EFFECTS OF LOCAL WIND PATTERN ON AIR POLLUTANT DISPERSION IN KANDY URBAN AREA

Premasiri H D S [1], Ellegala H MP S K [2], Lakmal N D C [3]
[1] Environmental Studies and Service Division, National Building Research Organization
[2] Faculty of Science, University of Peredeniya, Peradeniya
[3] Faculty of Science, University of Colombo, Colombo
sarath_nbro@yahoo.com

Abstract

Kandy urban area is located at the middle of the island with high elevation which is surrounded by mountain ranges and the nature is similar to a bottom of a basin. Its geographical condition has made it a major transportation center which can be reached by major motorways in several directions to the city. It has estimated that about 2,000 bus trips and more than 3,000 further through-servicers are operated daily within the Kandy urban area. The air emission from buses and other vehicles therefore deteriorate air quality in Kandy urban area, and its geographical condition results worsening the condition by low dispersion. Therefore, urban air pollution is identified as a serious environmental problem in Kandy city over past two decades. In addition, the air quality monitoring data in Kandy urban area indicates, the seasonal and local wind patterns have significant influence on air pollutant dispersion in the city. The study was done to investigate the effect of local and seasonal wind patterns of the city on air pollutant dispersion.

Air quality and wind pattern was measured at different locations in the Kandy urban area including parking places, streets, open areas, and high-rise buildings within Kandy Municipal Council area. Sulphur Dioxide and Nitrogen Dioxide (Air quality) concentrations were measured for four consecutive weeks together with observing wind direction to represent wind pattern. The results show that the air pollution concentrations are related to local wind flow path within the city. The relationship between air pollution and wind speeds was statistically analyzed and a weak inverse relationship can be observed among them ($r = -0.420$ for SO_2 and $r = -0.313$ for NO_2). Air pollution concentrations and wind measurements were mapped using inverse distance weighted (IDW) interpolation to obtain spatial variation. The results show a noteworthy correlation between local wind and pollution dispersion, but variability of wind pattern in different monsoonal seasons has a stronger influence on the dispersion of air pollutants within the Kandy City. The air quality management efforts should

specifically consider such seasonal variabilities, and should be incorporated into plans to ensure that ambient air pollution levels maintained within safe norms throughout.

Key Words: Air Pollution, Kandy, Wind Pattern