

Portable Water Treatment for Flood Resilience

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Abstract : Flood, caused by excessive rainfall, monsoon, cyclone and tsunami is a common disaster in many countries of the world especially sea connected low-lying countries. A stand-alone self-powered water filtration module for decontamination of floodwater has been designed and modeled. A combination forward osmosis - low pressure reverse osmosis (FO-LPRO) system powered by solar photovoltaic-thermal (PVT) energy is investigated which could overcome the main barriers to water supply for remote areas and ensure off-grid filtration. The proposed system is designed to be small scale and portable to provide on-site potable water to communities that are no longer themselves mobile nor can be reached quickly by the aid agencies. FO is an osmotically driven process that uses osmotic pressure gradients to drive water across a controlled pore membrane from a feed solution (low osmotic pressure) to a draw solution (high osmotic pressure). This drops the demand for high hydraulic pressures and therefore the energy demand. There is also a tendency for lower fouling, easier fouling layer removal and higher water recovery. In addition, the efficiency of the PVT unit will be maximized through freshwater cooling which is integrated into the system. A filtration module with the capacity of 5 m³/day is modeled to treat floodwater and provide drinking water. The module can be used as a tool for disaster relief, particularly in the aftermath of flood and tsunami events.

Keywords : flood resilience, membrane desalination, portable water treatment, solar energy

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