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CASE STUDY OF MANIKDOH DAM

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ABSTRACT

An integrated Kukadi irrigation project in western ghat of Maharashtra state in India comprises of five dams built the Kukadi River and its tributaries receiving seasonal rains. The water from four reservoirs namely Dimbhe, Manikdoh, Wadaj and Pimpalgaon Joge is fed to Yedgaon reservoir through canal and river. In the Kukadi integrated project the works of five dams namely Yedgaon dam, Wadaj dam , Manikdoh dam , Pimpalgaon Joge dam and Dimbhe dam are completed. The Reservoir has received a yield of more than 75% dependable yield only twice during the last 25 years since its completion. We are study the "Manikdoh Dam" among this dam. Thus storage of this reservoir is to be optimized to its full capacities by the end of monsoon approved reservoir operation schedule, to meet irrigation and drinking water requirements of the project for complete water year. An integrated project comprising of five reservoirs is being severely affected due to less rains than estimated in the Manikdoh catchment area. Due to this fact the storage capacity of Manikdoh reservoir is underutilized and adversely affected the performance of the integrated Kukadi project, ultimately resulting in a great stress on the minds of management engineers to fulfill the targets with limited water resources. In contrast, the Dimbhe catchment is drawing increased yield than estimated and excess water spills over.

Keywords*: Dam ,Hydro- electric project , Manikdoh hydro power project.*

I. INTRODUCTION

Manikdoh dam was constructed on 1984 by the Government of Maharashra, India. Manikdoh dam on Kukadi River near Junnar, Pune district in state of Maharashtra in India. With completion of dams, storage as planned is created. Also execution of canal system is nearing completion. The integrated project is planned to utilize 38.20 TMC of water in one year. Dimbhe reservoir is having maximum storage capacity of 13.5 TMC followed by Manikdoh reservoir of 10.88 TMC. The other dams namely Pimpalgaon Joge Dam and Wadaj are having comparatively smaller capacities. Dimbhe and Wadaj reservoirs are planned to feed Yedgaon reservoir through canal while Manikdoh and Pimpalgaon are planned to feed Yedgaon reservoir through river. Kukadi left bank canal of 249 km. length of takes from Yedgaon dam.In western Maharashtra the main sources available for irrigating the scarcity affected areas of Pune, Ahmednagar and Solapur districts are the Ghod and the Kukadi rivers. Mina a tributary of Ghod meets it's near Nirgudsar, Tal. - Ambegaon, Dist. - Pune. Pushpawati and Are rivers meet Kukadi River upstream of Yedgaon, Tal. - Junner, Dist. - Pune. All these five rivers have their sources in Western Ghats in the Junner and Ambegaon Tahsils of Pune district, where the rain fall is between 3810mm to 5080mm. With completion of dams, storage as planned is created. Also execution of canal system is nearing completion. The integrated project is planned to utilize 38.20 TMC of water in one year. Dimbhe reservoir is having maximum storage capacity of 13.5 TMC followed by Manikdoh reservoir of 10.88 TMC. The other dams namely Pimpalgaon Joge Dam and Wadaj are having comparatively smaller capacities. Dimbhe and Wadaj reservoirs are planned to feed Yedgaon reservoir through canal while Manikdoh and Pimpalgaon are planned to feed Yedgaon reservoir through river. Kukadi left bank canal of 249 km. length of takes from Yedgaon dam.

II. APPROACH AND METHODOLOGY

The Study is mainly based on analysis of Secondary data available with Water Resources and other concerned Departments and agencies except Socio-Economic System for which data on sample basis was collected for impact analysis. All the data primary as well as secondary data was collected by the concerned officers/staff of the Hydrology Project with the help of hired staff for field work of socio-economic survey. The consultant provided necessary technical guidance to Hydrology Project authorities with respect to data requirement, data collection, storage and analysis of data/information and report writing as envisaged in the PDS. The Objective, approach, methodology, data formats and outcome for each aspect of the study is given in subsequent chapters**.**

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III. STUDY AREA

The study area consists of Western Ghat of Maharashtra of Sahyadri hill range where five dams of the Kukadi integrated system are situated. Study area also extends up to command area in three districts of Pune. Figure 1 is a view of the Kukadi complex shows manikdoh dam taken from Google map.

