Research & Development Endeavour for Community Improvement

The mission of this research endeavor is to elevate the standard of living of the underprivileged communities through providing safe drinking water using low-cost and socially acceptable water treatment technologies. The technologies include household water treatment (HWT) technologies and disaster-relief (contingency) water supply solutions.

Project 1 Treatment of arsenic-contaminated groundwater for safe drinking water supply to villages in Vietnam

In this project, I worked with a team comprising members of a Singapore philanthropic organization, Vietnam’s Ministry of Natural Resource and Environment, and a local NGO in Vietnam to identify the communities that faced the problem of access to safe and reliable drinking water. The village identified in Vietnam is located in Ha Tay province in the Red River Delta near Hanoi. The project provided design and prototype development a simple point-of-entry (POE) groundwater treatment filter comprising iron-coated-sand filter. The main achievement of this project is to empower the beneficiary communities with the skills and knowledge to take ownership of the project for sustainable community development.


Project 2 Treatment of contaminated groundwater for safe drinking water supply to villages in Cambodia

In this project, I served as mentor to a group of NTU undergraduate students (4th year) who participated in collaboration project between Harvey Mudd College of California and Lien Institute for the Environment (LIFE), Singapore. The project carried the flagship of Global Clinic Project 2008-2009 of Harvey Mudd College, California. Among the highlights of the project are:

- One-week joint training camp in NTU for NTU and HMC participants.
- Design of a household’s point-of-use (POU) arsenic treatment system for rural Cambodia.
- On-site installation and development portable filters for treatment of arsenic contaminated groundwater in Cambodia.
- Field trip to Cambodian villages.
- On-site groundwater sampling and water sample analyses in laboratories.
Project 3 Simple disinfection with Ag nanoparticle for water treatment during disasters

Based on bacterial fecal indicators, WHO estimated that more than 1.1 billion people consume water with at least moderate risk of disease (WHO, 2014)\(^1\). About 1.8 million people, most of whom are children, die annually from diarrheal diseases. Meanwhile, there is a global increase in the frequency and intensity of natural disasters over the last decades due to climate change. Access to safe drinking water is one of the first priorities following a disaster that may result in water contamination, infrastructure damages and power failures.

This project was aimed to develop a simplistic, portable and power-free device that can rapidly deliver clean water to survivors of natural disasters and for remote expeditions. This was made possible through our development of a porous gel that was embedded with silver nanoparticles. The gel absorbs contaminated water, inactivates bacteria within a minute, and releases drinkable water with a simple squeeze.

A button-size dry gel can soak up and purify a glass of water. The gel can be reused more than 20 times. The research paper derived from this project won The Best Paper Award 2013 (Environmental Technology) for the journal of Environmental Science & Technology (ACS).