

UK AIR

Air Information Resource

Enter keyword



[Home \(https://uk-air.defra.gov.uk/\)](https://uk-air.defra.gov.uk/) > [Science & Research \(https://uk-air.defra.gov.uk/research/\)](https://uk-air.defra.gov.uk/research/)

Air modelling for Defra

Currently Defra and the Devolved Administrations use a suite of models to assess a range of pollutants at different spatial scales, from local to hemispheric, to meet a number of requirements. The main models currently used by Defra and the Devolved Administrations are outlined below:

Pollution Climate Mapping (PCM)

The Pollution Climate Mapping (PCM) model is a collection of models designed to fulfil part of the UK's EU Directive (2008/50/EC) requirements to report on the concentrations of particular pollutants in the atmosphere. These models are run by Ricardo Energy & Environment on behalf of Defra. There is one model per pollutant (NO_x, NO₂, PM₁₀, PM_{2.5}, SO₂, CO, benzene, ozone, As, Cd, Ni, Pb and B[a]p) each with two parts: a base year model and a projections model. The PCM provides outputs on a 1x1 km grid of background conditions plus around 9,000 representative road side values. PCM is also used for scenario assessment and population exposure calculations to assist policy developments and also provides model runs to support the writing of Time Extension Notification (TEN) applications for PM₁₀ and NO_x.

The Pollution Climate Mapping Model is used to produce background maps, 1x1 km grids of pollutant concentrations, for the UK. These are available from the modelling data page ([../data/modelling-data](#)). In addition you can download modelled background maps by Local Authority from the LAQM pages (<http://laqm.defra.gov.uk/review-and-assessment/tools/background-maps.html>).

Community Multi-scale Air Quality Modelling System (CMAQ)

The Community Multi-scale Air Quality Modelling System (CMAQ) (<http://www.cmaq-model.org/>) is used by Ricardo Energy & Environment (<http://ee.ricardo.com>) on behalf of Defra to calculate daily air quality forecasts. The daily forecast results are presented on the UK AIR forecasting pages

(../forecasting). CMAQ is an open source model developed by the USEPA, which can be downloaded from the CMAQ website. The CMAQ forecasting model (../forecasting/how-forecasts-are-produced?view=cmaq) uses meteorological data from the Weather Research and Forecasting model (../forecasting/how-forecasts-are-produced?view=wrf) (WRF). The model outputs are produced to a 50x50 km resolution over Europe, with nested 10x10 km squares for the UK.

Defra also funds a project to investigate and demonstrate how CMAQ might meet Defra's needs with respect to the national modelling and assessment of UK air quality policies and to develop a configuration optimised for those needs. See the CMAQ-UK (air-quality-modelling?view=cmaq-uk) page for more information.

Fine Resolution Atmospheric Multi-pollutant Exchange (FRAME)

The Fine Resolution Atmospheric Multi-pollutant Exchange (FRAME) (<http://www.uk-pollutantdeposition.ceh.ac.uk/frame>) is a Lagrangian statistical trajectory model run by CEH on behalf of Defra to calculate annual averages of SO_x, NO_x and NH_x wet and dry deposition at a 5 km x 5 km resolution. FRAME is also used for rapid calculations to respond to policy concerns and assist negotiations through input to the UK Integrated Assessment Model. More information regarding FRAME can be found on the FRAME webpages (<http://www.uk-pollutantdeposition.ceh.ac.uk/frame>). Deposition maps produced by FRAME can be downloaded from the FRAME modelling maps pages (<http://www.uk-pollutantdeposition.ceh.ac.uk/image/tid/8>).

EMEP4UK

Defra also funds research and development of the European Monitoring and Evaluation Program Unified Model for the UK (EMEP4UK) (<http://www.emep.int>) to provide assessments of critical load exceedances. The EMEP4UK is run by CEH and uses an outer grid of 50x50 km² and a nested UK grid of 5x5 km². Developing an Eulerian multi-scale, multi pollutant model will allow Defra to determine the effect of different policy scenarios on a number of pollutants with one model run. The EMEP4UK model is an open source model which can be downloaded from the EMEP website and uses the Weather Research and Forecasting (WRF) Model to generate the meteorology for the model, this can be downloaded from the WRF Model website (<http://www.wrf-model.org/index.php>)

Ozone Source Receptor Model (OSRM)

Defra uses the Ozone Source Receptor Model (OSRM) to advise on the effects of planned or proposed policy on ozone concentrations to changes in precursor emissions (particularly involving changes in NO_x and VOC emissions). OSRM is run by Ricardo-AEA and is a source-receptor Lagrangian trajectory model with single vertical layer covering the UK. The model produces hourly concentrations of O₃, NO, and NO₂ in the mid-boundary layer at named receptors or on a 10x10 km

UK grid. Post-processing code converts this to surface concentrations and also calculates metrics including exceedances of target values and long term objectives, and running averages of concentrations.

