

Delivering Excellence Through
Innovation & Technology



Modelling tools to support the UK National and Local plans

29/06/2018, FAIRMODE-TFIAM Technical Meeting,
Tallinn

Michel Vedrenne

www.ricardo.com

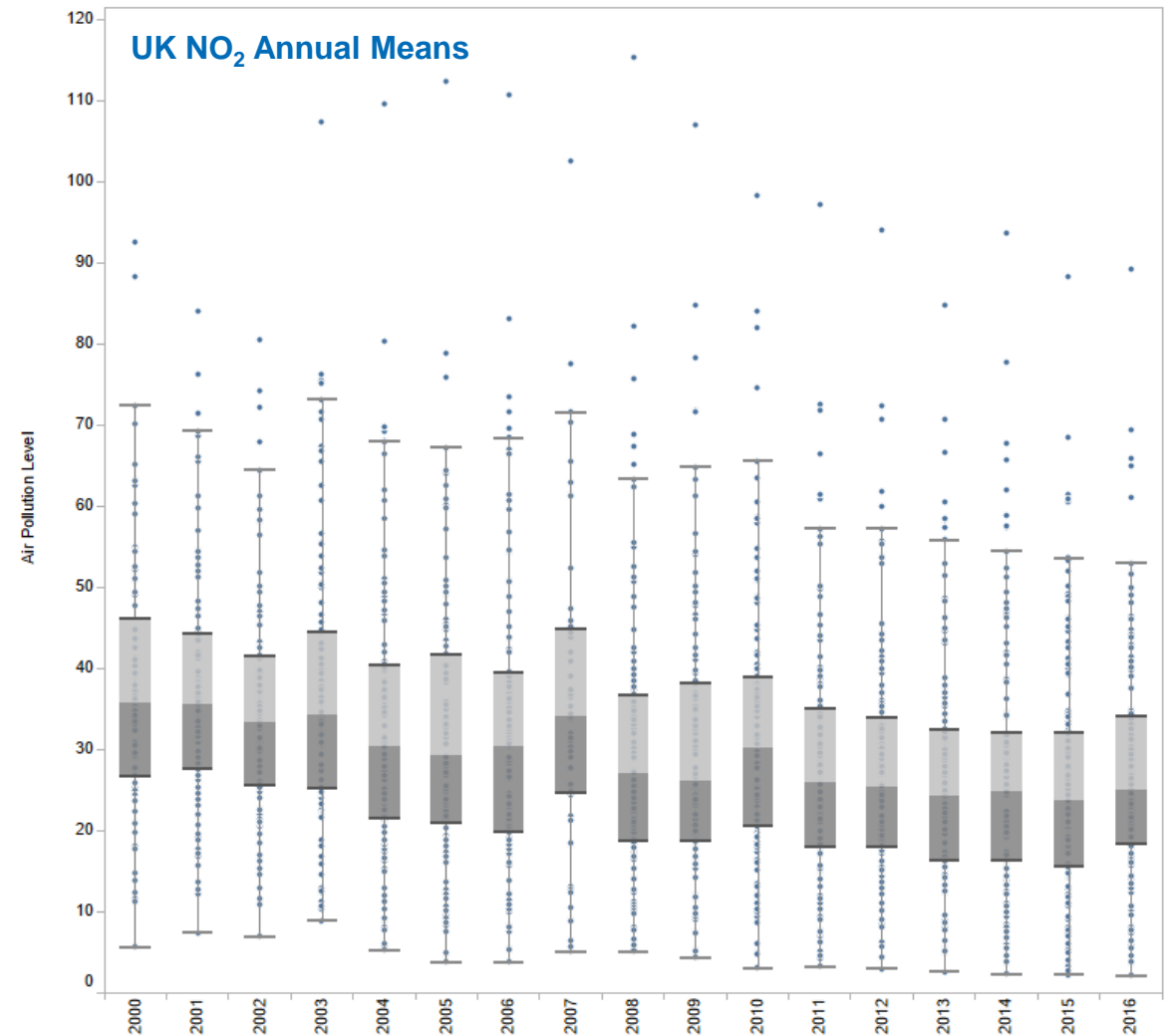
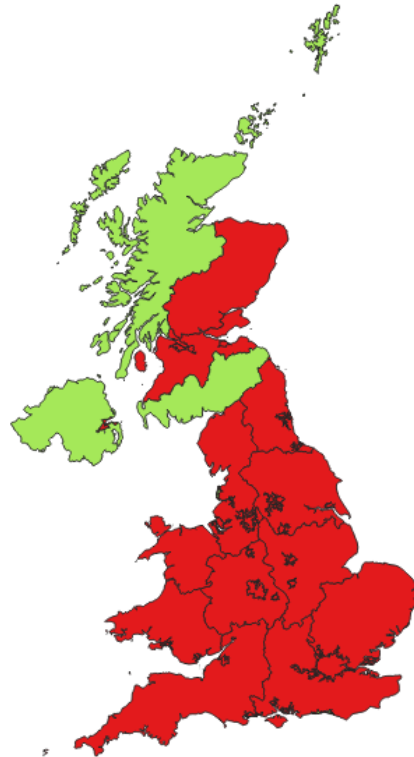
© Ricardo plc 2017

