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Title : Forecasting Groundwater Contamination and its Impacts on Livelihood at Perungudi

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Groundwater is the main source of drinking water and it has vital importance in developed and developing countries. Nearly 80% of all disease arises as a result of using unsafe and contaminated water.

The Perungudi dumping yard is one of the major municipal solid waste dumpsites of Chennai and started functioning since 1987. In the recent past, it is found that the site is subjected to many environmental changes. On an average 1500 tonne per day waste is being dumped in the open dumpsite. The precipitation seeps through the solid waste, producing contaminate water referred as leachate. Due to infiltration and normal flows of the groundwater, the leachate extends away from the dumpsite causing further contamination. The people living nearby dumpsite face many problems due to contaminant groundwater source.

The area is low lying marshy land and is connected to the sea through Buckingham canal and the Kovalam Estuary at the southern end of the depression. The dumpsite is bounded by 12°50' and 13°00' North latitude and East longitude 80°05' and 80°15' falls in Survey of India topographical map 66D/1 and D/5 which is 3.5 kilometer from the Bay of Bengal.

This work aims to assist in the reduction of groundwater contamination practises and suggest appropriate remedial measure which will be useful for the betterment of people living near the dumpsite.

To study the details of study area with the help of Focus group discussions conducted with the women's group and key informant interview with the Village Administrative Officer. The inference obtained is the groundwater contaminated near dumpsite area. The dumpsite in Perungudi fulfils only four out of seventeen requirement criteria in the Municipal Solid Waste (M&H) Rules, 2000. Situation Problem Query and Response tool is used to obtain the present situation at Perungudi includes various problems due to the existence of the open dumpsite.

The data collected from the Central Ground Water Board and Institute of Water Studies. From the data analysis, the groundwater concentration has its own cyclic response of monsoon and non monsoon period. The concentrations are increase in June of the year and decrease in the January due to the monsoon behavior. A digital elevation model is stored terrain elevation data for the earth's surface which can be used to create digital models and representations of that surface such as elevation maps or 3-D models. The general area of terrain is plain with an average altitude of 5 metres above the mean sea level. Dumpsite is placed on Marshy land, leachate leaking is high and its contaminate groundwater. The residential area elevation is high when compared to the dumpsite elevation. So that there is a chance to arrest the contamination.

In this study, a Neural Network Model for forecasting the concentration of different water quality parameter has been developed. The input parameters were pH, Lead, Chlorides, Total Hardness and Total Dissolved Solids. The neural networks used in this study were the Backpropagation networks, part of the MATLAB's neural networks Toolbox, version 7.8, for the PC (MathWorks Incorporated). The model developed was found to be performing very well in both the training and testing by using the CGWB water quality data (sixteen wells). The Neural Networking Models, however, are still influenced by trial and error considerations. It is of utmost importance to mention here that the architecture of the network that has been developed is very important in order to obtain better results.

From the model result, high concentration of Total Dissolved Solids, Total Hardness, Chlorides and Leads near the dumpsite deteriorates the quality of water. Groundwater flow in the study area is generally towards the east (well 1 and 2). The flow direction explains the larger contamination in the well in the east part of the dumpsite. It is observed that the contamination in groundwater within half a kilometer from the dumpsite. The Rate of plume movement was drawn with the help of MAP INFO package software. The result obtained from the rate of plume movement, nearly 100 metre moves every year.

Groundwater samples were collected from four wells various distances surrounding the dumping yard. The inference obtained is well water quality within one kilometer exceeds the Bureau of Indian standard limits. The principal threat to groundwater comes from inadequately controlled landfill where leachate generated from the dumpsite is allowed to escape to the surrounding and underlying ground

The inferred from ANN model and Questionnaire survey conducted among the local community is groundwater deterioration due to the presence of the dumpsite. Even though half a kilometer gets contaminated, the intensity of the concentration is very high. Proper management practices need to control the groundwater contamination and to arrest the movement of leachate from the dumpsite. The local people preferred sanitary landfill required to minimisation of the environmental issue.