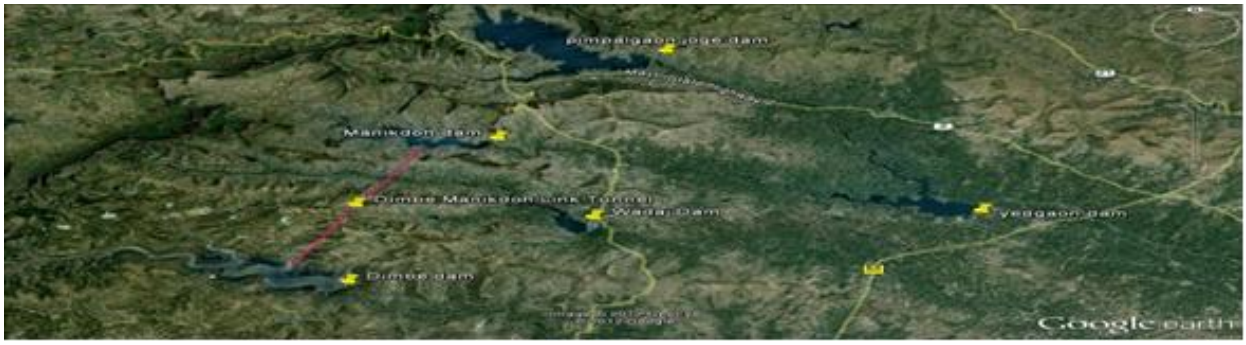

Photo No.01:Google map of the Kukadi complex of manikdoh dam

IV. GEOLOGY

The subsoil exploration done with 18 bore holes result show that Deccan trap lava flaws comprising compact basalt, amygdaloidal basalt, volcanic brachia and tachylyte. The flaws of amygdaloidal basalt free of joints form a good media for tunneling.

V. DAM DESCRIPTION

Manikdoh dam is the masonary type gravity dam. The height of the above lowest foundation is 51.8m (170ft) while the length is 930m (3,050 ft). The surface area is 18,434 sq.km (7,117 sq m). The volume content is 596 cu.km. (143 cu mi) and gross storage capacity is 308.060 cu.km (73,907.52 cu mi). The dam is located in the Ghod basin. A 6 MW power house is also built at the foot of this dam.

VI. YIELD STUDY OF MANIKDOH RESERVOIR

The yield series of Manikdoh reservoir during last 25 years after completion of dam reveals that 75% dependable yield is 5.564 TMC as against planned utilization of 10.986 TMC. The maximum yield received is 11.864 TMC (year 2006) and minimum yield received is 3.82 TMC (year 2009). The 75% dependable yield calculated earlier in year 1990 using 34 years records by Central Design Organization, Nasik is 5.1 TMC [2] Thus the study of yield pattern of about 50 years, i.e. 25 years prior to construction and 25 years after .

Photo No.02 – Kukadi Project On Manikdoh Dam

construction of dam indicates that 75% dependable yield ranges from 5.100 TMC to 5.564 TMC; this yield is less than planned utilization of 10.986 TMC. Thus the planning of the whole Kukadi project is adversely affected. This

fact has led the engineers to focus on the subject of augmentation of Manikdoh reservoir for sustainable development of irrigation of the Kukadi project.

VII. MANIKDOH PROJECT AT A GLANCE

a) Location of dam – Across river kukadi near village khamgaon
b) Name of project – kukadi project , Manikdoh Dam (Major project)
c) Administrative approval–Govt.of Maha. I & P dept.(Bombey letter No. PM/3475/15547 – IP(4) dt.26.7.75)
d) Type of dam - Masonary gravity dam
e) Purpose – Irrigation and power generation
f) Year Of Commencement – 1976-77
g) Year Of Completion – 1984
h) Estimated cost as per DSR 75-76 – 807.71 Lacs.

Location

a) Location – Near khamgaon
b) Village – Manikdoh
c) Taluka – Junnar
d) District – Pune
e) Name of Basin – Krishna
f) Sub Basin – Bhima
g) Latitude – 19^0-12'-0"
h) Longitude – 75^0-50'-0"
i) Catchment Area – 129 KM^2
j) Annual Rainfall – 100-5000

Manikdoh Left Bank Canal

a) Length Of Canal – 23.5KM
b) Bed Width Of Canal – 1.50m Fully linned
c) Discharge Capacity – 1.51cum/sec (53.59)cusecs
d) Length of tail channel – 150m
e) Gross Command Area – 2682.92

To bring under irrigation, the area about 2265 hectare area, Manikdoh left bank canal.

