iJRASET
International Journal For Research in Applied Science and Engineering Technology

INTERNATIONAL JOURNAL FOR RESEARCH

IN APPLIED SCIENCE & ENGINEERING TECHNOLOGY

Volume: 10 **Issue:** I **Month of publication:** January 2022

DOI: https://doi.org/10.22214/ijraset.2022.39765

www.ijraset.com

Call: 08813907089 | E-mail ID: ijraset@gmail.com

International Journal for Research in Applied Science & Engineering Technology (IJRASET)
ISSN: 2321-9653; IC Value: 45.98; SJ Impact Factor: 7.538
Volume 10 Issue I Jan 2022- Available at www.ijraset.com

Identification of Artificial Recharge Sites for Nand Samand Catchment

Dimple[1], P. K. Singh[2], S. R. Bhakar[3], M. Kothari[4], K. K. Yadav[5]
[1, 2, 3, 4]*Soil and Water Engineering Department, CTAE, MPUAT, Udaipur, Rajasthan*
[5]*Soil Science Department, RCA, MPUAT, Udaipur, Rajasthan*

Abstract: ***Security of groundwater is widely regarded as a serious impediment to India's economic and social progress. According to the Central Ground Water Board's (CGWB) assessment, India's groundwater tables are plummeting at an alarming rate, with reserves in some regions reaching critical levels. Unregulated groundwater use in southern peninsular India has also resulted in excessive extraction, lowering the 'critical' threshold. With over 30 million groundwater structures in use, India is on the verge of a disaster of over-extraction that will leave 60% of all aquifers in critical condition within the next two decades. To resolve the issue, a variety of renewable groundwater solutions must be implemented. Artificial recharge is a procedure that augments groundwater at a pace that is significantly greater than the rate of replenishment under natural conditions, which may give a solution. The current study is for the Nand Samand catchment in the district of Rajasthan. The investigation of artificial groundwater recharge sites is being conducted using an integrated Remote Sensing and Geographic Information System (GIS) approach. Thematic maps such as topographic elevation, post-mosoon groundwater level, recharge, slope, transmissivity and soils map are created, and weighted overlay analysis is used to identify areas suitable for artificial recharge.***

Keywords: ***Nand Samand catchment, artificial recharge zone, thematic map, remote sensing, GIS***

I. INTRODUCTION

Water is one of nature's most valuable resources. Economic growth pressures are causing a scarcity of surface water in several locations. Groundwater is a dynamic and replenishable natural resource that is the subsurface portion of the earth's water cycle. It is formed when rainwater percolates into the ground soil and porous/fractured rock. India is the world's greatest consumer of groundwater. It consumes over 230 cubic kilometres of groundwater each year, accounting for more than a fifth of the global total. Groundwater feeds more than 60% of irrigated crops and 85% of drinking water. The groundwater situation in India, which receives a significant quantity of yearly rainfall, is not encouraging, owing mostly to an imbalance between recharge and groundwater use. A significant proportion of rain water is lost to runoff, an issue that is exacerbated by the absence of rain water harvesting measures. Subsurface water extraction from deep aquifers also replenishes resources that have been accumulated over decades or centuries and on which the current yearly rainfall has no immediate effect Jyoti sarup et al. (2011). There have been few continuous efforts to identify zones where artificial recharge techniques can be used to conserve groundwater. There is an urgent need to improve natural groundwater recharge through enhancing precipitation infiltration into the subsurface. Artificial groundwater recharging has been critical in India over the last four decades. In recent years, the importance of Remote Sensing and GIS techniques in artificial recharge has garnered considerable attention. Numerous scientists have proposed ideal locations for artificial groundwater recharge based on geology and geomorphological data, with a lesser emphasis on subsurface geological and hydrogeological data (Suresh et al., 2015). Amartya Kumar Bhattacharya (2010) explained the need for artificial recharge of groundwater for augmenting the natural infiltration of precipitation or surface-water into underground formations.

