

Chapter-5 Hydrology

5.1 General

Planning for water resources development in a basin requires careful assessment of the available water resources and reasonable needs of the basin in foreseeable future for various purposes such as drinking, irrigation, hydropower, industries, navigation, etc. Hydrological studies are carried out to assess the available quantity of water in a given basin. In this chapter, hydrological analyses done for arriving at the available quantity of water at Polavaram project, for transferring surplus waters from Godavari river to Krishna river, are presented. As a part of these analyses, total yield of water at Polavaram is computed. And then, the balance of water that could be available, after meeting the in-basin requirements, for transfer to the Krishna river through the Polavaram - Vijayawada link canal, is assessed.

Before presenting the computation of the transferable quantity of water at Polavaram, a brief outline of the hydrological studies carried out by the Government of Andhra Pradesh for estimating the net inflows and surpluses at Polavaram is presented in the following section. Then the methodology adopted by the NWDA for assessing the yields (and balances) of various sub-basins and also yields (and balances) at Inchampalli and Polavaram is outlined. The yields at Inchampalli and Polavaram are computed as these are the project sites that are proposed to be used for diversion of waters from Godavari river to Krishna river and further down the Peninsular India. The yield figures are taken from the water balance studies already carried out by the NWDA. And then, various alternative studies are carried out for assessing the additional quantity of water that would be available at Polavaram for transfer (i.e., in addition to 2265 Mm³ of water that would be released into the Polavaram Right Main Canal as per GWDT award and as envisaged in the Polavaram project report prepared by the State Government of Andhra Pradesh).

5.2 Methodology Adopted for Water Balance Studies Carried Out by NWDA

Water balance studies for the twelve sub-basins of the Godavari basin have already been done and brought out by NWDA as separate reports. These studies include assessment of total surface water availability, existing use, reasonable requirements of the sub-basin in the foreseeable future (2025 AD) and determination of the order of surplus or deficit. The methodology adopted by NWDA for computing the water balance (surplus or deficit) sub-basin wise is discussed below.

5.2.1 Surface Water Availability

For realistic estimation of the water availability in a sub-basin, a long term yield series for that sub-basin is required. Generally observed flow data for a sub-basin is not available for longer duration. As such long term yield series for a sub-basin is developed from the available concurrent rainfall-runoff data using regression analysis. Usually terminal G & D site is considered for this purpose. However, reliability and period of availability of data are the other considerations for selecting the G & D site. To the observed flows of the selected G & D site

upstream utilisations in respect of irrigation, hydel, domestic and industrial requirements are added to get the virgin yields. Weighted rainfall values for the catchment upto G & D site and also for the whole sub-basin are worked out. Using these virgin flows and weighted rainfall upto the G & D site, the regression analyses are carried out. Using the best fit equation thus obtained and the weighted rainfall for the entire sub-basin, long term yield series are generated. From the long term yield series the 75% and 50% dependable yields of the sub-basin are computed.

5.2.2 Water Requirement

The requirement of water at the ultimate stage for various uses viz., irrigation, drinking, industry and hydropower are worked out as under:

Irrigation Needs: The requirements for irrigation are worked out for all the existing, ongoing and proposed major, medium and minor projects in a sub-basin. For this purpose, all the projects planned by the states, as per their master plans were considered. While the designed annual utilisation is considered for the existing and ongoing projects, the requirements for future projects are determined by adopting intensities of irrigation as 150%, 125% and 100% for major, medium and minor projects respectively. The deltas are worked out by climatological approach taking the irrigation efficiency as 55% for major/medium projects and 70% for minor projects. For assessing the crop water requirements by climatological approach, the potential Evapotranspiration values for various stations as given in the IMD, Scientific Report No.136 (1971) are adopted. In case of deficit sub-basin, where the ultimate annual irrigation, considering all the existing, ongoing and proposed major, medium and minor projects works out to less than 30% of the maximum culturable area of the sub-basin, the requirements have been calculated by increasing the annual irrigation to 30% of the maximum culturable area of the sub-basin. And 50% of such increased annual irrigation has been considered to be under future medium projects and the remaining 50% under future minor schemes. Similarly, in case of surplus sub-basins, the annual irrigation is increased to 60% of the maximum culturable area or to such maximum percentage between 30 and 60 as may be possible from the entire surface water available in that particular sub-basin.

