Spatio-Temporal Variation of Gaseous Pollutants and the Contribution of Particulate Matters in Chao Phraya River Basin, Thailand

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Abstract : The elevated levels of air pollutants in regional atmospheric environments is a significant problem that affects human health in Thailand, particularly in the Chao Phraya River Basin. Of concern are issues surrounding ambient air pollution such as particulate matter, gaseous pollutants and more specifically concerning air pollution along the river. Therefore, the spatio-temporal study of air pollution in this real environment can gain more accurate air quality data for making formalized environmental policy in river basins. In order to inform such a policy, a study was conducted over a period of January –December, 2015 to continually collect measurements of various pollutants in both urban and regional locations in the Chao Phraya River Basin. This study investigated the air pollutants in many diverse environments along the Chao Phraya River Basin, Thailand in 2015. Multivariate Analysis Techniques such as Principle Component Analysis (PCA) and Path analysis were utilised to classify air pollution in the surveyed location. Measurements were collected in both urban and rural areas to see if significant differences existed between the two locations in terms of air pollution levels. The meteorological parameters of various particulates were collected continually from a Thai pollution control department monitoring station over a period of January –December, 2015. Of interest to this study were the readings of SO_2, CO, NO_x, O_3, and $PM10$. Results showed a daily arithmetic mean concentration of SO_2, CO, NO_x, O_3, $PM10$ reading at 3 ± 1 ppb, 0.5 ± 0.5 ppm, 30 ± 21 ppb, 19 ± 16 ppb, and 40 ± 20 ug/m3 in urban locations (Bangkok). During the same time period, the readings for the same measurements in rural areas, Ayutthaya (were 1 ± 0.5 ppb, 0.1 ± 0.05 ppm, 25 ± 17 ppb, 30 ± 21 ppb, and 35 ± 10 ug/m3respectively. This show that Bangkok were located in highly polluted environments that are dominated source emitted from vehicles. Further, results were analysed to ascertain if significant seasonal variation existed in the measurements. It was found that levels of both gaseous pollutants and particle matter in dry season were higher than the wet season. More broadly, the results show that levels of pollutants were measured highest in locations along the Chao Phraya. River Basin known to have a large number of vehicles and biomass burning. This correlation suggests that the principle pollutants were from these anthropogenic sources. This study contributes to the body of knowledge surrounding ambient air pollution such as particulate matter, gaseous pollutants and more specifically concerning air pollution along the Chao Phraya River Basin. Further, this study is one of the first to utilise continuous mobile monitoring along a river in order to gain accurate measurements during a data collection period. Overall, the results of this study can be used for making formalized environmental policy in river basins in order to reduce the physical effects on human health.