

# SEDIMENTATION IN DAMODAR RIVER SYSTEM

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## Abstract

In early forties and fifties various water resource projects were constructed on river Damodar in a planned and integrated manner for the effective water management and flood control in Damodar valley region. Damodar Valley Corporation came into existence as an autonomous body to manage it. The success story of the project has been discussed for decades. But over the period of time because of the soil erosion in upper catchment area, there has been massive sedimentation in the reservoirs reducing its capacity of storage to the extent of 40% in some. This has alarmed the planners that if corrective measures are not taken in years to come Damodar may become again the sorrow of Bengal.

*Keywords: Damodar, sorrow of Bengal, first multipurpose water resource project in integrated manner in line with TVA, USA, achieved success-tamed the ferocious river, stored water for the industrial growth and economic activities, sedimentation in reservoirs reduced the storage capacity.*

## 1. Introduction

**Damodar River** is a river flowing across the states of West Bengal and Jharkhand. Rich in mineral resources, the valley is home to large-scale mining and industrial activity. Earlier known as the **Sorrow of Bengal** because of its ravaging floods in the plains of West Bengal, the Damodar and its tributaries have been somewhat tamed with the construction of several dams. Damodar River was earlier known as the "River of Sorrows" as it used to flood many areas of Bardhaman, Hooghly, Howrah and Medinipur districts. Even now the floods sometimes affect the

lower Damodar Valley, but the havoc it wreaked in earlier years is now a matter of history because of the effective control and management of water and creation of large storage capacity in the upper Damodar catchment.

The Damodar River was termed River of Sorrow or Sorrow of Bengal and even Sorrow of the Region. Its notoriety was demonstrated by the devastating floods in 1823, 1848, 1856, 1859, 1863, 1882, 1890, 1898, 1901, 1905, 1907, 1913, 1916, 1923, 1935 and 1943. While major floods occur at intervals, minor floods are experienced almost every year. The sediments brought by the Damodar create the problem of sedimentation in the Hooghly which in turn endangers the Kolkata port.

In order to control floods and other related problems, the Central Government, in consultation with the state governments of erstwhile Bihar (now Jharkhand) and West Bengal, worked out a unified development project for the Damodar Basin. The Damodar Flood Enquiry Committee suggested a comprehensive plan. This plan was based on the memorandum submitted by W.L. Voorduin, an engineer with the Tennessee Valley authority (TVA) in the USA. The Damodar Valley Corporation (DVC) was established on 18th February, 1948 to execute the Damodar Valley Project.

The original plan was to construct seven major dams. These dams were to be Aiyar and Panchet Hill on the Damodar river; Maithon, Belpahari and Tilaiya on the Barakar river; Konar on the Konar river and Bokaro on the Bokaro river. But the DVC has constructed only four dams (Tilaiya, Maithon, Konar and Panchet Hill).

## 2.0: WATER AVAILABILITY:

Being a rainfed river, about 95% of the annual flow is received during the monsoon months from June to October and the remaining months the river becomes almost dry. From the analysis it can be seen, though the annual availability of water at 75% dependability at 5 DVC reservoirs is 5675 MCM, and 95% Of this quantity is received in a very short period, it is not possible to utilize this quantity fully and the excess water is spilled below the dams without any use. The availability at 75% dependability as arrived at based on 10 years data by the Standing Committee on Inter State Agreement of 1978 between Govt. of West Bengal and Bihar(now Jharkhand) is 5550 MCM . Presently the annual quantum of utilized water for multipurpose uses from the system is 3,847 MCM. So, there is an allocable surplus water available to the tune of 1,007 MCM., which cannot be stored as per present situation. This is due to less storage of about 1,030 MCM. than planned (371 MCM at Maithon dam in between EI. 150.88m. and EI. 146.30 m. and 659 MCM. at Panchet in between EI.132.59 m. and EI .124.97 m.) due to lowering of conservation level for flood protection. Thus there is a case for construction of a new reservoir to store about 1,007 MCM Of water and utilize this water for hydel power generation, irrigation, industrial and domestic uses in the state of Jharkhand. The quantity of additional hydel power will depend on site conditions while it will irrigate on an additional area of 1,00,700 Ha .

Tenughat dam, constructed by the then Govt.of Bihar (now Jharkhand), was designed with the objective to supply an ensured quantum of 25.47 cumecs though out the year for industrial use in the region. But as per present status only 7.075 cumecs water are being used for the purpose, resulting in non-utilization of the storage capacity available at Tenughat and hence water is being spilled without using it. At least,490 MCM of water can be stored if land acquisition of tenughat reservoir as per design. Subsequently additional benefits in the field of irrigation, hydel power generation, industrial and domestic purposes can be achieved.

## 3.0: BENEFITS OF RESERVOTRS:

### Flood Moderation:

In the post period of completion of the four Damodar valley reservoirs in the first stage and commencement of effective operation of reservoirs a number of floods have occurred and were moderated at the reservoirs. It is a fact that almost all the floods had the intensity more than that of 1943 flood. Had there been no dam to moderate the flow, the devastation made by each of these floods would have been at least of the same order as that of the 1943 flood. Therefore, without the DVC reservoirs, the degree of devastation must have been catastrophic.

