

Research Article

Leaching of overloaded and unlined drains through the ground water in Delhi

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SUMMARY: Delhi, the capital of India is one of the fastest growing and developing cities in the world. There are sixteen drains which are carrying about 1900 MLD (million litres per day) municipal and domestic waste water and 392 MLD industrial effluent and discharge into the Yamuna river (Government of India, Ministry of Environment and Forests, 2010). The drains in Delhi are unlined and hence the risk of ground water contamination increases multifold. Lysimetric experiment was setup for the analysis of physico-chemical and microbial contamination of ground water through leaching from the saturated zone of soil profile near to drain site. The drain samples were collected from Okhla, Delhi. The physico-chemical parameters like colour, odour, presence of particle, pH, temperature, total dissolved solid (mg L^{-1}), total suspended solid (mg L^{-1}), total hardness $(CaCO_{2})$ (mg L⁻¹), alkalinity (mg L⁻¹) and dissolved oxygen (mg L⁻¹) of groundwater sample were tested, which indicated the positive physico-chemical and microbial contamination in ground water leachate and drains sample. Total heterotrophic bacterial contamination observed in ground water (0.20×10^2 cfu/ml), drain sample (25.70×10^2 cfu/ml) 10²cfu/ml), control leachate (19.00 x 10² cfu/ml) and drain leachate (48.00 x 10² cfu/ml) which is exceeding the limit of 1.0x0² cfu/ml. In addition, the plates for Eosin Methylene Blue agar (EMB) showed the faecal coliform as well as pathogenic bacteria colony in ground water (0.0 cfu/ml)), control leachate (8.2 x 10²cfu/ml), drain sample (7.80 $\times 10^{2}$ cfu/ml)) and drain leachate (1.28 $\times 10^{2}$ cfu/ml) showed the maximum. The results pose serious concern for ground water through unlined drains and make science-based decisions on the risks associated with groundwater.

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ncreasing human population has exerted an enormous pressure on the provision of safe drinking water especially in developing countries Umesh et al. (2005). Delhi is one of the developing cities in the world which has a great interest for the microbial population in drinking water due to exposure of unrestricted unlined drain/sewage wastewater flow, which may have a major and serious unpredicted problem for the ground water contamination through the soil profile as well as other sources. In India, Delhi is one of the largest Municipal solid Wastes (MSW) generating cities. Sixteen drains are discharging about 1,900 MLD of municipal sewage and wastewater into the Yamuna river. The industrial effluent load is 320 MLD. Municipal solid waste

generation is estimated to be 5,000 mt per day (Anonymous, 1997).

It is evident that many parts of the industrial areas in India are colonized and are in very close vicinity of the industries are using groundwater for drinking, cleaning, bathing, domestical and other agricultural practices. In the close vicinity of this industrial area, there is dense population of residents who generally use underground water for most of their domestic purposes (Wequar and Sharma, 2009). Historically, groundwater supplies were thought to be free of pathogenic microbes due to the natural filtering ability of the subsurface environment and the distance a microbe would have to travel in order to reach the groundwater source. Contaminants that find their way into