

# MAPPING SPATIAL DISTRIBUTION OF WATER QUALITY PARAMETERS USING GIS IN GROUNDWATER OF THE KELANI RIVER BASIN, SRI LANKA

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**Abstract-** The demand for water in Sri Lanka is gradually increasing with accelerated development, mainly for human consumption, agriculture, recreational and industrial requirement. This necessity is exerting considerable weight on the available groundwater resources. Kelani river basin is the third largest watershed of the country and considered as the main water source for the greater Colombo which is the main commercial and capital city of the country. The present study focused on application of GIS for graph spatial distribution maps referring for important water quality parameters of the ground water in the Kelani river basin. Total 72 ground water sampling locations were selected for the study and some physico-chemical and microbiological parameters were recorded using the standard methods. Most of the wells sampled for the study are being used for drinking purposes. It was found that well water in the later part of the transitional zone of the river basin has acidic nature (4.24-6.14). 90% of sampling locations showed high COD and BOD values were detected in meandering zone compare to transitional and head region of the river basin. 70% of groundwater sampling locations were contaminated with total coliform bacteria where 45% of sampling locations were contaminated with faecal coliform. Conductivity, TDS and hardness values of water were showed increasing trend from the head region through the transition to meandering region. Nitrate, Nitrite and phosphate concentrations were remained acceptable level for Sri Lanka Standards for drinking water (SLS). GIS spatial distribution maps give better visual image to understand the spatial distribution pattern to overlook better conclusion. The results of the study showed increasing trend of the pollution load towards the meandering part of the river basin suggesting proper management strategic plan is needed to protect groundwater resources of the Kelani river basin.

**Keywords-** Kelani river basin, Ground water, Physico-chemical and microbial parameters, Spatial distribution maps.

## 1. INTRODUCTION

Ground water is an essential and most important component of human life support system and it needs for drinking, domestic, industries and irrigation purposes. Activities such as irrigation, industrialization and urbanization are usually affected on the ground water quality [1, 2, 3]. Shallow characters and high permeability of ground water makes highly susceptible to pollution and once the groundwater is contaminated, its quality cannot be restored back easily [4]. Several materials have been identified as contaminants found in groundwater such as synthetic organic chemicals, hydrocarbons, inorganic cations, inorganic anions, radionuclides and pathogens [5]. In Sri Lanka, about 80% of the rural domestic water supply needs are supply from groundwater by means of dug wells and tube wells. In many areas in Sri Lanka where surface water and pipe borne water systems are not fully reliable and most of the industries in the country are depend heavily on ground water because of its good quality and self-manageability [6]. The Kelaniriver is one of the major river in Sri Lanka and its starting from the Nallathanniya which locates in the central highlands in the country and end from the Mattakkuliya which locates Colombo the main commercial and capital city in of the country [7]. It is 144 km long and drains an area of 2,230 km<sup>2</sup> and it could be ranked as the largest recipient of various types of industrial

effluents of the country [8, 9]. It has been documented that, six main types of groundwater aquifers have been identified in Sri Lanka and the Kelaniriver have broad and deep alluvial beds of variable texture and gravel content in the lower reaches [6]. Lower part of the Kelani river basin content high groundwater yield and a reliable volume of groundwater can be extracted from these alluvial aquifers throughout the year [6]. Geographic information system (GIS) has developed as a powerful tool for analyzing, storing and displaying spatial data and using these data for decision making in several areas including engineering and environmental fields [10, 11, 12]. In groundwater, GIS is commonly used for site suitability analyses, estimation of groundwater vulnerability to contamination, groundwater flow modeling, modeling solute transport and leaching and integrating groundwater quality assessment models with spatial data to create spatial decision support systems for groundwater studies [13,14]. Water management in Kelani river basin is important for present and future development of the country [7]. Groundwater quality assessment is important to ensure sustainable safe use of water, therefore aim of the present study is to provide an overview of groundwater quality condition of the Kelani river basin. Therefore, spatial distribution maps for some selected water quality parameters were used to evaluate the quality of ground water in the Kelani river basin for drinking