

4.5. LIFE OF RESERVOIRS

4.5.1 REDUCTION IN RESERVOIR CAPACITY

The useful life of a reservoir gets reduced due to sediment deposition causing a decrease in its storage capacity. The factors affecting the pattern of sediment deposition in reservoirs are:

- (i) sediment load (i.e., sediment inflow rate)
- (ii) sediment size (i.e., gradation of silt)
- (iii) compaction of sediment
- (iv) river inflow pattern
- (v) river valley slope
- (vi) shape of reservoir
- (vii) capacity of reservoir (its size and storage period)
- (viii) vegetal growth at the head
- (ix) outlets in the dam (their types, location and size)
- (x) reservoir operation
- (xi) upstream reservoirs, if any.

It has been found by experience that a low sediment inflow rate, large fraction of fine particles, steep slope, no vegetation at head of reservoir, low flow detention time in the reservoir (by operation of outlets of suitable size at different levels), possibly series of upper tanks or reservoir upstream (where deposition occurs) do not favour sediment deposition and compaction. The silt carried in the rainy season may be excluded from the reservoir by means of scouring sluices slightly above the deep river-bed, which discharge the heavily silt-laden water at high velocity. The percent of the inflowing sediment, which is retained in a reservoir is called the trap efficiency and it is a function of the ratio of reservoir capacity to total annual sediment inflow, since a small reservoir on a large stream passes most of its inflow quickly (giving no time for the silt to settle) while a large reservoir allows more detention time for the suspended silt to settle. The relation between trap efficiency of reservoir vs. capacity-inflow ratio, on the basis of data from surveys of existing reservoirs. The rate at which the capacity of a reservoir is reduced by sediment deposition depends on

- (i) the rate of sediment inflow, i.e., sediment load.
- (ii) the percentage of the sediment inflow trapped in the reservoir, i.e., trap efficiency.
- (iii) the density of the deposited sediment

4.5.2 RESERVOIR SEDIMENTATION CONTROL

Sediment deposition in reservoirs can not be actually prevented but it can be retarded by adopting some of the following measures:

- (i) Reservoir sites, which are prolific sources of sediment should be avoided.
- (ii) By adopting soil-conservation measures in the catchment area, as the silt originates in the watershed.

(iii) Agronomic soil conservation practices like cover cropping, strip cropping, contour farming, suitable crop rotations, application of green manure (mulching), proper control over graze lands, terracing and benching on steep hill slopes, etc. retard overland flow, increase infiltration and reduce erosion.

(iv) Contour trenching and afforestation on hill slopes, contour bunding gully plugging by check dams, and stream bank stabilisation by the use of spurs, rivetments, vegetation, etc. are some of the engineering measures of soil conservation.

(v) Vegetal cover on the land reduces the impact force of rain drops and minimises erosion.

(vi) Sluice gates provided in the dam at various levels and reservoir operation, permit the discharge of fine sediments without giving them time to settle to the bottom.

(vii) Sediment deposits in tanks and small reservoirs may be removed by excavation, dredging, draining and flushing either by mechanical or hydraulic methods and sometimes may have some sales value.
