OPEN ACCESS INTERNATIONAL JOURNAL OF SCIENCE & ENGINEERING

WATERSHED MANAGEMENT FOR LONI MAVALA WATERSHED USING GIS AND REMOTE SENSING TECHNIQUES

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Abstract: Loni Mawala is a watershed located at distance of 65 km from Ahmednagar. It lies between North latitude 19°0'30'' and East longitude 74°12'30''. The aim of work is to evaluate and examine various indices related to watershed in order to proposed water conservation structure to solve problem related to water scarcity. It will prevent the Loni Mawala village from the continuous water supply by tankers. Geographic information system (GIS) an most important tool for watershed planning and management tasks. with the help of GIS, drainage characteristics, features of topography, hydraulic characteristic, landform details can be easily identified. In the Loni Mawala watershed some measures have been already adopted for conservation and recharge of ground water, but this measures do not work at full pledge due to lack of maintainace of structures . If planning and designing watershed is done using recent technologies integrated with GIS and remote sensing , it will significantly reduce problem of water scarcity in area.

KEYWORDS: *Engineering measures, Watershed management techniques, ground water storage, Geographic information system.*

I INTRODUCTION

Sustainable development and increased food production in agricultural based developing countries requires availability of sufficient water and fertile land. Water especially affects greatly prosperity of people and their development potential and health. The availability of this vital resource is not guaranteed for large section of the world's population. Water as insufficient and commonly shared resource may become a case of conflict. To provide adequate water to the user, in the right quantities, at the right place and right time, by applying environmentally sound techniques and procedures is the challenge in this decade. Also due to vast industrialization and agriculture, the demand of water is increasing day by day. The effect of this not only the reduction of water table level but also has some hazardous effect on environment. Again there is loss of production in farm due to less availability of water for farming.

Watershed management means that the process of creating and implementing plans, programs and projects to sustain and improve watershed functions that affect the plant, animal and human communities within a watershed boundary. Watershed management isn't so much concerning managing natural resources, but regarding managing act as it affects these resources. The geographic region of the watercourse provides the natural boundary for managing and mitigating human and environmental interactions. as a result of act includes actions by government, municipalities, industries, and landowners, watershed management should be a cooperative effort. Proper watershed management will reduce problem of shortage of water, poor quality water, and erosion. The expense of enterprise watershed management is way lessfuture

Remediation. For development of agriculture and drinking water resource the basic elements required are land and water. The tremendous and unpredictable rise in population have led led to massive depletion of ground water. India is rain fed country. Agriculture here depend on rainfall.Indian agriculture contribute around 38% in country's GDP. But last 3-4 years due to inadequate rainfall, people are looking towards the ground water as alternative source without worrying to its recharge resulting in depletion of ground water table 100-200m below the ground surface.

II.LITERATURE REVIEW

1. A case study of watershed management for Madgyal village. (by Pandurang D. Jankar and Dr.Mrs.Sushma S. Kulkarni , July 2013)

To deal with water scarcity problems authors suggested some measures, which need to be implemented on priority basis within the watershed. It includes, Roof top rainwater harvesting, Form ponds, Check dams, Vanaraibandhara or Bunds.

Author also strongly deny that implementation of this techniques will solve problem of water scarcity. According to him the participation of community ,stakeholders and peoples are key element to make any watershed management succesfull.

2.Watershed Management Concept and Principles. (Suhas P Wani and Kaushal K Garg, January 2009)

This paper mainly focuses on watershed management approaches for successful building of watershed. There two approaches that need to be considered as holistically or individually for watershed management

- Integrated approaches: integration of technology
- Consortium approach : participation of community at various level

3.Watershed Development by Using GIS and Remote Sensing For Water Budgeting (Mr. Chetan B. Bansode, Mr. Vishal B. Bhosale, Mr. Akash M. Dongare, Mr. Lalit N. Kshirsagar, Mr. Aniket A. Malwadkar)

Publishing year : April 2018.

