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Integrated GIS and Remote Sensing for Mapping Groundwater Potential Zones : Case Study

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Abstract

Groundwater is significant new water asset. It assumes crucial part in drinking just as water system rehearses. Around there, lion's share of individuals doing horticultural practices and it's straightforwardly pondered groundwater draft. Geographical highlights, landforms, waste morphometry and land use/land front of any space control groundwater potential. Topographically, region is made out of monstrous and additionally broke and endured basaltic streams (basic and compound) and little fixes of sand, rock and residue along major nallas with EW, NW-SE and N-S moving dykes. Present examination paper shows outline of groundwater potential zones utilizing weighted overlay investigation in N-E Maharashtra.The groundwater potential guide is produced by incorporating and overlaying of topical layers/information (lithology, geomorphology, land utilized and land cover, incline, seepage and so on) utilizing GIS stage. The outcomes show that larger part of region having poor to direct groundwater likely zones. Far off detecting and GIS are appearance apparatuses utilized for groundwater likely zonation. The outcomes give huge data and guides to water strategy creator as a base information to choose the reasonable destinations for practical groundwater improvement and the executives.

Keywords: GIS, Groundwater potential; Groundwater exploration; weight age analysis; N-E Maharashtra.

Introduction:

assets assessment utilizing the far off detecting strategy. The groundwater prospect assessment by high-goal satellite symbolisms was accounted for by Mondal et al. (2007). The overlay examination by GIS procedure was utilized to outline the groundwater potential zone concentrated by Nag (1998); Sikdar et al., (2004); Prasad et al., (2008); Teixeira et al., (2008); Girish et al., (2008); Nagarajan and Singh (2009); and Sukumar and Sankar (2010).Agricultural, industry and homegrown water

Groundwater is the biggest new water asset on the Earth, which makes it a significant hotspot for human utilization and the general improvement of an area. Planning groundwater potential zones is fundamental for arranging the area of new reflection wells to fulfill the expanding need for water. The event, dissemination, and development of groundwater for the most part rely on the land and hydro-geomorphological highlights of the space. A nitty gritty investigation of groundwater events can be made by surface and subsurface examination techniques. The groundwater possible zones and paleochannels were researched utilizing the land and geophysical strategies revealed by Shirke et al. (2005) and Ariyo et al. (2011). In any case, these techniques depend on broad and tedious ground estimations that can be utilized distinctly for huge scope planning. The utilization of distantly detected information alongside Geographic Information System (GIS) is appropriate, and it very well may be handily joined with the information created from regular and ground estimation systems.Remote detecting and GIS have additional opportunities for hydrogeological examines (Thomas et al., 1999; Lokesh et al., 2007). High-goal satellite symbolisms are broadly utilized in groundwater concentrates because of their high phantom and spatial goal. They are utilized to distinguish the topography, geomorphology, soil, lineament thickness, seepage thickness, precipitation and landuse for maps that show the event of groundwater (Preeja et al., 2011). Rao et al. (2004) considered the incorporation of groundwater

clients in the north Chennai area rely on the siphoning of groundwater from the Arani and Koratalai stream bowl. Moreover, groundwater from this area is additionally being siphoned by Chennai Metropolitan Water Supply and Sewerage Board (CMWSSB) to supply water to the city of Chennai. Notwithstanding the enormous scope siphoning of groundwater from this space, no endeavor has been utilized distant detecting and GIS methods to recognize groundwater possible zones. Subsequently, the current examination was

done with the goal of planning the spatial circulation of groundwater likely zones in the N-E Maharashtra., which will aid the appropriate advancement of groundwater assets around here.

Case Study Area:

Study region is situated in the western piece of Jalgaon locale of Maharashtra state. It lies between Longitude 75°19'10" and 74°55'45" E and Latitudes 20o40'05" and 21o11'03"N, planned by Survey of India toposheets (46 K/16, 46 L/13, 46 L/14, 46 O/4, 46 O/8, 46 P/1, 46 P/2 and 46 P/8) planned on 1:50,000 scale and cover 1438.57 sq.km region (Fig.1). Environment of the space is dry and hot besides during the storm time frame and the normal yearly precipitation of the space is 736.75 mm. About 99% of the yearly precipitation is gotten during the southwest rainstorm season during long periods of June to September. Normal temperature in the space shifts from 10°C to 46°C and the air is dry besides during rainstorm period. Agribusiness is the principle practice for endurance of individuals, conspicuous harvests collecting in the space are Cotton, Jowar, Bajara, Maize and Grains.