II. STUDY AREA DESCRIPTION

Nand Samand dam is located in Rajasamand district of state Rajasthan, about 47.1 km from the district headquarter. Nand Samand catchment covers an area of two districts of Rajasthan, which are Rajasamand and Udaipur are the division of semi-arid region. It lies between 72°59'59.50" to 73°59'59.50" E longitude and 24°0'0.5" to 26°0'0.5" N latitude. Fig. 1 depicts the study area's location map. The study area comprises 3 tehsils i.e. Gogunda a tehsil of Udaipur district and Nathdwara, Kumbhalgarh tehsil of Rajasamand district of Rajasthan covering a survey of India toposheets number of 45G-12, 45H-5, 6, 9, 10, 13, 43NG-9 of 1:50,000 scale. The total area of Nand Samand catchment is 865.18 $km^{2,}$ with the highest elevation of about 1318 m and the lowest elevation is 570 m above mean sea level (MSL).

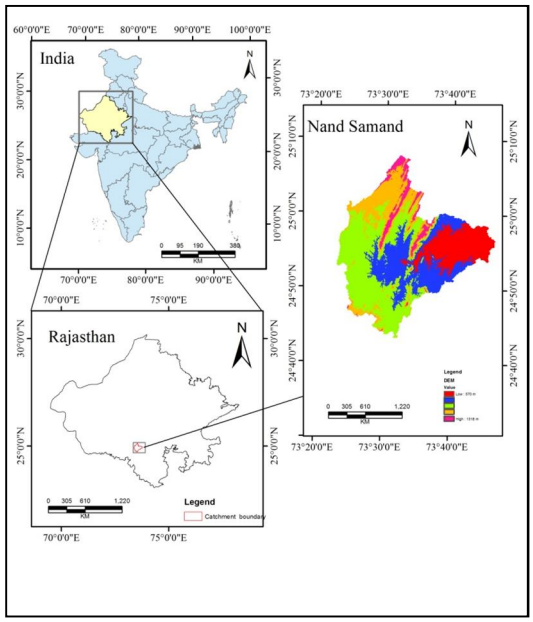


Fig. 1 Location map of the study area

A. Methodology

Figure 2 illustrates the methodology used to identify an artificial recharge site using an integrated approach of RS and GIS.

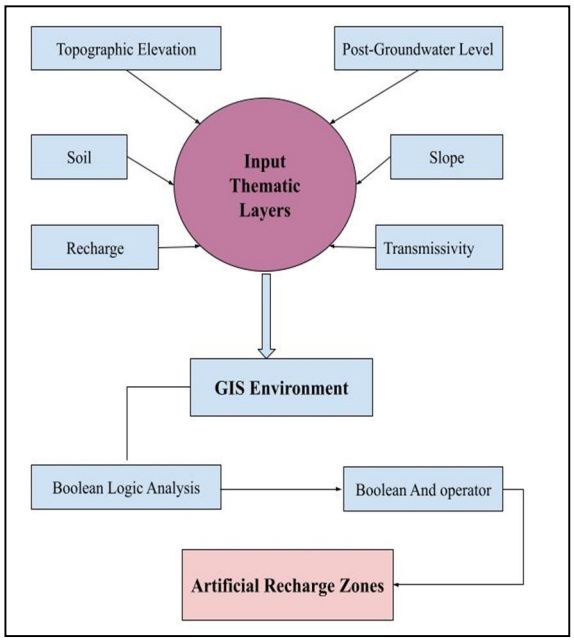


Fig. 2 Flowchart for deriving artificial recharge zones

III. RESULTS AND DISCUSSION

The favourable artificial recharge zones for the study area (Fig. 3) were delineated using RS and GIS techniques. The green colour indicates the suitable zone for artificial recharge in this map. The area suitable for artificial recharge is 59.65 km^2, which contributes only 6.89 percent of the total study area. It was found in the northern part of the catchment, and some southeast portion of the catchment has to scatter points of artificial recharge zones area. These results shows close conformity with the findings of study Machiwal and Singh (2015) studied for the Ahar River basin of Udaipur using BLA reported that the suitable artificial recharge zone for the study area was 9% of the total study area; similarly, Ouerghi, (2020) studied the Sidi Bouzid governorate, located in the centre of Tunisia, using boolean model, and in the GIS environment, the layers were produced and classified.

