# Supplementary Materials: Comparison of Land-Use Regression Modelling with Dispersion and Chemistry Transport Modelling to Assign Air Pollution Concentrations within the Ruhr Area
*Atmosphere* **2016**, *7*, 48

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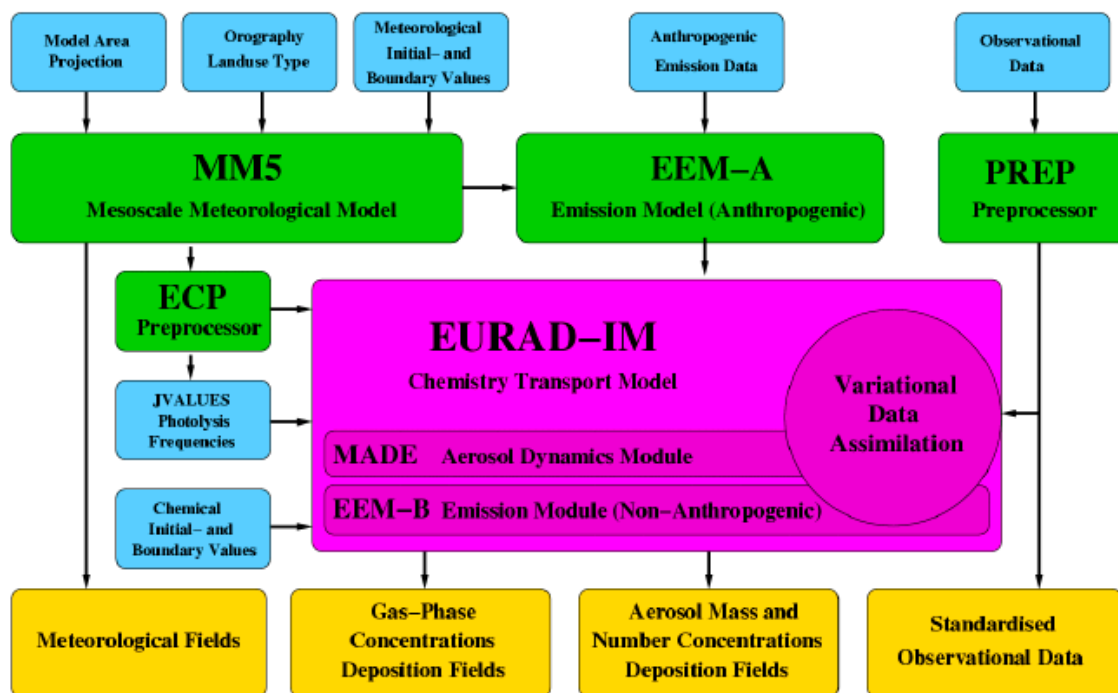
Figure S1. Flowchart of the EURAD model system containing the meteorological driver MM5, the pre-processors ECP and PREP, the emission model EEM and the chemistry transport model EURAD (input parameters are shaded in blue, output parameters are shaded in yellow and procedural parts are shaded in green or magenta) [1].
