

MODELLING OF GROUNDWATER LEVELS AND
QUALITY USING NEURAL NETWORKS,
GEOSTATISTICS, TIME SERIES, FUZZY SETS
AND REMOTE SENSING

by

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CERTIFICATE

This is to certify that the thesis entitled **MODELLING OF GROUNDWATER LEVELS AND QUALITY USING NEURAL NETWORKS, GEOSTATISTICS, TIME SERIES, FUZZY SETS AND REMOTE SENSING** being submitted by **Aman Sharma** for the award of the Degree of Philosophy, is a record of bonafide research work carried out by him. **Mr. Aman Sharma** has worked under my guidance and supervision for submission of this thesis, which to my knowledge, has reached the requisite standard.

This thesis, or any part thereof, has not been submitted to any other University or Institute for the award of any degree or diploma.



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Professor

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ABSTRACT

Groundwater is the most widely used source of water. The study of groundwater behaviour requires information on groundwater levels and quality. This study concentrates on the spatial variability of groundwater level and quality in a semi-arid environment which is facing the problems of waterlogging and salinity due to introduction of irrigation from groundwater. The groundwater behaviour has been studied using varied techniques such as Neural Networks, Geostatistics, Time series, Fuzzy sets and Remote sensing. The study area covers Anoopgarh, Hanumangrh, Suratgarh and Rawla blocks of Indira Gandhi Canal project, Rajasthan in the state of Rajasthan.

Geostatistics has been used to study the spatial variability of groundwater levels and salinity. The experimental semivariograms were derived using measured data. The semivariograms were then modelled using linear, spherical, gaussian, and exponential models. The technique of kriging was then used to select the model through cross-validation.

The technique of Remote Sensing was used to supplement the findings of Geostatistics. The IRS-1C, LISS-III data of the study area was used for the study. Artificial Neural Network using Backpropagation algorithm was used to model the groundwater behaviour in the study area. The technique was used to assess the spatio-temporal behaviour of the ground water.

The Time Series Models and Fuzzy Regression Analysis were used to assess the temporal behaviour of the groundwater in the study area.

The findings of the research work have emphasised the utility of various techniques in varied forms in a semi-arid environment. The results from the study showed that groundwater level variation can be studied using spatial and spatio-temporal techniques. The scope of further research work on various techniques were also highlighted as a part of the research work.

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