SURVEY AND ANALYSIS OF VILLAGE FOR WATERSHED MANAGEMENT AND MAKING MAPS USING GPS ESSENTIAL AND Q-GIS SOFTWARES.

(Case study : Pandare village)

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Abstract- Water is a prime natural resource for human beings and hence a precious national asset. The easy and cheaply available groundwater is the most important resource for domestic, industrial and agricultural uses etc. However, rapid growth of population, vagaries of rainfall, expansion of irrigation, increased industrialization etc. have resulted into enhanced demand for groundwater in various countries. Groundwater prospecting, exploration and management have become a big task in certain drought prone areas in India. Hence, in the current scenario, it has become crucial not only to find out groundwater potential zones, but also to monitor and conserve this important natural resource.

Introduction

For expansion of agriculture and consumption water resource the necessary elements obligatory are land and hose. Because of tremendous increase in population, urbanization, industrialization and crop growing area, resulting in steep incline hose down demand line. Indian crop growing sector is lot more depend upon the heavy rain. But last 3-4 years payable to too little rainfall, people are look towards the secretive water as alternative cause without as regards to its boost resulting in deepen of ground water table near on the subject of 100m poorer the ground surface

Watershed

Watershed is the area of land of water bounded by drainage divide within which the surface runoff collects &flows out of the watershed through a single outlet in to larger river or lake.

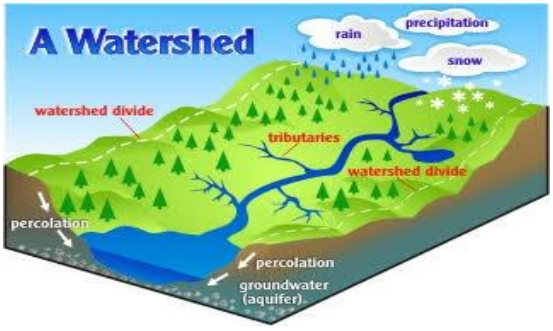

Figure No. 1: Concept of Watershed Management

Watershed management

Watershed management is defined as development of an area through watershed approach using natural resources and taking into consideration needs of the inhabitants with sustainable and integrated approach. Watershed management can convert degraded areas into high productive zones and thereby improve the status of inhabitants. Watershed Management is the revolutionary program for fulfilling the water needs in the scarce area as well as it is a process of creating and implementing plans, programs, and projects to sustain and enhance watershed functions that affect the plants, animals and human communities within watershed boundary.

Necessity of watershed management study

Water scarcity is one of the major problems that farmers have been facing for long time in arid and semi-arid region. India is an agricultural country, so farming is a major source of rupee for people in India. So farmers, who do farming in arid region, have very scarce water resources whole year. That's why they can't earn enough money from their farms. It is the major issue, in these regions there is rainfall but very low as below 500 mm in semi-arid region and below 250 mm in arid region.

So it is not the case that there is not at all rainfall, due to lack of water harvesting and management practices, also people don't know that how to store runoff when there is rainfall. The aim our project is to determine water availability, water requirement in selected case study area, provide most suitable water harvesting and conservation solutions and watershed management practices so that water should available for whole year for irrigation also to manage water effectively. This project will also study the rainfall pattern in selected arid region as well as doing crop management i.e. it's planning by varying land pattern, beneficial crop in that region, and availability of water.

Objectives

- To carry out general and socio-economic survey.
- To identify contour map and stream line map by using 'GPS Essential' & 'Quantum-GIS' softwares.
- To understand uneven fluctuations in study area.

- To increase water table level and reduce soil erosion by suggesting appropriate structures

METHODOLOGY

Methods used for achieve objective for achieving first objective we conduct general and social economic survey by preparing questionnaires and fill up this form of that village people

• To carried out visit to the Pandare village and collection of data from tehsil office and Grampanchayat.

• By carrying out Quantum GIS we get contour map and stream line map of whole area. With the help of this we get possible outlet and their location.

• By using G.P.S. survey plot the location after meet outlet points.

• To study the ground water level fluctuation of the study area, water levels in different wells located in the study area have been observed for different period for these 11 wells have been selected.

• These pre and post monsoon water levels are plotted and are compared with the overall fluctuation of average rainfall

• By suggesting appropriate structure in study area. Measurement of ground water fluctuation

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Following steps were followed for implementing techniques

• Selection of site for implementing watershed techniques.

• Collection of data of site condition and surrounding area.

• To manage and utilize run-off water for useful purpose, the suitable structures on water outlet points were suggested.

