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EVALUATE THE QUALITY OF GROUNDWATER SUPPLIES OF WESTERN INDIAN RIVER BASINS USING REMOTE SENSING AND GIS TECHNIQUES

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ABSTRACT

The current research controls the watersheds' groundwater potential and environmental issues. The available water should be utilized wisely through legal development and management mechanisms. These operations necessitate knowledge of a number of related disciplines, such as geomorphology, geology, meteorology, penology, remote sensing, groundwater exploration, hydrochemistry, and environmental issues. With this in mind, a point-by-point quantitative and subjective assessment of the watersheds' hydro geological and environmental characteristics has been attempted. The goal of this study is to contribute to effective groundwater ponders by using Remote Sensing, Field Studies, remote sensing, and GIS to develop groundwater resource assessment criteria in similar hydrological domains.

Keywords: groundwater, environmental issues, management mechanisms, remote sensing, GIS

INTRODUCTION

Water is one of the most important components since it is necessary for all kinds of life and is the most valuable common resource that must be maintained. Water is essential for man's fundamental needs in residential, rural, and contemporary occupations. Groundwater exploitation has been a serious concern over the last two decades. Nearly one-fifth of the world's water comes from groundwater resources, and since groundwater is a critical source of clean water in many places, securing its availability has become a top issue for CEOs. The organizers' possessions were all lost in the frenzy of change, resulting in chaotic changes and the loss of natural resources like lush green nurseries and bodies of water. The investigating region, unlike other areas, lacks a permanent river, which might explain why several lakes were formed crosswise over intermittent streams at the time.

Unique lakes on selected lands, such as Madivala, Sankey Tank, and Hebbala Lake, have recently been protected. Regardless of the water level, a portion of these lakes collect rubbish over time, contaminating the water. The tanks have been the location of garbage transfer in various zones.

It has also been estimated that the underground water system accounts for 70-80% of the value of watered items in India. In India, the value of a watered object is derived from the groundwater system (Mall et al., 2006). Groundwater assets are now widely recognized as a stable and important commodity for long-term local development. The substantial withdrawal of groundwater from water table springs causes a significant loss in groundwater assets, even in severe shocks. The growing pattern of local, industrial, and agricultural requirements is progressively becoming an issue (Dipankar Das, 2002). To fulfill the growing demand for groundwater in all water consumer areas, they were obliged to look for more efficient, deeper, and long-term groundwater production in the hard rock terrain.

Deeper sources are typically controlled by fractures and shear zones, which ensure long-term groundwater production in the hard rock terrain. The frequency of such fractures and shear zones in nature is very variable, and the power and arrangement of cracks are mostly determined by the kind of stone, structural twisting, and degree of endurance. Investigating such litho-structures suited for groundwater consideration, which are generally isolated, is tough and complicated. Individuals and planners seek to the application researcher for help with groundwater investigation in this manner.

In this comparison, satellite data acquired over time periods ranging from half a month to a few hours may be used. Remote detection strategies may provide vital information that is not readily available on the ground. The symbolism of the satellite may be used to extract a considerable amount of geological data. The compact perspective of the satellite's symbolism fosters improved geomorphologic energy and aids in the mapping of various landforms and their assemblages.

Gravel, sand, sandstone, or limestone are often found in springs. Water runs through these stones because they contain large linked gaps that make them porous. This is known as the water table, and it is the level of the surface where groundwater may be discovered. The water table might be as little as a foot below ground level, or as deep as two or three hundred meters.

Groundwater extraction may make the quantity of groundwater fall a vital component of the nation's soil and economy, and significant downpours can cause the water table to increase. It is essential for the preservation of vulnerable ecosystems. The best possible management of both surface and groundwater resources via precise stockpiling, protection, and lawful planning is critical for financial and social progress. Groundwater prospecting, particularly in hard rock areas, necessitates a thorough understanding of the region's geology, geomorphology, and lineaments, which are influenced directly or indirectly by factors such as enduring assessment, degree of cracking, permeability, slope, planting nature, landforms, land use/land distribution, and climate. 2,3. At all environmental sites, groundwater is regarded as one of the most essential and secure sources of water supply in the world4. Geology, lithology, geological structures, endurance depth, and degree of breaks, p auxiliary porosity, slope, instances of waste, landform, land use and distribution of land, and temperature are all factors that influence the occurrence and expansion of groundwater. The significance of water is felt in all branches as the population's demands and requirements expand.

