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WATERSHED MANAGEMENT OF DROUGHT PRONE AREA USING G.I.S.

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Abstract: Watershed is not simply the hydrological zone yet additionally socio-political-environmental element which assumes significant job in deciding nourishment, social, and practical security and gives life bolster administrations to country individuals. The rules for choosing watershed size likewise rely upon the destinations of the turn of events and territory incline. An enormous watershed can be overseen in plain valley territories or where woodland or field advancement is the principle objective. The most critical element of the work is that if such advances are created and received at bigger scope in rustic regions, it will forestall a great many towns of the nation from water flexibly by tankers. Geographic data framework (GIS) a fundamental device for watershed arranging and the board assignments. By the utilization of GIS mapping, seepage organize, geography, stream way of water are to be effectively find. The GIS can give all the morphological parameters of the ideal catchment zone. For our project we will be using Arc-GIS software to get all the morphological parameters of the selected draught prone area so that we can easily manage the water gained through the watershed.

Keywords: Engineering measures, Watershed management techniques, ground water storage, Geographic information system

I. INTRODUCTION

Watershed can be defined as the drainage basin or catchment area of particular stream or river simply it refers to the area from where the water to a particular drainage system, like a river or stream, comes from. Watershed development refers to the conservation regeneration & the judicious use of all the resources natural (land, water, plants, animals) & human with in a particular waters shed. Watershed management means the process of creating and implementing plans, programs and projects to sustain and enhance watershed functions that affect the plant, animal and human communities within a watershed boundary. Watershed management is not so much about managing natural resources, but about managing human activity as it affects these resources. The drainage area of the river provides the natural boundary for managing and mitigating human and environmental interactions. Because human activity includes actions by governments, municipalities, industries, and landowners, watershed management must be a co-operative effort.

Effective watershed management can prevent community water shortages, poor water quality, flooding and erosion. The expense of undertaking watershed management is far less than the cost of future remediation. For development of agriculture and drinking water resources the basic elements required are land and water. Because of tremendous rise in population, urbanization, industrialization and agriculture area, resulting in steep incline water demand line. Indian agriculture sector is lot more depend upon the monsoon. But last 3-4 years due to inadequate rainfall, people are looking towards the underground water as alternative sources without regarding to its recharge resulting in deepening of ground water table 100-200 m below the ground surface. Geographic information system (GIS) an essential tool for watershed planning and management tasks. For the GIS mapping drainage network, topography, flow path of water are to be easily find.

1.1 Watershed Management Approaches

1.1.1 Integrated Approach

This approach suggest the integration of technologies within the natural boundaries of a drainage area for optimum development of land, water, and plant resources to meet the basic needs of people and animals in a sustainable manner. This approach aims to improve the standard of living of common people by increasing his earning capacity by covering all facilities required for optimum production In order to achieve its objective, integrated watershed management suggests to adopt land and water conservation practices, water harvesting in ponds and recharging of groundwater for increasing water resources potential and stress on crop diversi1cation, use of improved variety of seeds, integrated nutrient management and integrated pest management practices, etc.

1.1.2 Consortium Approach

Consortium approach emphasizes on collective action and community participation including of primary stakeholders, government and non-government organizations, and other institutions. Watershed management requires multidisciplinary skills and competencies. Easy access and timely advice to farmers are important drivers for the observed impressive impacts in the watershed. These lead to enhance awareness of the farmers and their ability to consult with the right people when problems arise. It requires multidisciplinary pro1ciency in 1eld of engineering, agronomy, forestry, horticulture, animal husbandry, entomology, social science, economics and marketing. It is not always possible to get all the required support and skills-set in one organization. Thus, consortium approach brings together the expertise of different areas to expand the effective of the various watershed initiatives and interventions

1.2 Problem Statement

The study area, named Bindusara River, is located in the Beed Maharashtra which will know later as Bindusara river catchment area.

1.3 Objectives

- Water availability analysis of the selected area using the GIS software.
- Management of available water in the selected draught prone area.
- To moderate the floods peaks at downstream areas.

1.4 Scopes of Work

Watershed management research is an interdisciplinary effort at multiple scales within a long-term movement towards informed participatory decision-making at the watershed level. Despite its complexities and challenges, it can provide a very effective framework for DEM. To achieve functionality it requires the best of many different areas of research and the effective involvement of diverse stakeholders.

II. METHODOLOGY

1. ***ArcGIS***

ArcGIS is a gathering of GIS programming created by the Environmental Systems Research Institutes. It has two principle modules: ArcInfo (Arc and Info) and MapInfo (Map and Info). Bend/Map implies graphical substances and Info implies qualities. ArcGIS is a superior, unique programming family that produces fundamentally better-glancing exact maps in the most limited time. It has the office to impart layers to itself and worldwide gatherings through online ArcGIS or email. The primary segments of ArcGIS are ArcInfo, ArcView, and ArcReader.