This paper consist preparation of action plan using GIS for watershed management. Using GIS ,the orders of stream on undefined topography was determined. This helped in proper management, analysis and development of water shed at higher accuracy.

Watershed Management Structures and Decision Making Frameworks (by Anil Kumar Misra & Ankit Pachouri Amandeep Kaur, October 2015)

Publishing year:.

This paper consist corrective and preventive measure for ground water recharge.

Structure	Location
Vertical shaft	First order stream
Horizontal shaft	Second order stream
Horizontal shaft and check dam.	Third order stream

III METHODOLOGY

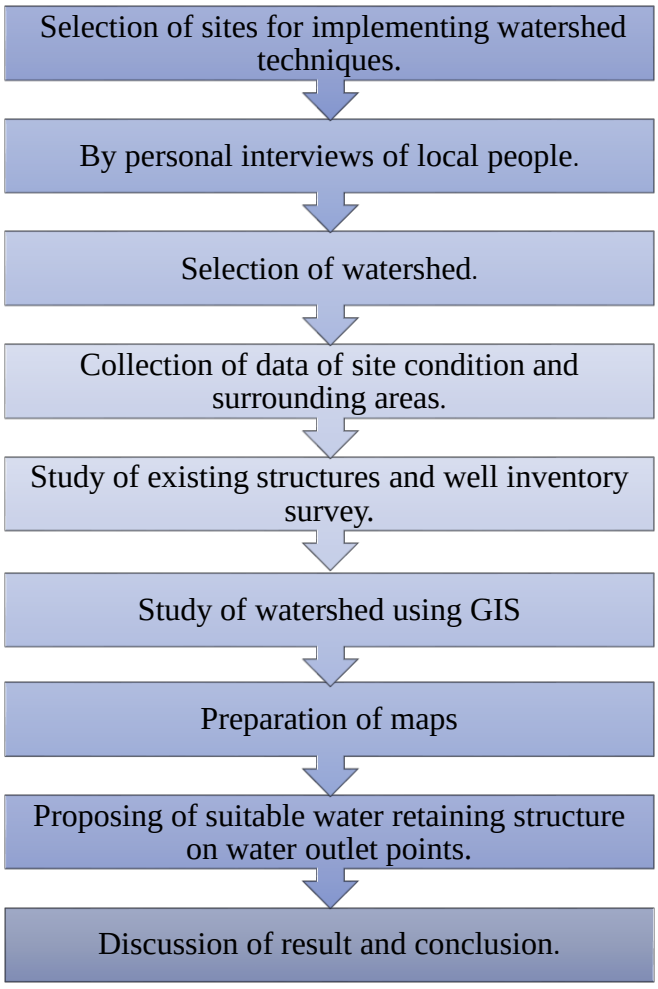
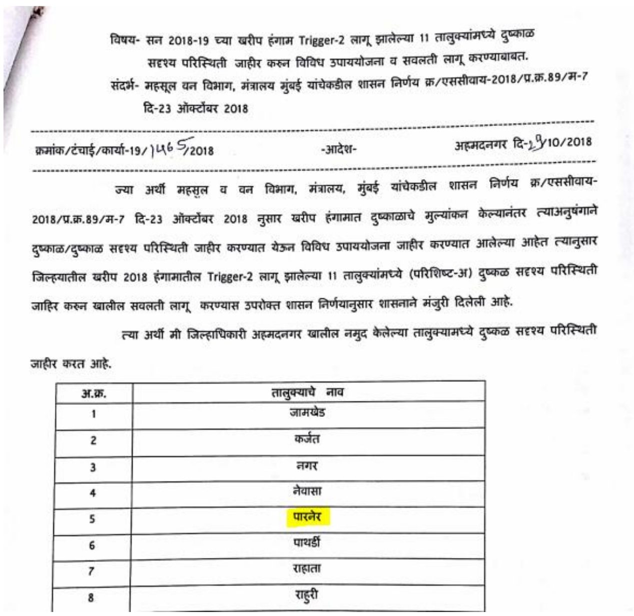


Figure 1: methodology Chat (self prepared)

Watershed is selected on basis of following newspaper cutout and G.R of government, which shows problem of water scarcity in Parner Taluka.