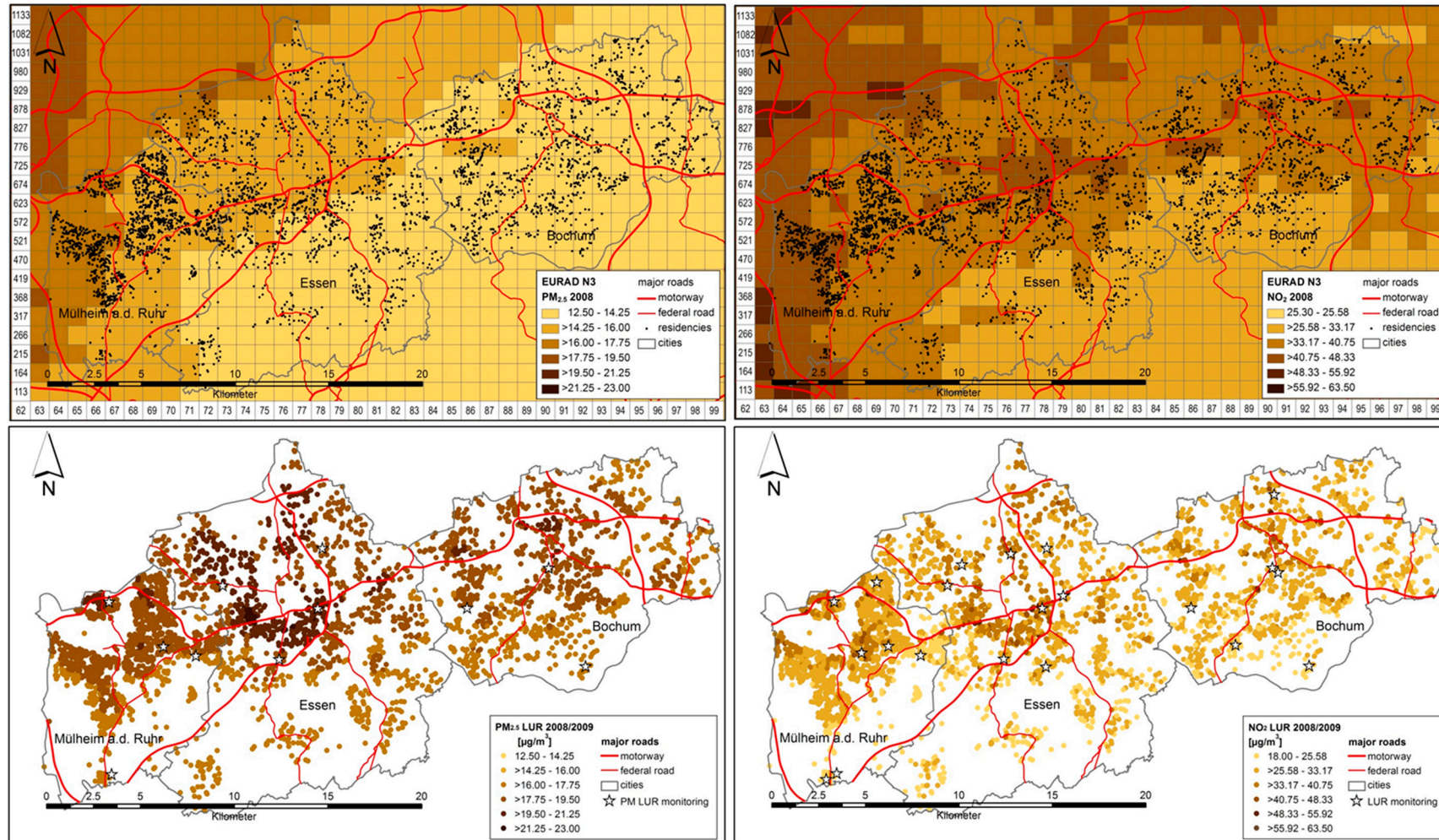
Figure S2. Spatial distribution of EURAD-CTM (1 km^2, yearly mean 2008) and ESCAPE-LUR (point-specific yearly mean October 2008–October 2009) at 4809 residences within the HNR study area for PM$_{10}$ (A+C) and NO$_2$ (B+D).
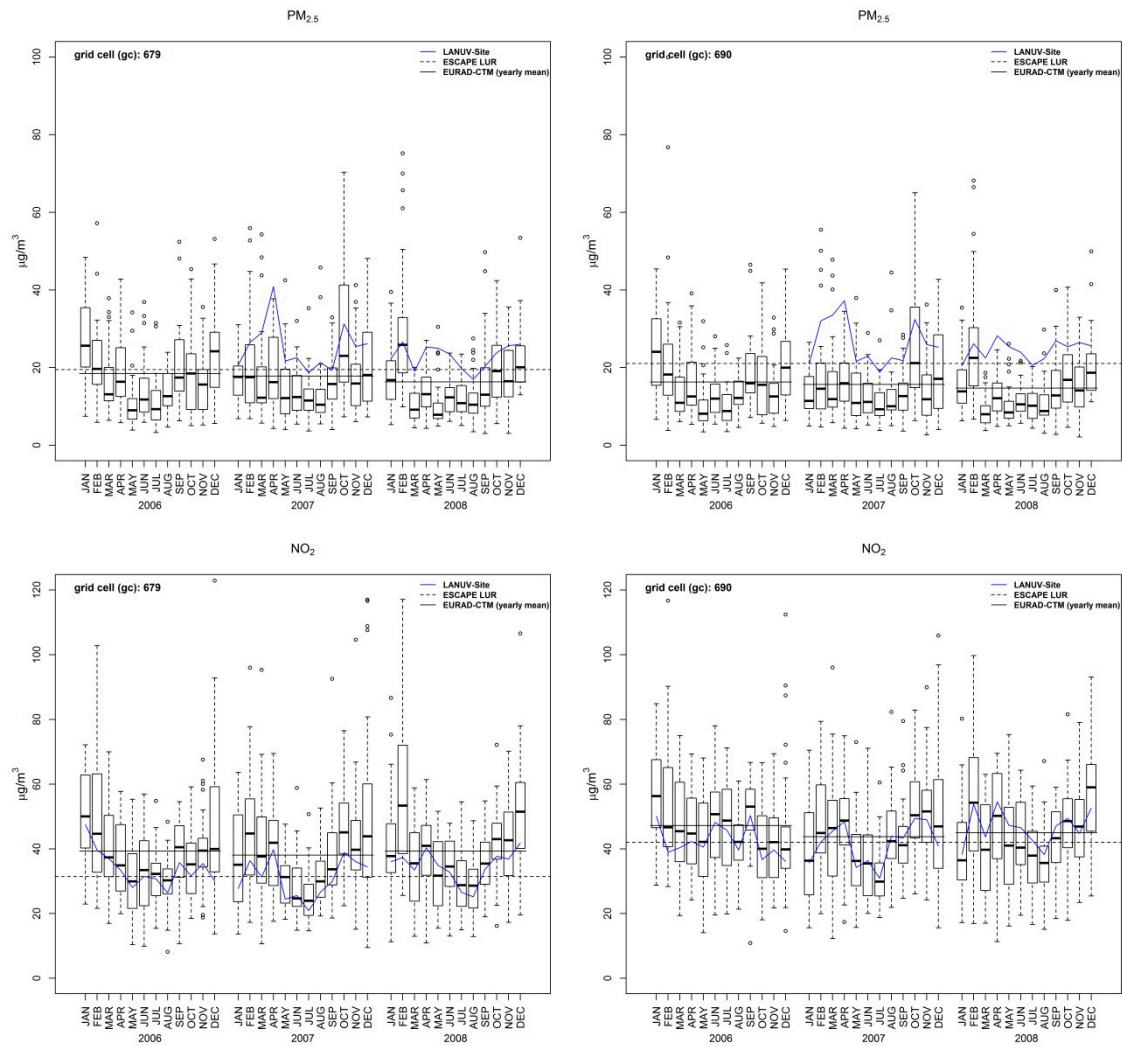
Figure S3. Boxplots of air pollution concentrations of monthly-mean PM_{10} and NO_2 concentrations over three year for a traffic-specific (grid cell: 690), and a background-specific location (grid cell: 679) with annual mean ESCAPE-LUR estimates and annual measurements at LANUV monitoring sites.