Domestic Needs: The total domestic use from both surface and groundwater is estimated based on 1991 census after projecting human population as well as livestock population to 2025 AD using suitable annual compound growth rates. The requirements are worked out separately for the rural, urban and livestock population. In case of rural and urban population, per capita daily needs of 70 litres and 200 litres respectively have been adopted as per the recommendations of the Ministry of Works and Housing in their manual "Water Supply and Treatment". In case of livestock population per capita daily need of 50 litres, has been considered. The requirement of 50% of the rural population and the entire livestock population is considered to be met from groundwater, and the requirement for the remaining 50% of the rural population and the entire urban population is considered to be met from surface water.

Industrial Needs: Due to lack of data to estimate precisely the industrial water needs, the industrial requirement is taken to be equivalent to the total domestic requirement for human population and live stock. The entire industrial requirement is considered to be met from surface water.

Hydropower Needs: Requirement for the hydropower is taken to be the evaporation losses at the reservoirs with hydropower production. Wherever the evaporation data of the projects is available, the same has been made use of and wherever the data is not available the same is worked out from the surface area of the reservoir assuming suitable evaporation values.

5.2.3 Regeneration

Regeneration is considered as 10% of the net utilisation for irrigation under major and medium projects and as 80% of the domestic and industrial use to be met from the surface water.

5.2.4 Water Balance

The total water requirement of a sub-basin worked out on the methodology outlined above is deducted from the overall surface water availability at 75% and 50% dependabilities to determine the surplus/deficit of water at 75% and 50% dependabilities respectively. Evaporation losses, based on the available data for existing major and medium reservoirs in the basin, imports to and exports from the basin are also taken into account while arriving at water balance.

5.3 Water Balance Studies at Inchampalli and Polavaram

Inchampalli and Polavaram are the two dam sites on the main Godavari river where surplus water of Godavari is proposed to be transferred to Krishna and further to other deficit basins in the Peninsular India through inter-basin transfer link canals as proposed in the National Perspective Plan. As such, separate water balance studies have been carried out at these two diversion points. For the purpose of assessing water balance at Inchampalli/Polavaram, only the catchment areas of the Godavari basin between Sriramsagar project (SRSP) and Inchampalli/Polavaram have been considered for the reasons explained below:

The water balance studies in respect of different sub-basins of the Godavari basin indicate that upstream sub-basins of the existing Sriramsagar project are deficit in water resources whereas the lower reaches of Sriramsagar project are surplus.

Transfer of this surplus water available in the lower reaches of the Godavari to the water short areas in its upper reaches may not be economically viable.

5.4 Water Balance at Inchampalli

Water balance at Inchampalli has been assessed by considering the Godavari basin between Sriramsagar project (SRSP) and Inchampalli, as described below:

5.4.1 Computation of Yield

The catchment area of the Godavari between SRSP and Inchampalli dam sites is 177249 km². This catchment includes part catchment of the Middle Godavari sub-basin below SRSP, Maner, Penganga, Wardha, Pranhita, Indravati sub-basins and a small portion of Lower Godavari sub-basin up to Inchampalli.

The annual yield series of the above sub-basins has been developed for the period from 1951-52 to 1981-82 by adding the year-wise monsoon and non-monsoon yields.

The gross annual yield series for the period from 1951-52 to 1981-82 of each of the sub-basins arrived at as above are added to arrive at the gross annual yield series of the Godavari basin between SRSP and Inchampalli. From this, the 75% and 50% dependable yields have been worked out to be 66193 Mm³ and 76185 Mm³ respectively.

