

Groundwater Level Study Using Ann for Gandhinagar District

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Abstract- Groundwater is the major source of fresh water on earth. The study of groundwater level gives information about the groundwater availability, groundwater flow, and the physical characteristics of an aquifer. Groundwater systems are very complex in nature. If the main aim of the study is to get accurate predictions rather than understanding the actual physics of the system, Artificial Neural Network (ANN) proves to be a good alternative method. In this research, Artificial Neural Network is used to predict groundwater level in Gandhinagar district. Model considers precipitation, maximum and minimum temperature, humidity, and Evaporation data as input parameter and groundwater levels as an output parameter.

Index Terms- Rainfall, Maximum and minimum temperature, Humidity, Evaporation, MATLAB and M.S. EXCEL.

I. INTRODUCTION

Groundwater is among the Nation's most precious natural resource. Groundwater is the largest source of fresh water on earth, and was little used until recently. Ground-water level (GWL) is the level below which the subsoil and rock masses of the earth are fully saturated with water. Groundwater level is an indicator of groundwater availability, groundwater flow, and the physical characteristics of an aquifer.

What is ANN?

An Artificial Neural Network (ANN) is a computational method. ANN represent highly idealized mathematical model of our present understanding of such complex system. One of the characteristics of the neural networks is their ability to learn using past historical data.

II. LITERATURE REVIEW

Kumar M. et al. (2002) applied Artificial Neural network (ANN) to estimate evapotranspiration (ET_o)

and compared it with conventional method (Penman–Monteith) used to estimate ET_o. From the results it is concluded that the ANN can predict ET_o better than the conventional method.

Dimitri P. Solomatine, et al. (2004) developed a flood forecasting model for the upper reach of the Huai River in China using M5 Model Trees and compared it with Artificial Neural Network (ANN). As M5 Model Trees, being analogous to piecewise linear functions, are more transparent and hence acceptable by decision makers, are very fast in training and always converge as compared to ANN. The hybrid model, which is combination of M5 Model Trees and ANN, gives the best prediction result.

Purna C. Nayak, et al. (2006) developed a model to forecast groundwater level in shallow aquifer of central Godavari delta system. The results obtained suggested that ANN models are able to forecast the water levels up to 4 months in advance. Such forecasts may be useful in conjunctive use planning of groundwater and surface water in the coastal areas that help maintain the natural water-table gradient to protect seawater intrusion or water logging condition.

III. STUDY AREA

Gandhinagar district of Gujarat is selected as study area. Gandhinagar district is one of the most developed districts of Gujarat State. Gandhinagar district has the area of 2137.6 Sq km and is located in centre part of Gujarat State. It lies between north latitude 23.2156° and east longitudes 72.6369°. There are 04 Administrative units/ talukas in Gandhinagar district viz. Gandhinagar, kalol, Dehgam, Mansa. Groundwater is the main source of irrigation in this area. The major sources of draft are dugwells and tubewells.



IV. GROUNDWATER RESOURCES

The ground water resources of the district were calculated as on March 2011 in collaboration with the Government of Gujarat using the methodology suggested by Ground Water Resource Estimation Committee (GEC-97). These resources were computed after reorganisation of the districts.

| Taluka | Stage of groundwater Development |
|-------------|----------------------------------|
| Dahegam | 102.93 |
| Gandhinagar | 115.72 |
| Kalol | 122.90 |
| Mansa | 148.46 |

V. DATA COLLECTION

The data required for simulation are Rainfall, Temperature, Humidity, Pan Evaporation and Piezometric Groundwater levels. The table below shows the list of data and their sources:

| Sr. No. | Data | Sources |
|---------|--|--|
| 1 | Rainfall, Temperature, Humidity, Pan evaporation | State water data centre, Gandhinagar |
| 2 | Piezometric groundwater levels | Groundwater investigation department, Unit-2, Kherva |

VI. CONCLUSION

In this research we studied about ANN and how it can be used to predict groundwater level for gandhinagar district and also collect the useful data for analysis of groundwater level using ANN for gandhinagar district. From literature review it is

concluded that ANN proves to be better tool for predicting groundwater level rather than other tools.

VII. FUTURE WORK

In next study I will analyze the groundwater level of gandhinagar district using ANN by useful data collected in this study. MATLAB will used to analyze the groundwater level using ANN. And also analyze the groundwater level using multiple linear regression (MLR) model. And finally I will compare these two model to get actual & accurate groundwater level in gandhinagar district.

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