UK integrated assessment model (UKIAM)

The UK integrated assessment model (UKIAM), has been developed using Defra funding by Imperial College London to investigate cost effective strategies for reducing UK emissions which maximise improvements in environmental protection in the UK while complying with future UK emission ceilings imposed to reduce transboundary air pollution in Europe. UKIAM brings together information on projected UK emissions of SO₂, NO₂, NO_x, NH₃, CO₂, N₂O, CH₄, PM₁₀ and PM_{2.5} to calculate the simultaneous effect of abatement measures on a combination of pollutants, and comparison of future scenarios. This includes calculating the effects with respect to changes in greenhouse gas emissions as well as human exposure to air pollution, urban air quality, and the natural ecosystems.

Other models

Defra also uses a number of other models to either to provide input data or validation data for the models listed above. These include but are not limited to: ELMO (Edinburgh-Lancaster Model for Ozone), NAME (Numerical Atmospheric-dispersion Modelling Environment), PTM (Photochemical Trajectory Model) and TRACK (TRajjectory model with Atmospheric Chemical Kinetics).

Reports and outputs from these models can be found in the Library (../library) section of this website. Data outputs from a number of these models can be downloaded from Defra's modelling data page (../data/modelling-data).

Air Quality Modelling (<https://uk-air.defra.gov.uk/research/air-quality-modelling>)

Air modelling for Defra (<https://uk-air.defra.gov.uk/research/air-quality-modelling?view=modelling>)

CMAQ-UK (<https://uk-air.defra.gov.uk/research/air-quality-modelling?view=cmaq-uk>)

Air Quality Modelling Review (<https://uk-air.defra.gov.uk/research/air-quality-modelling?view=review>)

Defra's Model Intercomparison Exercise (<https://uk-air.defra.gov.uk/research/air-quality-modelling?view=intercomparison>)

You may also be interested in...

Defra's Science Advisory Council Modelling Review report
(<https://www.gov.uk/government/organisations/science-advisory-council>)

Local air quality management (LAQM) (<http://laqm.defra.gov.uk>)

Research at Defra (<https://www.gov.uk/government/organisations/Department-for-environment-food-rural-affairs/about/research>)

Defra eTendering Portal (<https://defra.bravosolution.co.uk/web/login.shtml>)

Main Navigation

[Home \(/\)](#).

[Air Pollution \(/air-pollution\)](/air-pollution).

[Data \(/data\)](/data).

[Monitoring Networks \(/networks\)](/networks).

[Library \(/library/\)](/library/).

[Science & Research \(/research/\)](/research/).

[AQMAS \(/aqma\)](/aqma).

[SCA \(/sca\)](/sca).



Department for Environment Food & Rural Affairs

[Cookies policy \(/cookies\)](/cookies). [Terms & conditions \(/about-these-pages\)](/about-these-pages). [News & Events \(/news\)](/news).

[Jobs \(https://www.gov.uk/government/organisations/department-for-environment-food-rural-affairs/about/recruitment\)](https://www.gov.uk/government/organisations/department-for-environment-food-rural-affairs/about/recruitment).

[Privacy \(/privacy\)](/privacy). [Help \(https://www.gov.uk/help\)](https://www.gov.uk/help).

[Contact us \(https://www.gov.uk/government/organisations/department-for-environment-food-rural-affairs#org-contacts\)](https://www.gov.uk/government/organisations/department-for-environment-food-rural-affairs#org-contacts).

[Feedback \(mailto:aqinfo@ricardo.com?subject=User%20Feedback\)](mailto:aqinfo@ricardo.com?subject=User%20Feedback).

All content is available under the Open Government Licence v3.0, except where otherwise stated.

© Crown copyright