5.4.2 Import/Export

A quantum of 1692 Mm³ of water is being imported to the Maner sub-basin and 1206 Mm³ to the lower reaches of the Middle Godavari sub-basin from its upper reaches through the existing SRSP Stage-I. A quantity of 652 Mm³ is proposed to be diverted from the Sabari sub-basin to the Indravati sub-basin through the Upper Kolab project. There are proposals for importing 234 Mm³ of water to the Pranhita sub-basin and 338 Mm³ of water to the lower reaches of the Middle Godavari sub-basin from the SRSP Stage-II, and 418 Mm³ to the lower reaches of the Middle Godavari through the stabilisation of Kaddam project of SRSP Stage-II. Hence, the total import into the basin works out to 4540 Mm³.

At present there is no export of water from any project to outside the basin. However, it has been proposed to export 3136 Mm³ of water from the Indravati sub-basin to Tel sub-basin of Mahanadi basin through Indravati project and 655 Mm³ of water from Penganga sub-basin to Upper Godavari sub-basin through Upper Penganga project. Thus, the total export considered is 3791 Mm³. In addition to this, there is a natural export of 1499 Mm³ from Indravati sub-basin to Sabari sub-basin through Jauranala.

5.4.3 Water Requirements

5.4.3.1 Domestic Needs

The total domestic water requirement has been assessed as 2718 Mm³, out of which 1753 Mm³ will be met from surface water resources.

5.4.3.2 Irrigation Needs

The annual irrigation, from all the existing, ongoing and proposed projects including that from imported waters is given in Table 5.1

Table 5.1
Ultimate annual irrigation and annual utilisation up to Inchampalli
(below SRSP)

State	Annual Irrigation (ha)				Cultur-able Area (ha)	% of Cultu-r-able Area	Annual Utilisation Mm ³
	Existing Projects	Ongoin g Projects	Propose d Projects	Total			
Mahara-shtra	389960	854809	1717577	2962346	4704574	62.97	19843
Madhya Pradesh	135806	342992	1059709	1538507	2392094	64.32	10981
Andhra Pradesh	599986	37222	298956	936164	1860011	50.33	8140
Orissa	6704	86048	134743	227495	286119	79.51	1759
Total	1132456	1321071	3210985	5664512	9242798	61.29	40723

5.4.3.3 Industrial Needs

The industrial needs are assumed to be of the same order as that of domestic water requirement i.e., 2718 Mm³. This is proposed to be fully met from the surface water resources.

5.4.3.4 Hydropower Needs

The total evaporation losses of all hydel projects are worked out to be 3387 Mm³.

5.4.3.5 Water Requirement of the Inchampalli Project

The irrigation requirement and evaporation losses under this project are worked out to be 1184 Mm³ and 1642 Mm³ respectively. Thus the total consumptive surface water requirement from the Inchampalli project works out to be 2826 Mm³.

5.4.4 Regeneration

The regeneration has been worked out to be 1402 Mm³, 2174 Mm³ and 2715 Mm³ from the domestic, industrial and irrigation uses respectively.

5.4.5 Water Balance

The details of the surface water balance at 75% dependability, thus arrived at as described above, for the catchment between SRSP and Inchampalli are presented in Table 5.2.

Table 5.2
Surface water balance at Inchampalli dam site (below SRSP)

Unit: Mm³

Surface water availability at 75% dependability		
a) Gross annual yield		66193
b) Surface water import		4540
c) Surface water export (-)		5290
Regeneration from (+)		
a) Domestic use	1402	
b) Industrial use	2174	
c) Irrigation use	2715	
Sub-total	6291	6291
Overall availability		71734
Surface water requirement for (-)		
a) Irrigation use	40723	
b) Domestic use	1753	
c) Industrial use	2718	
d) Hydropower (evaporation losses)	3387	
e) Consumptive use from Inchampalli	2826	
Sub-total	51407	51407
Surface water balance		20327

5.5 Water Balance at Polavaram

5.5.1 Computation of Yield

Water balance at Polavaram has been assessed by considering the Godavari basin between SRSP and Polavaram as described below.

