Urban Air Pollution: Causes, Impacts and Mitigation Strategies

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More than 50% of the human population is living in urban areas, and this fraction is projected to increase to 65% in a few decades. Extreme examples of urbanization are the so-called megacities with a population of several millions of people; ten million is often used as a threshold to define a megacity. This large concentration of human activity has adverse impacts on the environment, including the quality of ambient air on scales ranging from local to global. Consequently, a number of field studies are carried out in different parts of the world in conjunction with laboratory-based investigations and modelling efforts to (1) understand the sources and atmospheric transformations of air pollutants, (2) provide predictive capability for the impact of specific mitigation measures, and (3) create sustainable monitoring and compliance technologies. Recent research suggests that the most important factor for human health involves the presence of fine particles (PM$_{2.5}$; particulate matter (PM) with aerodynamic diameter (d) $\leq$ 2.5 µm). For this reason, measurements of the chemical composition of PM$_{2.5}$, the development of an emission inventory, and the design of control strategies aimed at reducing the levels of PM$_{2.5}$ are considered as high priority activities for megacities. This presentation will review our current understanding of various environmental and health issues related to PM$_{2.5}$, discuss the major outcomes of research efforts on source apportionment of PM$_{2.5}$, and point out the need to pursue cross-disciplinary studies that can achieve multiple benefits.