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Conservation and Restoration of the Major Water Supply Source of Jaipur City: Ramgarh Dam

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ABTRACT

During last few years, the ground water level in Rajasthan is going downward speedily. Due to extreme heat and scarcity of rainfall, the dams are drying up rapidly resulting in rigorous water crisis. The problem is more acute in the city like Jaipur where drinking water supply exclusively depends upon ground water and nearby dams. Major dams like Ramgarh and Bisalpur from where Jaipur city is getting water, have barely any water left. The water storage capacity of Ramgarh dam was 75.5 M cum in the year 1903, but after the year 2006 its capacity was found waterless. Due to this the burden on ground water storage has been increased.

In this paper an attempt has been made to investigate the factors affecting reducing the storage capacity of Ramgarh dam at Jaipur, India and remedial measures are suggested to improve its storage capacity so that the storage water can be efficiently utilized to fulfill the demands of the city.

KEYWORDS: Catchment area, dam, water inflow, encroachments

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1. INTRODUCTION

India is assumed to be a gifted country with vast land and water resources but in fact, it is water short country in relation to agriculture, municipal and industrial needs. About 80% of the annual rainfall and runoff are rigorous only in the monsoon months. During this period, maximum exploitation of water can be made from the run of the river with small regulation requiring very little storage [1].

India accounts for about 2.4% of the world's total surface area but supports 16.7% of the world's population. Population pressure will reduce the per capita availability of drinking water. Still, India possesses highly dismal per capita storage capacity as compared to even those countries; where rainfall is more or less evenly distributed in time and space. While per capita storage capacity in North America, Russia, Australia, China are respectively 6150, 6013,4729 and 2486 cubic meters whereas in India it is only 262 cubic meters [2] .

Most parts of the India, being dependent upon water storage on 3-4 month long monsoon, reservoirs are created to store water for use in non monsoon months. The reservoirs, created by dams on rivers, also get silt in the water of the rivers that enters the reservoirs and a significant proportion of the silt settles down in the reservoir, thus reducing the space available for storage of water. Moreover, studies over the years have shown that the silt gets deposited in both the dead storage and in the live storage. Siltation results in reduction in benefits from the projects constructed. Siltation of reservoirs can also have a number of other impacts, including increased evaporation losses, increased backwater flooding [3]. Sedimentation results in reduced lifespan for reservoirs [4].

Decrease in continuous rainfall during last few years, resulted insignificant inflow into surface water bodies, while at the same time the requirement for irrigation water is increasing. Periods with low flows are generally also those with the highest irrigation water requirement. This could result in even lower inflows into reservoirs when these are located downstream of irrigation water abstraction sites. The impact of land use on low flows, show the effect of water abstraction for irrigation in response to changes in rainfall on the occurrence of low flow in streams [5].

THE RAMBAGH DAM

The Ramgarh dam was constructed on Banganga River near Jaipur in 1903 having capacity of 75.0 M m^3 and covers the gross catchment area of 769.20 km^2. The dam is 30 km away from Jaipur city at Jamwa Ramgarh and was a multi-purpose project to provide the irrigation facilities to nearby area and the

water supply for Jaipur city, but from year 1961 it was reserved only for water supply to Jaipur city. The dam was served water to Jaipur city till mid of year 2006 but after that dam was dried completely. Table 1 shows monthly and total inflow of water. After the year 2000, the inflow of water reduced continuously and reached to zero level in the year 2006 and onwards,

Table I: Inflow of water in Ramgarh Dam in Years 1995-2011 in Mcum

S.N.	MONTH	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007-11
1	JAN	2.58	31.84	36.19	21.1	13.65	1.45	1.53	0.7	1.95	2.81	1.29	3.42	nil
2	FEB	1.84	29.07	35.02	19.27	13.13	0.85	1.52	0.71	0.78	2.29	1.24	2.94	nil
3	MAR	1.48	27.07	33.14	17.44	10.86	1.37	1.51	0.72	0.69	2.07	1.21	2.55	nil
4	APR	0.97	25.77	30.8	15.11	8.57	0.92	1.43	1.97	0.7	1.64	1.04	2.06	nil
5	MAY	1.32	23.12	27.85	12.66	5.67	0.43	1.18	1.29	0.59	1.36	0.93	1.56	nil
6	JUN	0.74	20.85	24	9.75	1.83	0.44	0.88	0.94	0	0.85	0.72	1.15	nil
7	JUL	1.39	23.81	22.24	6.95	1.25	1.31	0.68	0.66	0.45	1.46	0.95	0.73	nil
8	AUG	2.68	24	20.72	20.34	5.16	0.66	0.66	0.55	9.09	0.7	1.76	1.32	nil
9	SEP	41.68	30.98	20.85	21.1	4.87	1.73	1	0.85	8.08	0.65	1.51	0	nil
10	OCT	39.6	43.85	20.85	21.6	7.87	1.91	0.94	0.87	4.51	0.7	5.85	0	nil
11	NOV	35.95	40.65	22.11	18.32	2.83	1.56	0.73	0.76	3.87	1.8	4.67	0	
12	DEC	33.14	37.82	21.3	16.76	4.95	1.26	0.8	0.72	3.35	1.32	3.89	0	
	Total	163.47	358.84	315.07	200.41	80.65	13.9	12.87	10.74	34.07	17.65	25.06	15.74	0
	Average	**13.61**	**29.9**	**26.26**	**16.7**	**6.72**	**1.16**	**1.07**	**0.9**	**2.84**	**1.47**	**2.09**	**1.31**	**0**

