

ASSESSMENT OF GROUNDWATER VULNERABILITY IN WALawe RIVER BASIN, SRI LANKA

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In the present study, DRASTIC model has been used as a feasible methodology to assess the groundwater vulnerability in Walawe river basin, Sri Lanka. The main objective of the study is to assess the potential level of groundwater vulnerability for pollution and to compare the areas with land use activities representing the degree of usage of fertilizers in agriculture.

The DRASTIC methodology consists with seven factors which influence the pollution potential level: depth to groundwater, recharge, aquifer media, soil media, topography, impact of the vadose zone and hydraulic conductivity. Seven DRASTIC parameters are divided into either ranges or media types. Each range or media type has been assigned with a rating. Since the ranges and the ratings of the parameters in the study area are deviated from the values assigned by EPA's committee of experts, the typical ranges and ratings schemes given in DRASTIC guide manual (Aller et al, 1987) were modified according to the local hydro-geological conditions. The Geographical Information Systems (GIS) has been used to develop vulnerability maps, showing the relative vulnerability of the area. The DRASTIC Index (DI), has been determined by,

$$DI = D_W D_R + R_W R_R + A_W A_R + S_W S_R + T_W T_R + I_W I_R + C_W C_R \quad (1)$$

Where subscripts R is the rating for each factor and W is the weighting factor

The final DRASTIC coverage shows the distribution of DRASTIC vulnerability index over the study area (Fig. 1). The DRASTIC index ranges between 89 and 197 which are compatible with the range given by Aller et al, (1987); within the range 50 to 200. The DRASTIC index was further divided into five categories: very low, low, moderate, high, and very high, where the higher DRASTIC index gives the greater relative pollution potential. The classification of the vulnerability based on the DRASTIC Index can be shown as follows;

Very low vulnerability ($DI < 100$)

Low vulnerability ($100 < DI < 125$)

Medium vulnerability ($125 < DI < 150$)

Moderately high vulnerability ($150 < DI < 180$)

High vulnerability ($DI > 180$)

Results show that the values of the DRASTIC index clusters around moderate vulnerability with very few points in the low and high vulnerability ranges. It favorably shows that the lower part of the basin is exposed to higher vulnerability while the upper eastern part has very low and low vulnerability. The central region of the basin covers with medium to moderate vulnerability. The ground water vulnerability maps are compared with the agricultural land use pattern of the area and it is noticed that the areas with intense agricultural activities are overlapped with the areas with high DRASTIC index values. In the area with higher DRASTIC index and with intense agricultural activities, including the extensive usage of fertilizers and pesticides, more attention should be focused to establish monitoring network for adequate groundwater quality control. Thus an effective use of composite DRASTIC and land use assessments can assist in assessing the groundwater vulnerability and planning guidelines which take into account the hydrological realities as well as human activities.

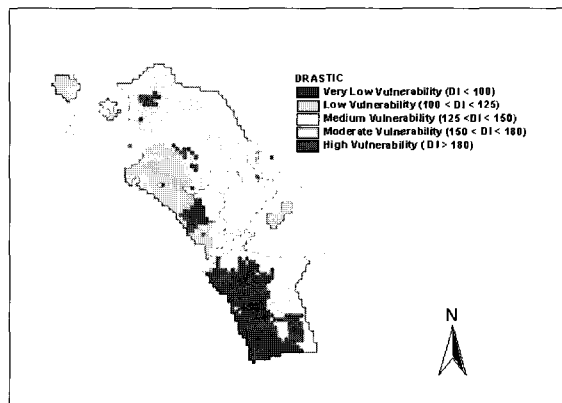


Fig. 1 Resultant DRASTIC map

REFERENCES

- Aller, L., Bennett, T., Lehr, J.H., Petty, R.J., Hackett, G., (1987), DRASTIC: A Standardized System for Evaluating Groundwater Pollution Potential Using Hydrogeologic Settings, EPA/600/2-87/035, Ada, Oklahoma.