

# CHARACTERIZATION OF PAPER MILL EFFLUENT AT VALAICHCHENAI AND INVESTIGATION OF THE SYNERGISTIC IMPACT OF OTHER ANTHROPOGENIC FACTORS

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The process of paper manufacturing generates considerable volume of effluent. Paper processing effluent from the National Paper Corporation (NPC) at Valaichchenai, Sri Lanka has been discharging into the adjacent marshy land surrounded by many open wells and agricultural fields for decades. Impacts of such discharge on the environment however, have not been investigated so far. Evaluation of the current status of the effluent at the recipient environment is an important prerequisite to understand the waste treatment process. Accordingly, present study provides an assessment on the current status of physicochemical characteristics and collective impact of the paper mill effluent together with other anthropogenic inputs on the quality of potable water.

Samples were collected along the length of the effluent canal and the eleven susceptible open wells within the 200 m and 400 m radii from the center of effluent accumulation point from July to November 2013. In situ measurements were taken at the time of sampling for pH, temperature, turbidity and conductivity. Individual parameters were determined as per the Standard Methods of American Public Health Association (APHA). Findings were assessed against the Central Environmental Authority (CEA) standards and Sri Lanka standards for potable water (SLS 614:1983), and compared with the control systems. Data were analyzed by means of SPSS (version 18.0.0) statistical software.

A substantial variation ( $p < 0.05$ ) of temperature, turbidity, TDS, EC, pH, BOD, COD,  $\text{SO}_4^{2-}$ ,  $\text{NO}_3^-$  and  $\text{PO}_4^{3-}$  was observed among the sampling locations along the length of effluent canal. Nevertheless, temperature, pH, BOD, COD,  $\text{PO}_4^{3-}$ , along with oil and grease and heavy metals (Pb, Cd, Ni and Zn), were within the tolerance levels whereas TSS ( $189.7 \pm 102.0$  mg/L) exceeded the level stipulated by CEA (150 mg/L; discharged into marine environment and 50 mg/L; discharged into inland surface waters).

Having drastically higher levels of turbidity, EC, TS, COD,  $\text{SO}_4^{2-}$  and  $\text{PO}_4^{3-}$  than the SLS 614:1983 and that of the control system, wells within both the radii of 200 m and 400 m exhibited influences of the paper mill effluent. Wells in the areas contaminated due to agricultural and livestock activities also expressed similarly peak levels of  $\text{NO}_3^-$ ,  $\text{SO}_4^{2-}$ ,  $\text{PO}_4^{3-}$ , TS and EC which apparently no connection with the paper mill effluent.

The Vahaneri tank, nearby main water reservoir, showed that temperature, turbidity, EC, TSS and pH still good agreement with its earlier reported values. While, TSS, COD and anions;  $\text{NO}_3^-$ ,  $\text{SO}_4^{2-}$ ,  $\text{PO}_4^{3-}$  were exceeded the levels a decade ago. The study showed a deterioration of the water quality of the potable wells collectively due to untreated discharges from the paper processing industry and other human activities, suggesting the need of management measures for untreated discharges.