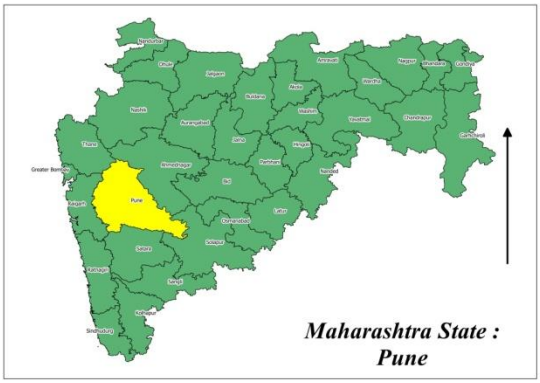

Figure no. 2: Maharashtra State- Pune

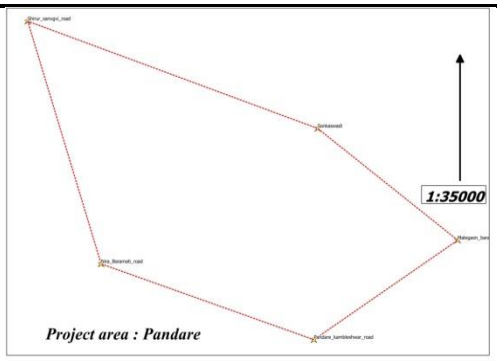

Figure no. 3: Georeference image

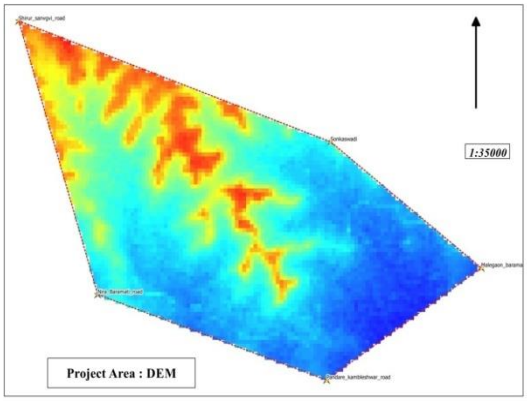

Figure no. 4: Digital Elevation Model(DEM)

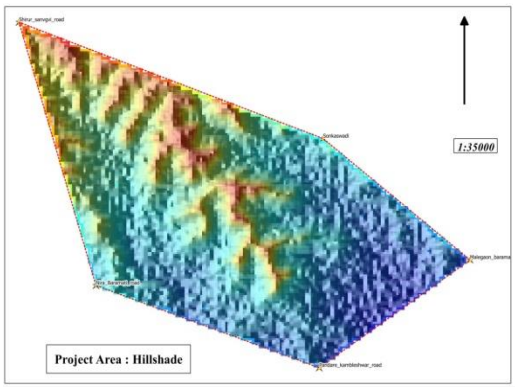

Figure no. 5: Hillshade Map

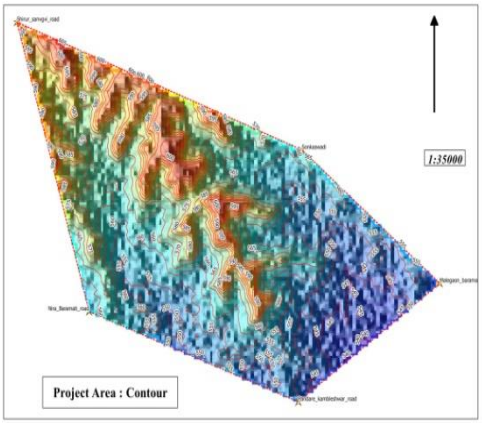

Figure no. 6: Contour Map

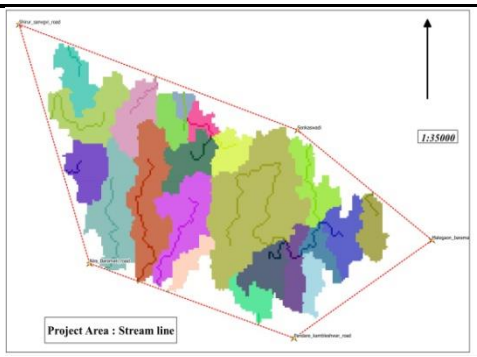

Figure no. 7: Streamline map

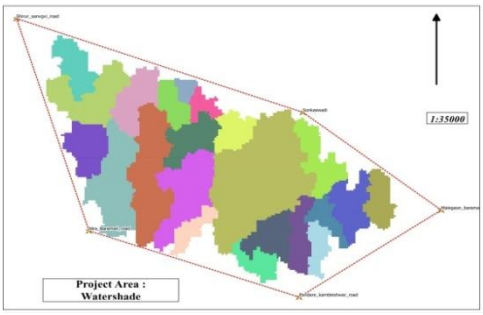

Figure no. 8: Watershed Map

Demand and Supply Analysis

Total demand = Domestic requirement + Annual requirement + Agri. requirement
= 18447.1 + 14916.86 + 2215012.5
= 2248376.4 cu. m
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= 18447.1 + 14916.80 + 22015012.5
= 2248376.4 cu. m

Runoff & water requirements of study area [Inglis formula = For cal. yield based on studies carried out for catchments in western Ghat & Plains of Maharashtra C.G. Inglis gave the following relation for non-ghat (Hilly) area with Rainfall P less than 200 cm.
Yield = {P[P-17.78]}/254

Where P is precipitation expressed in cm.

