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Application of Water Quality Index to Monitor Ground Water Quality: A Case Study in Colombo Catchment of Sri Lanka

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Abstract

Deterioration of groundwater quality directly threatens the livability of a community. Sri Lanka is currently undergoing a rapid increase in the demand for water, particularly for urban/rural water supplies, irrigated agriculture and in the industrial sector, exerting a considerable pressure on the available groundwater resources. This study was carried out to assess the status of groundwater quality around the Parliament Lake, in Colombo catchment, Sri Lanka by employing the Canadian Council of Ministers of the Environment (CCME) Water Quality Index (WQI) from September 2016 to September 2017 (one year). The objective of the study was to assess the suitability of groundwater in the study area as potable water through CCME WQI. Water samples were collected from thirty-four (34) locations including twenty-six (26) domestic shallow wells and eight (08) deep wells. The in-situ measurements of the parameters pH, Temperature, Dissolved Oxygen, Total Dissolved Solids, Electrical Conductivity, Salinity were conducted monthly while the laboratory testing for Ammonia, Nitrate, Phosphate, Chemical Oxygen Demand, Biological Oxygen Demand were conducted twice for fifteen (15) selected wells during the project period. CCME WQI was calculated taking pH, Temperature, Dissolved Oxygen, Total Dissolved Solids, and Electrical Conductivity into account. Results revealed Nitrate, Sulphate and Calcium levels of both shallow and deep wells were within the Maximum Permissible Levels in the SLS 614, 1,983 drinking water standards. The Nitrate levels of both shallow and deep wells were comparatively high in the dry season and in contrast, Phosphate, Calcium, Sulphate and BOD values in most the shallow wells and deep wells were comparatively high in the wet season. High Ammonia levels of five (05) out of fifteen (15) selected shallow wells exceeded the maximum permissible level given in standards. The highest COD levels in dry and wet seasons were recorded 42.0 mg/l and 88.0 mg/l respectively indicating that the water is unsuitable for drinking. According to the CCME WQI, the quality of twenty three (23) out of twenty seven (27) shallow wells were in the "Marginal" level (85.19%) and one in "Poor" condition (3.70%). The water quality of these twenty four (24) shallow wells is frequently endangered or deteriorated. The CCME-WQI values indicated that the water in four Deep Wells is in good quality (57.14%), whereas water in two deep wells is in Marginal level quality. Present study revealed that GW 20, GW 08, GW 09, GW 10 and GW 28 have deteriorating water quality with downgrading parameters of Electrical Conductivity, Salinity, and Total Dissolved Solids. Accordingly, it is proposed to carry out a well-planned groundwater quality management mechanism to avoid further pollution. In addition, detail studies to identify the causes of ground water pollution should be conducted.

Keywords: Ground water quality, Pollution, Colombo catchment, Water quality index