

Wastewater Production, Treatment and Use in Cambodia

PRAK Piseth Raingsey¹, KOCH Savath², CHEA Vannara³

¹ Preventive Medicine Department, Ministry of Health, Cambodia

² Technical Affairs General Directorates, Ministry of Environment, Cambodia

³ Water Quality Analysis Office, Hydrology and River Works, Ministry of Water Resources and Meteorology, Cambodia

Wastewater production and treatment

Despite the fact that Cambodia has many water resources (surface water, ground water and rain water), but most land-based water resources suffer from pollution due to human activities. At the present time Cambodia commonly does not have a fundamental wastewater treatment plants, therefore a few central wastewater treatment plants are under operation and/or construction in some provinces but only for urban areas, such as Phnom Penh, Battambang, Siem Reap, Sihanoukville, Kampong Cham, Kandal etc. , it is not respond to a certain requirement as a whole. The total daily release of human excreta to water bodies, totaling 234 tons of feces, 2,335 cubic meters of urine, and 8,154 cubic meters of gray water per day. This generates approximately 497 tons of biological oxygen demand (BOD) on a daily basis¹. Most of wastewaters are discharged with treated, untreated or by natural purification process into receiving waters sources without act in accordance with the environmental standards. However wastewater treatment basins in Cambodia, at most in industrial sector, are commonly primary and secondary treatment process². The challenge noted with a high investment, the maintenance costs required for sophisticated wastewater treatment systems and requires high-skilled personnel.

Wastewater use

Phnom Penh, the capital city of Cambodia, is surrounded by natural wetlands which play a significant role in the storage of wastewater/sewage and stormwater. The main functioning wetlands include Boeng Cheung Ek, Boeng Trabek, Boeng Salang, Boeng Tumpun, located at the South and Southeast part of the city's and these wetlands gathered urban wastewaters by sewage systems and run off into opened channels, retention into wetland, passing a self purification through natural treatment process and finally flows to Bassac River². Boeung Cheung Ek is the largest of these water bodies, covering 3403 hectares of land 5 km; thus the lake receives 80% of the waste/sewage water from the city along with untreated effluent from 3000 small and large scale industrial enterprises, which more than 1 million m³ of the city's household wastewater and stormwater are discharged daily³. The lake is an effective, low cost means of biological treatment of the city's wastewater through its aquatic production, capturing and reutilizing valuable nutrients (nitrogen and vegetable phosphorous)⁴. Therefore the production of water spinach (*Ipomoea aquatica*) commonly known as morning glory, and water mimosa (*Neptunia oleracea*) are grown attached to a rope network floating on the surface of the lake. This production requires relatively easy growing techniques with lower labour costs compared to other cultivated plants⁵. In addition the toxic metal levels present within water spinach tissues

grown in the lake constituted a low risk for human consumption. However elevated levels of thermotolerant coliform *E.coli* and protozoans (*Giardia*, *Cryptosporidium* and *Cyclospora*) were found in plants located close to the waste water inlets, constituting a potential risk to consumers if the water spinach was not well washed and cooked before consumption⁴.

Policies and institutional set up and need for wastewater management

The Royal Government of Cambodia has passed new environmental regulations stipulating that dischargers of wastewater, such as small and medium enterprises and housing estates, will be held responsible for wastewater pollution. Therefore these entities should treat wastewater adequately on-site *before* it is discharged or released into the environment. Wastewater is advised/ordered to be treated to abide by the environmental legal instruments before discharging into receiving water, otherwise, a penalty will be done in according to the law. Sub-decree on water pollution control, aims to minimize and phase out various pollution activities to public water areas, including improve wastewater management for sustaining good water quality suitable to human desires. The standard for discharging of effluent into public water areas and the standard for water quality at public water areas for biodiversity conservation was included. In actual fact the proposed parameters to check treated wastewater from industrial sector commonly is varied depending on a nature substance in wastewater:

- □ pH, conductivity, BOD5, COD, Oil and Grease, ToP, TSS, and some heavy metal parameters (factories those use chemicals and/or chemical compounds)
- □ pH, conductivity, BOD5, COD, Oil and Grease, ToP, TSS, fecal coliform, NO₂; NO₃ (normal factories).

Practice on different aspects of wastewater

Decentralized Wastewater Treatment Systems for the Sovann Komar Orphanage in Kandal Province implemented by BORDA under DEWATS Project in Cambodia, has developed modular, decentralized, and cost-effective wastewater treatment service packages in helping to cause damage to the downstream activities and life along the Mekong River. Their systems can provide wastewater treatment for domestic or industrial sources and for flows as high as 1000m³ per day, and are tolerant to flow fluctuations, require low maintenance, and are durable. The Wastewater flow: primary settling unit, anaerobic baffled reactor, anaerobic filter, horizontal gravel filter, and discharge pipe. The plant roots within the gravel help to oxygenate the wastewater, which has been anaerobic to this point and still usually has a noticeable odor, as well as remaining organic compounds. This oxygenation helps to degrade these remaining organic pollutants, which also reduces the odor.

The treated effluent had BOD and COD values (in mg/L) that complied with the Ministry of Environment's regulations for wastewater effluent discharged into public waters and sewers, the standards of which are: COD < 100 and BOD < 80. After the HGF, effluent is usually considered clean enough for safe river discharge. The reduction in pollution to the Mekong River, in terms of reduction of health risks for users of the river water and less

stress on existing marine life⁶.

Status and need for the knowledge and skills on the safe use of wastewater

The Ministry of Environment does major activities to protect and conserve water environment through a monthly monitoring and control public water quality at selected public water areas. In the fact of restriction to treated and/or untreated effluents to abide by the national effluent standards which strengthen and improved the capacity of water environment management and protection to provincial/municipal departments. Beside this the Ministry of Water Resources and Meteorology has enlarged their tasks by doing water sampling at primary and secondary stations for monthly analysis, especially, the carrying out of quality assurances and quality control, study and evaluate beneficial uses of water including groundwater for socio-economic development. Control and monitor any activities which caused negative impacts to water environment. With the regard of human resource and financial constraint, some activities seemed to be limitedly solved⁷. Indeed the lack of particular national strategic plan to mitigate and eliminate various activities, which threatened to aquatic environmental decline; an inadequacy of expertise staff, especially, in the field of waste management and their treatment engineering. Some treated effluents occasionally exceed the National Effluent Standard due to inappropriate management. Inadequacy of supporting tools like particular legal tools and analytical facilities and public awareness towards the context of aquatic environmental quality management is limited⁸. To fruitfully achieve the above remediation initiatives, Cambodia requires: Technical support / cooperation from international communities and other donors, including technological transfer, internal and external networking, experience exchange with other countries in the region/globe⁷.

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