The results suggested that the most suitable area is equal to 12.1%. Also, the use of the land impacted the removal of restrictions of artificial recharge areas. They have reported that 5.5% of the studied area was considered suitable for artificial recharge in Boolean logic using land-use filtering. Zaidi *et al.,* (2015) conducted a study in the north-western part of Saudi Arabia. The results showed that 17.90% of the studied area is suitable for artificial groundwater recharge zones. Sinha (2012) also conducted a similar study for the Wakel River basin and reported that the favourable artificial recharge zone was 9.2 per cent of the total study area, which shows similar results for the catchment.

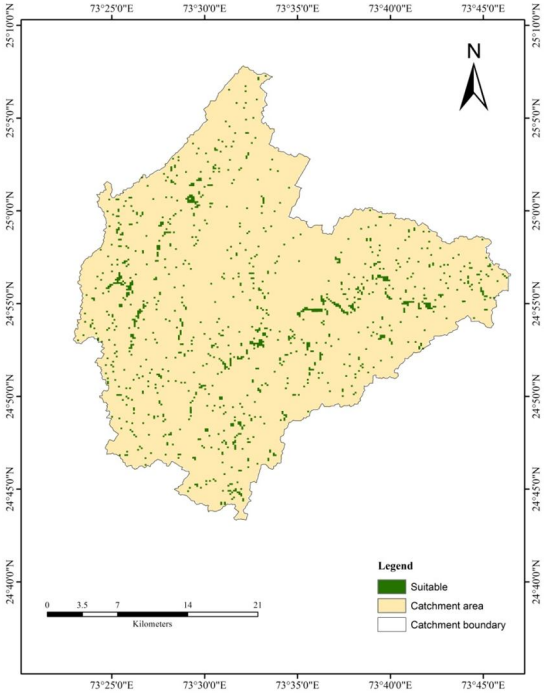


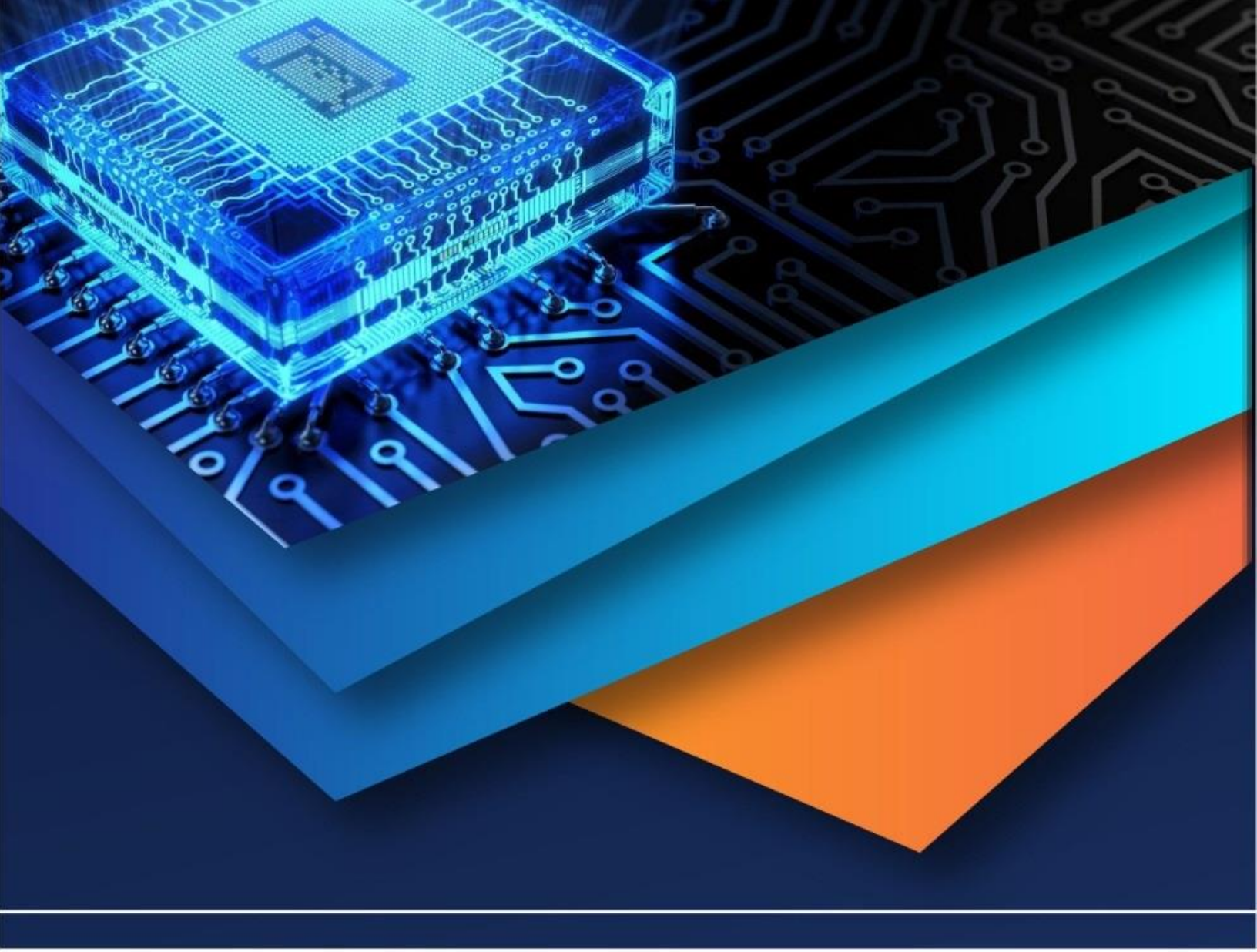
Fig. 3 Suitable artificial recharge zones

