Geophysical Research Abstracts
Vol. 16, EGU2014-11243, 2014
EGU General Assembly 2014


# Road construction: Emissions Factors and Air Quality Impacts

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Very few studies have investigated the air pollution impacts of road construction. Over a 17 month period a congested main road in south east London was widened from two lanes to four. Emissions factors for road construction were determined and a notable deterioration in residential air quality was found with the final expanded road layout.

Air quality monitoring sites measuring PM10, PM2.5, NOX, $NO_2$ and meteorological variables were deployed on both sides of the road construction to quantify ambient air quality before, during and after the completion of the road works, with additional measurements from a nearby background site. PM10 samples were collected for oxidative potential measurements.

PM10 was the only pollutant to increase during the construction; mean PM10 from the road increased by 15 $\mu$g m-3 during working hours; weekdays between 6 am and 5 pm; and on Saturdays between 6 am and 12 pm, compared to concentrations before the road works. During the construction the number of days with daily mean PM10 concentrations greater than 50 $\mu$g m-3 was more than 35 for both sides of the road, breaching the European Union Limit Value (LV).

Downwind-upwind differences were used to calculate real-world PM10 emissions associated to the construction activity by means of box modelling. The quantity of PM10 emitted per area and month of construction was 0.0009 kg PM10 m-2 month-1 for the construction period. This emission factor was similar to the one used in the UK National Atmospheric Emissions Inventory (NAEI). Worst case construction emissions factors were 0.0105 kg PM10 m-2 month-1, compared to 0.0448 kg PM10 m-2 month-1 and 0.1038 kg PM10 m-2 month-1 used in current European and US inventories, respectively.

After the completion of the road widening an increase in all pollutants was measured during rush hour peaks: 2-4 $\mu$g m-3 for PM10; 1 $\mu$g m-3 for PM2.5; 20 and 4 ppbv (40 and 8 $\mu$g m-3) for NOX and $NO_2$, respectively, leading to a breach of the $NO_2$ annual mean LV at this location for the first time. The increased air pollution was associated with an increase in the number of cars, taxis and LGVs. The glutathione dependent oxidative potential did not increase during the construction period but a significant increase was found when the new widened road was in operation.