Remote sensing provides multi-sensor data on earth surface loads to determine the relative relevance of each base. As a result, several strategies have been developed, primarily classified as emotional and target techniques. In abstract weighting techniques, loads are inferred using information and preferential judgment of chiefs, and in target weighting techniques, mathematical models are used to evaluate loads.

In prior research of the definition of groundwater potential zones, analysts used emotional weighting methodologies such as weighted linear combination, Analytical

Hierarch process20, weighted accumulation approaches, and weighted entire model, among others.

2. LITERATURE REVIEW

Ashim Das Gupta (1996) argued that combining the long-haul characteristic revival assessment with the dynamic response evaluation of the spring mechanism gives a viable approach for determining the long-haul sustainable yield of the groundwater structure. Two empirical studies have been used to describe this system: one for the groundwater bowl in Nepal's Kathmandu Valley and the other for the beachfront Spring of Mannar Island in Sri Lanka.

The groundwater capacity of the West Godavari district in Andhra Pradesh, India, was estimated by Kamaraju et al. in 1995. For example, groundwater regulating characteristics such as lithology, geomorphology, and the structure and power condition of the evaluation zone were broken down using Arc Data GIS programming. An evaluation of the groundwater potential and age of a guide was provided, which showed three primary hydro-land situations with probable groundwater outcomes that could be used as a basic tool in the region's groundwater extraction.

In India, Naik and Awasthii investigated the lower Koyna canal basin (2003). The water table adjustment approach was used to assess regional yield and groundwater vitality.

Reddy (2002) rejected a fair way to evaluate groundwater capacity after conducting a complete investigation of the bowl's precipitation details in conjunction with the Saligeru bowl drought in Andhra Pradesh. Groundwater recovery from identification wells has been designed and tested using water table vacillation knowledge dating back years. It was discovered that wells placed at higher elevations were subjected to the most groundwater vacillations.

Sophocleous (1991) (6) analyzed the restoration of traditional groundwater by combining the equalization of dirt water with water-level variance processes and dubbed it the 'Cream Water Shift Strategy.' Huge weaknesses were found in the methods to water balance and groundwater variance studies, and a mix technique was recommended to eliminate certain vulnerabilities. When field-assessed data from Kansas was utilized, it was discovered that the suggested technique produced preferable and progressively dependable findings over both ideologies when combined.

Sameena et al. (2005) set out to determine the groundwater balance using the variance technique of the water table, in which each component of the water balance's condition was specified and the precipitation stimulus was the most puzzling component. The majority of the data was taken from Remote Sensing satellite data. While time-consuming, this procedure has produced consistent and meticulous results from a variety of methodologies.

Saraf and Jain (1996) showed the combination of Remote Sensing and GIS technologies for groundwater study in sections of Lalitpur District, Uttar Pradesh. Different information layer plans, such as geographical, soil, land, and groundwater information, were adopted in combination with IRS-1A LISS-I groundwater investigation information. The groundwater invigoration map provided information on groundwater levels as well as specific statistics on the manufacture of various stone innovations.

Sharma (2002) investigated many models that might be used to various control systems. A vast number of these models might be used on a modest scale. He emphasized the critical requirement to develop groundwater estimating models in order to resurrect appropriate precipitation, channel architecture, and water field return streams for regional use from various sources.

Shiv Kumar et al. (2004) conducted groundwater awareness study in the Bareilly, Uttar Pradesh region to evaluate direct groundwater, its latent capacity, and depiction of the water table. Groundwater storage has been put up to measure groundwater production, using the water table as an example.

