Environmental Research, Technology Demonstration and Conference Project

Project Number:	ECF 92/2017
Project Title:	Optimal deployment of drones for monitoring air pollution from ships in the Pearl River Delta domestic emission control area
Principal Investigator:	Dr WANG Shuaian, Department of Logistics and Maritime Studies, The Hong Kong Polytechnic University
Total Approved Grant:	$484,000
Duration:	1/6/2018 to 30/11/2019
Project Status:	Completed
Project Scope:	Ship related SOx emissions account for 44% of the total SO_2 emissions in Hong Kong. Starting from January 2019, the Hong Kong SAR Government will work together with the Mainland to set up the Pearl River Delta (PRD) domestic emission control area (DECA), within which ships are required to use fuel with a sulphur limit of 0.5%. Drones have been identified as an efficient way to detect non-compliance of ships in emission control areas, as they offer the advantage of covering a wide range of surveillance areas. To date, the managerial perspective of the deployment of a fleet of drones to inspect air pollution from ships has not been addressed. This project aims to address the need of optimal deployment of drones for monitoring air pollution from ships in the PRD DECA. A decision support system will be developed to automatically generate the deployment of drones to detect and alert non-compliant ships for DECA regulators. The guidelines developed in this project will provide significant value in reducing SO_2 emissions from ships.
Summary of the Findings/Outcomes:	(a). Have developed models, algorithms, and programs that allow marine and environmental officers to efficiently manage drones to inspect vessels; (b). Analysis shows that scientific algorithms will generate drone routing and scheduling decisions that lead to the maximal number of ships inspected when the same amount of resources is used; (c). In view that the International Maritime Organization has reduced global sulphur limit of marine fuel from 3.5% to 0.5% since 1 January 2020, it can be anticipated that monitoring air emissions from ships will become more significant and challenging. The developed models, algorithms, and programs will therefore assist the enforcement of regulations on sulphur limit of marine fuel; (d). Published three papers and presented findings of the project at the International Workshop on Transport Modelling held in Auckland, New Zealand in January 2019; (e). Organised a special session on ship air emissions at a conference in Hong Kong in May 2019; (f). Have developed a website for sharing results of the project.