The catchment area of the Godavari basin between SRSP and Polavaram dam site is 215249 km². This catchment includes Middle Godavari sub-basin below SRSP, Maner, Penganga, Wardha, Pranhita, Indravati, Sabari sub-basins and a portion of Lower Godavari sub-basin up to Polavaram.

The annual yield series of the above sub-basins has been developed for the period from 1951-52 to 1981-82 by adding the year-wise monsoon and non-monsoon yields.

The gross annual yield series for the period from 1951-52 to 1980-81 of each of the sub-basins arrived at as above are added to arrive at the gross annual yield series of the Godavari basin between SRSP and Polavaram. From this, the 75% and 50% dependable yields have been worked out to be 80170 Mm³ and 96549 Mm³ respectively.

5.5.2 Import/Export

There is an existing import of water to the tune of 2898 Mm³ from the SRSP Stage-I. There is a proposal to import 990 Mm³ of water from SRSP Stage-II. Thus, the total import into the basin works out to 3888 Mm³.

There is an existing export of 3951 Mm³ of water from Dowlaiswaram barrage in Lower Godavari sub-basin to Yeleru project and Kolleru lake. There is also a proposal to export 234 Mm³ of water from Dowlaiswaram barrage to Yeleru sub-

basin through the extension of Samalkot canal. Total export from Dowlaiswaram barrage thus works out to 4185 Mm³. There is a proposal to divert 3136 Mm³ of water from Indravati sub-basin to Tel sub-basin of Mahanadi basin and 655 Mm³ of water from Penganga sub-basin to Upper Godavari sub-basin.

In addition to these diversions, the Polavaram project as proposed by the State of Andhra Pradesh includes the export of water for irrigation outside Godavari basin in the sub-basin of east flowing rivers north of Godavari through the left main canal and in the Kolleru Lake catchment through the right main canal. The irrigation water demands under these canals as worked out by the State of Andhra Pradesh have been revised by NWDA by adopting climatological approach. The revised calculations indicate that the water demands under the left and right main canals for transfer outside Godavari basin are 2413 Mm³. The Polavaram project caters to the water supply requirement of 664 Mm³ for Vishakapatnam which is located outside the basin and hence considered as export. Also the transfer of 2265 Mm³ (80 TMC) to Krishna as proposed under Polavaram project is also considered as export. The total quantity of export thus works out to 13318 Mm³.

5.5.3 Requirements

5.5.3.1 Domestic Needs

The total domestic water requirement has been assessed as 3002 Mm³, out of which 1890 Mm³ will be met from surface water resources.

5.5.3.2 Irrigation Needs

The annual irrigation under all the existing, ongoing and proposed projects in the Godavari basin between SRSP and Polavaram is as given in Table 5.3.

Table 5.3
Ultimate annual irrigation and annual utilisation up to Polavaram (below SRSP)

State	Annual irrigation in ha				Culturable Area in ha	% of culturable area	Annual Utilisation Mm ³
	Existing Projects	Ongoing Projects	Proposed Projects	Total			
Mahara-Shtra	389960	854809	1717577	2962346	4704574	62.97	19843
Madhya Pradesh	144054	352226	1278916	1775196	2765470	64.19	12700
Andhra Pradesh	718677	69361	609061	1397099	2317151	60.29	10949
Orissa	9489	239492	286391	535372	694293	77.11	4049
Total	1262180	1515888	3891945	6670013	10481488	63.64	47541

5.5.3.3 Industrial Needs

The industrial water requirement is assumed to be in the order of total domestic water requirement i.e., 3002 Mm³.

5.5.3.4 Hydropower Needs

The total evaporation loss from all the existing, ongoing and proposed hydropower projects is worked out to be 6380 Mm³.

