**INDIAN INSTITUTE OF TECHNOLOGY GUWAHATI**
**SHORT ABSTRACT OF THESIS**


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Thesis Title: **Road Traffic Noise and $PM_{2.5}$ Impacts on Workers' Health in Different Microenvironments of an Urban Traffic Corridor**


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## SHORT ABSTRACT


Urban traffic corridors are severely polluted by traffic air, and noise pollution due to unprecedented growth of traffic. This study investigated the workplace annoyance and cardiovascular health of people working in two microenvironments such as street (vendors) and workplace (office workers) whose blood pressure (BP) and heart rate (HR) might be affected due to regular exposure to $PM_{2.5}$ and traffic noise. The $PM_{2.5}$ and noise levels measurements, face-to-face questionnaire survey and health check-ups were carried out on working days from 10 a.m. to 8 p.m. in Jan-Dec 2019. The data was analysed by various statistical approaches in which the link between the traffic-borne $PM_{2.5}$ and noise level at 1/3rd octave frequencies has been established with the participants' BP and HR considering the demographic, socio-contextual, habitual and annoyance perception factors. The median measure of $PM_{2.5}$ (106.67 µg/m$^3$ at street level and 33.33 µg/m$^3$ at office indoor) and noise level (71.35 dB (A) at the street and 65.78 dB (A) at office indoor) violated the WHO and NAAQS allowable limit. In winter, noise levels and $PM_{2.5}$ were relatively higher than in other seasons. The street-side $PM_{2.5}$ has been observed to be slightly correlated ($\rho$=0.299-0.344) with street-side peak noise and background noise, which might be due to the significant contribution from the same source on noise and the particulate pollution in that study area. This slight correlation suggests there might be the possible influence of other sources and some urban factors.The workplace annoyance was correlated with questionnaire variables (ρ: 0.364-1.000) and $PM_{2.5}$ (ρ:-0.326-0.235). The low-mid frequencies noise, $PM_{2.5}$, residential characteristics, family income, smoking, night traffic activities near residential area, and family income were the significant predictors of workplace annoyance. The results showed that above 40 dB (A) of 50Hz, 35 dB (A) of 100 Hz, 50 dB (A) of 315 Hz noise spectrum and > 50µg/m$^3$ of $PM_{2.5}$ significantly increase high annoyance perception of the respondents. While, noise level > 55 dB (A) 630 Hz leads to decrease annoyance of office workers' and > 100µg/m$^3$ of $PM_{2.5}$ leads to decrease the annoyance of street vendors.

The results further showed that the workers working in traffic corridors had abnormally high BP and HR. The systolic BP, diastolic BP and HR values were higher than normal in male workers than female workers. The influence of low noise spectrum (50-630 Hz) was mostly observed. Therefore, the combined effect of $PM_{2.5}$ > 50 µg/m$^3$ and noise

spectrum (63 and 100 Hz) > 30 dB (A) significantly affected the office workers' health in the traffic corridors. The hearing aids, breathing troubles in the traffic corridor and annoyance perception also influenced the BP and HR of the respondents. SoundPLAN traffic noise modelling study highlighted that car movement significantly contributes the low frequencies noise spectrum while, bus and truck contributes the higher frequency noise in that study area. The results are indicative and might be helpful in urban environmental planning to improve the well-being of urban traffic corridor users.