This presentation will briefly cover:

- Past and present air quality situation in the UK
- Legal action against the UK government due to poor air quality (I, II and III)
- Modelling support needs and background of the SL-PCM tool
- Description of the SL-PCM
- Use of the SL-PCM tool for the 2015 Air Quality Plans
- Use of the SL-PCM tool for the 2017 Air Quality Plans
- Final remarks on SL-PCM

Past and present air quality situation in the UK

- Historically, NO₂ levels across the UK have been high and **exceeding** the **annual limit value**.
- Continuous exceedances of NO₂ standards of 2008/50/EC.
- In 2016, **37** of 43 **zones** and agglomerations exceeded the annual limit value.
- Compliance **gaps** range between 7 µg/m³ and 62 µg/m³.



Source: EIONET (2018). <https://cdr.eionet.europa.eu/>
Submission date: 2017/09/29

Source: EEA (2018). <http://eeadmz1-cws-wp-air.azurewebsites.net/products/data-viewers/statistical-viewer-expert/>

Legal action against the UK government due to poor air quality (I)



IN THE SUPREME COURT OF THE UNITED KINGDOM

29 April 2015

Before:

Lord Neuberger
Lord Mance
Lord Clarke
Lord Sumption
Lord Carnwath

R (on the application of ClientEarth) (Appellant) v Secretary of State for the Environment, Food and Rural Affairs (Respondent)

THE COURT ORDERED that

- 1) The appeal be allowed
- 2) The Respondent prepare and publicly consult upon new replacement draft Air Quality Plans in respect of the zones and agglomerations set out in Schedule 1 to this Order in accordance with Article 23(1) of Directive 2008/50/EC on ambient air quality and cleaner air for Europe and Regulations 26 and 28 of the Air Quality Standards Regulations 2010 (SI 2010/1001)
- 3) The public consultation on the draft Air Quality Plans last for a minimum of 40 working days
- 4) The new Air Quality Plans be delivered to the European Commission not later than 31 December 2015

- ClientEarth took Defra to court due to failure to comply with NO₂ limit values in 2013. The UK Supreme Court referred the case to the CJEU on 1st May 2013.
- The CJEU declared the national court competent for scrutinising air quality plans.
- The European Commission initiated an infringement procedure against the UK on the 20th February 2014.
- The case returned to the UK Supreme Court in 2015.
- In April, the Supreme Court issued a mandatory order requiring Defra to prepare new air quality plans by the end of 2015.
- Plans for 38 zones and agglomerations. Minimum consultation period of 8 weeks (September 2015).
- Preparation of air quality plans in 8 months!

Source: ClientEarth (2015). <https://www.documents.clientearth.org/wp-content/uploads/library/2015-04-29-r-v-sosefra-uksc-final-order-29-april-2015-ext-en.pdf>