VIII. MANIKDOH STORAGE ON KUKADI RIVER

The river Kukadi flows between two hill ranges which are off shoots of Western Ghats, going in an eastern direction and forming the dividing ranges between the Kukadi on side and the Kukadi and the Meena on the other. These off shoots have a few spurs approaching close to the banks of the river Kukadi at a few places between Thakarwadi and Padli villages. A few alternative dam sites were therefore investigated in this reach and they are described in detail in the earlier project report. In the administratively approved project report of 1966, a site near village Manikdoh had been recommended for this project and a composite am with masonry section in the main gorge and earth embankment on the both the flanks was proposed.20 The dam site is located at 190-14' north Latitude and 730-49' East Longitude. The site is approachable by Junner-Ghatghar road and is about 3km. from Junner. The dam on the river Kukadi at Manikdoh (i.e. Thakarwadi) envisages a gross storage of 308Mcum (10.88 TMC). Initially it is proposed to let out the water in to the river through six river sluices each of 1.2M. x 1.8M provided in the spillway portion. This water was to be picked up at Yedgaon dam, already existing on the downstream for releases in the main Kukadi Left Bank Canal.21 During the course of construction, the people from Junner Tahsil demanded irrigation water from this storage at Manikdoh. Considering their demand a small Left Bank Canal having 1.52Cumecs capacity at head is proposed, for a length of 23.5Kms. Due to this proposal out of the six river sluices originally proposed in the gorge, two are shifted near the outlet location at Ch. 270mtr in addition to the one for Manikdoh Left Bank Canal. Thus now there are four river sluices in the four piers in the spillway portion and three outlets of the same size at Ch. 270M at the starting of Manikdoh Left Bank Canal. The construction of the main dam is practically completed in June 1984.

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IX. SPECIFICATION OF MANIKDOH HYDRO POWER PROJECT

1. Gross storage - 308.08 MCM = 10.87 TMC
2. Dead storage - 44.268 MCM = 1.562 TMC
3. Live storage – 288.16 MCM = 10.167 TMC
4. Total dam length – 930 m
5. Maximum head – 46.25 m
6. Design head – 38.00 m
7. Minimum head -21.31 m
8. Full reservoir level – 711.75 m
9. Maximum water level (HWL) – 713.69 m
10. Minimum draw down level (for generation) – 688.75 m
11. Type of turbine – Vertical Kaplan
12. Rotation per minute – 375
13. capacity – 1 x 6000 KW
14. Projected production capacity – Yearly

X. SALIENT FEATURES OF MANIKDOH HYDRO ELECTRIC PROJECT

1.Location – Surface power house at the foot of manikdoh dam , Tal- Junnar , Dist – pune
2. Size – 29.4 X 14.60 m without auxillary building
3. Maximum head - 44.25 m
4. Design head - 38.00 m
5. Minimum head -19.90 m
6. Design discharge – 19.74 m
7. Installation – 1 unit of 6000 KW
8. Type of turbine – Vertical Kaplan
9. Annual generation – 20.91 M

Switchyard

1. Location – attached to service bay site power house
2. Size – 20.10 x 13.01 m

Tail Race Channel

1. Type – R.C.C. open type
2. length – 23 m
3. Location of D T gate – at end of unit bay
4. Bed width – 5.50 m
5. F.S.D. – 1.53 .

XI. IMPACT OF CHANGING WATER ALLOCATION ON ENVIRONMENTAL SYSTEM

The impact of reduced inflow in the reservoir and reduced water allocation in the command area with respect to sedimentation of reservoir, ground water status in the command, changes in river flow regime, quality of water in the river is studied and reported in this chapter. the monsoon and post monsoon flow is arrested by the reservoir. The inflow series shows that for about 70% years, there is no or very less outflow from the reservoir. During the years of appreciable outflow also, the outflow lasted for few days only. The senior citizens in the area commented that before manikdoh Project, there was a considerable flow in the kukadi River even in the month of May and now it goes dry after December. This has definitely affected the regime of river.This has affected the agriculture, irrigation, socio-economic and environmental systems to some extent. This type of situation is occurring in most of the irrigation projects in the State. It is therefore necessary and useful to study the impact of changing water allocation on the performance of the project. The outcome of this study will help for better planning and management of available water resources.

