

Environmental Research, Technology Demonstration and Conference Project

ECF Project:	ECF 2017-87
Project Title:	Enhancing water resilience with blue-green infrastructure: A pilot-scale study on bioretention systems for stormwater harvesting in new development areas
Principal Investigator:	Professor Tsang Chiu Wa Daniel, Department of Civil and Environmental Engineering, The Hong Kong Polytechnic University
Total Approved Grant:	\$2,499,280
Duration:	29/6/2018 to 28/6/2021
Project Status/Remarks:	Completed
Project Scope:	<p>The project aims to develop a blue-green infrastructure for sustainable management of surface runoff for stormwater harvesting in line with the planning of sustainable urban drainage systems for the New Development Areas in Hong Kong. The project team will evaluate the environmental performance (e.g., quality of harvested stormwater for non-potable reuse in water features and landscape irrigation) and sustainable use (in particular, service life and maintenance requirement) of pilot-scale bio-retention system, including bio-swale and bio-filtration basin with regard to subtropical climate and surface runoff quality in the local context.</p> <p>(a). To improve the quality of surface runoff by means of bio-retention system to avoid contamination to receiving waters;</p> <p>(b). To ensure that the harvested stormwater in bio-retention system can meet the local authority standards for non-potable reuse;</p> <p>(c). To investigate the fate and transport of other priority contaminants (i.e., bacteria, heavy metals, and herbicides) in pilot-scale bio-retention system;</p> <p>(d). To develop an engineered filter media to handle the runoff flow rates for storm events of 2- and 5-year return periods (as a benchmark), and further assess its performance under 10- to 100-year return periods in Hong Kong;</p> <p>(e). To compare the performance of engineered filter media with that of typical media design and normal landscaping planter in terms of the quality of harvested stormwater; and</p> <p>(f). To evaluate the overall performance and sustainable use of pilot-scale bio-retention system for developing an unprecedented local technical guideline for planning, design, construction, operation, and maintenance of bio-retention system in Hong Kong's context.</p>
Summary of the Findings/Outcomes:	Blue-green infrastructure (or sustainable drainage system (SuDS)) is an innovative stormwater management technology to improve stormwater quality and regulate hydrological performance.

To enhance soil health and pollution removal of Blue-green infrastructure, it is necessary to develop site-specific design (e.g., infrastructure sizing, filter media selection, and vegetation selection) based on the land use and climate region, etc. The project results revealed that bioswale and bioretention basins co-amended with biochar and compost can effectively mitigate flood risk and remove metals/metalloids and trace organic compounds (e.g., herbicides, pharmaceuticals, and industrial pollutants) from stormwater under mild rainfall events.

Based on comparison of life cycle impacts of different blue-green infrastructures, bioswale basin might exhibit the best performance with a negative carbon footprint.