Current Practice

- Air Quality Review & Assessment Process for UK Local Authorities
- Over 130 Air Quality Management Areas declared (NO$_2$ and PM$_{10}$ roadside hotspots)
- Dispersion Manual for Roads and Bridges (DMRB) for screening assessment
- Advanced modelling and monitoring for detailed assessment
Operational Models

- **WinOSPM** (NERI, Denmark)
- **AEOLIUS** Screen, Emission, and Full (Met Office, UK)
- **ADMS-Urban** 2.0 (CERC, UK)
- **CAR** International (TNO, Netherlands)
- **STREET** (Stratford Research Institute, USA)

Model Parameterisation

\[ L = 2rH \sin \varphi \]
Input Requirements

- Street dimensions and orientation
- Receptor location (height & distance)
- Met data (wind, temperature, cloud cover, global radiation, atmospheric pressure)
- Vehicle emission factors (EFT with cold starts)
- Vehicle fleet composition (small/large)
- Vehicle counts and average vehicle speed
- Background concentrations
- $NO_x - NO_2$ chemistry scheme

Case Studies

Most modelling studies deal with ideal street canyons – but in reality urban canyons are very complex!

- **Stratford Road** (Birmingham)
  - H/W = 0.5
  - AADT = 29000

- **Marylebone Road** (London)
  - H/W = 0.5
  - AADT = 76000
(1) Stratford Road

Annual mean concentrations – 1

![Chart showing observed and predicted concentrations of NO2, PM10, and CO at Stratford Road in 2003. The chart indicates over-prediction in certain scenarios.]
Correlation with measurements – 1

Stratford Road (2003)

- NO2
- CO
- PM10

Correlation coefficient

- Lower correlation for PM10

WinOSPM  ADMS-Urban  AEOUS Full

(2) Marylebone Road

http://www.airpollution.org.uk/dapple/

HARMO-10 Crete 2005
Annual mean concentrations – 2

Marylebone Road (2003)

- NO2
- PM10
- CO

Over-prediction

Correlation with measurements – 2

Marylebone Road (2003)

- NO2
- CO
- PM10

Higher correlation for PM10
Wind Direction – NO₂

Wind Direction – CO
Conclusions and future work

- Street canyons have been associated with exceedences of air quality objectives in UK
- Several screening and advanced models available (WinOSPM, ADMS-Urban, AEOLIUS Full)
- Tested models in reasonable agreement with measurements from two low-rise canyons, but...
- Modelling results as good as input data and corresponding assumptions
- Further work on pollutant dispersion in low-rise canyons and urban intersections (traffic-induced turbulence during congestion, particle re-suspension, etc.)

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