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Estimating Road Dust Emissions – Methods & Parameters

Dr. Sarath Guttikunda
New Delhi, India
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V-dust
Vehicular Fugitive Dust Calculator

Estimating Road Dust Emissions – Methods & Parameters

Air Pollution Impacts

http://cat.inist.fr/?aModele=afficheN&cpsidt=13918190

One of the critical problems in making an effective strategy to control fugitive road dust is to estimate the emission factor accurately. The paper presents measured results of emission factor at field and in a wind tunnel. For the field study, three unpaved roads in Hsin Chu, Taiwan were tested. For the wind tunnel testing, the tested road dust was also collected from the field. Results of field study indicate that the emission factor of unpaved roads increases with the increasing wind speed, the number of vehicles and the speed of vehicles. It can be predicted as e (g/m^2-day)=$0.00872V_w^{0.64}s^{0.19}M^{-0.05}V_v^{1.32}N_v^{1.11}$ (V_w, m/s-wind speed; s, %-silt content of road dust; M, %-moisture content of road dust; N_v, #/h-number of vehicles; V_v, km/h-speed of vehicles) by the multi-variable regression technique. The fractions of PM_{10} and $PM_{2.5}$ in the TSP reentrained from the unpaved roads are 20.6±12.9% and 2.3±1.2%, respectively. The wind tunnel test results show that air acceleration rate and edge effect of the dust surface increase the emission factors considerably. As air acceleration rate increases from 0.1 to 1.5 m/s^2, the emission factor increases linearly from 0.0001 to 0.0007 kg/m^2s. However, test results show no significant effect of air acceleration and edge effect of dust surface on the threshold wind speed of reentrainment.

For urban air pollution, among the many pollutants that are critical, the particulate (PM) pollution is the most important[1]. The issue of urban air quality is receiving increasing attention as a growing share of the world's population is now living in urban areas[2]. The urban sector of the world's population is already 50 percent and it is expected to reach ~75 percent by 2030. Growing levels of urbanization in developing countries have generally resulted in increasing air pollution due to higher activity in the transportation, energy demand among industrial sectors, and lagging air pollution control programs. Unfortunately, air pollution from fuel combustion and industrial activity has important detrimental impacts on human health and the environment. For example, the health impacts, The World Health Organization (WHO)[3] estimated that urban air pollution from particulate matter (PM) accounts for ~800,000 deaths annually and the burden occurs primarily in developing countries[4].

This review on PM arises from a concern over the lack of comprehensive information on the sources, science, and composition. Without understanding the sources of pollution and their strengths, it is difficult for policymakers to formulate rational, effective policies and make informed investment decisions related to air quality

[1] Molina, M. J. and Molina, L. T. 2004. Megacities and atmospheric pollution. J. Air Waste Management Assoc. 54(6):644-680.
[2] World is Soon Half Urban (May, 2008) - http://www.worldwatch.org/node/5455
[3] WHO challenges world to improve air quality – www.who.int/mediacentre/news/releases/2006/pr52/en
[4] Comparative Quantification of Health Risks - http://www.who.int/publications/cra/en/

improvements[5].

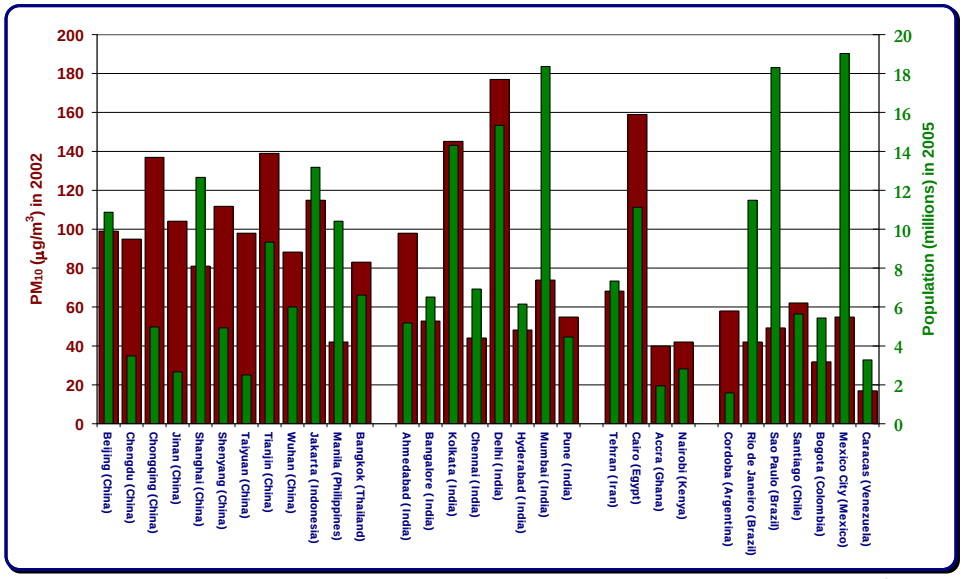

Figure 1: Population vs. PM_{10} in urban centers (WDI, 2007)[6]

[5] SIM Series 2008-003 "Informed Decision Support for AQM in Developing Cities" @ http://www.urbanemissions.info/simair

[6] World Development Indicators - http://devdata.worldbank.org/data-query/