5.5.3.5 Water Requirement of Godavari Delta System and Polavaram Project within Godavari Basin

The surface water requirements for Godavari delta system and the irrigation requirement under Polavaram project within Godavari basin also will have to be met from the releases from Polavaram dam. These requirements are as under:

1)	Delta system irrigation requirement	3590 Mm ³
2)	Irrigation requirement under Polavaram Project within Godavari basin	870 Mm ³
3)	Domestic water requirement	79 Mm ³
4)	Industrial water requirement	102 Mm ³
	Total	4641 Mm³

The contribution from the intermediate catchment between Polavaram dam site and Dowlaiswaram barrage estimated at 75% dependability is 833 Mm³ (on pro-rata basis). Thus, the net requirement to be met from the releases from Polavaram works out to be 3808 Mm³.

5.5.4 Regeneration

The regeneration quantities computed are 1512 Mm³, 2402 Mm³ and 3138 Mm³ from domestic, industrial and irrigation uses respectively.

5.5.5 Water Balance

The details of the surface water balance at 75% dependability, as discussed above, for the catchment between SRSP and Polavaram are presented in the Table 5.4.

Table 5.4
Surface water balance at Polavaram dam site (below SRSP)

Unit: Mm³

Surface water availability at 75% dependability		
a)	Gross annual yield	80170
b)	Surface water import	3888
c)	Surface water export (-)	13318
Regeneration from (+)		
a)	Domestic use	1512
b)	Industrial use	2402
c)	Irrigation use	3138
	Sub-total	7052
	Overall availability	77792
Surface water requirement for (-)		
a)	Irrigation use	47541
b)	Domestic use	1890
c)	Industrial use	3002
d)	Hydropower (evaporation losses)	6380
e)	Consumptive use from Polavaram	3808

Sub-total	62621	62621
Surface water balance		(+) 15171

5.6 Water Transfer from Polavaram Project to Krishna Basin

6500 Mm³ of water is proposed to be delivered at Dowlaiswaram barrage on Godavari river by the Mahanadi - Godavari link canal. Due to this the water saved at Polavaram project can be transferred through the Polavaram - Vijayawada link canal to the Krishna river.

The quantity of water available at Polavaram for transfer to Krishna through the link canal has been assessed by NWDA by adopting two approaches. In the first approach, the yield of the Godavari river at Polavaram available at 75% dependability has been considered and the overall surplus at 75% dependability has been worked out. For this purpose, the catchment area of the basin below the proposed Inchampalli project up to Polavaram only has been taken into consideration, since all the surplus water available at Inchampalli is proposed to be diverted to Krishna through Inchampalli - Nagarjunasagar and Inchampalli - Pulichintala link canals. As such the water that could be intercepted at Polavaram consists of only the flows from the Sabari sub-basin and the part catchment of Lower Godavari sub-basin between Inchampalli and Polavaram.

In the second approach, detailed reservoir simulation studies were carried out for Bhopalpatnam Hydroelectric Project on Indravati river, Inchampalli and Polavaram projects on main Godavari. In this approach, the spills at Inchampalli project are assumed to be available at Polavaram project for use.

The details of the two studies are given in the following paragraphs.

5.6.1 First Study - Overall Surplus at Polavaram at 75% Dependability

In this study, the catchment of Godavari below Inchampalli only is assumed to contribute to the flows at Polavaram. The yield series of the Godavari basin from Inchampalli to Polavaram is obtained by adding the gross annual yields of Sabari sub-basin and that part of the Lower Godavari sub-basin between Inchampalli and Polavaram (on proportionate catchment area basis) for the period from 1951-52 to 1980-81. From this series, the 75% and 50% dependable yields have been worked out to be 14879 Mm³ and 18984 Mm³ respectively.

The natural flow of water from Indravati to Sabari through Jauranala which is worked out to be 1499 Mm³ at 75% dependability is treated as import to this basin area. 652 Mm³ of water from Sabari sub-basin to Indravati sub-basin through Upper Kolab project is considered as export from this basin area.

The irrigation requirements of the Lower Godavari sub-basin between Inchampalli and Polavaram have been worked out by considering the existing, ongoing and proposed major, medium and minor projects in this catchment. The domestic and industrial water requirements in this catchment are taken on pro-rata basis.