Review Of Hydrology

The Objective of this chapter is to take review of Hydrological studies of Manikdoh Project done at various points of time by different agencies and to compare the yield estimations. In addition, the actual yield received in the

reservoir, actual dependability and effect of upstream interceptions on the yield is also studied. The outcome is presented in subsequent paragraphs.

Review Of Water Planning

The review of water planning and allocation for different canals and purposes is taken in this chapter. The manikdoh Project was originally formulated in the year 1976. The summary of water planning and allocation is presented in this chapter. Similarly the actual water allocation for various purposes, year wise, since inception of the project is also presented.

Impact On Agriculture System

The objective of this chapter is to study the impact of variations in water availability on agriculture system. The data collected from , junnar and from other related organizations is used to study the impact with respect to actual crop pattern, crop yield, adequacy of water, irrigation scheduling etc. Actual crop pattern in normal years is very much different than designed crop pattern e.g. Rice is almost nil, cash crops like sugarcane, and H.W. Ground nut are more (almost double the design cropping pattern), cotton is almost negligible, cereals are also minimum. This indicates that farmers prefer remunerative cash crops in normal years. Sugarcane is tolerant to water stress and hence grown in larger proportion. In deficit years, wheat and cash crop like hot weather groundnut is reduced to greater extent because they are sensitive to water stress.

a) Irrigation capability in Kharip (Hectare.) -1178
b) Irrigation capability in Rabi (Hectare.) -1246
c) Total irrigation capability (Hectare.) – 2424

XII. NECESSITY OF KUKADI PROJECT

The problems of providing irrigation benefits to the scarcity area from Pune, Ahmednagar and Solapur Districts was engaging an attention of the state for quite a long time. Shirur Tahsil of Pune District, Parner, Karjat, Shrigonda, Tahsils of Ahmednagar District and Karmala Tahsil of Solapur Districts are chronically affected by scarcity year after year. Lands in the valleys are fertile and capable of growing a variety of crops if irrigation facilities are made available. This has been evident from the irrigation practiced on a number of wells, in this area. The rainfall varies from 100mm. to 500mm. which is inadequate, for growing crops especially when it is unevenly distributed. This happens, for almost every alternate year. The poverty of the tract and non-sustaining character of the lands are evident by the depleted population in these Tahsils as compared to the adjoining Kopargaon and Shrirampur Tahsils. The entire area would remain undeveloped if the project as now contemplated and which is already under construction does not materialize.

XIII. CONCLUSION

There is every possibility of diversion of 2.9 TMC with 75% dependability and 6.3 TMC with 50% dependability. The starting level at 712.00m (Gross capacity 10.00 TMC) is so decided that the requirement of 9.5 TMC of Dimbhe reservoir is not affected. Thus study as per alternative No.3 is most suitable for diversion of shortfall of 5.90 TMC at Manikdoh reservoir. The linking of two reservoirs will provide sustainable irrigation to water scarcity areas of Pune, Ahemadnagar, Solapur districts of Maharashtra state. The canal system is ready but in present scenario, sustainable irrigation is not possible due to less storage at Manikdoh reservoir. The augmentation of Manikdoh reservoir from Dimbhe reservoir will not only help in sustainable development of irrigation of 35000 Ha in the Kukadi integrated project which not only increases per capita income of farmers but also contributes towards agricultural benefits of nation. The project also contributes towards power generation of 16.15 million units every through existing dam foot power house of 6 MW. capacity.The researcher made an attempt to study the history of Manikdoh project,
its features and benefits for the irrigated area. This study is much closer with the statement of the problem.

- Name of dam – Manikdoh dam
- River – kukadi
- basin - krishna
- Catchment Area : 129 Sq.kms.
- Gross Storage : 308.060Km3 (73,907.52 cu mi)
- Live Storage : 278.26 MCM

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- Type of Dam : Masonary gravity dam
- Length of Dam : 930 m (3050ft)
- Maximum height of dam above River Bed : 53 m at NOF
- Live storage capacity – 278.26 MCM
- Dead storage capacity – 19.81 MCM
- Submergence area – 1.74 Th.Ha.
- Land affected total – 2.05809 Th.Ha.
- Land affected culturable – 1.9166 Th.Ha.
- Towns and viilages affected – 14

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