JWARP> Vol.2 No.11, November 2010

OPEN ACCESS

Assessing Groundwater Vulnerability in Azraq Basin Area by a Modified DRASTIC Index

PDF (Size:921KB) PP. 944-951 DOI: 10.4236/jwarp.2010.211112

Author(s)

Alsharifa Hind Jasem, Marwan Alraggad

ABSTRACT

Groundwater is the main source for water supply in Jordan. Surface water is limited due to low precipitation rates. Studying groundwater vulnerability helps to protect this main source of depletion and degradation for present and coming generations. Different vulnerability indices were built taking into consideration the different environmental setting of the different areas for which these indices were established. Environmental and weather conditions are very important factors in determination groundwater vulnerability hence arid to semi arid areas conditions must be taken into account in applying different indices. The reason after selecting Azraq as a rest point is related directly to the availability of fresh water resources in the form of the wetland supported by many potential springs making Azraq a rich environment for economic activities. A modified DRASTIC vulnerability index was applied to Azraq basin area due to its special climate and wetland area conditions. The index takes the special landuse and the different groundwater depths into consideration and suggests a few measures to alleviate the vulnerability of the groundwater resources due to overexploitation and human activities changing the value of landuse. Azraq basin represents four different vulnerability classes, ranging from Low to very high vulnerability class. The lower vulnerability class areas are distributed in theareas with high depth to water table and low recharge areas with low human activities. The higher vulnerability classes are shown in the areas with high possibility of the pollutants to reach the groundwater. The modified DRASTIC index added the value of the human activity and the structural features in the area which give a more ease to pollutant to permit the aquifer.

KEYWORDS

Groundwater, Vulnerability, Azraq, DRASTIC Index, Aquifer, GIS

Cite this paper

A. Jasem and M. Alraggad, "Assessing Groundwater Vulnerability in Azraq Basin Area by a Modified DRASTIC Index," *Journal of Water Resource and Protection*, Vol. 2 No. 11, 2010, pp. 944-951. doi: 10.4236/jwarp.2010.211112.

References

[1] Water Authority of Jordan (WAJ) (2005): Internal files for groundwater basins in Jordan.

[2] Vrba, J. & Zoporozec, A. [eds.] (1994): Guide book on Mapping Groundwater Vulnerability. – International Contributions to Hydrogeology (IAH), 16: 131 p.; Hannover.

[3] Merchant, J. M (1994). GIS-Based groundwater pollution hazard assessment: A critical review of the DRASTIC Model. Photograommetric Engineering & Remote sensing, Vol. (60), No. (9), pp. 1117-1127.

[4] Engel et al., 1996. B.A. Engel, K.C.S. Navulur, B.S. Cooper and L. Hahn, Estimating groundwater vulnerability to non-point source pollution from nitrates and pesticides on a regional scale. In: (1996), pp. 521-526 (IAHS Publication No. 235).

[5] R.C. Knox, D.A. Sabatini and L.W. Canter, Subsurface transport and fate processes., Lewis Publishers, USA (1993).

[6] Murray, K., S., and Rogers, D, T (1999). Groundwater vulnerability, Brownfield Redevelopment and Land Use Planning. Journal of Environmental Planning and Management. Vol. (42), No. (6), pp. 801-

810.

[7] IUCN, 2010, Azraq oasis restoration project, regional office for west asia ROWA, Jordan.

[8] Fortin, M., Thomson, K., P., B. and Edwards, G (1997). The role of error propagation for integrating multisource data within spatial models: the case of the DRASTIC groundwater vulnerability model, Earth Surface Remote Sensing Procedure SPIE conference, London, pp 358- 361.

[9] Fritch, T., G. et al. (2000). An aquifer vulnerability assessment of the paluxy aquifer, central Texas, USA, using GIS and a modified DRASTIC approach. Environmental Management, Vol. (25), No. (3), pp. 337-345.

[10] Jasem, H. (2009) Groundwater vulnerability assessment in wadi Kafrain catchment area and its surroundings_ using GIS, ground truthing and lab analysis_. PhD thesis, University of Jordan, Jordan.

[11] Aller, L., Bennett, T., Lehr, J. H., Petty, R. J., Hackett, G. (1987). DRASTIC: A standardized system for evaluating ground water pollution potential using hydrogeologic settings. U.S. Environmental Protection Agency, EPA/600/ 2-87/036, 622pp.

[12] MWI – Ministry of Water and Irrigation (2010), open files.

[13] Esri, environmental system research institution, 2006. Arc view GIS 9.1, computer software to visualize explore query and analyze data spatially, USA.

[14] Piscopo, G (2001). Groundwater vulnerability map, explanatory notes, Castlereagh Catchment, NSW Department of Land and Water Conservation, Australia.

[15] NRA, 1993, Azraq basin geologic map.

[16] SUBAH, A. & HOBLER, M. (2004): Groundwater Resources of Northern Jordan, Special Report No. 7: Hydrogeological Proposal for the Delineation of a Groundwater Protection Area for the Qunayyah Spring. - Unpubl. report, BGR archive no. 0126726, 30 p.; Amman.