The water requirements in Sabari sub-basin have been taken from the water balance study of the sub-basin. The details are given in Table 5.5.

Table 5.5
Surface water requirement between Inchampalli and Polavaram projects

Unit: Mm³

Uses	Lower Godavari sub- basin between Inchampalli and Polavaram	Sabari sub-basin	Total
Irrigation	1967	3667	5634
Domestic	66	70	136
Hydropower	--	362	362
Industrial	140	143	283
Total	2173	4242	6415

The regeneration quantity from the above uses is worked out to be 702 Mm³ and the break-up is given in Table 5.6.

Table 5.6
Regeneration between Inchampalli and Polavaram Projects

Unit: Mm³

Uses	Lower Godavari sub- basin between Inchampalli and Polavaram	Sabari sub-basin	Total
Irrigation	151	215	316
Domestic	53	56	109
Industrial	112	115	227
Total	316	386	702

Apart from the requirements between Inchampalli and Polavaram (as indicated in the preceding paragraphs) requirements in the downstream to be met from Polavaram project are also to be taken into account. These requirements are outlined below:

- (i) Irrigation demand under Polavaram project outside Godavari basin is 2413 Mm³.
- (ii) Water supply to Vishakapatnam through Left Main Canal of Polavaram project is 664 Mm³.
- (iii) Net release required from Polavaram project for delta requirements and direct irrigation requirement under Polavaram project within Godavari basin after taking into account the yield from the intermediate catchment between Polavaram and Dowlaiswaram is 3808 Mm³.

(iv) Polavaram reservoir evaporation losses of 989 Mm³.

The total downstream requirements to be met from Polavaram project works out to 7874 Mm³.

The regeneration from the above uses is not accounted for, since the utilisation is on the downstream of the Polavaram project.

Water Balance at Polavaram

The details of the surface water balance at 75% dependability, as discussed above, for the catchment between Inchampalli and Polavaram (excluding diversion through Polavaram - Vijayawada link canal) are presented in Table 5.7.

Table 5.7
Surface water balance at Polavaram
(between Inchampalli and Polavaram)

		<i>Unit: Mm³</i>
Surface water availability at 75% dependability		14879
Natural import through Jauranala (+)		1499
Export from Sabari to Indravati through Upper Kolab(-)		652
Export from Dowlaiswaram to Yelleru (-)		4185
Requirements between Inchampalli and Polavaram (-)		
a) Irrigation	5634	
b) Domestic	136	
c) Industrial	283	
d) Hydropower	362	
Sub-total	6415	6415
Regeneration (+)		702
Requirement from Polavaram dam (-)		7874
Committed Diversion to Krishna (-)		2265
Water to be received from Mahanadi (+)		6500
Net surplus available for diversion through the Polavaram - Vijayawada Link canal		2189

Thus, the additional quantity of water available at Polavaram, further diversion is computed to be 2189 Mm³.

5.6.2 Second Study - Simulation of Reservoirs

The first study indicated that a quantum of 2189 Mm³ of additional water would be available at Polavaram for diversion to the Krishna, apart from the quantum of 2265 Mm³ (80 TMC) proposed by the State of Andhra Pradesh and the irrigation requirement of 1402 Mm³ for the direct command of the link canal.

However, by the simulation studies, it is found that an additional quantity of 1658 Mm³ could be transferred through the Polavaram - Vijayawada link canal in addition to the committed diversion of 2265 Mm³ as per the GWDT award. The above quantity comprises of:

- (i) Irrigation requirements of 1236 Mm³;
- (ii) Domestic and industrial requirements in the direct command area of the link canal to the extent of 162 Mm³;
- (iii) Transmission losses as estimated to be 260 Mm³ considering 0.6 cumec per million sq.m. of wetted area of the canal.

