POTENTIAL SITE SELECTION FOR RAINWATER HARVESTING USING GIS A REVIEW

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ABSTRACT
Water is one of the main resource for the survival of any living things, without which we can't live on earth. Water scarce areas in the world present in various states suffer not only from limited precipitation but also from poor management of rain water for the agriculture and other various purposes. The present study has been made for the site suitability analysis for rain water harvesting using GIS. In the present study spatial variations in landscape characteristics such as land use land cover, slope information, drainage characteristics, contours are defined as important criteria for identifying suitable rainwater harvesting sites such as farm ponds and check dams, are also identified.

Keywords: Groundwater, Groundwater Recharges, Precipitation, GIS, Water harvesting site.

1.INTRODUCTION

Water is essential for the survival of all living things on earth. Water scarce areas in the world present in various states suffers from various problems like limited precipitation, poor rain water management for the agriculture and other various purposes. One can collect excess runoff water during rainy season and store it for different uses during dry seasons. This is one of the techniques for rain water harvesting. The current review focuses on earlier studies made for the site suitability analysis for rain water harvesting using GIS. It has been found that for identifying suitable rainwater harvesting sites it is essential to study land use land cover, drainage characteristics, slope information, contours. Water is the vital natural resource. It is required for the survival of animate on the earth. Further this is essential for economic development too.

Around 5% of available water is used for domestic consumption, 8% for industrial processes and 87% for agricultural purpose. Major source of water on the earth is precipitation which may be in the form of rainfall, frost, snowfall, etc. The consequent runoff is made available in the form of lake, river, ponds, ground water etc.

Many times the intermittent runoff fails to meet the growing water demands because of swift urbanization and ever increasing population. Water harvesting structures are significant to preserve valuable natural resources like water and soil which is depleting daily. The water harvesting structures such as Check dam, KT weirs, Nala bunds, Farm ponds, Percolation tank etc. are very important.

Inadequate rainfall causes draught. This place faces inadequate rainfall every year because of which the rain water harvesting structures plays a vital role for providing water to every houses. Rain water harvesting structure recharges the ground water and thus water is made available for the uses throughout the year.

For the purpose of selection of rain water harvesting structure, GIS software is being used which stands for

Geographical information system. It is a tool based on computer which allows us to create, manipulate, analyze, store and display information based on its location. GIS makes it possible to integrate different kinds of geographical information such as digital maps, aerial photographs, satellite images and global positioning system(GPS) data.

2. PREVIOUS WORKS

J.P.Singh and Darshdeep Singh: Conducted a case study on "selection of suitable sites for rain water harvesting structures using remote sensing and GIS" in Soankhad watershed, Punjab, India. In this area the average runoff for the wet season (july-sept) 1996 was computed to be about 1543.82mm and the total runoff volume from the soankhad watershed was estimated to be about 143.52 mm3. According to the world bank report (Anon, 2002) India will be in water stress zone by the year 2025 and water scare zone by 2050. The maps of soankhad watershed were delineated from survey of india topo-maps, supplied by Punjab remote sensing center, Ludhiana. The base map was prepared through visual interpretation of satellite data, showing various permanent structures, delineating water boundaries, drainage network etc. the digital analysis was carried out using Arc GIS ver. 8.3. The very first step that was initiated was the geo referencing of scanned topo-sheets and by this various thematic maps were proposed like LU-LC maps, drainage maps, slope map, buffer map, site suitability map for RWH etc. the suitable sites for RHS were identified with the application of remote sensing and GIS and using this 14 check dams and 6 percolation tanks at appropriate sites are proposed. Sites were not suitable for nala-bunding and farm ponds due to the steep slope, less soil thickness and higher runoff velocity.

Surajit Bera and Mobin Ahmad : Worked on "Site suitability analysis using remote sensing and GIS" in the eastern singhbhum district of Jharkhand state. This area is one of the leading growth mining regions in india and the minerals are abundantly found here because of which the ground water present here is decreasing thoroughly. Various data like Landsat-7 ETM, Topo sheets, Geological map, soil map etc were collected and the software being used for this purpose were Arc GIS, ERDAS and Microsoft office. The present study demonstrated the efficiency of Geoinformatics as a tool in the study of rain water harvesting to fight with the problems faced by the lack of water demand. The study area defines four classes very high, high, low and very low. North, south-western and middle part of the study area found in suitable zone for rainwater harvesting in east Singhbhum district.

Harish Chand Prasad and Parul Bhalla: Conducted a study on "Site suitability analysis of water harvesting structures using remote sensing and GIS" in the Pisangan watershed, Ajmer district, Rajasthan. The study area of Pisangan watershed is 1201.61 sqkm and located between 230 44'45'' N to 23058'30'' N latitude and 78035'45'' E to 78046'15'' E longitudes. The climate of the study area is semi-arid. This region has very limited water resources. Water is the most crucial for maintaining an environment and ecosystem conducive to sustaining all forms of life. The groundwater table in most part of Rajasthan is steadily going down due to over- exploitation and inadequate natural recharge, resulting from frequent drought conditions in a region where the erratic annual rainfall is below 50-60cm in most of the parts. To meet the objectives for the study area, data from the both primary and secondary sources have been used like landsat images, band 3,4,5; resolution -30 m, ASTER DEM, rainfall data of 12 years, LC-LU, drainage, slope, secondary data – geomorphology, lithology etc. The software used for this is Arc GIS 9.3. By using Arc GIS certain potential sites were developed for water harvesting structures like Storage tank, Percolation tank, stop tank and check dam.

Abhijit M. Zende and Sagar Devkate: Conducted study on 'Selection of suitable sites for water Harvesting structures in Chand watershed" in the Yerala river in western Maharashtra region. This area experiences a lot of tectonic movement in the past as evidence by varying fold, fault and lineament association with hills located in the western side of study area. After collecting various data like rainfall intensity, reservoir storage capacity, spatial data, DEM etc, these data were analyzed using Arc GIS software and the exact location for the rainwater harvesting structures were determined.

Danial Dabiri and Abas Alipor: Conducted a case study on "Suitable areas determination for Rain water harvesting" in the northern part of the Kerman province in southeast Iran that includes about 14136093.5 hectares of the country's land and situated in northern 200 25' and eastern 310 57'. The maximum elevation is 4471 m in Kerman province. Iran country located in an area of the world where annual rainfall is less than 1/3rd of the world's annual rainfall. In addition due to poor distribution of rainfall on temporary and spatial scales, even some of the rainiest part of the country need to irrigation during the summer. For combat water shortage, rainwater harvesting is the best option in the arid region like Iran. In this study, important parameters for determining appropriate areas of rain water harvesting systems were selected. Produced layer of this parameters in the Arc GIS then each of them evaluated by several experts and then all parameters were standardized and inserted to EXT-AHP software and integrated different weights with their layers and finally, produced final maps. The results show that integration of GIS and decision making systems such as AHP can be powerful and useful tool for site selection of suitable areas of RWH.

3.CONCLUSION

From the literature it was observed that due to less rainfall intensity, rapid urbanization and other several various problems, the ground water table is getting deteriorated day by day. The new software technologies like Arc GIS, Quantum GIS etc are used for assessment of suitability of sites for pre-selection of rainwater harvesting structures which recharges the existing ground water table like Percolation tank, check dams, nala bunds, farm ponds, KT weirs etc.

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