Emerging Water Environment Issues and Sustainable Development

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There have been serious environmental problems, especially in less developed countries due to growing population and industrial development. Currently, almost half of global population is still below the poverty level, lacking access to safe water supply and adequate sanitation services. At present about 1.74 billion people in Asia and the Pacific continue to live without access to improved sanitation, while more than 792 million people suffer with the indignity of practicing open defecation. Such poor sanitation conditions can have adverse public health outcomes leading to disease and approximately 1 million deaths annually. Besides polluted water resources, other impacts include time loss from daily activities, degraded environment, and lost opportunities to use human excreta for energy or fertilizers. Furthermore, there have been reports of surface and ground water contamination with pharmaceuticals and personal care products (PPCPs), which can result in long-term effects on human health. Intensive agricultural farming is another potential threat to water resources, causing the depletion of phosphorus minerals, which can eventually affect food security and the sustainability of the food system. To cope with these emerging water environment issues, there is on-going research to develop "solar septic tanks" that utilize solar heating to inactivate more effectively fecal pathogens and digest the fecal sludge whole at the same time producing biogas for domestic uses. By utilizing low-cost heating materials, temperatures in septic tanks could increase up to 50^{o}C while reducing to half the amount of digested sludge. This could offer a low-cost alternative for sludge emptying and disposal. On the other hand, since PPCPs are not easily biodegradable, advanced constructed wetlands containing certain aquatic plants were found to produce strong oxidation reactions capable of degrading organic matter. Nutrients in wastewaters (e.g. nitrogen, phosphorus) can be recovered through chemical precipitation, and be used to produce magnesium-ammonium-phosphate or 'struvite', a slow-release fertilizer. Although these technological solutions are being tested at pilot-scale, they could potentially help to improve public health and food security if scaled-up, contributing thus to sustainability in the urban environment.

Chongrak Polprasert is currently Professor of Civil/Environmental Engineering at the Faculty of Engineering, Thammasat University, Thailand. He received his Ph.D. in civil/environmental engineering as a Fulbright scholar from the University of Washington and began his career as Research Assistant at the International Development Research Centre in Ottawa, Canada, working on a low-cost sanitation and resource recovery with the World Bank. Prof. Polprasert was a faculty member at the Asian Institute of Technology (AIT) (1997-2009), holding the AEON Group Chair of Environmental Engineering during (1991-1995) and being Dean of the School of Environment, Resources and Development (1996-2005). He was appointed as Director and Professor at the Sirindhorn International Institute of Technology (SIIT) of Thammasat University, Thailand (2009-2012). Prof. Polprasert has served in the U.S. National Academy of Sciences panel on productive utilization of wastes in developing countries and the Water Environment Federation task force on natural systems for wastewater treatment. Professor Polprasert was a recipient of the Biwako Prize for Ecology (Japan), Outstanding scientist award (Thailand), Thailand Research Fund publication award, Outstanding researcher award in engineering and industry (Thailand), an elected fellow of the Graduate School of Engineering, the University of Tokyo, Japan, and an associate fellow of the Royal Institution, Thailand. He was invited to serve as visiting professor/scholar at the

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