Air pollution from vehicle emission in an industrial environment

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ABSTRACT

Road traffic network has grown in order to accommodate the demands of urbanization and industrialization. Despite the important contributions from other sources, road traffic has become one of the major source of air pollutants in cities and industrial area. This study aims to understand the relationship between the ambient concentration of major air pollutants and the road traffic volume in an industrial environment and to suggest strategies to reduce air pollution from traffic flow within the industrial area. This study monitors the concentration of sulfur dioxide (SO_2), nitrogen dioxide (NO_2), carbon monoxide (CO), ozone (O_3) and particulate matter with diameters less than 10 µm (PM_{10}) on a site in the HiCom industrial area, Shah Alam. Two sampling stations were selected and samples were taken at two points, 1 m and 100 m from the roadside for each stations. The results will be compared with the ambient air quality data within the industrial environment. The GIS-based dispersion model OML-Highway was used to calculate the real-world concentration of PM_{10}, particulate matter with diameters less than 2.5 µm ($PM_{2.5}$), particulate matter from exhaust (PM_{exh}), CO, NO_x, NO_2, and O_3 pollutants from traffic emission. The concentrations of pollutants at the sampling point 1 m from the roadside were significantly higher than at the sampling point 100 m from the roadside for PM_{10} and CO, while the opposite was observed for the concentration of O_3 ($p \leq 0.05$). The level of pollutants detected at the sampling area is significantly higher on a working day compared to a non-working day ($p \leq 0.05$) for PM_{10}, CO and SO_2 at station 1 (1m). The long term monitoring analysis also shows that the diurnal pattern of PM_{10}, CO and NO_2 are closely related to the road traffic rush hour. The OML-Highway modelling shows that the mean concentration of PM_{10}, CO, NO_x, NO_2 and O_3 are ranging at 56.4-83.4 µg/m^3, 998– 1684 µg/m^3, 22.0 – 376 µg/m^3, 63.4 – 86.9 µg/m^3, and 7.16 – 28.0 µg/m^3 respectively. OML-highway modelled the pollutant concentration to be higher at receptor points closer to the roadside compared to the receptor points 100 m away from the roadside except for O_3 where the concentration is higher at receptor points further than the roadside. The result demonstrates that vehicle traffic is closely related to the concentration of air pollutants in an industrial area. The OML-Highway model results and its visualization can be used as vital information for road traffic emission management.