Salinity intrusion and its impact on Groundwater quality-Case study in downstream of Bentota River Basin, Sri Lanka

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Ranjana.U.K. Piyadasa, K.D.Dhineshika Chandani

Department of Geography, University of Colombo, Colombo, Sri Lanka.

Abstract:

The research study was conducted to identify one of the critical issues through salinity inclusion in the Bentota River and its impact on environment. Main drainage systems can be identified in the study area and it's identified as Bentota River, Lunu Gaga and Aturuwella channel. The main source of water for the river is rain water runoff collecting from surrounding catchments but during the dry seasons the river gradually filled with brackish water due to sea water intrusion. Geomorphologicaly the study area is a flat land but northern section of the lake is slightly hilly and the southern part is fairly flat land. The objective of the study is identifying the surface and groundwater quality variation due to influence sea water intrusion and its impact on groundwater quality in the surrounding area. For the present research study, a network of 14 dug wells distributed over 25 km^2 and Continuous monitoring were conducted with respect to electrical conductivity (EC), total dissolved solids and salinity were measured using portable EC/pH meters. Study reveled that pH values are change in the range of 6.6 to 7 and it's within acceptable range of WHO and SLS standers for drinking water.

INTRODUCTION

The study addressed the problem of salinity inclusion in Bentota area, which is a critical issue of the area. Three drainage systems, namely: Bentota river, Lunu Ganga and Aturuwella canal are located in the study area. The drainage systems in the study area comprise of fresh and brackish water.

Natural salinity levels in ground water are predefined by a combination of geology and the presence of airborne salts.According to the result of research on chemical characteristics the salinity level of <500µs/cm in drinking water, is considered good. For levels up to 1000 or 2000µs/cm, the salty taste becomes increasingly objectionable to most people.

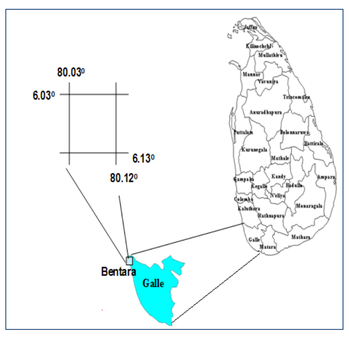


Fig.1. Absolute Location of the Study Area

OBJECTIVES

Distribution of Groundwater Level Elevation in Bentota Area and study physical characters (Ec & pH) of groundwater

METHODOLOGY

In order to achieve the objectives of this study, primary data have been profoundly used, supported by other information from secondary data sources.

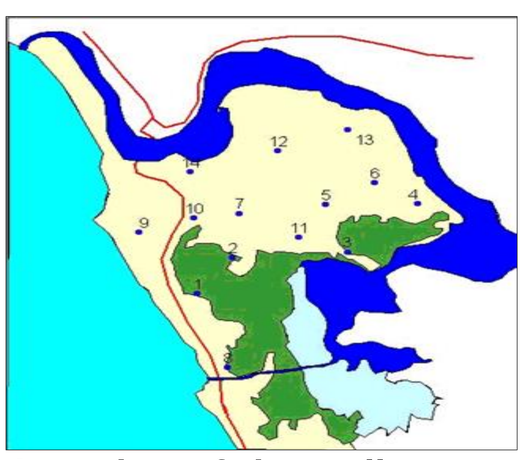


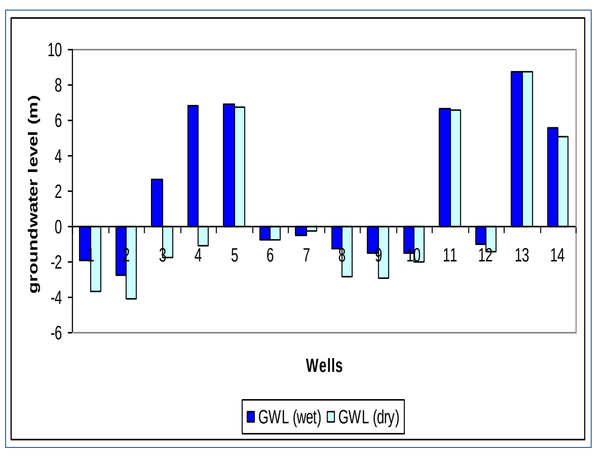
Fig. 2. Monitoring Wells

Location of the wells was detected with a GPS. Continuous monitoring of the water levels in the wells were conducted in monthly interval between September 2009 to March 2010, and the water quality in respect to electrical conductivity (EC), salinity were measured using portable EC/pH meters. GIS package MAPINGFOR was applied to plot the hydro-geological maps.

