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Geographical distribution of air pollution in Doha Qatar

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Urban air pollution is an inevitable consequence of the urbanization representing a growing concern to scientists, policymakers and an increasing fraction of the population. Air pollution is an acute problem especially in the developing countries, where the growing population, developing industry and improving life standards are generating environmental challenges. The State of Qatar has witnessed unprecedented rapid economic growth, and fast development and urbanization during the last few decades, accompanied as usual, by heavy construction and mega scale projects, resulted in adverse environmental effects. Air pollution represent one of these major effects and challenges. Direct exposure to volatile organic compounds VOCs implies public health concern. Even low concentrations of VOCs have been associated with damage to the central nervous system (CNS). The CNS is the primary target organ for toluene toxicity in both humans and animals for acute (short-term) and chronic (long-term) exposures (HMDB, 2014). Benzene is a known human carcinogen and is linked to an increased risk of developing lymphatic and hematopoietic cancers, acute myelogenous leukemia, as well as chronic lymphocytic leukemia (EPA, 2004). Information regarding ambient VOCs exposure is limited in Qatar and in the whole Gulf region in terms of values and types of compounds; however, it can be expected that the concentration values are elevated as they are regarding the other combustion related components such as CO, NOX, SO2 and black carbon (Qatar Environment Statistics Annual Report, 2014). The ozone concentration is also often exceeding the limit value due to the intensive photochemical processes induced by the strong sun radiation and the presence of ozone precursors. The main sources of the critical VOC pollutants in the atmosphere- Benzene, Toluene, Ethylbenzene, and Xylenes- referred to as BTEX, are the motor vehicle exhausts, emissions from the use of solvents, and emissions from the chemical and petroleum industries.

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This study was an attempt to assess and evaluate the impact of traffic and nearby industry on the air quality of Doha by studying the most important combustion related volatile organic compounds such as BTEX, and atmospheric trace gases (NO, NO2, O3 and NH3). The research aims have been accomplished by conducting two sampling campaigns across the area of Greater Doha with 14 different locations at the main access roads and remote areas during two weeks sample collection period; from February 29, 2016 to March 15, 2016; and from March 16, 2016 to March 31 2016, to quantify the ambient air levels of these pollutants. Passive absorption (diffusion) tubes were used in this campaign because of their mobility, applicability and affordability for outdoor air sampling, as they are easy to handle and require cheap and user-friendly equipment (Buczynska, 2009). Concentrations from most components indicated hot spots roads at the south more than the north of Doha in which BTEX ranged from 7.68-40.5 µg/m3, NO from 7.97-170.4 µg/m3, NO2 from 41.5-105.5 µg/m3 and NH3 was ranged from 8.87-30.4 µg/m3. On the other hand, ground level ozone (O3) depleted at the air pollution hotspots showing higher concentrations at the northern part of the city with a range from 12.1-70.9 µg/m3. Among the samples, the maximum NO2 level was lower than Qatari environmental executive law of 150 µg/m3 on average period of 24-hours. Also, the maximum benzene concentration was 3.15 µg/m3 less than the standard of 5 µg/m3 established by European Community (EC). Visualization of the results has been performed using demonstration hotspot multilayers maps, overlaid in Google-Earth, showing the geographical distribution of the concentration of each individual component. The anticipated continuation of this research will be accomplished by increasing the sampling points and conductive more extensive survey in order to get more representative data with higher spatial resolution. The resulted air quality maps will be essential tools in the hands of policy and decision makers, as a contribution to the current efforts to improve air quality in urban areas. The authors would like to thank Qatar National Research Fund (QNRF) for funding and supporting this project under the National Priorities Research Program (NPRP) award number NPRP 8-202-3-043. Refreneces: Buczynska, A. J. (2009). Atmospheric BTEX-concentrations in an area with intensive street traffic. Atmospheric Environment, 311–318. Committee on Tropospheric Ozone, N. R. (1991). Rethinking the Ozone Problem in Urban and Regional Air Pollution. Washington, D.C.: NATIONAL ACADEMY PRESS. EPA. (2004). EPA Air Toxics. Retrieved from https://www.epa.gov/sites/production/files/2016-09/documents/toluene.pdf HMDB. (2014). Human Metabolome Database. Retrieved from http://www.hmdb.ca/metabolites/HMDB0001505