Chapter 7
Reservoirs

7.1 General

The proposed Godavari (Inchampalli) – Krishna (Nagarjunasagar) link canal project envisages to transfer a quantity of 16426 Mm^3 of surplus water from the proposed Inchampalli reservoir on river Godavari. This link proposal envisages the construction of Inchampalli reservoir with FRL 112.77 m as was originally planned by the three states viz Maharashtra, Chhattisgarh and Andhra Pradesh as a joint project at its head.

Nagarjunasagar reservoir, at tail end of link canal is the existing reservoir on river Krishna (FRL 179.832 m). 14200 Mm^3 of Godavari water would be delivered into the Nagarjunasagar reservoir after enroute irrigation in the commands under Kakatiya Canal Stage – II of Sri Ram Sagar Project and the Srisailam Left Bank Canal.

7.2 Controlling Levels and Storages

7.2.1 Inchampalli Reservoir

The Inchampalli project is a joint project between states of Maharashtra, Chhattisgarh and Andhra Pradesh. The dam site is 12 km downstream of the confluence of Indravati with Godavari River. The river Godavari forms the boundary between states of Chhattisgarh and Andhra Pradesh at dam site.

The principal levels and corresponding storages of the reservoir are furnished in Table 7.1 below**.**

Table 7.1
Principal Levels and Storages of Inchampalli Reservoir

Particulars	Level (m)	Storage (Mm^3)
MWL	112.77	10374
FRL	112.77	10374
MDDL	106.98	6089
DSL	103.62	4452

7.2.2 Bhopalpatnam Project

Bhopalpatnam dam site is situated on the river Indravati 9 km from Mattimarka village in Bijapur Tahsil of Bastar district in the state of Chattisgarh .The site is about 31 kms from Bhopalpatnam and is connected with Jagadalpur by a metalled road. The details of principal levels and storages of Bhopalpatnam reservoir are given in Table 7.2.

Table 7.2
Principal levels and corresponding storages of Bhopalpatnam reservoir

Particulars	Levels (m)	Storage (Mm^3)
MWL	201.160	-
FRL	200.254	9494
MDDL	174.480	1073

7.2.3 Nagarjunasagar Reservoir

Nagarjunasagar is the existing terminal reservoir on river Krishna. The project is formulated to provide irrigation facilities to about 8.95 lakh hectares situated in Guntur, Prakasam, Nalgonda, Khammam and Krishna districts of Andhra Pradesh apart from generating about 960 MW of seasonal hydro-electric power, navigation facilities, development of pisciculture and providing recreation benefits besides mitigating the flood hazards. Accordingly, the reservoir storages and levels have been fixed to fulfill the above needs. The principal levels and corresponding storages of the reservoir are furnished in Table 7.3.

Table7.3
Principal Levels and Storages of Nagarjunasagar Reservoir

Particulars	Level (m)	Storage (Mm^3)
MWL	181.05	11918
FRL	179.83	11560
MDDL	155.45	5827
DSL	149.05	4727

7.3 Sedimentation Studies and Life of Reservoirs

7.3.1 Inchampalli Reservoir

As per the Inchampalli joint project report Volume - I (1988) prepared by the Irrigation Department, Govt. of Andhra Pradesh, it is assumed that the useful life of the reservoir gets terminated when its capacity is reduced to 20% of the designed capacity. On the above assumption and taking into account, the net dependable yield and sediment flow at Inchampalli site with all the upstream existing, committed and contemplated schemes, the useful life of the reservoir is assessed as 265 years. However, in the project report, the life of the reservoir is considered as only 100 years for the purpose of sediment distribution.

7.3.1.1 Effects of the Link Proposal on the Life of Inchampalli Reservoir

Due to the construction of a large number of reservoirs in the upper reaches of the Godavari and its tributaries, the silt is likely to be trapped in the reservoirs and relatively silt free water would flow into Inchampalli reservoir and thus the life of the reservoir has been assessed as 265 years as indicated above. Inchampalli is not a terminal reservoir for any of the link canals proposed. Being the diversion point for two major link canals viz (i) Inchampalli – Nagarjunasagar (ii) Inchampalli – Pulichintala involving huge discharges, reduces the retention period of flood water, thereby less sedimentation and increase in the life of reservoir.