3. METHODOLOGY

The base guide is made up of 1:50,000 scale topographic maps from the Survey of India (SOI). Satellite data and security data were used to create thematic maps such as land use/land spread, soil, geology, geomorphology, inclination, waste, groundwater level, and water quality. By using the GIS spatial specialist module and the addition technique, maps such as lineament thickness and drainage thickness were created. On Arc-GIS organize; all of the topical layers were scanned. Squander demand following was in charge of the stream requests.

3.1 Area of Research

The Godavari river basin, located in western Maharashtra, was chosen for research. Geographically, the region is between 11° 31'40.7"N and 11° 51'53.185"N and 78° 36'44.894"E, at 79° 7'45.337"E. The river basin spans 1122.67 square kilometers and is shown on the 1:50,000 scale SOI top sheets 58I/9, 58I/10, 58I/13, and 58I/14. According to 2011 statistics for India, the total population is roughly 4,52443 males and 2,24058 females, with a population density of 403 people per square kilometer. In the test area, about 130.97km2 of tropical deciduous forest and backwood habitat were conserved. The highest temperature recorded during the late spring season is 38 °C, and the lowest temperature recorded during the winter season is 22 ° C. Additionally, the basin receives approximately 75 percent of rainfall from the west-north rainstorm during the winter months, and 25 percent rainfall from the south-west rainstorm during the mid-year months. The average annual rainfall is about 1085 mm. The basin's northwest portion receives the highest rainfall (1260 mm), while the basin's western section receives the least (792 mm).

3.2 Slope

The slope has been studied for a variety of river basins. Slope is an important factor in determining how various kinds of land develop and are arranged. The impact of topographical factors and slope on groundwater supply is well understood (Venkatesha Rao, 1998). Near-level and sloping regions, in general, aid infiltration and revitalize groundwater. Surface overflow and invasion development are fewer in sloping locations, despite the fact that they are mild to dry.

4. FINDINGS

4.1 Slope

Incline is also important for the soil water system and power estimation. The highest and lowest elevations are 1460 m and 860 m, respectively. The examination region's general rising examination is 600 meters above mean sea level, with a general north-to-south trend.

The examination territory's slants are divided into three categories: near level, splash slope, and steep slope. A large portion of the field of request is near to the delicate slant class. Most watersheds have a delicate to incredibly delicate slant to extraordinarily douse slant, as seen by the NW1, NW2, and NW3 watersheds.

4.2 HYDROGEOMORPHOLOGY

Denudation slopes, lingering valleys, inselberg, pediments, shallow lateritic plain pediplains, mildly enduring pediplains, and valley fills are the geomorphologic units found in more youthful stones and peninsular gneisses.

4.3 Hills of Deforestation

Mild to highly absorbent slopes cause the surface overflow. Godavari NW1, NW3, and NW3 Watershed Rivers It encompass 5.23 km2 in the NW1 watershed, accounting for 10.3% of the overall area of NW1. NW2 watershed comprises 7.87 km2 and accounts for 21.6 percent of the overall area of NW2. Watersheds in NW3 occupy an area of 2.84 km2, accounting for 2.8 percent of the overall area of NW3. These hills are typically overflow places that generate poor to poor groundwater prospect zones and provide significant stimulation to the confined valleys' connecting plains.

4.4 Remaining Hills

We exhibit reduce tone and abrasive surface in very contrasted photos and decline green with red shading due to the expansion of vegetation in counterfeit composite coloring. In the northern (NW1, NW2, and NW3) and southern (SW1) regions of the examination zone, extra energetic stone exposures occur as residual slopes.

CONCLUSION

In this study, GIS and remote sensing data have become more useful in identifying attractive groundwater potential zones. This technique is extremely efficient in terms of covering a bigger area and using less time. According to GIS study, lithological type, lineament, landforms, soil texture, and drainage thickness are the key determinants of groundwater potential. The preparation of mapping is a logical assumption for planning and execution.

