

MODULE VII : PROPOSED RESERVOIRS IN YAMUNA FLOODPLAINS

- 1.0 In 1996, Cmdr. SD Sinha [Retd.] and INTACH had suggested the possibility of creating floodplain reservoirs in the Yamuna floodplains in order to store some of the monsoon season flow for use in the lean season.
- 2.0 Subsequently, INTACH, in its 'Blueprint For Water Augmentation in Delhi', 1999, [for Dept. Of Irrigation & Flood Control] recommended creation of 6 off-channel reservoirs on Yamuna Floodplains.
- 3.0 An example of this kind of engineering is available in the River Road Reservoir off Consanga River in Georgia, USA. With the objective of storing waters during peak flows and in the absence of suitable on-channel dam sites, a suitable off-channel reservoir has been constructed having an embankment of 2.4 km length and a storage capacity of 5.5 MCM. The project was found to be a cost effective technique of water harvesting.
- 4.0 The Yamuna floodplain comprising of 97 sq.km. of area in Delhi offers a good scope for development of groundwater resources subsequent to the storage of monsoon waters on the floodplain itself. Under the Yamuna water sharing agreement, out of the 580 MCM of monsoon season flow allocated to Delhi, about 280 MCM goes unutilised due to lack of storages.
- 5.0 The construction of any structures or barrages across the river or on the floodplains has several technical and legal implications rendering it quite difficult and time consuming to clear any scheme of construction within the jacketed floodplain. In the light of current thinking on the subject construction in the floodplain zone is highly undesirable and should not be carried out.
- 6.0 That leaves us with the option of creating floodplain reservoirs which are basically excavated depressions in the remnant floodplains which are to be filled by the swelling of the water flow during monsoons.
- 7.0 The riverbed is characterised by large tracts of land prone to inundation on both banks. Most of the remaining land comes under an assortment of low intensity uses largely agricultural. Further with the passage of time and several pockets have become prone to unauthorised growth/encroachments and various constructions promoted by the government. Lately, the National Green Tribunal has ruled that agricultural activity would also have to be relocated away from the flood plains.
- 8.0 Salient features of the flood plains are :
 - Total length of river Yamuna in NCT of Delhi : 51 kms.
 - Width (floodplain including water) : 1.5kms to 3kms.

- Area of river bed : 9700ha.
- Area under water : 1645ha.
- Area under dry land : 8055ha.
- Major drains outfalling in Yamuna : 18

9.0 The Yamuna Flood Plain occupying 97 sq.kms. area in NCT of Delhi offers a good scope for developing the ground water resources as well as storing additional water of flood discharge during monsoon. The flood plain has prolific aquifers. The hydro-geological setup and availability of substantial quantity of flood flows are favourable for augmentation and exploitation of ground water resources.

10.0 The riverbed within Delhi is 97.0 sq.kms (9700 ha.). As per DDA Masterplan this falls in Zone 'O' and 'P II'. The present status of land ownership is given below :

➤ DDA / Nazul lands	4722 ha.
➤ Private lands	1359 ha.
➤ Unauthorized cultivation	1657 ha.

11.0 The depth to ground water table varies from 3mbgl in adjacent areas of river channel to 5mbgl beyond 500 to 1000m from the main river channel. River Yamuna in Delhi has developed floodplains by eroding and deposition of unconsolidated material as a result of inundation during high flood periods. The unit is made up of unconsolidated clay, silt, sand, gravel and offers good ground water potential. The top strata is sandy upto a depth of 40.0 mts. and thus has excellent infiltration and percolation qualities.

11.0 IRS-1C data was used to infer the relative potentiality of the Yamuna flood plan in Delhi for water harvesting scheme. It was inferred that the flood plain harvesting scheme should be initiated at Rajghat, Kishanghat, Nagli Rajpur and Abdul Ajaib enclave. Further from Wazirabad to Ibrahimpur flood plan water harvesting scheme is suggested. Eastern part of Yamuna is showing relatively low slope from Shakarpur to Mayur Vihar extension. In this area alteration of clay and silt with occasional sand patches is inferred. The clay deposits will not support the scheme of water recharge in this area. However, storage reservoirs are possible.

12.0 The potential flood plain reservoirs of large size have been selected by carefully examining the topographical map of the floodplains [scale 1 : 10,000, S0I, 1979-80]. **This SoI map is the most recent detailed topographical data of the Yamuna floodplains with contours at 0.5m difference – no further updates are to be found even in the SoI map of Delhi, 2010, where the contour lines are at large intervals and the scale of 1:50,000 and thus of no use.** Latest Google imagery has been referred to in order to accommodate subsequent construction. In view of the high water table maximum depth excavation is restricted to 1.5m or as per actual site condition. Earthworks would also be required to shape the reservoirs, build low

embankments on the upstream and active channel sides which in turn would have to be planted with riverine grasses to stabilize the bundhs and protect them against erosion and filter the silt brought in by flood waters.

13.0 The following Table gives physical parameters of the proposed reservoirs :

S. No.	Location	Surface Area [Sq.M.]	Average Depth [m]	Storage Volume [CM]	Cost [Rs. Cr]
1	Right Bank, north of Old Bawana Escape [Sheet No. 33]	900,000	1.5	1,350,000	23.63
2	Right Bank, south of Old Bawana Escape [Sheet No. 33]	1,170,000	1.5	1,755,000	30.71
3	Left Bank, west of Sabapur, [Sheet No. 33]	840,000	1.5	1,260,000	22.05
4	Left Bank, south of Wazirabad Barrage [Sheet No. 34]	2,500,000	1.5	3,750,000	65.63
5	Left Bank, between Railway Bridge and ITO Bridge [Sheet No. 41]	605,000	1.5	907,500	15.88
6	Left Bank, opp. Mayur Vihar [Sheet No. 41]	3,120,000	1.5	4,680,000	81.90
7	Total			13,707,500	239.80

Note : Rate of excavation Rs. 175/- per cu.m.

Note : Above surface area calculation based on scaled map

Minor alteration in site conditions can be factored in at DPR stage

Site selection is based on availability of unencumbered land with unhindered inflow route from active channel

14.0 Almost an equivalent cost for disposal of the excavated earth would be incurred. So the total cost of excavation and disposal would be in the region of Rs. 480 Cr. [The disposal would also raise issues of location of disposal. This can be partially mitigated by converting the excavated material into stabilized soil blocks for construction.]

15.0 The floodplain reservoirs will be filled during the monsoon season flood discharge in the river. At this time the water flow transports sediments from the upper reaches. The sediment normally gets deposited in the floodplains and will thus be annually deposited in the created reservoirs necessitating desiltation activity. The issue of controlling sedimentation of the reservoirs would be addressed as follows :

- Riparian vegetation species would be planted densely to filter out the sediment load
- The excavated material would be used to create a 'bundh' on 3 sides of the reservoirs on sides other than RME/LME
- Naturally occurring riparian grasses would be planted on these 'bundhs'
- The species would consist of typha, sarkanda, phragmites, scripus
- Over time the grasses would form a dense mesh which would filter out the sediments

16.0 Use of Reservoir Water : The water stored in the reservoirs can be used as follows :

- a) The 13.7 MCM of stored waters translates into 9 MGD. This would enable a decentralized source of water supply to adjacent settlements. The water would be recovered through a battery of shallow tubewells.
- b) The water, thus impounded, would contribute to the aquifer and, as a result of lateral movement, be available through tubewells at further downstream locations