The simulation at Polavaram has been carried out by considering the releases for power generation and spills from the upstream projects viz., Bhopalpatnam and Inchampalli with two initial reservoir conditions viz., i) Reservoir at half FRL and ii) Reservoir at MDDL. Prior to this, simulation studies have been carried out at Bhopalpatnam and Inchampalli projects for both reservoir conditions for finding out the releases and spills which would be available at Polavaram as inflows.

The Bhopalpatnam hydroelectric project was proposed by the Government of Madhya Pradesh on Indravati river just before its confluence with Godavari river. This project is planned for producing 235 MW of firm power. The gross annual yields at Bhopalpatnam for the period from 1951-52 to 1980-81 have been estimated on pro-rata basis considering the catchment areas of the entire Indravati sub-basin and that up to Bhopalpatnam. Net annual inflows into Bhopalpatnam reservoir have been worked out by deducting the net surface water requirements of the Indravati sub-basin up to Bhopalpatnam from the gross annual yields available at Bhopalpatnam.

The 10-daily inflows at Bhopalpatnam are worked out from the net annual inflows by using the 10-daily runoff data of Pathagudem G & D site (maintained by CWC) situated on Indravati downstream of the project.

Inchampalli reservoir was proposed by the Government of Andhra Pradesh on river Godavari just downstream of the confluence of Indravati river with Godavari. The requirements between SRSP and Inchampalli consist of the requirements of Middle Godavari sub-basin below SRSP, Maner, Penganga, Wardha, Pranhita, Indravati sub-basins below Bhopalpatnam and Lower Godavari sub-basin up to Inchampalli dam site. The gross annual yield series for the years from 1951-52 to 1980-81 at Inchampalli has been worked out by adding the annual yields of the above mentioned catchment areas. The surplus annual yield series has been worked out by deducting the requirements from the gross yields. To these surplus yields, releases for power generation and spills from Bhopalpatnam project are added to arrive at the inflows at Inchampalli.

The net annual yields at Inchampalli are divided into monthly flows based on the flow data at Perur G & D site (maintained by CWC) which is located just downstream of Inchampalli dam site.

For the purpose of carrying out the simulation at Polavaram reservoir, the total demands considered have been worked out to be 8233 Mm³ as discussed in the following sections of this chapter

The simulation at Polavaram reservoir has been carried out for the period from 1951-52 to 1980-81 considering the area-capacity of the reservoir after 50 years of sedimentation.

The net annual yields at Polavaram are computed by deducting the net requirements of entire Sabari sub-basin and part catchment of Lower Godavari sub-basin between Inchampalli and Polavaram, from the gross annual yields of the corresponding catchment and spills from the Inchampalli reservoir (with initial storage at half full or at MDDL as the case may be). The net annual yields arrived at Polavaram are divided into monthly inflows considering the data of Konta G & D site (maintained by CWC).

Considering the demands and the inflows as mentioned above, simulation has been carried out.

Simulation results

From the yearly working tables for both the initial conditions i.e., reservoir storage at MDDL and the reservoir storage at half full, it is seen that the success rate of meeting the domestic & industrial as well as irrigation requirements works out to be more than 75%. For computing the success rate, the year in which deficit is less than 10% of the demand is considered as year of success. Various demands that are successfully met are given in Table 5.8.

Table 5.8
Various demands met from the Polavaram project

		<i>Unit: Mm³</i>
S.NO.	Purpose	Quantity (Mm³)
1.	Water supply to Visakhapatnam	664
2.	Polavaram Left Main Canal	1881
3.	Godavari delta	623
4.	Polavaram Right Main Canal	1402
5.	Krishna delta	2265
6.	Additional diversion through P-V link	1236
7.	Domestic and industrial requirement	162
	Total	8233

5.7 Additional Quantity of Water that can be Diverted Through the Link Canal

The hydrological analysis carried out by NWDA indicate that an additional quantity of 1398 Mm³ (1236 + 162) can be diverted through the Polavaram - Vijayawada link canal besides the quantity required for other purposes (mentioned in the above table) as envisaged in the Polavaram project report prepared by the State of Andhra Pradesh.