Modelling support needs and background of the SL-PCM tool



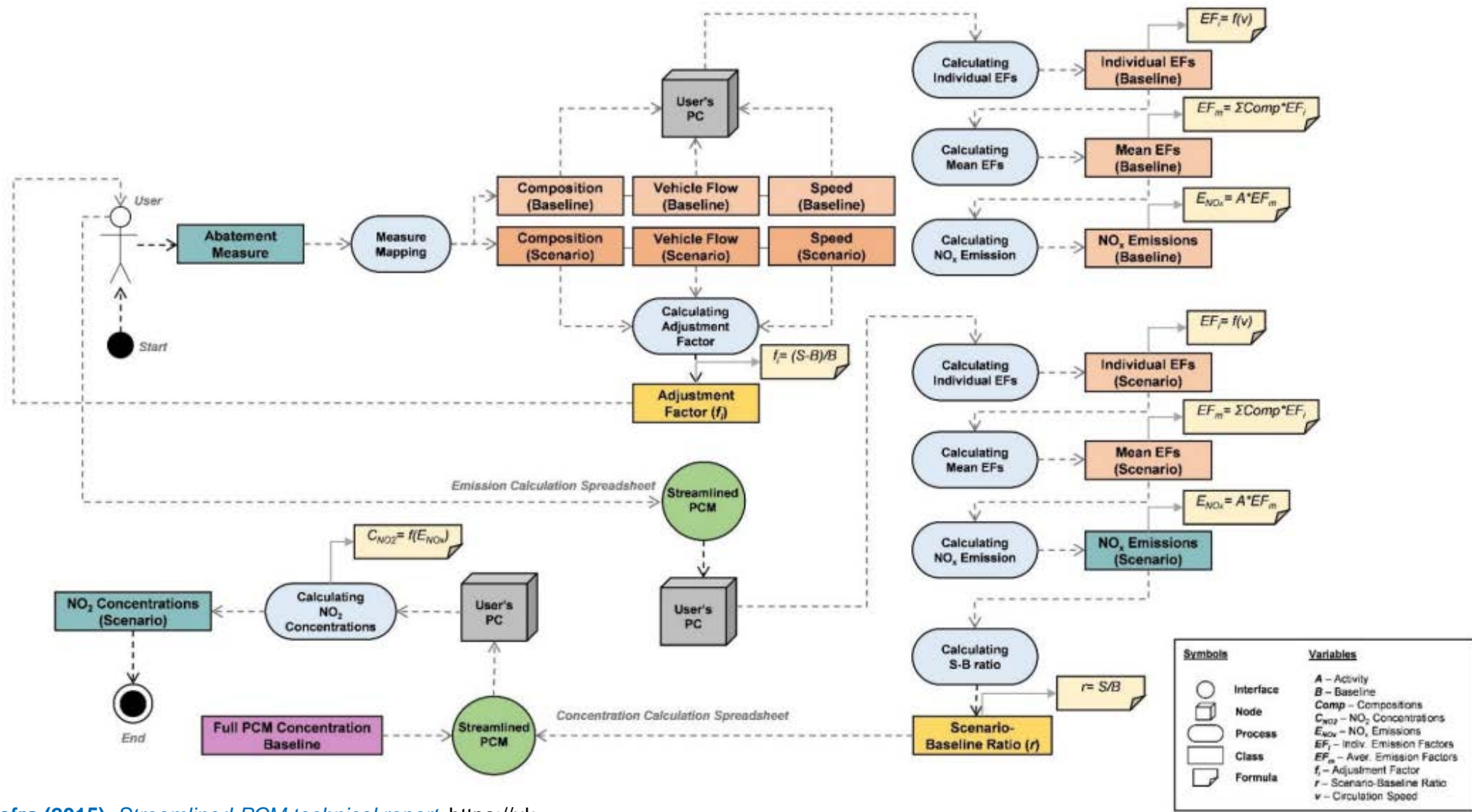
- The **Pollution Climate Mapping (PCM)** is the model used by Defra for annual compliance assessment in the UK. The model provides policy support to Defra; however it requires **several weeks** to carry out the full emissions calculations, emissions mapping and concentration modelling required to **test the effect** of measures.
- In order to make well-informed decisions in a **shorter timeframe**, Defra required a **simplified** version of the **PCM** to model a range of **road-traffic scenarios**. Furthermore, it required this tool to be able to be run in-house and not by expert modellers.
- The **Streamlined PCM (SL-PCM)** has been built as an **approximation** of the full PCM model using data from the National Atmospheric Emissions Inventory (NAEI). The results of the tool have a **base** which is **consistent** with the compliance assessment and baseline projections of the full PCM model.
- It has a number of **limitations** compared to the **full PCM model** and it is **not** intended to be a **substitute**. Furthermore, the Streamlined PCM requires data produced by the full PCM so it is **not** an **independent** model. **SL-PCM** should be regarded as a **screening tool**.

