures_2013.pdf">http://uk-air.defra.gov.uk/assets/documents/reports/bap-nickel-measures/ni_swansea_UK0027_reportonmeasures_2013.pdf</a>
South Wales	UK0041	<a href="http://uk-air.defra.gov.uk/assets/documents/reports/bap-nickel-measures/ni_southwales_UK0041_reportonmeasures_2013.pdf">http://uk-air.defra.gov.uk/assets/documents/reports/bap-nickel-measures/ni_southwales_UK0041_reportonmeasures_2013.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 Modelling