2nd International conference of Center for Environmental Studies

Proceedings of the

International conference on

Environmental Monitoring and Management

EMM2020

23rd of October 2020

Center for Environmental Studies
University of Peradeniya

Measuring Traffic-Related Air Pollution Using Smart Sensors: Before and During a New Traffic Plan

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Change in traffic flow in a city can cause increased, decreased or no change in overall air pollution. Air pollution levels may vary significantly in some street segments compared to others and this variation may not get accurately captured by stationary monitors. In this study, we aimed to measure air pollution before and during a New Traffic Plan (NTP), Kandy, Sri Lanka using smart sensor technology. Air pollution data ($PM_{2.5}$, PM_{10} and NO_2) were collected using a mobile air quality sensor unit mounted to a Police traffic motorbike, four times a day before and during the NTP (2019-03-02 to 2019-03-07). After data collection, roads were divided into segments according to road length, geographic features and road traffic conditions using GIS software. Air pollution in each segment of roads was compared before and during the NTP. Trends of air pollution at different times of the day was compared using data from a stationary smart sensor. During the NTP majority of the road segments had higher mean levels of air pollution compared to before the NTP. For any given time (Morning, Mid-day, Afternoon and Evening), and any given period (before or during NTP), the highest $PM_{2.5}$ and NO_2 concentrations were observed at Station Road Kandy. The $PM_{2.5}$ concentrations were moderately correlated with NO_2 and positively correlated with PM_{10}, before and during the NTP. $PM_{2.5}$ concentrations during the NTP means were statistically significantly higher than the before NTP ($p=0.0067 < 0.05$). $PM_{2.5}$ concentrations at roads of the Kandy city were much higher than the WHO standards. Mean NO_2 concentrations were not significantly different before (109.87 ppb) and during NTP (104.73 ppb).The recent change in the Kandy city traffic plan might have caused an increase of $PM_{2.5}$ levels. Proper development of road infrastructure with compatible traffic plan could reduce air pollution in urban areas.

Keywords: Air quality, Mobile air quality sensors, Particulate Matters, Road traffic