Description of the SL-PCM tool



- The **SL-PCM** is a tool that enables the quantification of the **effect** of **measures** applied to different aspects of **road traffic** on the **emissions** of **nitrogen oxides (NO_x)** and the **annual mean** concentration of **nitrogen dioxide (NO₂)**.
- It has the capacity to assess the impact of measures applied at different spatial scales including **national**, **local authority**, **specific geographic areas** or the **individual road** level
- The tool combines a **simplified** road traffic **emissions model** that relies on NAEI data and a parameterisation of **PCM** air quality response for ambient **NO₂ concentrations**. Delivered as a Microsoft Excel ® spreadsheet.
- According to the specific abatement measures, the relevant **activity** variables, **fleet compositions** and **emission factors** are combined to calculate **NO_x emissions** and **variation ratios** with respect to a **reference scenario**.
- The estimation of **NO_x emissions** is carried out for **18,346 road links** in 406 local authorities of the United Kingdom and the change in **NO₂ concentrations** for **9,336 roads** for which compliance with **Directive 2008/50/EC** is assessed.

Description of the SL-PCM tool

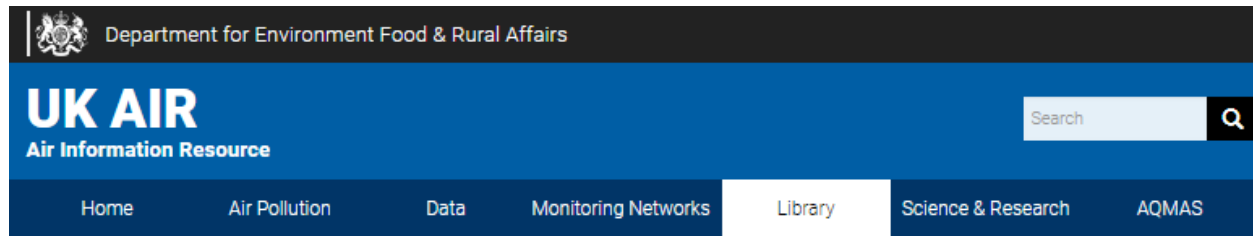


Source: Defra (2015). Streamlined-PCM technical report. [https://uk-air.defra.gov.uk/assets/documents/reports/cat09/1511260938_AQ09_59_Streamlined_PCM_Technical_Report_\(Nov_2015\).pdf](https://uk-air.defra.gov.uk/assets/documents/reports/cat09/1511260938_AQ09_59_Streamlined_PCM_Technical_Report_(Nov_2015).pdf)

Availability of the SL-PCM tool (2017 Air Quality Plans)

- Publicly available from the UK Air Website

<https://uk-air.defra.gov.uk/library/no2ten/2017-no2-projections-from-2015-data>



Department for Environment Food & Rural Affairs

UK AIR
Air Information Resource

Search

Home Air Pollution Data Monitoring Networks Library Science & Research AQMAS

Home > Air Quality Library > Air quality plan for the achievement of EU air quality limit values for nitrogen dioxide (NO₂) in the UK
> 2017 NO₂ projections data (2015 reference year)

2017 NO₂ projections data (2015 reference year)

[« Return to NO₂ Air quality plans](#)

Projections for concentrations of nitrogen dioxide (NO₂) and oxides of nitrogen (NO_x) across the UK in the years 2017 - 2030 inclusive, have been calculated as part of a Pollution Climate Mapping (PCM) model assessment for the development of the UK plan for tackling roadside nitrogen dioxide concentrations.

The baseline projections represent the projected concentrations assuming no further action beyond the air quality measures that were committed by the reference year (2015). In addition, the technical report accompanying the UK plan for tackling roadside nitrogen dioxide concentrations contains projections for two scenarios that represent the projected concentrations assuming additional measures are implemented, as outlined in the plan. These scenarios are as follows:

NO₂ Air quality plans

[2017 NO₂ projections data \(2015 reference year\)](#)

[2017 zone plan documents](#)

[2015 NO₂ projections data \(2013 reference year\)](#)

The Streamlined Pollution Climate Mapping (SL-PCM) models (version 3.2.1) used to calculate the projected roadside NO₂ concentrations for the CAZ scenario and CAZ plus additional actions scenario are available to download via the links below. Each SL-PCM model consists of two tools, an emissions tool and a concentrations tool. There is a dedicated SL-PCM model for each year from 2018 to 2030 inclusive:

- 2018 SL-PCM emissions tool (v3.2.1) (ZIP 42.9MB)
- 2018 SL-PCM concentration tool (v3.2.1) (ZIP 16.4MB)
- 2019 SL-PCM emissions tool (v3.2.1) (ZIP 42.9MB)
- 2019 SL-PCM concentration tool (v3.2.1) (ZIP 16.3MB)
- 2020 SL-PCM emissions tool (v3.2.1) (ZIP 42.9MB)
- 2020 SL-PCM concentration tool (v3.2.1) (ZIP 16.3MB)
- 2021 SL-PCM emissions tool (v3.2.1) (ZIP 43.1MB)
- 2021 SL-PCM concentration tool (v3.2.1) (ZIP 16.3MB)
- 2022 SL-PCM emissions tool (v3.2.1) (ZIP 42.6MB)
- 2022 SL-PCM concentration tool (v3.2.1) (ZIP 16.4MB)
- 2023 SL-PCM emissions tool (v3.2.1) (ZIP 42.8MB)
- 2023 SL-PCM concentration tool (v3.2.1) (ZIP 16.3MB)
- 2024 SL-PCM emissions tool (v3.2.1) (ZIP 42.8MB)
- 2024 SL-PCM concentration tool (v3.2.1) (ZIP 16.2MB)
- 2025 SL-PCM emissions tool (v3.2.1) (ZIP 43.3MB)
- 2025 SL-PCM concentration tool (v3.2.1) (ZIP 16.2MB)
- 2026 SL-PCM emissions tool (v3.2.1) (ZIP 43.7MB)
- 2026 SL-PCM concentration tool (v3.2.1) (ZIP 16.2MB)
- 2027 SL-PCM emissions tool (v3.2.1) (ZIP 42.8MB)

- Technical document available for download (2015)

[https://uk-air.defra.gov.uk/assets/documents/reports/cat09/1511260938_AQ0959_Streamlined_PCM_Technical_Report_\(Nov_2015\).pdf](https://uk-air.defra.gov.uk/assets/documents/reports/cat09/1511260938_AQ0959_Streamlined_PCM_Technical_Report_(Nov_2015).pdf)

Use of the SL-PCM tool for the 2015 Air Quality Plans

- Versions of the **SL-PCM** tool of **2020** and **2025** were produced to evaluate compliance. These were the target years of the PCM projections – emissions and concentration baselines.
- The **SL-PCM tool** supported the selection of the main measures on the transport sector by carrying out a preliminary screening. The measures were then fully modelled with PCM.
- Analysis of the impact of local measures and **Real Driving Emissions (RDE)**:
 - Step 1: conformity factor of 2.1 for all new model types in 2017 and all vehicle registrations in 2019.
 - Step 2: conformity factor of 1.5 for all new model types in 2020 and all vehicle registrations in 2021.
- **Clean Air Zones (CAZ)** were defined and modelled in terms of assumed vehicle substitutions for either buses, HGVs, LGVs or passenger cars.

Zone/Agglomeration (City Clean Air Zone applied within)	Modelled Class
Greater London Urban Area (London)	2020 - D (in ULEZ)/ 2025 - C in Greater London
West Midlands Urban Area (Birmingham)	C
West Yorkshire Urban Area (Leeds)	C
East Midlands (Derby)	B
Nottingham Urban Area (Nottingham)	B
Southampton Urban Area (Southampton)	B

Source: Defra (2015). *Improving air quality in the UK*. https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/492901/air-quality-plan-2015-technical-report.pdf

Legal action against the UK government due to poor air quality (II)



Neutral Citation Number: [2016] EWHC 2740 (Admin)

Case No: CO/1508/2016

Before :

MR JUSTICE GARNHAM

Between :

ClientEarth (No.2)

