

NICOLA CAROLINE COURTHOLD

ASPECTS OF AIR QUALITY MANAGEMENT IN AN URBAN AREA: A CASE STUDY IN BRISTOL, UK

ABSTRACT

Studies have been pursued investigating the air quality management process for predicting concentrations of nitrogen dioxide (NO₂) in Bristol, UK.

Specifically, a small area around the M4/M5 interchange to the North of Bristol, is used to test several linear source dispersion models including CALINE4, DMRB, AAQuIRE and ADMS-Urban. The model predictions are compared with diffusion tube monitoring data collected between April 1994 and March 1995. The predictions of annual average NO₂ concentrations showed CALINE4 to be most suitable model for the air quality management process in Bristol.

An emissions inventory is compiled for NO_x emissions in 1995 in Bristol. The completed inventory is compared with a database produced by LRC (Buckingham *et al.*, 1997b). Results show that road sources are the dominant source of NO_x in Bristol. The significant differences found between the Courthold and LRC method were in the emissions of NO_x from road sources.

The dispersion models ADMS-Urban and Indic Airviro are evaluated for the use as tools in predicting NO₂ concentrations for a complex urban environment. ADMS-Urban was found to predict hourly NO₂ concentrations at a continuous monitoring site in the centre of Bristol most accurately. A correlation coefficient of 0.61 was found between modelled predictions of NO₂ and monitored concentrations, with 78 % of model predictions within a factor of 2 of the monitored concentrations. ADMS-Urban is also used to compare the results on a spatial scale using annual average diffusion tube data from the Bristol monitoring network and the AEA diffusion tube survey.

Future concentrations of NO₂ in Bristol are also investigated, to examine whether the air quality objectives for NO₂ will be breached. Estimations of future emissions are made using current trends in population, transport and economic growth. Model predictions showed that the annual average NO₂ objective is likely to be breached at only one roadside location in the centre of Bristol in 2005.

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