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Emission Characteristics and Risk Assessment of Carcinogenic Air Toxics in the Industrial Metropolitan Area by using AERMOD Model

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Air toxics, also known as hazardous air pollutants (HAPs), have caused more public attention in recent years. Air toxics may be released from various sources, such as mobile source, stationary source, and fugitive emission. This study investigated the air toxics profiles from mobile sources, stationary sources, and the operations in port in an industrial metropolitan area in Taiwan. Six carcinogens, benzene, formaldehyde, 1,3-butadiene, arsenic, 2,3,7,8-TCDD, and diesel particulate matter (DPM), were chosen as the target pollutant. The AERMOD model was applied to simulate the ambient air toxics concentration, the concentration will used to evaluate cancer risk. Cancer risk of each air toxics was also conducted to evaluate the potential impact on residents.
The results of emission estimation for the base year (2014) showed that the emissions of benzene, 1,3-butadiene, and formaldehyde mainly attributed from mobile sources in the study areas, the contributions in order are 86%, 77%, and 69%. DPM emissions from port operations account for 76%, and most of arsenic (70%) and 2,3,7,8-TCDD (99%) were emitted from stationary sources, especially emitted from steel industry. Approximately 66% and 32% of cancer risk of air toxics is contributed by the emissions from port operations and on-road vehicles, respectively, in this area, and approximately 1.4% of the risk are contributed form stationary sources. DPM is the pollutant which posted the highest cancer risk among all six air toxics, it accounts more than 80% of overall cancer risk, and following by 1,3-butadiene (10%), benzene (4.7%), formaldehyde (1.2%), arsenic (0.7%), and 2,3,7,8-TCDD (0.2%). The dominate sources of DPM were ocean-going vessels and diesel trucks.