7.3.2 Nagarjunasagar Reservoir

Silt observations on Krishna River are being made systematically for a long time. They show that the Krishna River carries less silt compared to many other rivers of our country. The Srisailam reservoir, situated upstream of Nagarjunasagar reservoir, is having the storage capacity of 4461 Mm^3 upto MDDL and the useful life of the reservoir is estimated to be more than 300 years by the Andhra Pradesh Irrigation authorities. As the Nagarjunasagar reservoir is having a dead storage capacity of 4727 Mm^3 and is located downstream of Srisailam reservoir, the useful life of the reservoir would be still higher. Further, due to the construction of a large number of reservoirs in the upper reaches of the Krishna and its tributaries, the silt is likely to be trapped in those reservoirs and relatively silt free water would flow into the Nagarjunasagar reservoir.

7.3.2.1 Effect of the Link Proposal on the Life of Nagarjunasagar Reservoir

There are apprehensions by the Govt. of Andhra Pradesh that with the diversion of surplus Godavari waters to the tune of 14200 Mm^3 into the Nagarjunasagar reservoir, it might get silted up soon and thereby cause reduction in the useful life of the reservoir, as the Godavari river carries more silt as compared to the relatively silt free waters of Krishna river. The diversion of surplus Godavari waters into the Nagarjunasagar reservoir is proposed from the contemplated Inchampalli reservoir on Godavari, as the silt carried by the Godavari River to a large extent would get trapped in the Inchampalli reservoir itself and relatively silt free water is likely to flow into the Nagarjunasagar reservoir, through the Inchampalli - Nagarjunasagar link canal. As such, the effect of the diversion of surplus Godavari waters to the Nagarjunasagar reservoir on its life is likely to be minimal.

7.4 Annual Evaporation Losses from the Reservoirs

7.4.1 Inchampalli Reservoir

The monthly pan evaporation data considered for simulation of Inchampalli reservoir to work out the evaporation losses is furnished in Table 7.4.

Table 7.4
Monthly Evaporation Losses of Inchampalli Reservoir

Month	Evaporation (cm)	Month	Evaporation (cm)
June	23.1	December	10.2
July	15.2	January	10.2
August	15.2	February	10.1
September	15.3	March	15.5
October	12.1	April	23.1
November	10.2	May	23.3

7.4.2 Bhopalpatnam reservoir

The monthly evaporation losses of Bhopalpatnam reservoir considered for simulation studies carried out by NWDA are furnished in Table 7.5.

Table 7.5
Monthly Evaporation losses at Bhopalapatnam Reservoir

Month	Evaporation (cm)	Month	Evaporation (cm)
June	18.1	December	11.9
July	10.3	January	15.7
August	19.6	February	20.2
September	22.6	March	30.3
October	17.7	April	38.9
November	17.3	May	49.7

7.5 Submergence Area

7.5.1 Inchampalli Reservoir

The reservoir would submerge areas in all the three states of Maharashtra, Chhattisgarh and Andhra Pradesh. The total submergence area in these three states is about 94620 ha. The submergence area consists of 31.9% of forest, 38.3% of cultivable lands, 23.3% of open water bodies, 5.8% of shrubs, fallows and rock out crops and 0.7% of other varieties.

Tables 7.6 and 7.7 give the state-wise breakup of the area of submergence and number of villages and population affected.

Table 7.6
Breakup of Submergence Area

Area: ha

Sl No	Particulars	Andhra Pradesh	Maharas-htra	Chhattis-garh	Total	Percen-tage
1.	Total submergence area	36875	24131	33614	94620	100.0
2.	Forest Land	9024	14392	6754	30170	31.9
3.	Cultivable lands	15296	5769	15146	36211	38.3
4.	Shurbs, fallows & rock out crop	3744	1263	513	5520	5.8
5.	Open water bodies	8718	1901	11201	21820	23.3
6.	Other uses	93	806		899	0.7

Table 7.7
Villages and the Population Affected

Sl.No.	Name of the State	No.of villages	Population to be displaced
1.	Andhra Pradesh	65	38815
2.	Maharashtra	100	43186
3.	Chhattisgarh	64	18079
	Total	**229**	**100080**

The river portion of the submergence area namely Godavari and Indravati is 21820 ha. The cultivable land is mostly agricultural land sown by rain-fed crops like jowar and dry paddy.

7.5.2 Nagarjunasagar Reservoir

Nagarjunasagar is an existing reservoir and no additional storage is proposed, therefore, there would be no additional submergence due to the Godavari (Inchampalli) – Krishna (Nagarjunasagar) link canal project.