

Annex: Examples of past R&D projects funded under Competitive Funding for Water Research (CWR) programme as part of the Research, Innovation and Enterprise (RIE) 2020 Plan

Since 2006, NRF has allocated more than \$700 million to grow the local water industry and research capabilities. More than 550 water research and development (R&D) projects have been funded with over 190 test-bedding projects hosted at PUB's facilities over the years. Table 1 below provides some examples of these R&D projects.

Table 1: Examples of R&D projects funded and deployed by PUB

Company	R&D Project
AeroLion Technologies is a spin-off from the Unmanned Systems Research Group of the National University of Singapore (NUS). They provide unmanned aerial solutions for urban industrial problems and have rich capabilities and experience in developing drones that can operate in GPS-denied and/or obstacle-rich environments.	Objective Robotics and drone solutions to minimise manpower required in operations and maintenance Outcome Since 2018, AeroLion Technologies conducted R&D to develop a miniature unmanned aerial vehicle (UAV) that could carry out autonomous inspections in deep underground areas with no communication signals, location services or lighting, such as PUB's Deep Tunnel Sewerage System (DTSS), minimising the manpower required. PUB awarded a contract to AeroLion Technologies in 2020 to deploy their UAV system to inspect around 120 km of closed drains at 93 locations over the next three years.
Jacobs is an international professional services firm providing technical and construction services, as well as scientific and specialty consulting to their clients.	Objective Enhance resilience of operations at Changi Water Reclamation Plant Outcome A first-of-its-kind Digital Twin for the Changi Water Reclamation Plant (CWRP) in 2019 by Jacobs – a virtual copy of a plant that can simulate the consequences of various operational scenarios (e.g. power or equipment failures) and help operators to prepare for such events. Beyond simulations, predictions of imminent deviations in treatment processes and poor effluent quality were also tested to provide early warning to operators. These

	capabilities developed through R&D have enhanced the resilience of operations at CWRP today.
EnvironSens is a spin-off from the Centre for Water Research in NUS that designs, manufactures and provides round-the-clock water quality monitoring products and services.	Objective To optimise the detection of heavy metals and cyanide in PUB's sewerage network. Outcome The Microbial Electrochemical Sensor (MES) was developed by EnvironSens, which was supported under a translational grant call in 2016. Using the grant, EnvironSens increased the technology readiness level of the sensor, and simplify its operation and maintenance regime. Today, PUB has installed 100 of these units in various parts of its sewerage network to provide round-the-clock alerts on toxic materials discharged into the sewers.