The current investigation focuses on the watersheds' groundwater potential and environmental issues. The existing water should be used wisely via proper development and management strategies. Geomorphology, geology, meteorology, pedology, remote sensing, groundwater exploration, hydrochemistry, and environmental considerations are only a few of the disciplines that are needed for these activities. A careful quantitative and qualitative research of the hydrogeological and environmental characteristics of the watersheds has been undertaken with this viewpoint in mind.

REFERENCES

1. Ahmad M., Wim G.M. Bastiaanssen and Reinder A. Feddes, "A new technique to estimate net groundwater use across large irrigated areas by combing remote sensing and water balance approaches, Rechna Doab, Pakistan", Hydrogeology Journal, Vol.13,2005, p 653-664.
2. Alessandro, V. et al. (1994). 'Study of some geohydrological features in the southern Azaoud (Mali) by satellite imagery analysis", Tenth them. conf. Geo. Rem. Sensing, San Antario, Texas, pp 180-188.
3. Ashim Das Gupta, "Groundwater Resources Evaluation", Subsurface-Water Hydrology, Kluwer Academic Publishers, Netherlands, 1996, p 175-191.
4. Brown et al. (1999). Sustainable groundwater resources, Heretaunga plains, Hawke bay, New Zealand. Journal of Hydrogeology, 7(5), 440-453.
5. Choubey, V. K. and Subramanian, V., (1992). "Estimation of suspended solids using Indian Remote Sensing Satellite-1A :A case study from Central India", Int1.Jou. Rem. Sen, vol.(13) No.8, pp 1473 - 1485.
6. Ghulam et al. (2004). "Satellite remote sensing of groundwater: quantitative modelling and uncertainty reduction using 6S atmospheric simulations" Itl. Jou. Rem.Sensing, (25) No. 23, pp. 5509-5524.
7. Hoffmann J. and Sander P (2007) Remote sensing and GIS in hydrogeology. Hydrogeol J 15(1):1–3
8. Sankar K. (2002). Evaluation of groundwater potential zones using Remote sensing data in upper Vaigai river basin, Tamilnadu, India. Journal of Indian Society of Remote Sensing, 30(3), 119-129. doi:10.1007/bf02990644.
9. Saraf A.K. and Jain S.K., "Integrated use of remote sensing and GIS methods for groundwater exploration in parts of Lalitpur District, U.P.", Subsurface-Water Hydrology, Kluwer Academic Publishers, Netherlands, 1996, p 251-259.

10. Sarah 0. Et al (2006). "Remote sensing and GIS for mapping groundwater recharge and discharge areas in salinity prone catchments, southeastern Australia", Hydrogeology Journal, (7), 141-121

11. Sarukkalige, P.R., 2011. "Assessment of satial variation of groundwater quality and its relationship with landuse in Perth metropolitan", Jou. Of water res. And Protection, Vol. 3, pp. 311 —317.

12. Sharma K.D.,“ Modelling groundwater recharge processes in hard rock”, Proceedings of International Conference on Sustainable Development and Management of Groundwater Resources in Semi-Arid Region with Special Reference to Hard Rock, (IGC- 2002), Feb 20-22, Dindigul, Tamil Nadu, India, 2002, p 175-181.

13. Shiv Kumar, Yogendra Kumar and Sharma H.C., “GroundWater Studies in District Bareilly of Uttar Pradesh”, Proceedings of International Conference on AdvancedModelling Techniques For Sustainable Management of Water Resources (AMTSMW2004), Jan28-30,Organised by NIT-Warangal, Vol.1, 2004, p 254-259.

14. Sophocleous M.A., “Combining the soil water balance and water-level fluctuation methods to estimate natural ground-water recharge- Practical aspects”, Journal of Hydrology, Vol.124, 1991, p 229-241.

15. Spatz, D.M and Wilson R.T. (2015). "Exploration Remote sensing for Porphyry copper deposits, western America Cordillera', Tenth Them.conf.on Geol Rem. Sensing, San Antario, Texas, pp. I227-238.