ABSTRACT

Sewage treatment plants (WTPs) use a combination of physical, chemical and biological processes to reduce the pollutant loads in wastewater. The treated wastewater is then either discharged to surface water or is reused. Successive stages in wastewater treatment plants reduce the quantity of suspended solids, biological contaminants, organic matter content and nutrient constituents in sewage. Changes in the properties of the effluents can occur along the treatment process leading to reduction or little change in effluent quality based on the effectiveness of the treatment process. The discharge of inadequately treated sewage from ineffective WTPs into the rivers and other receiving water bodies are both potential health risk and environmental hazard to both adjacent and downstream communities. This study estimates the efficiency of Kangemi Sewage Treatment Works (KSTW) in pollutant removal and the impact of its effluent on water quality of Chania River (CR). For environmental quality assurance, the plant's performance requires consistent monitoring to evaluate the impact of the effluents to the receiving waters. Key nutrients (Nitrogen and Phosphorus), total suspended solids (TSS) and biological oxygen demand (BOD5) were determined using American Public Health Association (APHA, 2005) standard methods. Kruskal-Wallis test was run at $p<0.05$. Nitrogen, BOD5 and TSS indicated a significant difference between the sites ($P<0.05$). Physico-chemical parameters varied significantly, however, no significant difference for TP (Kruskal Wallis, 4.515, P=0.341) and SRP (Kruskal Wallis, 2.160, P=0.696) respectively across sites in KSTW. Removal efficiency for BOD5, TSS, NH4 and TN were 60%, 85%, 59% and 54% respectively. The KSTW had high removal efficiency for N but low for P but it was a source of nitrate, nitrite and TP. Organic-N was the most dominant form of N in KSTW, while P was mostly inorganic. In CR, the confluence (S8) recorded highest concentrations for most parameters (N, P, BOD5 and TSS). Inorganic-N in the CR was more than organic-N after effluent discharge point. Nitrate-N was the most common species of the dissolved nitrogen in CR. All parameters measured in CR showed a significant difference except TSS (Kruskal Wallis, P=0.733). Nutrients and organic matter in both the KSTW and Chania River indicated a strong correlation with temperature, DO and pH. Both for N and P, the organic form was dominating in CR. In conclusion, Pollution impact was highest at the KSTW point of effluent discharge (S8), with, the river indicating quick recovery downstream. In contrast, TSS indicated a progressive increase in concentration downstream from S8-S10. For recommendation, long-term surveys should be conducted to capture temporal efficiency and impact of KSTW effluent on Chania River.

Keywords

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