RESULTS AND DISCUSSION

Dry and wet periods affect the groundwater level. In Bentota area, elevation of the groundwater table varies from 4 m below the mean sea level to 8.5 m above the mean sea level. (See Figure 3)

Recharge areas can be identified as dark colour patches in the groundwater contour map and recharge take place in to the light colour areas. (See Figure 4) Dry and wet periods affect the groundwater recharge of the area.



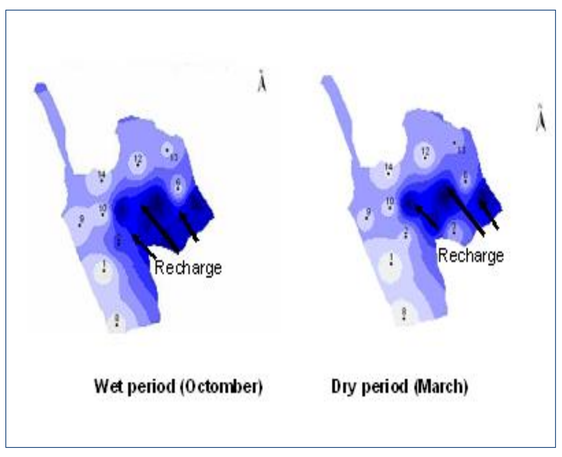
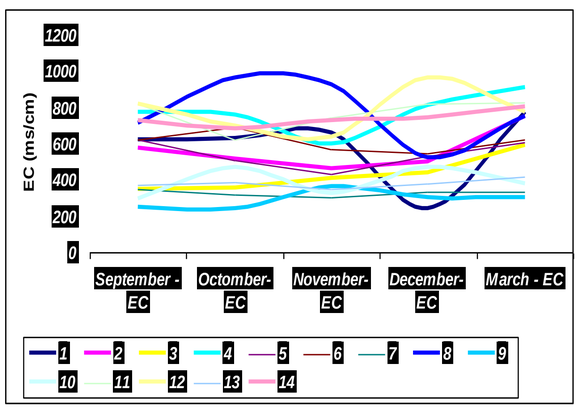


Fig: 3 Fig: 4

Electrical Conductivity & pH distribution



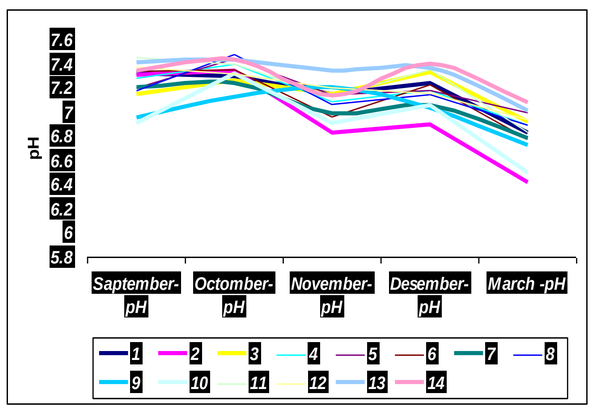
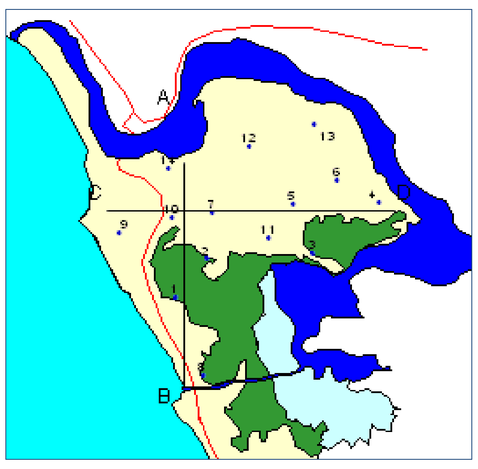