Figure 2(a): newspaper cutout (Sakal newspaper)



विषय- सन 2018-19 च्या खरीप हंगाम Trigger-2 लागू झालेल्या 11 तालुक्यांमध्ये दुष्काळ सदृश्य परिस्थिती जाहीर करुन विविध उपाययोजना व सवलती लागू करण्याबाबत.

संदर्भ- महसूल वन विभाग, मंत्रालय मुंबई यांचेकडील शासन निर्णय क्र/एससीवाय-2018/प्र.क्र.89/म-7 दि-23 ऑक्टोंबर 2018

क्रमांक/टंचाई/कार्या-19/1465/2018 -आदेश- अहमदनगर दि-29/10/2018

ज्या अर्थी महसूल व वन विभाग, मंत्रालय, मुंबई यांचेकडील शासन निर्णय क्र/एससीवाय-2018/प्र.क्र.89/म-7 दि-23 ऑक्टोंबर 2018 नुसार खरीप हंगामात दुष्काळाचे मुल्यांकन केल्यानंतर त्याअनुषंगाने दुष्काळ/दुष्काळ सदृश्य परिस्थिती जाहीर करण्यात येऊन विविध उपाययोजना जाहीर करण्यात आलेल्या आहेत त्यानुसार जिल्ह्यातील खरीप 2018 हंगामातील Trigger-2 लागू झालेल्या 11 तालुक्यांमध्ये (परिशिष्ट-अ) दुष्कळ सदृश्य परिस्थिती जाहिर करुन खालील सवलती लागू करण्यास उपरोक्त शासन निर्णयानुसार शासनाने मंजुरी दिलेली आहे.

त्या अर्थी मी जिल्हाधिकारी अहमदनगर खालील नमुद केलेल्या तालुक्यामध्ये दुष्कळ सदृश्य परिस्थिती जाहिर करत आहे.

अ.क्र.	तालुक्याचे नाव
1	जामखेड
2	कर्जत
3	नगर
4	नेवासा
5	पारनेर
6	पाथर्डी
7	राहाता
8	राहुरी

Figure 2(b):G.R of government of Maharashtra (INTERNET)

IV . GENERAL INFORMATION OF LONI MAWALA.

- Loni Mawala is a village in ParnerTaluka district Ahmadnagar, state Maharashtra, country India
- Coordinates are Latitude 19°0'30''N, Longitude 74°12'30''E
- It is 18.4 km away from taluka main town Parner
- Area of Loni Mawala village is 1850 hectares.
- Total population of Loni Mawala village is 3791; male: 1944, female: 1847(as per population census 2011).
- Average annual rainfall: 690 mm (2002- 2012)
- Literacy rate of Loni Mawala is 60.82%
- Sex ratio is 951 females per 1000 males.
- The major population are dependent on agriculture and others are having small business like grocery shop, dairy, textile shop, etc.
- Water scarcity occurs in the month of January and lasts up to May.
- This duration tends to be most critical for villagers due to shortage of water

