

## Assessment of Pollutant Concentrations and Respiratory Tract Depositions of PM from Traffic Emissions: A Case Study of a Highway Toll Plaza in India

**Authors :** Nazneen, Aditya Kumar Patra

**Abstract :** The aim of this study was to investigate the personal exposures of toll plaza workers on a busy national highway in India during the winter season to PM<sub>2.5</sub>, PM<sub>10</sub>, BC (black carbon), and UFP (ultrafine particles). The results showed that toll workers inside the toll collection booths (ITC) were exposed to higher concentrations of air pollutants than those working outside the booths (OTC), except for UFP. Specifically, the concentrations of PM<sub>2.5</sub> were 204.7 µg m<sup>-3</sup> (ITC) and 100.4 µg m<sup>-3</sup> (OTC), while PM<sub>10</sub> concentrations were 326.1 µg m<sup>-3</sup> (ITC) and 244.7 µg m<sup>-3</sup> (OTC), and BC concentrations were 30.7 µg m<sup>-3</sup> (ITC) and 17.2 µg m<sup>-3</sup> (OTC). In contrast, UFP concentrations were higher at OTC (11312.8 pt cm<sup>-3</sup>) than at IOC (7431.6 pt cm<sup>-3</sup>). The diurnal variation of pollutants showed higher concentrations in the evening due to increased traffic and less atmospheric dispersion. The respiratory deposition dose (RDD) of pollutants was higher inside the toll booths, especially during the evening. The study also revealed that PM particles consisted of soot, mineral and fly ash, which are proxies of fresh exhaust emissions, re-suspended road dust, and industrial emissions, respectively. The presence of Si, Al, Ca and Pb, as confirmed by EDX (Energy Dispersive X-ray analysis) analyses, indicated the sources of pollutants to be re-suspended road dust, brake/tire wear, and construction dust. The findings emphasize the need for policies to regulate air pollutant concentrations, particularly in workplaces situated near busy roads.

**Keywords :** air pollution, PM<sub>2.5</sub>, black carbon, traffic emissions

**Conference Title :** ICEESD 2023 : International Conference on Energy, Environment and Sustainable Development

**Conference Location :** Amsterdam, Netherlands

**Conference Dates :** August 03-04, 2023