**Capacity Assessment of Dnyanganga Reservoir, Maharashtra by Geospatial Technology for Sustainable Water Resource Management.**

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**Introduction**

One of the essential inputs required for effective water planning of reservoir is assessment of its present storage capacity. It is therefore essential for the irrigation manager to know the quantum of water available in the live storage zone. Remote sensing technique for reservoir sedimentation surveys is essentially based on mapping of water-spread areas at the time of satellite over pass. It uses the fact that water-spread area of the reservoir reduces with the sedimentation at different levels. The parameters namely water-spread area and the elevation information are used to calculate the volume of water stored between different levels. These capacity values are then compared with the previously calculated capacity values to find out change in capacity between different levels.

The Maharashtra Engineering Research Institute (MERI), the State’s Water Resources Department, has done substantial work in the field of reservoir capacity assessment. This institute has carried out more than 350 surveys of capacity assessment of Maharashtra and India .Present paper deals with study of Dnyanganga reservoir by satellite remote sensing technique has been conducted after 46 (1971-2017) years of its first impounding.

**Data (Field and Satellite)**

The Dnyanganga reservoir lies between Latitude 20’: 22’: 15.00” N to 20’:26’: 16.00” N and Longitude 76’: 39’: 45.00” E to 76’:35’:44.76” E. The reservoir was constructed on confluence of river Dnyanganga, near village Geru matargaon in Khamgaon taluka of Buldhana district. Total catchment area of the reservoir is 200.000 sqkm. The designed gross storage capacity of the reservoir is 36.264 Mm3and live storage capacity is 33.930 Mm3.The designed dead storage capacity is 2.335 Mm3.The reservoir was first impounded in the year 1971.Presently due to scanty rainfall and higher demand of water for domestic purpose arises problem of equitable distribution of water hence capacity assessment of present storage was necessary for irrigation manager. Hence the hydraulic data of reservoir such as Elevation Area Capacity table, Controlling levels ,area under submergence were taken up from the field officials.

Satellite Data includes the Resourcesat 1(P6) LISS III Nine images and Resourcesat 2 LISS III five images with a resolution of 23.5 m were analyzed for this study.

**Methodology**

The basic approach is to find out the water-spread area from satellite data for different water levels between MDDL to FRL. The difference between aerial spread of water between current year and earlier years is the areal reduction at these levels. The methodology for estimation of live storage capacity of reservoir using remote sensing consists of following major tasks.

1)Digital data base creation,

2)Estimation of water-spread area,

3)Calculation of reservoir capacity,

4)Comparison of result with previous surveys,

5)Estimation of live capacity loss due to sedimentation.

National Remote Sensing Centre website was browsed and a list of cloud free dates of IRS P6 (with LISS III sensor) and Resourcesat2 (with LISS III sensor) satellite pass over Dnyanganga reservoir was prepared for the period between Year 2013 and 2018. The reservoir levels and corresponding water spread areas for dates of satellite pass were obtained from the field office. The selection of the satellite images was done after studying the draw down pattern of the lake levels, selected satellite data in Geo-referenced mode was procured from the NRSC Hyderabad.

Water Spread Area Extraction**-**Area extraction is done by either Normalized Difference Water Index (NDWI) or by unsupervised classification method. For Dnyanganga reservoir, unsupervised classifications out puts were generated for specific scene and range of unsupervised classification for water body delineation was noted for respective scene. From analysis, WSA around FRL is observed as 2.954 Mm2 and WSA around MDDL is observed as 0.651 Mm2.then computation of reservoir capacity at different elevations has been done using following prismoidal formula.

Where, V = Reservoir capacity between two successive elevations h1 and h2

H = Elevation difference (h2 – h1)

A1 and A2 are areas of reservoir water spread at elevation h1 and h2.

**Results**

Storage capacity of Dnyanganga reservoir between R.L390.650 m and FRL 404.900 m is estimated as 25.337 Mm3 for the year 2016-17against designed storage capacity of 30.831 Mm3 between these levels. The cumulative loss between two consecutive surveys worked out to be 5.494 Mm3. The percentage cumulative loss is 17.820. From the first impounding of reservoir in 1971 to year 2017 (46 years) the annual % loss is 0.390. Hence the siltation rate Ha-m/100 km2 /year worked out to be 5.972 and in mm/year the silt rate is 0.597.

**Concluding Remark**

Following conclusions can be drawn from the study:

* 1. The live storage capacity of Dnyanganga reservoir is 25.337 Mm3 in year 2016-17.
  2. Capacity loss of 17.820% in live storage is observed in a period of 46 years since first

Impounding in 1971.

* 1. Siltation rate of Dnyanganga reservoir is 0.597 mm/year which on higher side than designed silt rate which is 0.357 mm/year.

**Recommendation**

Periodical monitoring of siltation helps keeping the content table updated. Remote sensing technique is a cost effective technique for such surveys.

**References**

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