# Controlling air pollution at construction sites

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As policies to control air pollution emissions from industry and transport grow ever stronger the spotlight falls on emissions sectors that have not previously been the focus of controls including, most recently, the construction sector. The 2010 London Atmospheric Emissions Inventory (GLA, 2013) included construction emissions for the first time. It was estimated that construction machinery was responsible for 12% of London's $NO_X$ emissions, 17% of $PM_{2.5}$ and 12% of $PM_{10}$. Construction and demolition dust added a further 1% to London's $PM_{10}$ emissions.

As a consequence London introduced the world's first Low Emission Zone for construction machinery in September 2014 (https://nrmm.london/). Also, dust management programmes are now required for large construction sites including perimeter $PM_{10}$ measurements and an action limit of 250 µg $m^{-3}$ (15 minute mean) set to protect the public. If this value is breached then construction should stop and the cause of the breach investigated. The action limit was based on a single study in London in 1999 (Fuller and Green, 2004).

This investigation sought to re-evaluate the 250 µg $m^{-3}$ threshold as an indicator for construction emissions given newer measurement techniques and changes to urban background PM over the last 16 years. It also investigated the validity of the emissions inventory estimates from construction.

## Methods

Pollution measurements from nine construction sites were analysed. Construction projects varied between three months and five years duration and ranged in scale. Projects included the construction of a single storey out-building, the landscaping of 3.2 ha of urban space, the construction of 1.8 km urban road and the demolition and construction of housing blocks. The final dataset included pre and post measurement periods at each construction site and comprised 1.8 million measurements. It is the largest analysis of construction $PM_{10}$ to our knowledge.

The pre/post construction period was compared to construction periods to re-assess the action limit and to investigate emissions ratios of construction dust emissions (assumed to be $PM_{10}$) to exhaust emissions of $PM_{2.5}$, $NO_X$ and $NO_2$.

## Results and discussion

Comparing construction with non-construction periods, the impacts of $PM_{10}$ from construction were not always apparent in the median and 95th percentiles at every construction site. Construction $PM_{10}$ was most apparent in the top 0.3% of measurements. Substantial differences in $PM_{10}$ concentrations between similar types of construction site showed the scope for good site management. Proximity was also a factor in local $PM_{10}$ concentrations from construction. However, even by controlling peak concentrations, local $PM_{10}$ from construction might still increase by 4-5 µg $m^{-3}$ as a median over a construction project.

Construction emissions of $PM_{10}$ were detected at several sites but there was no evidence of $PM_{2.5}$, $NO_X$ or $NO_2$ from construction machinery exhaust (see Figure 1).

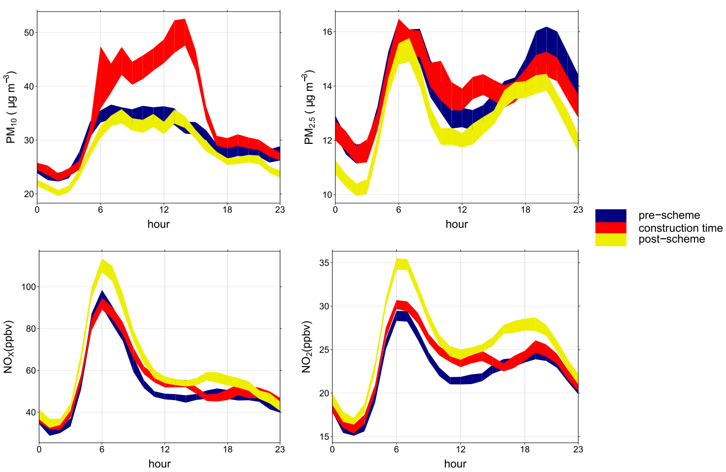


Figure 1. Mean diurnal weekday concentration of $PM_{10}$, $PM_{2.5}$ $NO_X$ and $NO_2$ before (blue), during (red) and after (yellow) a road construction project.

## Conclusions

A concentration threshold of 190 µg $m^{-3}$ (hourly mean) was shown as a reliable indicator of local construction $PM_{10}$. This would have very low (<1%) false alarm rate if used as part of new dust control programmes. In contrast to emissions inventory estimates, $PM_{10}$ from construction and demolition was far greater than $PM_{2.5}$ and $NO_X$ from construction machinery.

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