Claimant

- and -

Secretary of State for the Environment, Food and
Rural Affairs

Defendant

- and -

Mayor of London

Scottish Ministers

Interested

Welsh Ministers

Parties

Secretary of State for Transport

- The 2015 **Air Quality Plans** predicted compliance in the whole of the UK by **2025** (London).
- ClientEarth took Defra to the High Court in **2016** arguing that full compliance should be achieved as **soon as possible** (AQD).
- In November **2016**, the judge concluded that:
 - The 2015 Air Quality plans were **unlawful**, do not achieve compliance by the soonest date possible.
 - Defra fell into error by fixing the projected compliance dates of **2020** and **2025** (London).
 - The future emissions were too **optimistic**.
 - The 2015 Air Quality Plans **failed** to comply with Article 23 of Directive 2008/50/EC.
- The judge ordered the 2015 Air Quality Plans to be **quashed** and the submission of new plans by July 2017.
- Preparation of second air quality plans in **8 months!**

Source: **Judiciary UK (2016).** <https://www.judiciary.uk/wp-content/uploads/2016/11/clientearth-v-ssenviron-food-rural-affairs-judgment-021116.pdf>

Use of the SL-PCM tool for the 2017 Air Quality Plans



Department
for Environment
Food & Rural Affairs



Department
for Transport

UK Plan for tackling roadside nitrogen dioxide concentrations

Technical report

July 2017



Year	Baseline Non-compliant Zones
2017	37
2018	36
2019	34
2020	31
2021	22
2022	18
2023	9
2024	3
2025	3
2026	3
2027	1
2028	1
2029	1
2030	1

Includes Manchester

London, Birmingham, Leeds

London

- Versions of the **SL-PCM** tool were produced for **2018-2030**. For these years, emissions and concentration baselines from PCM were also produced.
- Modelling was conducted for each year separately and no interpolation was required. These have been used to estimate the air quality impact of the measures with more accuracy in these years.
- The **SL-PCM tool** was independently evaluated by a panel of external experts.
- Examples of the measures that were developed by these plans are:
 - 21 Clean Air Zones (including the previous 5 local authorities).
 - Retrofitting schemes for buses, HGVs and black cabs.
 - Scrappage schemes.
 - Ultra-low emission vehicles (ULEVs).
 - Motorway speed limits.
- Clean Air Zone Framework.

Sources: Defra (2017). https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/632916/air-quality-plan-technical-report.pdf
 Brook Cottage Consultants (2017). <https://www.slideshare.net/ies-uk/draft-national-air-quality-plan-claire-holman>

Legal action against the UK government due to poor air quality (III)

Thursday, 27 April 2017

B e f o r e:

MR JUSTICE GARNHAM

Between:

THE QUEEN ON THE APPLICATION OF CLIENTEARTH

Claimant

v

SECRETARY OF STATE FOR ENVIRONMENT, FOOD AND RURAL AFFAIRS

Defendant



- ClientEarth took Defra to the High Court in 2017 for a third time stressing the lack of feasibility studies for many local authorities in the UK and the lack of an air quality plan in Wales.
- On the 2nd February 2018, the judge ruled that the 2017 plans were unlawful but he **did not order** them to be **quashed**. He issued a mandatory order requiring the urgent production of a **Supplement** to the 2017 Plan containing measures sufficient to rectify the deficiencies by 5 October.

*“I accept the evidence that **national monitoring and modelling** used for the purposes of the 2017 Plan has been undertaken in accordance with the criteria set out in the Air Quality Directive.”*

*“I would add that, in my judgment, modelling future compliance with NO₂ limit values is pre-eminently a **matter of technical judgement** upon which expert opinion is likely to be decisive. Defra established **an independent panel of experts to provide guidance on this issue**. As Ms Smith submits, **any challenge to such modelling must show clear legal error or irrationality**. I see no such legal error or irrationality here.”*

Source: Judiciary UK (2018). <https://www.judiciary.uk/wp-content/uploads/2018/02/clientearth-no3-final-judgmentdocx.pdf>

This presentation has given some insights on the use of a simplified assessment tool which originates from the UK national compliance assessment model (PCM) in real policy examples.

Streamlined PCM is ...

- A national-level **screening tool** based on the **full PCM model** that estimates the effect of road-transport measures on **NO_x emissions** and **NO₂ concentrations**.
- A **resource** used by DEFRA for the quick investigation of the **effectiveness** of mitigation measures with regards to compliance with **Directive 2008/50/EC**.
- Comparable results with the full PCM model for road transport measures.

Streamlined PCM is not ...

- A **substitute** or an **independent** model from the Pollution Climate Mapping model.
- An **alternative** to national, regional or local **air quality modelling**.
- An **air quality model** in itself.