Table S1. Time and locations of the ESCAPE-measurement campaign.

Time of measurements	Autumn: • 16 October 2008–30 October 2008 • 3 November 2008–17 November 2008 • 19 November. 2009–3 December 2008 • 5 December 2008–19 December 2008 Winter: • 7 January 2009–21 January 2009 • 26 January 2009–9 Febuary 2009 • 11 Febuary 2009–25 February 2009 • 27 Febuary 2009–13 March 2009 Spring/summer: • 24 June 2009–8 July 2009 • 10 July 2009–24 July 2009 • 28 Jul. 2009–11 August 2009 • 13 August 2009–27 August 2009
Characteristics of site	Background: • No influence by sources in the "direct vicinity" of site • No more than 3000 vehicles per day in a 50 m-buffer • No important sources of PM or NOx within a 100 m-buffer (combustion source, construction works, small industries, district heating plant, parking areas) and • Distance to large industries > 100 m. Traffic: • Traffic intensity > 10,000 vehicles per day at site location • Absence of other sources (preferable) • Ground level or first floor measurements (2–3 m).
Filter type of measurement sites	NO_2: Ogawa badges PM: Harvard Impactors

Table S2. ESCAPE-LUR for $PM_{2.5}$, PM_{10} and NO_2.

Air Pollutant	Linear Model	Predictors	Adj. R^2	LOOCV-R^2
$PM_{2.5}$	$81.73 + 5.61 \times 10^{-8} \times$ HEAVYTRAFLOAD_1000 + 1.20 $\times$ $10^{-7} \times$ INDUSTRY_5000 + 1.04 $\times 10^{-4} \times$ POP_1000 $- 2.57 \times 10^{-5} \times$ XCOORD	Heavy traffic load in a 1000 m-buffer, Industry in a 5000m-buffer, Population in a 1000m-buffer, X-Coordinate of residential address	0.85	0.74
PM_{10}	$23.86 + 1.47 \times 10^{-7} \times$ HEAVYTRAFLOAD_1000 + 2.44 $\times$ $10^{-4} \times$ POP_1000	Heavy traffic load in a 1000m-buffer, Population in a 1000m-buffer	0.66	0.59
NO_2	$19.66 + 3.48 \times 10^{-7} \times$ INDUSTRY_5000 + 0.022 $\times$ POP_100 + 4.1 $\times 10^{-6} \times$ PORT_5000 + 1.31 $\times 10^{-6} \times$ TRAFLOAD_100	Industry in a 5000m-buffer, Population in a 100 m-buffer, inland sea-ports in a 5000 m-buffer, traffic load in a 100 m-buffer	0.88	0.82

Table S3. Time and Location of routine monitoring sites, provided by LANUV, within the HNR study area [2].

Name and Adress of Monitoring Site	Air Pollutant and Time of Monitoring	Frequency of Monitoring
Mülheim-Styrum (STYR) Neustadtstraße, 45476 Mülheim	NO_2 (since 1981) PM_{10} (since 2002) $PM_{2.5}$ (since 2007)	Daily Daily 2-day-basis
Essen-Vogelheim (EVOG) Hafenstraße, 45356 Essen	NO_2 (since 1985) PM_{10} (since 2002) $PM_{2.5}$ (since 2008)	Daily Daily 2-day-basis
Essen-Ost (VESN) Steelerstraße, 45138 Essen	NO_2 (since 1986) PM_{10} (since 2003) $PM_{2.5}$ (since 2003)	Daily Daily Daily

References

1. Elbern, H.; Friese, E. Eurad-IM Products, Quality and Background Information. Available online: http://www.uni-koeln.de/math-nat-fak/geomet/eurad/modell/eurad_descr_e.html (accessed on 16 December 2015).
2. Stationen und Messwerte. Available online: http://www.lanuv.nrw.de/umwelt/luft/immissionen/stationen-und-messwerte/ (accessed on 30 November 2015).