IDENTIFICATION OF ANNUAL VARIATIONS IN SPATIAL DISTRIBUTION OF AMBIENT NO_2 IN THE COLOMBO MUNICIPAL COUNCIL (CMC) AREA

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One of the major air pollutants, NO_2 is largely emitted from vehicles. Ambient NO_2 concentrations are influenced significantly by the degree of urbanization of a city, traffic density of and distance to a nearby highway[1]. Environmental exposure to NO_2 increases the morbidity of pulmonary diseases and susceptibility to airway infections. NO_2 cause worsening of obstructive lung diseases[2]. Unhealthy exposure to NO_2 also induces neutrophilic inflammation in the bronchi of healthy humans[3]. In addition NO_2 is one of the major precursors of acid rain. It is obvious that the clean and pure air is very essential for the health and survival of human beings as well as the eco systems' stability. Therefore air quality monitoring, air pollution analysis and air quality management are essential for any country in order to sustain clean and quality air. Hence the study of NO_2 concentration in Colombo, Sri Lanka would be a help to sustain a green environment.

This study was carried out using NO_2 concentration data of 12 monitoring stations within the CMC limits from 2003 to 2008 except 2006 obtained from National Building Research Organization (NBRO) and the topographic map of CMC administrative boundaries obtained from the CMC. Spatial distribution analysis of NO_2 in the CMC area was performed using ArcGIS 10. The topographic map was scanned and added to ArcMap 10 and spatial coordinates were assigned to the image in order to align it with existing geographically referenced data, using geo-referencing tool. The geo-referenced map was digitized using ArcCatalog 10 and ArcMap 10. After, NO_2 point observation data were transformed to an interpolated surface, using Inverse Distance Weighted Method (IDW) and estimated the NO_2 concentration for the 5m x 5m cells using spatial analyst extension. Pollutant concentrations and polluted area with different pollutant concentrations were calculated using the developed spatial distribution map.

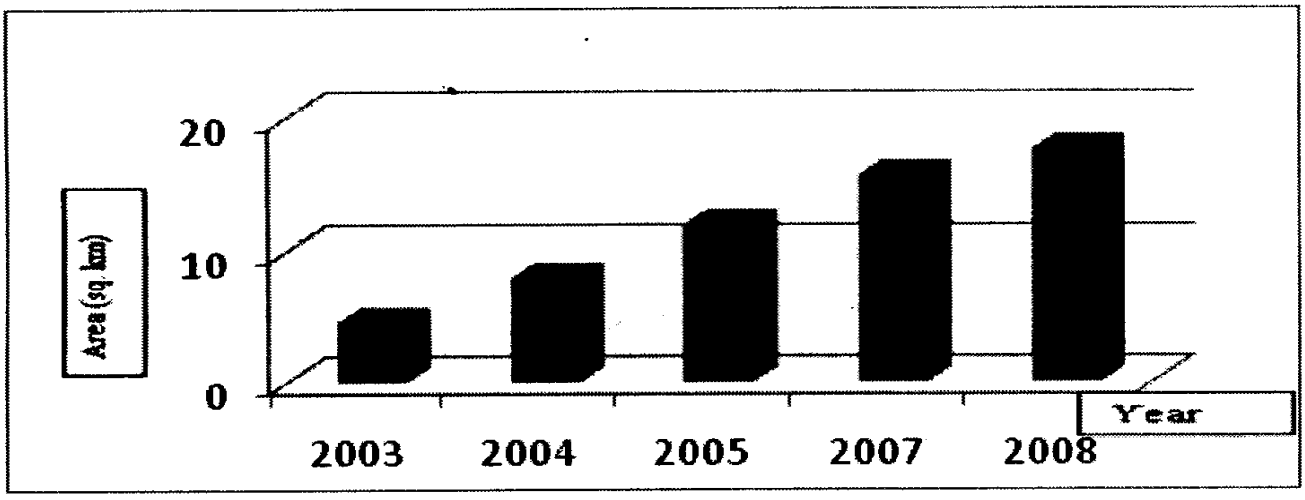

Figure 1: Variations in polluted area with higher pollutant concentrations (>40 ppb)