Runoff calculation

Avg. yearly rainfall in Pandare.
=287.75 + 246.75 + 490.88 + 332.55 + 326.44/5
P= 33.69 cm
A] Runoff by using basic formula
formula = [P(P-17.78)]/254
= [33.69[33.69-17.78]]/254
= 2.11 cm
B] Total available water = Area of watershed [sq. m] × Rainfall
= 82593000×0.3369
= 2782558.17 cu. m
Ground water recharge =Area of watershed [sq. m]×avg. fluctuation × Specific yield =82593000×1.5×0.15
= 1858342.5 cu. m
Formula runoff =Precipitation-ground water recharge
= 2782558.17-1858342.5
= 9,24,215.67 cu.m.

Evaporation

Pan evaporation rate = CP × Pan Evaporation
In this region use Class A land Pan
Therefore CP=0.6
=0.6× Pan Evaporation
Take avg. value of Pan Evaporation 2014, 2015, 2016
Pan evaporation = 4.81+4.89+4.98/3
=4.893mm/day
=0.4893cm/day
=0.004893×365×64700×0.6
=69330 cu.m.
Water available for artificial recharge for watershed development
= Runoff – Evaporation
=924215.67-69330
=854885.67 cu.m.

Measures to be taken for improvement of water table surface as well as subsurface and reduce soil conservation

Contour trenching and tree plantation: It is proposed to excavate trenches along the contours and planting the trees on their downstream sides.
Bore Well Recharging: The area has two bore wells which would dry in summer seasons. Hence it is proposed to recharge them by diverting the water from contour ditches nearby them.
Construction of continuous contour trenches on upstream side of the hill.

Plantation of “Madras Anjan” grass on hilly slope, “Stylo” grass on downstream of continuous contour trenches and “Khus” grass on bund constructed on pond.

Vanarai bandhara

Vanarai bandhara or Bunds are constructed across a stream or small river using gunny bags refilled with locally available soil or sand. These bags are sealed properly and are arranged in the form of a wall barrier. This is a temporary structure built across water course to collect the water as well as to reduce the velocity of stream so that infiltration rate of water increases. The Vanarai Bandharas constructed at location as shown in table

Design details of check dam

Check dams are proposed across bigger in areas having gentler slopes. Layout and construction of permanent check dams to ensure proper storage and adequate outflow of surplus water to avoid scours on the downstream side for long stability of the dam. The site selected for check dam have sufficient thickness of permeable soils or weathered material to facilitate recharge of stored water within a short span of time.

Conclusions

• After the rainy season around month of February up to month may of each year the water scarcity starts in the study area and water demand increases. As large amount of ground water is drawn out from under ground, reduction of ground water table which in turn reduces water level in wells.

• To cater this problem of water storage in study area, the technique of watershed management is best suited. By implementing this method the ground water table is increased thus providing sufficient water to the farmers during drought season and reducing the call of tankers on which crores of rupees were spent by the government. This method is cheap and also provides employment to villagers.

• In this village there are great losses due to evaporation upto 69330 cu.m. So take remedial measures to avoid these losses. By reducing these losses we get extra supply of water for watershed management. Total demand of water in that village including man, animal and crop requirement is 2248376 cu.m. and supply is 89448 cu.m. This supply is calculated by considering evapo-transpiration losses and avoiding evaporation losses.

Future Scope

• 1. From this we had concluded that the evaporation losses are major concern. To prevent evaporation losses further study can be carried out.

• 2. In this project work we did not done work on estimation and design of structure. It will be more rational to know how much finance need for construction of structures.

ACKNOWLEDGEMENT

Visualizing assets and the surrounding environment when you build, upgrade, and repair infrastructure helps you decide how to prioritize your work, convince others of its importance, and make good decisions about how to move forward with your plans. Having an accurate, clear picture of the project helps you better understand needs, reduce problems, and mitigate costs and environmental impacts. These processes are improved when GIS is the core system for data management and visualization. With all the demands on your time, using tools that streamline your business processes and provide you with the best mapping and visualization makes sense. GIS can help you present information in a straightforward way to partners in your projects, government officials, and the public. With Q-GIS Server technology, you can take maps that you have created with Q-GIS Desktop software and publish them over the Web so you, your partners, and your staff in the field can see how a project is progressing.

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