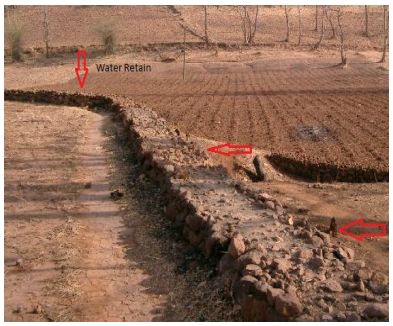
(Source PHED office Ramgarh Dam)

FACTORS RESPONCIBLE FOR REDUCTION IN THE WATER INFLOW

An extensive study has been taken up numerous site visits and personal interviews with troubled official employees to examine the factors responsible for the reduction in the inflow of the water in Ramgarh dam. The salient observations made are presented below:

1. There are around 415 water bodies like village ponds, ani-cuts, contour bundings etc. in the catchment area of Ramgarh dam. These structures are constructed by various Government departments like forest, watershed and local bodies. The height of these structures is in the range of 2 to 8 m, which is sufficient to retain runoff. The possibility for revival of flow into the dam can be made with suitable modification in the existing water bodies in catchment area of Ramgarh dam.

2. The dam has been silted up to a depth of approximately 4.57m and resulting in reduction of its storage capacity.
3. Water is also obstructed by construction of Ditches and bunding along the contours in foot of hills. The



height of contour bunding can be observed from 2.0 to 5.0 m and they covers almost entire hills in the forest area. Due to unplanned construction of these bundings, water is entrapped before coming to drain. Fig 1(a) shows obstruction in water flow by constructing bund by forest department.

4. It is also observed that several roads have been constructed by various agencies raised to 1-3 m high embankments in the catchment area and at some places the roads are constructed across the main river obstructing a significant volume of water. No provision for cross drainage work has been made. Fig 1(b) shows example of gravel rural road constructed under Mahatama Gandhi National Employment Guarantee (MNERGA).
5. Soil conservation department has covered 773.55 km^2 areas by various activities of soil conservation, which has reduced the velocity of flow resulting in higher infiltration as well as high rate of evaporation.
6. Several authorized and unauthorized mining activities exist at number of places in the catchment area, prominent of them are near Kant, Bilaunchi and Chandwaji village. Such activities caused obstruction in the natural flow of rain water.
7. In most of the catchment areas, farmers have constructed water harvesting structures in the forms of Dols or Mud –bundi (low height earthen dams) in their farms, which harvest water for their local purpose. This practice retains significant water by obstructing the flow created in the steam, resulting in less runoff. Fig 1(c) shows small dols/mud- bundi which obstructs natural flow of water. As land holding decreases with increase in farmer's population, these dols are used to divide the land during partition.
8. There are many small rivers and drains in the area which supply water to the Ramgarh dam but flow of the rivers were obstructed due to huge encroachments. Recently, the high court in his verdict directed the government to initiate stern actions against illegal encroachment holders.

Fig 1 (a) Watershed Activity (b) Rural Road (c) Small Mud or Dols

It has been concluded that the overall catchment area has been severely reduced due to construction of a large no of water bodies in the catchment area. Another reason may be the scanty rainfall in past few years. The capacity of dam is reached to a level of 1.16 m^3 in the year 2000,1.07 m^3 in the year 2001 and 0.90 in m^3 in the year 2002 which is an indicator of the reduced rain fall in these years as well as less inflow in the dam indicative of the drought years as well.

CONSERVATION AND RESTORATION

Following may be taken as serious suggestive measures by the concerned departmetns to perserve the usefulness, importance and utilities of the dam;

1. All activities in the catchment area by different departments which are contributing in deterioration of the catchment may be stopped immediately.
2. Water bodies having high structures can be gated and water bodies of low height can be modified by constructing spillway/overflow structures in such a way that the water column retained in any water body may be restricted to 0.75 m only which will serve the purpose of local needs and surplus water will be allowed into main reservior.
3. The respective deparment may be asked to modify their structures and to remove obstructions from local nallah, drain etc. which otherwise are responsible for impending flow into main river course.
4. It is also observed that main river is in sandy soil and at many locations the rever course is too wide causing shallow depth of runoff which in turn leeds to more eveporation and percolation into river bad.There is a need of detailed survey for channelization and training of the river so that the significant runoff can be generated with minimum eveporation and infiltration losses.
5. No permanent structure like masonary walls, compound walls should be allowed in the existing farms/farm houses in the vicinity of main river/nallah.

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