

Application of ANN for Groundwater Quality Management with Special Reference of Coral Island

PALLAVI BANERJEE^{*1}, V. S. SINGH²

^{1, 2}*National Geophysical Research Institute (CSIR), Hyderabad, India*

Purpose the study is to assess the optimum groundwater abstraction on the island aquifer that becomes imperative in order to develop sustainable management scheme. Kavaratti Island is such a coral island in the western coast of India. It is one of the densely populated islands of the Lakshadweep archipelago, India. Lakshadweep is an archipelago of coral islands in the Arabian Sea off the western coast of India. In the range of 220–400 km off the western coast of India, there are about 36 islands, 12 atolls, 3 reefs and 5 submerged coral banks spread over an area of 32 km² in the Arabian Sea^{1,2}. Groundwater is the only source of fresh water for the islanders. Thin lens shaped aquifer of the island is vulnerable to seawater intrusion due to various stresses such as pumping, tide, draught, etc. The demand for groundwater is increasing every year due to growing population and urbanization. That cause increase in groundwater abstraction rate through pumping. As a consequence of indiscriminate exploitation, the quality in some parts of these islands has already started deteriorating³. On the other side the peculiar hydrologic, geologic and geomorphic features restrict the availability of groundwater.

A newly introduced tool in the field of hydrology, called Artificial Neural Network (ANN)⁴ is used to assess the optimum groundwater abstraction rate. Feed-forward artificial neural network (FFANN) models have been used for assessing groundwater quality with different inputs. The proposed networks use Quick Propagation (QP) training algorithm^{5, 6}. The Quick Propagation (QP) algorithm is a discrete pseudo-Newton method. It utilizes individual learning rates for each connection weight that is dynamically adjusted as training progresses. The analysis has given an early signal of deterioration in groundwater quality, when pumping rate is exceeding the value of 13,000 L/day, in addition to raising utilization (Fig. 1).

* Address of Main Author:

1st Floor, Groundwater Building, N.G.R.I. (CSIR), Uppal Road, Hyderabad, Andhra Pradesh, INDIA, Pin 500007

Contact No: +91 40 23434615; +91 9949219120

E-mail: yns_pal@yahoo.co.in

Fax: +91- 040-27171564

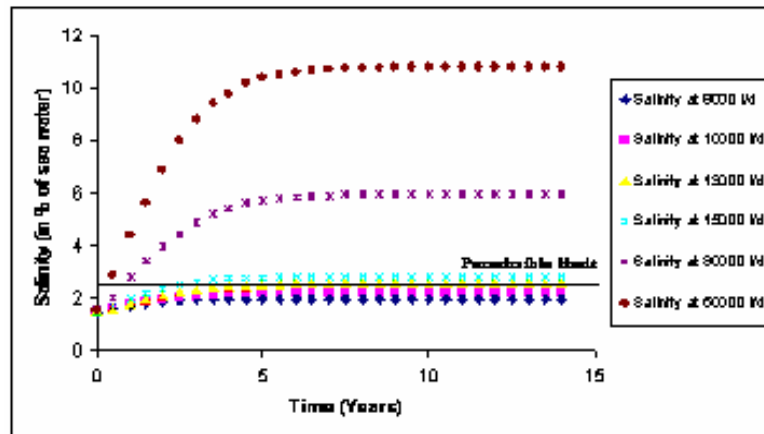


Figure1. Salinity forecasted data of different pumping rates

KEYWORDS: Artificial neural network; Quality forecasting; Coral island; Groundwater quality; Sustainable management.

REFERENCES

- [1] Wagle B G and Kunte P D *Indian J. Marine Sci.* Vol. **22**(3) 203–209. 1993
- [2] Mallik T K J. *Geol. Surv. India Spec. Publ. Vol.* **56** 1–8. 2001
- [3] Singh and Gupta, *Environmental Geology. Vol.* **37** (1-2). 72-77. 1999
- [4] Zhang, G., Patuwo, B. E., & Hu, M. Y., *International Journal of Forecasting, Vol.* **14**, 35–62.1998
- [5] Fahlman S. E., *Technical Report CMU-CS-88-162, Carnegie-Mellon University, Computer Science Dept., Pittsburgh, PA.* 1988.
- [6] Patterson, D., *Artificial Neural Network. Singapore, Prentice Hall, 1996.*