2. ***Watershed Management***

Watershed can be characterized as the waste bowl or catchment region of specific stream or waterway just it alludes to the zone from where the water to a specific seepage framework, similar to a waterway or stream, originates from. Watershed improvement alludes to the protection recovery and the reasonable utilization of the considerable number of assets regular (land, water, plants, creatures) and human – with in a specific waters shed.

3. ***Morphological parameters of watershed***

The investigation of basin morphometry relates basin and stream arrange geometries to the transmission of water and residue through the bowl. Deliberate depiction of the geometry of a seepage bowl and its stream channel requires estimation of straight parts of the channel arrange and contributing ground slopes.

4. ***Linear aspects***

Direct parts of the basins are firmly connected with the channel examples of the seepage arrange wherein the topological qualities of the stream portions as far as open connections of the system framework are analyzed.

5. ***Stream order***

The assignment of stream orders is the initial phase in waste bowl examination and depends on a hierarchic positioning of streams. In the current examination, positioning of streams has been done dependent on the technique proposed by Strahler (1964). The request shrewd stream numbers and stream lengths of the three sub-watersheds

6. ***Rainfall***

The sum and force of precipitation influence the dregs yield from a bowl. Precipitation is arbitrary metrological marvel. In the event that a thick system of downpour check stations and long haul precipitation information are accessible, at that point the impact of precipitation attributes on soil disintegration might be taken thought. Be that as it may, inside little districts precipitation qualities don't shift a huge degree and can be expected comparable over a huge time range.

7. ***Topography***

One topographic component that for the most part impacts the disintegration procedure is the level of incline. With the appearance of GIS system it is currently conceivable to set up the computerized rise model (DEM) of a region. Utilizing the DEM, the height at every network is determined and this can be changed over from raster to vector to get polygon map which data can be used for surveying the powerlessness to soil disintegration.

8. ***Land use/ Land cover***

Land use/land spread impact soil disintegration. Vegetation not just lessens the raindrop's ability to segregate soil particles yet in addition hinder speed of streaming water and fundamentally influences the disintegration procedure. Land use/land spread guide was produced with the assistance of IRS-P6 (Resource sat-I) satellite information utilizing unaided characterization.

9. ***Soil***

The physical properties of soil influence its invasion limit and the degree to which the dirt can be isolates, scattered and moved. The properties which most impact disintegration incorporate soil structure and surface, natural issue content, dampness content, thickness (conservativeness), shear quality just as concoction and organic attributes. To examine the impact of soil condition in the watershed the dirt disintegration map arranged by NBSSLUP was utilized.

10. ***Morphology***

The connection between the morphology of streams and silt yield has been viewed as significant for a long time, particularly when changes in morphology may some way or another be connected to changes in dregs yield from the scene. The circulatory proportion is characterized as the proportion between the zone of the bowl and the zone of the circle having a similar edge as that of the bowl a higher circulatory proportion instigates lesser disintegration. The lengthening proportion is the proportion between the width of circle having a similar territory (as that of bowl) and the most extreme length of the bowl. A higher prolongation proportion prompts lesser disintegration.

11. **Estimation of Surface Runoff by manual method (Rational Formula)**

To calculate the surface runoff depth, the rational method is applying using the following equation

(C x I x A)/ 360 Q = (1)

Where Q is the flood stream in cubic meter, C is the overflow coefficient, I is the precipitation force in mm every hour, and An is the seepage territory adding to spillover in hectare .n this strategy, the waste region is partitioned into various sub zones and the hour of convergence of various sub regions, were determined utilizing condition (2) underneath: tc = 0.00032 x L0.77 x S-0.385 (2)Where tc is the hour of focus in hours, L is the most extreme length of movement of water in meter, and S is the incline equivalent to H/L, where H is the distinction in height between the remotest point on the bowl and the outlet (m).

III•LITERATURE REVIEW

A fundamental part of the watershed the board venture was the writing audit. The writing audit was utilized related to the master board gatherings to decide the flow cutting edge in the watershed the board and GIS. It was likewise used to research any catchment zone..

Raghunath pal, padminipani"remote detecting and gis-based examination of developing planform morphology of the center lower some portion of the Ganga waterway, india" the egyptian diary of remote detecting and space sciences 22 (2019) 1–1The present street numbers the planform elements of the Ganga River in the center lower divide throughout the most recent six decades and the advancement and change of the station and its floodplain with the assistance of remote detecting and GIS procedures. The procedure of the examination has been joined into topographic sheet and satellite picture handling and mapping and geomorphic investigation. Three geomorphic strategy have been fused here for the geomorphic investigation: twist channel proportion, sinuosity file and water-bar secured territory proportion.

