

Street Level Air Pollution and the Effects of Land Use/Urban Planning Variables: Initial Findings from the Colombo Metropolitan Region

¹Perera, G.B.S., ¹Emmanuel, R., ²Nandasena, Y.L.S.,

¹Department of Architecture, University of Moratuwa, ²Medical Officer, Ministry of Health

ABSTRACT

The aim of this study is to inventorize urban and rural air pollution, estimate the effects of land use and urban planning variables on street level air pollution and to work towards developing urban planning and design strategies to minimize street level exposure to aerosols. The inventorization of air pollution was carried out by a time series survey within two street canyons: high risk urban street (Galle Road, Mount Lavinia) and a low-risk rural road (Padiyathalawa, Ampara District). The Total Suspended Particulates (TSP), SO₂ and NO₂ levels were measured, using active samplers. For the purpose of estimating the air quality effects of land use and planning variables, a free-ware model named ENVI-met was used. ENVI-met is a numerical, 4- dimensional (three spatial plus the time dimension) microclimate model which can simulate the microclimate within street canyons through the solution of the physical basic equations for the wind current, the thermodynamics and the radiation balance of surfaces.

It was found that the high risk urban location had an RPM of 437µg/m³ whereas low risk village had 212 µg/m³. TSP levels during peak hours (7.30am-8.30am and 2.00pm- 3.00pm) exceeded the Sri Lankan standard (>538 µg/m³ against 500 µg/m³). The data also revealed that apart from the number of vehicles, metrological factors such as higher temperature, lower relative humidity and moderate wind speeds increased the RPM. Changes in urban microclimate, particularly air temperatures, humidity

and wind speed can affect pollution emission and formation.

In order to estimate the effect of land use and urban planning variables, several ENVI-met simulations were run: change of street vegetation, change of soil conditions (bare soil vs. paved side walks) and building geometry. Measured RPM values were used to calibrate the simulation cases.

Based on these findings, street design strategies are currently being developed and the presentation covers initial work in this area.