### IRRIGATION:

In the Pre- project period the irrigated area in the valley was around 10,117 Ha. against the total command area of 75,271 Ha .. Mostly the cultivation in the command area was dependent on monsoon rains and was restricted during that period only. After commissioning of the DVC reservoirs, the stored water in the reservoirs is mainly used for irrigation resulting in increase in number of cultivated crops to three in a year which was only one in pre -project period. Now, in addition to kharif crops (monsoon crop) Rabi and Boro crops are also cultivated in the command area in winter and summer respectively. consequently the average area cultivated annually under kharif, Rabi and Bora Irrigation has increased remarkably. The Kharif irrigation is being done in areas to the extent of 3,28,000 Ha. at annual average area of 2,89,017 Ha. Cultivation of Rabi and Bora crops with the help of irrigation water is done in an area to the extent of 96,800 Ha.at an annual average area of 42,503 Ha.

It may be noted that, specially from 1971 onwards, quite substantial quantity of water have been supplied for Bora irrigation though there is no stipulation provided for allocation of water in the reservoir regulation manual for this purpose. This was possible by storing water over and above the conservation levels at reservoirs during monsoon by taking some calculated risk, as Bora cultivation is high yielding popular crop among the farmers. But, this risk is to be avoided. If reservoirs are operated and water is stored as per the regulation manual there will be no water left for Bore irrigation after meeting all committed requirements.

### 4.0: PROGRESSIVE SILTATION IN THE RESERVOIRS:

In spite of achievement of substantial benefits as a result of planned development of the Damodar River system as mentioned the problems due to floods and resulting damages could not be solved totally. Some of the principal reason for this can be identified, as follows:

- a) Although the present control structures have come as per plans worked out for the objective of total flood control, the total designed flood storage has not yet been created and the second phase of the project has not yet been taken up after fiftees
- b) Moreover, the land as per design has not been acquired so far, causing substantial reduction in flood cushion of the reservoirs.
- c) Another additional problem is the progressive siltation in the reservoirs, causing depletion of storage in the reservoirs. The reduction in dead storage that has taken place in the order of 43.5% and 31.7% in Maithan and Panchet reservoirs as compared with the original survey. This rate of siltation is quite high than the estimated rate. The percentage rate of reduction in the live storage is also high and it is worked out to be 25.6% in Maithan and 224% in Panchet. In actual measurement of volumetric terms, the sedimentation survey done on two major reservoirs of Maithon and Panchet. The original allocated capacity of dead and live storage for Maithon and Panchet is 81380 hectare-meter and 48848 hectare-meter respectively. In 1979 the last survey was done for Maithon and it was found that live and dead storage loss has been 11599 and 10110 hectare-meter respectively( overall around 20% loss upto 1979). Similarly for Panchet sedimentation survey done in 1974

indicated that the live and dead storage loss has been 6908 and 13569 hectare-meter respectively( overall 40% loss upto 1974 ). If the datas are extrapolated one can very well predict that present reservoir capacity for Panchet and Maithon together may be hardly 60%. This is very difficult scenario realizing not only the constant rise of water demand in the region but also the effective flood control.

#### **5.0: REDUCTION IN THE CHANNEL CARRYING CAPACITY:**

Though it was planned that the channel carrying capacity in the lower Damodar below Durgapur is to be maintained such that 7075 cumecs of discharge can safely be carried, but with time due to siltation and poor maintenance of the channel the river spills in the lower reach even for a discharge of the magnitude of 1981 cumecs.

Moreover, the flood affected lower valley lies in the deltaic plains of West Bengal, which is very flat in nature. This gives rise to drainage congestion in the lower reach. In addition other rivers in the lower reach viz. Dwarakeswar, Silai, Kansabati, Rupnarayen etc. all of which ultimately outfall in river Hooghly, causes synchronization of floods many times. The tidal effect from Bay of Bengal makes the problem more severe on some occasions.

The problem of encroachment in the flood plains is also very significant. It has also been observed that temporary bunds are put across the river during the non-monsoon season to withhold the flow for local use of water at different reaches of the lower valley. These bunds are normally washed away in monsoon season and the materials get deposited on the river channel itself.

#### **4. Conclusions**

For the purpose of better management of floods in Damodar basin, full flood storage as per the original proposal is to be created. In place of increasing the capacity of the Maithon and Panchet reservoirs to full design flood storage capacity by acquisition of

additional land, it is desirable that additional storage should be created at other locations in the upper catchment area. Balpahari in between Tilaiya and Maithon can be an ideal location for the dam construction which will give additional storage capacity in the system to meet the rising demand of water for agriculture, industries as well as drinking in the two districts of Dhanbad and Giridih. This will add another potential for generation of 60 MW hydroelectric power. The investment proposed on the water supply to Dhanbad from Maithon need to be thought of from practical and monetary consideration. Can we not create new potential of water storage which will be permanent solution for drinking water in the district of Dhanbad.

2. Maithon and Panchet reservoirs can be dredged to restore its original storage capacity and this alone will solve the present crisis of water in the Damodar valley area. This is technically and financially feasible. The huge silts coming out of dredging can be used to fill up the abandoned open cast mined areas as well as low land area.

3. The problem of siltation in the river course is to be solved by scientific dredging so that the river channels are re-sectioned and their capacity is increased. Special attention should be drawn for increasing the carrying capacity of the lower Damodar so that it can carry a discharge in the tune of 7075 cumecs as per original plan. Along with this, construction of embankments along the Damodar and Mundaswari rivers may be undertaken by Govt. of W. B., wherever necessary on the basis of design studies. Encroachment in the river is to be stopped and a firm demarcating boundary line is to be identified so that any human interference to the channel beyond this mark is stopped. For this, necessary documentation and publicity is also to be made to motivate the common people in the lower valley. Construction of temporary bunds across the river in lean season should not be encouraged, instead small barrages / weirs / may be constructed in a planned manner. This action is required to moderate and manage the flood effectively.

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