

Environmental Research, Technology Demonstration and Conference Project

ECF Project:	ECF 2017-99
Project Title:	Tracking particulate matter pollution in Hong Kong and the Pearl River Delta: Ten-year variations (2008-2017)
Principal Investigator:	Professor Yu Jianzhen, Department of Chemistry & Division of Environment and Sustainability, The Hong Kong University of Science and Technology
Total Approved Grant:	\$1,669,630
Duration:	1/2/2018 to 31/12/2021
Project Status/Remarks:	Completed
Project Scope:	<p>The objectives of this project are –</p> <ol style="list-style-type: none"> 1. To generate a decadal set (2008-2017) of particulate matter (PM_{2.5}) chemical composition data including specific source tracers for three sites in the region (one urban site in Hong Kong, one suburban and one urban site in the Pearl River Delta); 2. To investigate the obtained data set by trend analysis and source analysis and establish whether, and the extent to which, the PM_{2.5} concentrations have changed over the ten-year period in relation to community development and the implementation of control measures; and 3. To identify major contributing sources on high PM_{2.5} days and to evaluate the relative contributions of regional vs. local sources during the episodic events. The data analysis undertaken in this project will assist stakeholders and interested parties in understanding the trends in local and regional PM pollution, the major contributing sources, as well as the effectiveness of control measures in improving the air quality.
Summary of the Findings/Outcomes:	Fine particulate matter (PM _{2.5}) is a major air pollutant that harms health and impairs visibility. PM _{2.5} was introduced as a criteria pollutant in Hong Kong in 2014. Different from criteria gaseous pollutants, PM _{2.5} is a

complex mixture containing inorganic ion, elemental carbon, tens of thousands of individual organic compounds, and metal oxides. The multiple layers of complexity mean that PM_{2.5} mass concentration alone is insufficient to identify contributing sources or to attribute a reduction in PM_{2.5} to a particular control measure. The chemical composition information is essential in evaluating the sources and evolution of PM_{2.5} pollution. This project has generated a data set of chemical composition of PM_{2.5} spanning ten-year (2008-2017) and covering three sites in the Pearl River Delta. Such a long time series of PM_{2.5} data are rare in China and elsewhere in Asia. Over the decade, the PM_{2.5} pollution dropped at a rate of 1.5-3.0 $\mu\text{g m}^{-3} \text{ yr}^{-1}$ at the three sites. This decrease had contributions from all major components of PM_{2.5}, including sulfate, ammonium, nitrate, organic matter, and elemental carbon. The measurement data has unambiguously verified the effectiveness of vehicular emission controls and SO₂ reduction in lowering PM_{2.5} pollution in our region.