

Estimation of Exhaust and Non-Exhaust Particulate Matter Emissions' Share from On-Road Vehicles in Addis Ababa City

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Abstract : Vehicular emission is the key source of air pollution in the urban environment. This includes both fine particles (PM_{2.5}) and coarse particulate matters (PM₁₀). However, particulate matter emissions from road traffic comprise emissions from exhaust tailpipe and emissions due to wear and tear of the vehicle part such as brake, tire and clutch and re-suspension of dust (non-exhaust emission). This study estimates the share of the two sources of pollutant particle emissions from on-roadside vehicles in the Addis Ababa municipality, Ethiopia. To calculate its share, two methods were applied; the exhaust-tailpipe emissions were calculated using the Europeans emission inventory Tier II method and Tier I for the non-exhaust emissions (like vehicle tire wear, brake, and road surface wear). The results show that of the total traffic-related particulate emissions in the city, 63% emitted from vehicle exhaust and the remaining 37% from non-exhaust sources. The annual roads transport exhaust emission shares around 2394 tons of particles from all vehicle categories. However, from the total yearly non-exhaust particulate matter emissions' contribution, tire and brake wear shared around 65% and 35% emanated by road-surface wear. Furthermore, vehicle tire and brake wear were responsible for annual 584.8 tons of coarse particles (PM₁₀) and 314.4 tons of fine particle matter (PM_{2.5}) emissions in the city whereas surface wear emissions were responsible for around 313.7 tons of PM₁₀ and 169.9 tons of PM_{2.5} pollutant emissions in the city. This suggests that non-exhaust sources might be as significant as exhaust sources and have a considerable contribution to the impact on air quality.

Keywords : Addis Ababa, automotive emission, emission estimation, particulate matters

Conference Title : ICEP 2020 : International Conference on Environment and Pollution

Conference Location : Zurich, Switzerland

Conference Dates : July 27-28, 2020