MATERIALS AND METHODOLOGY

For present examination all spatial and non-spatial data of the investigation territory are gathered from source associations and created utilizing assets like LISS IV satellite information (2011), Survey of India's (SOI) toposheets, District Resource Map distributed by Geological Survey of India, Historic information of the wells and subsurface lithological subtleties accessible with the Ground Water Survey and Development Office (GSDA), Jalgaon and Field work notes (About the Geology, Geomorphology, Landuse/ Landcover and so on) ERDAS Imagine 9.1 programming is utilized for Image preparing and Image investigation and

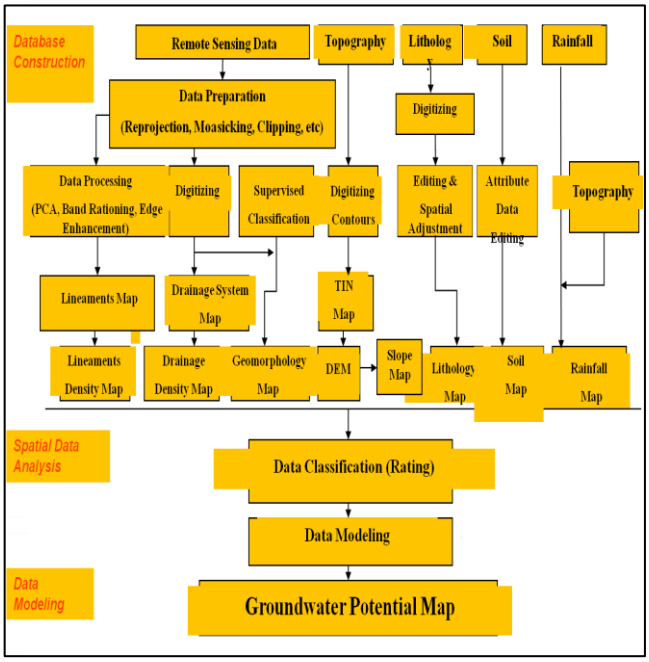
Circular segment GIS 10.2 programming is utilized for age and updation of topical data, GIS joining,GIS examination and displaying.GIS demonstrating is the best practice to divide Groundwater Potential Zones. Weighted overlay examination technique is utilized to portray groundwater likely zones. Groundwater potential zones are confirmed in the field.

OBJECTIVES:

1.To portray the groundwater potential zones utilizing pertinent information (precipitation, geography ,topography ,soil and so forth

2. To build up a GIS model that can recognize groundwater potential zones dependent on the topical guides.

3.To approve the consequences of this examination with information from field.



Conclusion :

Study area is located in the North Maharashtra region which is dominantly marked as a alluvium and basaltic flows of Sahyadri group of Deccan Trap. sensing and GIS in identifying ground this study has been established methodology for demarcation of groundwater potential zones by considering weightage overlay analysis in addition to geospatial techniques. The upstream part of the study area is covered with hard basaltic rock which gives high slope percentage (15-35 %), high drainage density and less soil depth, whereas, the downstream part of the study area having poor to null slope percentage, low drainage poor slope, low drainage density and alluvium in downstream part of study area are found favorable for groundwater exploration and development, which also categorized into good to excellent groundwater potential zones. According to

geomorphologic categorization, maximum area of the Bori-Chikli watershed is characterized by moderately dissected plateau (MDP) having moderate to good groundwater potential. In study area there are five groundwater potential zones have been identified i.e. Excellent, Very Good to Good, Good to Moderate, Moderate to Poor and Poor. The obtained results can be used for sustainable groundwater resource development and management plan as well as it can be used for artificial recharge site suitability.

REFERENCES

1. Adyalkar, P. G., Ayyangar, R.S., Tikekar, S.S. and Khare, Y. D. (1996). Groundwater potential of Deccan Flood Basalt of Nagpur District in Maharashtra: An imprint derived from satellite imagery In Deccan basalt, Gondwana Geol. Soc. Sp. Vol. 2, pp. 485-492.

2. Agrwal, P.K. (1995) the Techno- economic aspect of groundwater potential and development in Deccan flood basalts, Maharashtra. Gondwana Geol. Mag. V.10, pp. 79-88.

3. Bhoyar C. P., Khadse S. P. and Rokade V. M. (2012) Geophysical Approach for Delineation of Ground Water Potential Zones: A Case Study from Deccan Basalt" Paper published in the Memoir of Geological Society of India, No. 80, pp. 67 -77.

