Government of India

Central Water Commission

Hydrological Studies Organization

Hydrology (N) Directorate

Water Availability Study

of

Song Dam

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Introduction

Song Dam is proposed to be constructed across Song river, a tributary of river Ganga, near village Sondhana in District Dehradun of Uttarakhand. The dam is proposed to cater the drinking water needs of Dehradun city and surrounding areas.

Data Availability

The following data have been furnished by the project authorities:

Name of Station	Type of Data	Period
Satyanarayana G&D site (CWC)	10-daily discharge	1971-72 to 2003-04
Song dam	Daily discharge	March 2001 to December 2005
Dehradun (IMD)	Daily Rainfall	1989 to 2017
Dhanaulti		1989-91, 1996-99 & 2011-159 (with gaps)
Mussoorie		1985-86 & 2011-2017 (with gaps)

Water availability study

The physiographic parameters of the river catchment at Satyanarayana site / Song dam site have been estimated by GIS processing of STRM DEM. The catchment area of Satyanarayana site comes out to be 963.7sqkm whereas catchment area upto the proposed Song dam site is 85.225 sqkm.

The discharge data at Song dam site is available for 4 around years and yield during 2001-02 to 2004-05 is as under.

Year	Yield at Song Dam site (mm)		Rainfall at IMD Dehradun Station (mm)	
	Jun-Sep	Annual	Jun-Sep	Annual
2001-02	1337	2063	2056	2408
2002-03	774	1126	1208	1458
2003-04	1124	1464	1600	1866
2004-5	836	1238	1718	2018

From above, it is observed that there is large variation in yield at Song dam site. Further, considering IMD Dehradun rainfall station data, there is large variation also in the runoff factor in different years on monsoon (0.49 to 0.70) as well as on annual (0.61 to 0.86) basis and discharge data at Song dam site is of limited period. In light of above, the discharge data of Song Dam has not been considered for further for any analysis.

At Satyanarayana G&D site, discharge data is available for the period from 1971-72 to 2003-04 and checked for its consistency. Monthly Arial Gridded Rainfall in mm in catchment upto Satyanarayana G&D Site from 1971-72 to 2012-13 has been worked out. The monsoon runoff factors at Satyanarayana vary from 0.89 in year 1997-98 to 0.21 in 1989-90 with average 0.48. The regression between monsoon yield at Satyanarayana and arial grid rainfall up in catchment upto Satyanarayana G&D Site has been tried and the R^2 value comes out to be 0.156. The R^2 value of 0.650 is arrived after removing some outlier data and the regression equation of "Q = 0.518 * Grid Rainfall – 25.58" is obtained. The removed outlier data have been re-computed using the runoff coefficient of 0.480. Considering 1971-72 to 2003-04 discharge data, the 10 daily/monthly averages have been estimated. Further, the estimated averages are converted into percentage to Annual flow. As the IMD Grid rainfall data is available up to 2012-13, the Satyanarayana discharge data have been extended from 2004-05 to 2012-13 by Monsoon (June-September) regression equation and percentage of non-monsoon to annual discharge. Accordingly, the total monsoon discharge is estimated as 55.51% of Annual discharge and using this annual discharges for the period from 2004-05 to 2012-13 are estimated. The consistency checks on annual discharge data of Satyanarayana site for the period from 1971-72 to 2012-13 have been carried out and found consistent. Further, the 10-daily discharges of extended period from 2004-05 to 2012-13 are computed using the monsoon regression equation for monsoon period and using the percentage to Annual flow for non-monsoon period.

IMD Dehradun raingauge station is located about 14 km from the dam site and annual average rainfall (1989-90 to 2016-17) is estimated as 2249.12 mm whereas annual average rainfall at Satyanarayana site based on IMD grid rainfall (1971-72 to 2012-13) is estimated as 1365.95mm. The ratio between mean annual rainfall at Satyanarayana and Song dam is 0.61. Further, the mean annual rainfall based on TRMM 2B31 for the years 1998-2009 in Song dam catchment area is 2500 mm whereas the same for the Satyanarayana G&D site catchment is 1500 mm. The ratio between mean annual rainfall at Satyanarayana and Song dam site comes out to be 0.60. In view of above, the rainfall data at Dehradun may be considered as the representative rainfall at Song dam catchment.

The water availability series at Song dam has been derived from the discharge data of Satyanarayana site in catchment area proportion considering rainfall variability. Hence, a ratio of 0.1456 (85.225/963.7*2249.12/1365.95) has been used to derive the water availability series at Song dam from the discharge data of Satyanarayana site. Necessary consistency checks have been carried out and found consistent. The 10-daily water availability series at Song dam for the period from 1971-72 to 2012-13 is enclosed as Annexure-I.

Using the annual yield values the dependable yield has been estimated. Accordingly, the estimated minimum yield is 72.26 MCM and the 75% & 90% dependable yields are 111.01 and 98.60 MCM respectively (Annexure-II). E-flows, if any as per statutory norms, may also be maintained.