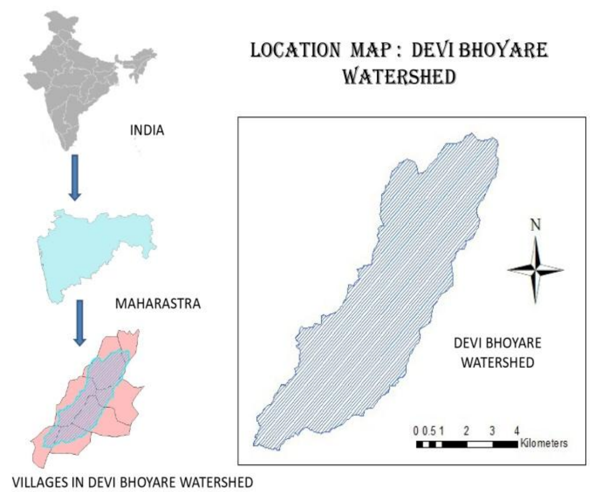


Figure 2(c) :Location map

4.1. Sources of Livelihood

Like most of Indian villages, devi bhoyare is also rain fed region. Most of population here is dependent on agriculture and rest depend on sheep grazing, grocery shops, dairy, etc. Few people also work in nearby industries for their daily bread.As per living standard & per capita water requirement it isdecide that this area is drought area. From socio-economic survey, it is found that the average income of people living in devi bhoyare is about 6000/- to 100,000/- per year.

V.WORK DONE USING GIS AND BASED SOFTWARES

Software like ARC GIS prove an aid to the topographic analysis of study space .With the help of CARTOSAT DEM knowledge from NRSC Bhuvan the required DEM knowledge of 50km X 50km grid of individual study zone is obtained. The digital elevation model provides the elevations of the

topography and provides topographic details. A Mapset file is formed to process all such DEM and formation knowledge inside. With the assistance of good GIs computer code the map of Loni Mawala village was georeferenced to create it viable and correctly refenced with the selected coordinate system (one of the various existing within the world i.e WGS84)

Georeferencing truly makes the study space map or toposheet exist on the globe map .This georefrenced map will currently be used with the DEM to method and acquire desired outcomes essential for study and outcomes of the project. is used for various operations like streamlines formation, relief features. Contours tool from spatial analyst tool is used to make contours at different interval.

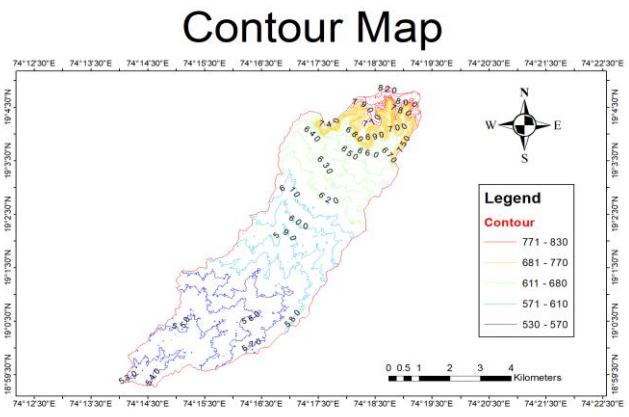


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Figure 3 :Contour map of Loni Mawala village(self prepared)

Contours are lines that join points having same elevation. The value of each contour line indicates elevation at that point. For smaller changes the value of line is more. Instant rise and fall indicates closeness of lines. The closer contour lines stows steeper topography of area. They correspond with the areas of higher elevation. Above map is indicating Loni Mawala village contour map. With help of contour line we can find hilly area, undulated area and topographical features of area, which will help us to locate a spot for different types of researching structures like check dam, bandhara, contour trench, etc. In the Loni Mawala village higher contour 575m, lower contour 510m and other area is flat. Hilly terrain in N-W side and average slope of ground is towards East. In this map , it is observed that nature of the terrain and helps in analysis of watershed in the area.

VI. GEOLOGY OF THE AREA:

In ahmednagar district, top layer on flat ground consist of black cotton soil and steep slope have layer of soft Murom. Depth of soil cover varies from 0 to 3m.Below this rocks like amygdule basalt, vesicular basalt &fractured basalt is there.