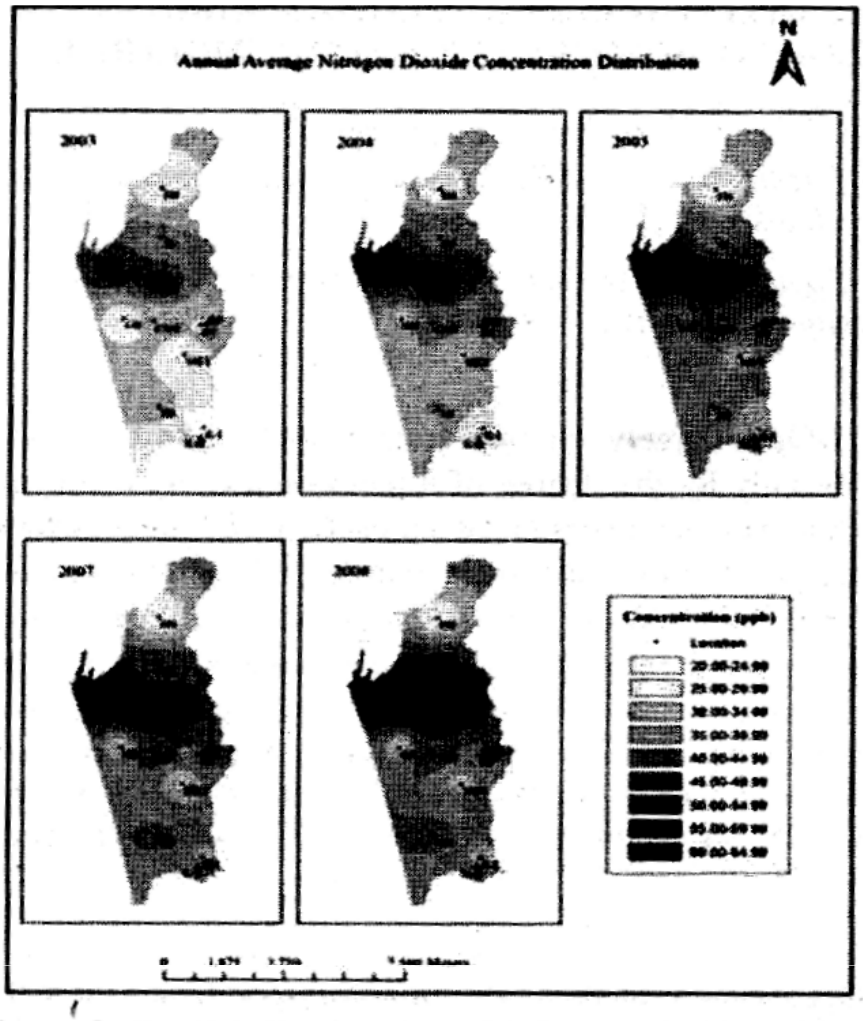

Figure 2: Spatial distribution of NO_2 from 2003 2008

According to figure 1 the polluted area has been varying, annually. Area with higher NO_2 concentration (>40 ppb) has increased from 4.56 km^2 (12.36% of the CMC area in 2003) to 17.62 km^2 (47.75% of the CMC area in 2008). According to figure 2 there is visible increase in annual average concentration of NO_2. Annual average concentration has been increased by 8.96 ppb from 2003 to 2008 (32.47 in 2003, 36.18 in 2004, 38.84 in 2005, 40.24 in 2007, 41.43 in 2008), which is an increase of 27.59% from the initial average concentration.

There is an increasing trend in the annual average concentration of NO_2 and the area with higher pollutant concentration (>Annual Guideline value (40 ppb) stipulated by the WHO). Colombo Fort and Maradana could be identified as high risk areas in terms of ambient NO_2 concentration.

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