ABSTRACT

ESTIMATED EMISSIONS OF AIR PM$_{2.5}$ DERIVED FROM SATELLITE IMAGERY, LOCAL EMISSION FACTORS, AND ACTIVITY DATA VALIDATED IN SITU USING SOURCE APPORTIONMENT BY POSITIVE MATRIX FACTORIZATION (PMF) IN CABANATUAN CITY, NUEVA ECIJA

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Air particulate matter (APM) exposure is an emerging public health concern and environmental problem that affects many urban areas in the Philippines. Existing studies and emission inventories mainly focus on point and mobile sources, while research involving personal exposures to particulate pollutants is mostly lacking. This paper presents a method for estimating the amount fine (PM$_{2.5}$) particulate emissions by utilizing local emission factors and activity data interpreted from satellite imagery. The city center and surrounding area of Cabanatuan City is chosen to be the study site, divided into squares of around 100 x 100 m each (1 hectare in area) and laid out into a 24 x 40 grid. This is then used to calculate the emissions based on the type of emission activity and density of households in the area. The estimated emissions are mapped using geographic information systems (GIS) software. A verification study involving ground level 24-hour air sampling was conducted during a dry season from February 5-27 and during a wet season from June 10-July 5, 2016 to evaluate the validity of the estimation method. APM samples gathered from this activity were analyzed by ICP-MS, OC/EC measurement, and ion chromatography. Source apportionment by positive matrix factorization was then conducted to determine the possible sources of particulates in the study area. The results indicate high concentrations of PM$_{2.5}$ inside the Cabanatuan city center. In addition, PMF analysis points to biomass burning as a major source of PM$_{2.5}$ inside the study site.