The ahemednagar district forms part of Deccan Plateau. It consists of few parts of Sayadri Hills lying within district boundary.The major part of ahmednagar consist of basaltic lava flows, which were formed by the intermittent fissure type eruptions during of upper cretaceous to lower eocene age. The Deccan Trap has succession of 19 major flows in the elevation range of 420 to 730 m above mean sea level (amsl). These flows are characterised by the prominent units of vesicular and massive Basalt.It also consist of alluvium which are deposit of clay, silt, and sand left by flowing floodwater in a river valley

6. Thematic maps of watershed :

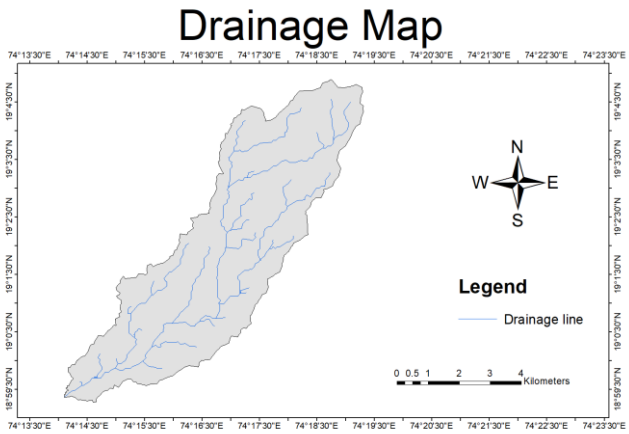

Figure 4 :Drainage map (self prepared)

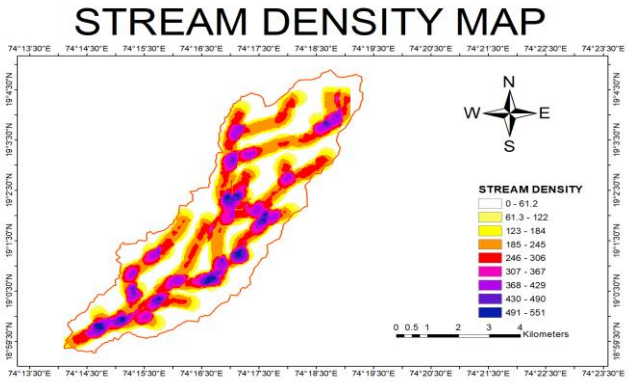

Figure 5 :stream density map (self prepared)

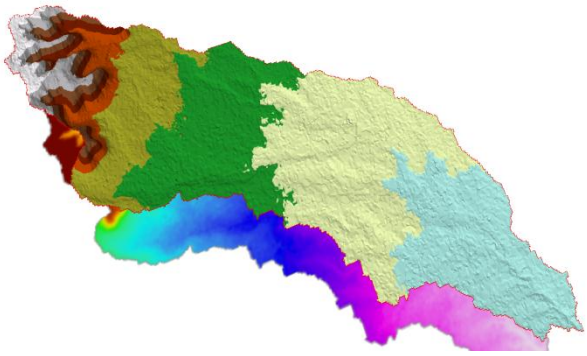

Figure 6 :Terrain map (self prepared)

VII .PROBLEMS EXISTING IN THE AREA:

- Poverty and fluctuating income
- Low income levels
- Peoples are totally dependent on agriculture for their livlihood
- Lack of water supplies in summer season
- Agricultural production is uniseasonal
- The average rainfall is more i.e. average annual rainfall of 635 mm.
- Insufficient rainwater harvesting structure scarce rainfall and
- Lack of awareness of people of water conservation structure Loni Mawala Watershed.

VIII .PROPOSED WORKS IN THE AREA:

- Farm pond
- Check dam
- Percolation tanks
- Vanarai bandhara
- K.T weir (Kolhapur type weir)

IX . COCLUSION:

- Water scarcity occurs in the month of January and lasts up to May.
- This duration tends to be most critical for villagers due to shortage of water.
- Proper watershed management will help to minimize the peak discharge and increase groundwater storage capacity.
- This will ultimately help in minimizing draught

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