4. Biswas Arkoprovo, Jana Adarsa and Sharma Shashi Prakash (2012).Delineation of Groundwater Potential Zones using Satellite Remote Sensing and Geographic Information System Techniques: A Case study from Ganjam district, Research Journal of Recent Sciences, 1(9), 59-66.

5. Bondre N. R., Duraiswami, R. A., and Dole G (2004a). Morphology and emplacement of flows from the Deccan volcanic province, India. Bull Volcanol 66:29–45.

6. Central Ground Water Board (CGWB) (2009). Ground Water Information of Jalgaon District, Maharashtra. Government of India, Ministry of Water Resources, report prepared by Bhushan R. Lamsoge.

7. Davoodi Moghaddam, D., Rezaei, M., Pourghasemi, H.R., Pourtaghi, Z. S., and Pradhan, B., (2015). Groundwater spring potential mapping using bivariate statistical model and GIS in the Taleghan watershed, Iran, Arabian Journal of Geoscience, 8 (2): 913-929.

8. Deolankar S B (1980). The decaan basalt of Maharashtra India: their potential as aquifers, Groundwater Vol-19(5),pp 434-437.

9. Deshpande G G (1998). Geology of Maharashtra; Geological Society of India, Bangalore, 223p

10. Dinesh Kumar P. K., G. Gopinath and P. Seralathan (2007). Application of remote of sensing and GIS for the demarcation of groundwater potential zones of a river basin in kerala, southwest coast of India, Int.J.Remote Sensing, Vol-28, No-24,pp-5583-5601.

11. Domingos Pinto, Sangam Shrestha, Mukund S Babel, and Sarawat Ninsawat (2015). Delineation of groundwater potential zones in comero watershed, Timor Leste using GIS, RS and Analytical Hierarchy Process (AHP) techniques. Applied water science.

12. Duraiswami R.A. (2005) Dykes as potential groundwater reservoirs in semi-arid areas of Sakri taluka, Dhule district, Maharashtra. Gond Geol Mag 20:1–9.

13. Duraiswami. R. A. (2008b). Changing geohydrological scenario in the hard-rock terrain of Maharashtra: issues, concerns and way forward. In: Subhajyoti Das (Ed.), changing Geohydrological Scenario: Hardrock Terrain of Penninsular India. Golden Jubilee Memoir of the Geological Society of India, no.69, 314 p.

14. Duraiswami. R. A., Subhjyoti Das and Tahira Shaikh (2012). Hydrogeological framework of aquifers from the Deccan Traps, India: some insights, Memoir Geological Society of India, No.2012, Pp.1-15. 15. GSI (2009) Jalgaon District Resource Map published by Geological Survey of India.

16. GSDA (2012) Old Dug Well and Bore Well details for accessing Depth of Weathering and Depth to water Table (Noted from registers).

17. Kulkarni Himanshu, Deolankar S.B., Lalwani Anil, Joseph Bijoy and Pawar Suresh (2000). Hydrogeological framework of the deccan basalt groundwater systems, west-central India. Hydrogeological Jour., v.8, pp.368-378.

18. Magesh, N.S., Chandrasekar, N., and Soundranayagam, J.P. (2011) Morphometric evaluation of Papanasam and Manimuthar watersheds, parts of Western Ghats, Tirunelveli district, Tamil Nadu, India: A GIS approach. Environmental Earth Sciences, 64, 373–381

19. Magesh N. S., Jitheshlal K. V., Chandrasekar N. &Jini K. V. (2012) GIS based morphometric evaluation of Chimmini and Mupily watersheds, parts of Western Ghats, Thrissur District, Kerala, India. Earth Sci Inform 5:111–121.

20. Muley R.B., Md. Babar. Atkore S.M and Ghute B.B. (2010) Application Of Geology And Remote Sensing In The Groundwater Potential Zones In Drought Prone Areas Of Parbhani District, Maharashtra, India.

21. Muley R.B., Md. Babar. Atkore S.M and Ghute B.B. (2012). Hydrogeological study for identifying groundwater potential areas of Dhudhgaon in Parbhani District, Maharashtra, Memoir Geological Society of India, No.2012, pp-39-49.

22. Nag, S.K. and Chakraborty, S. (2003) Influence of rock types and structures in the development of drainage network in hard rock area. Journal of the Indian Society of Remote Sensing, 31 (1), 25-35.

23. Nag S. K., Ghosh P. (2012). Delineation of groundwater potential zone in Chhatna Block, Bankura District, West Bengal, India using remote sensing and GIS techniques, Environ Earth Sci.,Vol54,Number-4.