IV. CONCLUSION

As a result of growing urbanisation and the catchment high population density, demand for water has surged at an unprecedented rate. Remote Sensing and Geographic Information Systems have proved their capacity to conserve water in the Nand Samand catchment. This integrated strategy was successful in identifying appropriate groundwater locations for deficiency areas requiring rapid action. The study demonstrated that GIS approaches are effective at delineating drainage patterns and determining numerous topography factors such as slope, soil, and surface runoff, all of which contribute to a better knowledge of land forms and their characteristics. Additionally, it aids in the identification of groundwater recharge sites for the watershed, as well as in the catchment future planning and management. This work can be used to assist planners and decision makers in managing natural resources at the micro level of any terrain for the purpose of sustainable development.

REFERENCES

[1] Amartya Kumar Bhattacharya 2010. Artificial ground water recharge with a special reference to India, IJRRAS Vol 4, Issue 2.
[2] Jyoti sarup, Manish K. Tiwari and Vardichand Khatediya, 2011. Delineate Groundwater Prospect Zones and identification of Artificial Recharge Sites using Geospatial Technique , International Journal of Advance Technology & Engineering Research (IJATER), Vol. 1,Issue 1.
[3] Machiwal, D. and Singh, P.K. 2015. Comparing GIS-based multi-criteria decision-making and Boolean logic modelling approaches for delineating groundwater recharge zones. Arabian Journal of Geosciences, DOI 10.1007/s12517-015-2002-5.
[4] Ouerghi, S. 2020. Identification of Suitable Sites for Groundwater Recharge Using the Boolean Model: Case Study: Sidi Bouzid Acquifers. Current Journal of Applied Science and Technology **39(32):** 55-76; Article no.CJAST.60832.
[5] Sinha, A.K. 2012. An integrated approach of groundwater management in Wakal River basin using RS and GIS. PhD thesis submitted to SWE, CTAE, MPUAT, Udaipur, Rajasthan.
[6] Suresh, D., Colins, J.J. and Jayaprasad B K. 2015. Identification Of Artificial Recharge Sites For Neyyar River Basin, International Journal of Remote Sensing & Geoscience (IJRSG)
[7] Zaidi, F.K., Nazzal, Y., Ahmed, I., Naeem, M. and Jafri, M.K. 2015. Identification of potential Artificial Groundwater Recharge zones in North Western Saudi Arabia using GIS and Boolean Logic, Journal of African Earth Sciences, doi: 10.1016/j.jafrearsci.2015.07.008.



10.22214/IJRASET

45.98

IMPACT FACTOR: 7.129

IMPACT FACTOR: 7.429

INTERNATIONAL JOURNAL FOR RESEARCH

IN APPLIED SCIENCE & ENGINEERING TECHNOLOGY