Er.Afreeda.V, Dr.Balaji Kannan "Determination of Watershed Morphological Parameters Using Remote Sensing and GIS" 2018 IJESC

In the current examination, an endeavor has been made to decide morphological parameters of three sub watersheds falling in Nilgiris area of Tamil Nadu. Remote Sensing (RS) combined with Geographical Information System (GIS) procedure has end up being an effective device in seepage depiction and their updation for morphometric investigation. For nitty gritty examination, we utilized four diverse DEM sources viz., Toposheet, ASTER, SRTM and Cartosat information for depicting watershed limit and topographical data framework (GIS) was utilized in assessment of straight parts of morphometric parameters. The three outlined sub watersheds were Devarshola, Pykara and Parsons Valley River. The correlation of morphological parameters of the watershed viable got utilizing various sources viz., SRTM, ASTER and Cartosat DEM with the watershed got from Survey of India geographical sheet, 1:25,000 scale was finished.

R.M. Lobatskaya, I.P. Strelchenko"GIS-based investigation of deficiency designs in urban territories: A contextual analysis of Irkutsk city, Russia" Geoscience Frontiers 7 (2016) 287e294In this paper neo-structural structure of the zone is envisioned in three measurement (3D) considering flaw plunges, utilizing the ArcGIS, Global Mapper and Paradigm Geophysical bundles. The investigation territory is separated into squares of various size classes as per the length-based positions of the bouncing deficiencies, which are of five classes recognized with the equivalent interim technique. The squares show diverse distortion designs, with various densities and strikes of intersection and jumping deficiencies. The information are factually prepared utilizing GIS to gauge the distortion degrees of squares in discretionary units per square kilometer utilizing the qualities of rank and intersection/jumping position of shortcomings and the size of squares.

Thorat MM" Watershed Management" Int. Res. J. of Science and Engineering, 2017; Vol. (5): 81-83 ISSN: 2322-0015The paper looks at the significance of watershed advancement and some progressive water the board stories in India. The paper dependent on auxiliary information which is distributed by government investigate foundations, diaries, books and so on. Nature doesn't perceive individuals decided regulatory limits. A watershed the executives gives a "characteristic ecological unit for arranging a formative activity." This paper is pecifically focused on, right off the bat understanding the principle issues causing flooding in the beach front region of bJakarta, and besides proposing medium and long haul arrangements from the point of view of an incorporated watershed the board approach. The proposed arrangement will likewise remember institutional and budgetary courses of action for a cross-authoritative limit circumstance.

Mr. Pandurang D. Jankar and Dr.Mrs.Sushma S. Kulkarni "Watershed Management-A Case Study OfMadgyal Village" International Journal of Engineering Research and Technology (IJERT) Vol. 2 Issue 7, July – 2013 IJERTIJERT ISSN: 2278-0181 :For this situation study Madgyal is a little town situated at separation of 25 Kms from Jath city. It lies between North scope 17°02'56.94" and East longitude 75° 13'8.14". A few measures have been embraced to revive the ground water assets. Thus it is intended to take such building and organic estimates which will guide this additional overflow to ground water stockpiling. The most critical component of the work is that if such innovations are created and embraced at bigger scope in rustic territories, it will forestall a great many towns of the nation from water flexibly by tankers. Geographic data framework (GIS) a basic apparatus for watershed arranging and the executives assignments. For the GIS mapping waste system, geology, stream way of water are to be effectively find. In the Madgyal a few measures have been received to energize the ground water assets, yet it has been discovered that these measures don't work with full limit at times. In the Madgyal watershed zone, request of water fo agribusiness and drinking design is expanding quickly draining water assets combined with overpopulation. Endeavors are made to redirect enormous measure of water to energize ground water assets.

Santosh M. Pingale, Harish Chandra, H.C.Sharma, S.Sangita Mishra" Morphometric Analysis Of Maun Watershed In Tehri-Garhwal District Of Uttarakhand Using GIS" International Journal Of Geomatics And Geosciences Volume 3, No 2, 2012The examination zone is situated between 78o 22‟ 28" to 78o 24‟ 57"E longitude and 30o 17‟ 19" to 30o 18‟ 52"N scope and spreads a zone of 8.71 km2. The subjective examination of the morphometric qualities of the bowl have been done and processed utilizing GIS programming. The seepage organize in the investigation territory is dendritic to sub-dendritic which demonstrates the impact of lithology and landscape on waste example. The outcomes unmistakably show relations among different morphometric characteristics of the bowl and help to comprehend their job in forming the outside of the area.

Richard Bruneau"Watershed Management Research: A Review of IDRC Projects in Asia and Latin America" International Development Research Center 2005This report features bits of knowledge from ongoing watershed undertakings of the Minga and Community-Based Natural Resource Management (CBNRM) Program Initiatives of the International Development Research Center (IDRC). Its motivation is to help new ventures, inside IDRC and past, in drawing upon bits of knowledge from past encounters and to additionally create and combine great practices in participatory coordinated watershed the executives examine. The two Program Initiatives have diverse local foci: Latin America and the Caribbean, and Asia. Regardless of numerous socio-social, political, financial, recorded and physical contrasts between the two areas, watershed investigate ventures have encountered numerous comparative issues. This report orchestrates these encounters into key experiences, recognizing issues that are one of a kind to watersheds and furthermore bigger issues that have explicit pertinence to watershed situations.

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