Fig. 5. Electrical Conductivity distribution of the area

Fig. 6. pH distribution of the area

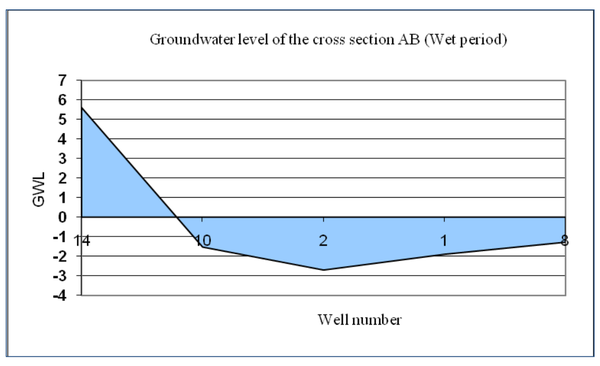
Electrical Conductivity of the water varied from 200 ms/cm to 1000 ms/cm at Bentota during the period of observation. Peak values are identified in the months of October and November. The pH value varied from 6.4 to 7.4 at Bentota during the period of observation.

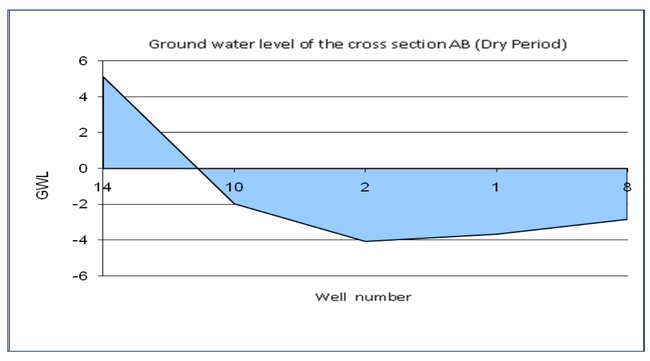
GROUNDWATER LEVEL BY CROSS SECTION

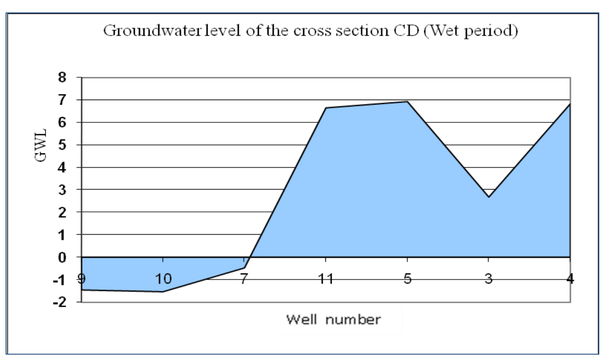


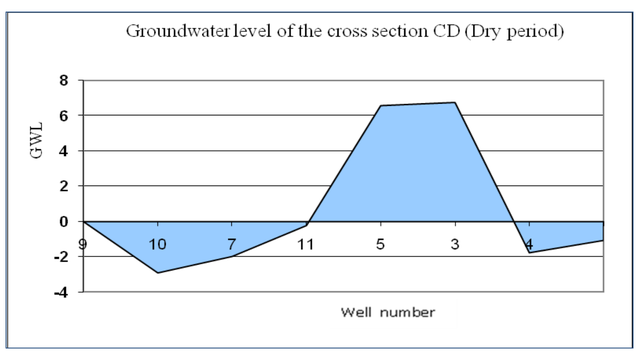
Distribution of the ground water level is mapped using two cross sections (AB and CD) of the area. The selected cross sections are shown in Figure 7.

Fig. 7. Selected Cross Section of the Area (AB and CD)









CONCLUSIONS

Recharge areas can be identified in the Eastern part of the study area. Groundwater level and groundwater recharge areas change with the rainfall.

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