24. Oikonomidis, S. Dimogianni, N. Kazakis, and K. Voudouris (2015). A GIS/Remote Sensing based methodology for groundwater potentiality assessment in Tirnavosarea, Greece, Journal of Hydrology (525), 197-208.

25. Pourtaghi, Z.S., and Pourghasemi, H.R., (2014). GIS-based groundwater spring potential assessment and mapping in the Birjand Township, southern Khorasan Province, Iran, Hydrogeology, 22: 643-662.

26. Rahmati, O., Nazari Samani, A., Mahdavi, M., Pourghasemi, H.R., and Zeinivand H., (2014). Groundwater potential mapping at Kurdistan Region of Iran using analytic hierarchy process and GIS. Arabian Journal of Geoscience, DOI: 10.1007/s12517-014-1668-4.

27. Ray Ranjini, ShethHetu and y Mallik Jyotirmo (2006). Structure and emplacement of the Nandurbar-Dhule mafic dyke swarm, Deccan traps, and tectonomagmatic evolution of flood basalts, Bull Volcanol, Vol-69, pp- 537-551.

28. Ranade, P., and Katpatal, Y.B., (2009) Water Resource Assessment and preparation of Management Planning Strategy using Remote Sensing and GIS in Indian Himalayas- a case study for Sainj River watershed, Himachal Pradesh,. Himalayan Studies Jour, Vol. 2 No. 1, pp 59-64.

29. Rokade, V. M., Kundal P. and Joshi, A. K. (2004). Water Resources Development action plan for Sasti watershed, Chandrapur district, Maharashtra using Remote Sensing and Geographic Information System, Journal of the Indian Society of Remote Sensing, Vol. 32, No. 4, 2004, pp. 363- 372.

30. Rokade, V. M., Kundal P. and Joshi, A. K. (2007). Groundwater Potential Modeling through Remote Sensing and GIS: A case study from Rajura Taluka, Chandrapur District (MS), Journal of Geological Society of India, Vol. 69, No. 5, 2007, pp.943.

31. Salwa Farouk Elbeih (2014) An overview of integrated remote sensing and GIS for groundwater mapping in Egypt.Ain Shams Engineering Journal, Elsevier,6:1–15.

32. Saraf, A. K. and Choudhuray, P. R. (1998). Integrated remote sensing and GIS for groundwater exploration and identification of artificial of artificial recharge sites, Int. Journal of Remote Sensing, 19 (10): 1825-1841.

33. Shahid S., Nath S.K. and Roy J. (2000). Groundwater potential modeling in a soft rock area usinga GIS, Int. J.Remote Sensing, Vol-21, No-9, pp-1919-1924.

34. Sheth HC, Duncan RA, Chandrasekharam D, Mahoney JJ (1997) Deccan Trap dioriticgabbros from the western Satpura–Tapi region. Curr Sci 72:755–757

35. Singh, L. M., Roy, P. K., Roy, A. K. and Anand, R. (1993). Application of Remote Sensing and Geographic Information System in hydrogeologic investigation of Imphal Valley (Manipur). Proc. Nat. Symp. Remote Sensing Application for Resource Management with special emphasis on NE Region, Guwahati, Nov. 25 – 27, 1993. pp. 143-147.

36. Strahler, A. N. (1964). Quantitative geomorphology of drainage basins and channel networks, Handbook of Applied Hydrology, Edited by V. T. Chow, McGraw-Hill, pp. 4 – 39.

37. Varade Abhay M. ,Khare Y. D., Kolte D. M, Yadav Shrilata, Thakur Nitesh G. (2017). Significance of lineaments on the groundwater regime of a Basaltic Terrain: a case study of a watershed from Nagpur District, Central India .Sustain. Water Resour. Manag. 3:41–53.

38.Vijith, H. and Satheesh, R. (2006) GIS based morphometric analysis of two major upland subwatersheds of Meenachil River in Kerala. Journal of the Indian Society of Remote Sensing, 34 (2), 181-185.

39. Vishnu P. Pandey, Sangam Shrestha, Futuba Kazama (2013). A GIS based methodology to delineate potential areas for groundwater development: A case study from Kathmandu valley, Nepal. Applied Water Science 3: 453-465.

40. Wakode H. B., Dibyendu Dutta, Desai V. R., Baier Klaus & Azzam Rafig (2011). Morphometric analysis of the upper catchment of Kosi River using GIS techniques. Arab J Geosci, 6:395–408.