ABSTRACT

Water is the most indispensable fluid for all the living systems on this earth planet. The existence of this natural source is in different forms viz., surface water, groundwater, glaciers, rainfall, oceans and seas. Out of these resources, surface water and groundwater play a vital role for drinking and domestic purposes. The quality of the above water resources is very crucial to determine the sustainable health of human beings. But currently, the quality of the water that we get is very unfavourable condition and misuse of water prompts water shortage. The study area faces a lot of problem due to poorgroundwater and surface water quality. In this present research, the quality of surface water and groundwater is investigated for drinking and irrigational needs and also the potential zones of groundwater are located for sustainable development.

The Coimbatore district is in the western part of the Tamil Nadu and this research work is carried out for Coimbatore Corporation. The study area is located between the latitudes N 10°54′45” and 11°6’12”; the longitudes E 76°52′14” and 77°3′52” comprising an area of 257.06 Sq.km. The northern and southern sides of the study area have Nilgiri Reserve Forest and the Noyyal River flanked with water tanks selected for our study. The western part is encompassed by the Western Ghats and most of the eastern part is in a dry condition. The main geological features in the study area are hornblende biotite gneiss, fissile hornblende biotite gneiss and fluvial (black cotton soil with gypsum) deposits, and a minimum area covered with of granite, quartzite and garnet sillimanite. The predominant type of soil in the study region is red calcareous soil which occupies an area of 180.23 Sq.Km.

The geology, soil, geomorphology, drainage, slope, land use/land cover and lineament are contemplated by using the Geographic Information System to recognize the groundwater possible zones.

The seven rain gauge locations are identified in and around the study region. The rainfall examination for the research area is done by rainfall record information provided by the meteorological department; this reaches out for a long time precipitation of information from the time of 2005 to 2014. The season wise and average annual rainfall data are taken to GIS platform for generating the thematic maps to understand the rainfall variations in the study area the moderate rainfall was recorded in 2011 in all the rain gauge stations. During the Northeast monsoon season the rainfall recorded is 543.95 mm, which is comparatively higher than the other seasons. The groundwater fluctuation study is also carried out. Seven observation wells are selected and groundwater level data is obtained from CGWB, for investigating the trend in groundwater level. The groundwater level is studied for yearly and seasonal changes. Spatial distribution map is prepared for groundwater level. The shallow groundwater level is high in the southern region because of the water tanks.

Nine Surface water bodies are available in the study area, physico-chemical parameters have been analyzed for drinking and irrigational purposes assessed with WHO standards. 18 water samples from the water bodies were collected during pre-monsoon season and post-monsoon seasons and 22 physico-chemical parameters were analysed. Majority of the samples are exceeding the limit in pre-monsoon season; for various parameters whereas a few samples are within the permissible limit in the post-monsoon season especially because of dilution of the water. Trace elements viz chromium, zinc, cadmium, copper and nickel are determined in the lake water to estimate the impurity level. All the samples exceed the permissible limits

recommended by WHO standards and found not suitable for drinking and irrigational purposes.

The geophysical resistivity exploration is carried out by using Schlumberger resistivity method to represent the groundwater potential zones in the study area. For this purpose 54 vertical electrical soundings VES (Vertical Electrical Soundings) were conducted to a depth of 150m, to identify the prospective thickness of the subsurface layer and its resistivity. The lower the resistivity, the higher is the possibility of groundwater potential zones. By using GIS, the integration of the various resistivity maps like weathered zone resistivity, first fracture zone resistivity and second fracture zone resistivity maps are drawn to identify the groundwater potential zones. The good groundwater potential zones have an area of 93.37Sq.km; therefore 36% of study area comes under good groundwater potential zone. It is located in the southern part of the study area. Artificial recharge sites are also determined by integrating the thickness map for different layers, the various subsurface thickness maps like weathered zone, first fracture zone and second fracture zone thickness in GIS. The suitable sites for constructing recharge structures have an area of 75.80Sq.km occupying southern and northern regions.

The hydrogeochemistry of the groundwater samples are investigated to find out whether the water shall use for drinking and irrigational purposes. For this, 60 groundwater samples have been taken from the entire study area during pre and post-monsoon season. The Physical parameter includes pH, TDS and EC, are determined. Major cations like calcium, magnesium, sodium and potassium, and the major anions like sulphate, chloride, fluoride and nitratewere determined. The results are correlated with WHO standards and the spatial distribution maps are generated for all these parameters. The suitability of drinking water zone is

done by integrating all the thematic maps in GIS.Good water qualities occupy an area of 103.80 Sq.km during pre-monsoon and the good water quality occupies 121.11Sq.km during post-monsoon.

The irrigational water quality analysis includes Sodium Absorption Ratio (SAR), Kelley's ratio, sodium percentage and magnesium ratio. Majority of the samples are within the limits, and are suitable for the irrigational purpose. The quality of irrigational water is estimated by using graphical analysis like Piper Trilinear, Doneen Permeability Index, USSL, Wilcox and Gibbs plot. The analysis done by Piper trilinear shows that the majority of samples are $CaHCO_3$ and mixed Ca-Mg-Cl type during pre and post-monsoon season.Doneen, USSL, Wilcox diagrammatic representations reveal that majority of the samples are within the limit and suitable for irrigation.Gibbs plot clearly indicates that all the samples are coming under rock dominance type.

Water Quality Index (WQI) for groundwater samples is carried out to find out the suitability of the water for drinking and irrigation needs. This index is carried out for both in pre and post-monsoon seasons. In pre-monsoon, 45% of samples are suitable for drinking purpose and in the post-monsoon season 48% of samples. WQI shows that the groundwater is suitable for irrigation in both the seasons. The Spatial distribution map is generated for WQI for during both the seasons for drinking and irrigational needs. Statistical analysis is done for the groundwater samples to understand the relationship between the samples and the variables; Cluster and correlation statistics are used to find most predominant factors which influence the pollution in the water.