

News Article for RISUD Strategic Focus Area (SFA) Scheme

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| 1. Principal Investigator: | <u>Prof. Hai Guo</u> | <u>CEE</u> |
| 2. Name of SFA: | <u>Urban Air Pollution and Health</u> | |
| 3. Project Title: | <u>Urbanization and Atmospheric Air Pollution: Anthropogenic Processes and Human Exposure/Health</u> | |
| 4. Second Year Progress/Achievement | | |

Due to rapid urbanization in East Asia, Hong Kong has been facing severe air pollution for a long period. The latest World Health Organization (WHO) report indicates that air pollution is the fifth leading risk factor for mortality worldwide, accounting for 4.9 million deaths in 2017. In Hong Kong, it was estimated that more than 3,000 premature deaths were caused by air pollution every year. Therefore, air pollution and health problems have been concerned by the public and in the spotlight. To fulfill the mission of “To create innovative solutions to problems generated by high-density urban development through multi-disciplinary, collaborative research”, Research Institute for Sustainable Urban Development (RISUD) funded the project “Urbanization and Atmospheric Air Pollution: Anthropogenic Processes and Human Exposure/Health”, which aimed to enhance our understandings on primary and secondary air pollutants in Hong Kong, human exposures and the health consequences of inhalation exposures. The project was kicked off in January 2018, and will be ended in December 2020. During this (the second) reporting period (January – December 2019), satisfactory progresses have been made and significant results were obtained. Following the field campaign at an urban background site in Hong Kong carried out in last reporting period, we did in-depth data analyses and found that biomass burning was the largest contributor of airborne organic aerosols (OAs), even at the background site, when cold front led to prevalence of north winds in Hong Kong. Besides, the secondarily formed OAs (SOA) derived from anthropogenic emissions dominated over those derived from biogenic emissions in the sampling period. Interestingly, the formation of anthropogenic SOA was intensive in air masses originating from South China Sea, and seemed to be facilitated by sulfur dioxide from ship emissions. This finding was out of our expectation, because the marine air was generally considered to be clean. It reminds us of the necessity of paying attention to marine emissions in air quality study, assessment of human exposure, and epidemiological survey. Besides, we organized two more field campaigns to improve the spectrum of air pollutants we recognized, with one focusing on outdoor air pollution and the other one targeting at household air pollution. A preliminary review on data collected in the latter campaign indicated that indoor exposure was higher than outdoor exposure for some air pollutants, and the exposure could be elevated by dozens to hundreds of times by human activities like cooking, smoking, incense burning and candle burning. As such, an integrated consideration by taking both indoor exposure and outdoor exposure into account is necessary, when the overall human exposure and health consequences are assessed. Our

toxicological studies also provided new evidences proving the impairments of exposure to airborne particulate matters (PM) to respiratory and nervous systems. The innovations included that the maternal exposure led to neuroinflammation and development of autism-like behavior in offspring, and even the low-dose PM exposure caused lung damage. Attentions were also paid to an elder cohort in Hong Kong, who suffered from chronic kidney diseases (CKD). We found that PM exposure significantly increased the mortality of elder patients with CKD. Thus, more care should be given to the susceptible and vulnerable populations when severe air pollution is encountered. To broadcast this project and the main findings to the research community, we attended at least seven conferences/workshops in this year, and invited an established researcher who has expertise in source emission of air pollutants and health impacts from Fudan University as visiting scholar. For the purpose of continuous research on air pollution and health, the project team submitted five proposals for grants application. One of them is successful, one failed and the other three are pending. Last but not the least, five publications were generated from the project in this reporting period, with acknowledgement to the financial support from RISUD. This project has enhanced the inter-/multi-disciplinary collaboration among the investigators, and at the same time, contributed to the development and impact of RISUD.