Chapter 13
Benefit Cost Ratio

13.1 Benefits

The water transferred by the Pennar (Somasila) – Palar – Cauvery (Grand Anicut) link canal is utilized for enroute irrigation, industrial and domestic use and transfer of water to Cauvery River. An attempt is made to work out the benefit-cost (B.C.) ratio on the basis of the annual benefits from enroute irrigation and water supply for domestic and industrial uses and the annual cost of the link project.

13.1.1 Direct benefits

Probable values of produce in post and pre-irrigation scenarios in the proposed command area have been separately worked out to estimate the direct benefits from irrigation. These details help in visualizing the likely improvement in the crop – wise yield in the post irrigation scenario. Gross values of the benefits for the post – project and pre – project conditions are computed adopting the yields and prices of the commodities obtained from the Agricultural Department of the Government of Tamil Nadu. The yield and prices of commodities pertaining to Andhra Pradesh state has not been taken into consideration since about 90% of the command area lies in Tamil Nadu state.

An area of 491200 ha has been identified for providing irrigation to enroute areas along the link canal. The net annual benefit after introduction of irrigation in enroute areas along the link canal is estimated to be Rs 87071 lakh. The water requirements in the command area for domestic and industrial uses are estimated as 605 Mm^3 and 500 Mm^3 respectively. The annual net revenue from the water supplies for domestic and industrial uses adopting the rates in vogue in Chennai city of Tamil Nadu state is estimated as Rs. 77128 lakh.

13.1.2 Indirect benefits

Apart from the direct benefits, many indirect benefits would also accrue from the link project leading to tremendous development in all the socio – economic aspects of the enroute region. These indirect benefits could

be visualized or quantified in broad perspective only. Some of these likely indirect benefits are listed below.

(1) Assured irrigation in the enroute region, which is hitherto devoid of any significant irrigation facilities, will create direct employment opportunities for the agricultural labour and for other professionals in this sector and several job opportunities would become available for the local people during the construction of the project.

(2) With the implementation of the scheme, living standards of the local farmers, in general, would improve because of better yield from their fields and hence higher returns for their work.

(3) Once the irrigation facilities are developed, agro – based industries, dairy farms, poultry farms, marketing facilities for the agricultural inputs like pesticides and fertilizers etc are likely come up in the region, leading to general prosperity and economic upliftment of the people of the towns and villages in the enroute area.

(4) The ground water availability in the command area would get enhanced on account of increased recharge to the ground water as a part of the water supplied for irrigation gets percolated into ground.

(5) Better communication facilities would become available resulting in better connectivity among the villages.

(6) Infrastructural facilities would improve due to increased industrial and marketing activity in the enroute region.

(7) Plantation along the canal banks and the proposed afforestation of the surrounding areas would enhance environmental status of the region.

(8) Rehabilitated people are likely to have better living conditions in planned colonies provided with all the basic amenities.

13.2 Cost

The cost of this link project is estimated under two main components viz. Unit I- Head works, Unit II – Conveyance system. The details are given in Chapter on “Cost Estimate”. The total cost of the project is estimated

to be Rs. 6769 crore at the 2003-04 year price level. For the purpose of working out the B.C. ratio, the annual cost is worked without considering the apportioned cost of the water brought by the upper links.

The annual cost is estimated considering 10% interest and 1% depreciation on the capital cost, adding annual O & M charges for the project taken @ Rs.150/ha, maintenance of head works @1% of head works. The annual cost is worked out to be Rs 41744 lakh.

13.3 Benefit – Cost Ratio

The benefit-cost ratio is worked out as follows.

I	**Capital cost**	Amount (Rs. in lakh)
	Estimated cost of the project	676889
	Apportioned cost of the project	372230
II	**Annual benefits**	
A	**Irrigation**	
a)	Post project	
i)	Gross value of produce	215023
ii)	Expenditure	120064
iii)	Net value of produce	94959
b)	Pre-project	
i)	Gross value of produce	19402
ii)	Expenditure	13454
iii)	Net value of produce	(-) 5948
c)	Loss in agricultural production in land going out of cultivation due to distributory system @ 10% of gross value of produce before irrigation	(-) 1940
	Net benefit from agriculture (a-b-c)	87071
B.	**Water supply**	
a)	Revenue from domestic water supply 605 Mm^3@ Rs.24.55 lakh/Mm^3	14853
b)	Revenue from industrial water supply 500Mm^3@ Rs.124.55 lakh /Mm^3	62275
	Net benefit from domestic and industrial water supply (a+b)	77128
	Total benefit (87071 + 77128)	164199
III	**Annual cost**	
a)	Interest @ 10% of capital cost	37223

b)	Depreciation @ 1% of capital cost	3722	
c)	Annual O&M charges @ Rs.150.00/ha for 491200 ha	777	
d)	Maintenance of head works @ 1% of cost of head works	22	
	Total		41744
IV	Benefit – Cost ratio = 164199/41744		3.93

The B.C ratio is worked out considering the likely enroute benefits and cost of this link project only, which is not an independent link project by itself. This B.C. ratio is helpful to have an idea about the worth of the benefits from this particular link in comparison to the annual cost likely to be incurred on the same.

The proposed Pennar (Somasila) - Palar – Cauvery (Grand Anicut) link canal forms the part of the peninsular linking system viz. Mahanadi, - Godavari – Krishna – Pennar – Cauvery – Vaigai- Gundar, which is intended to divert the surplus flows of Mahanadi and Godavari rivers to the water-deficit Krishna, Pennar, Cauvery, Vaigai and other minor southern river basins. Thus, the Pennar (Somasila) - Palar – Cauvery (Grand Anicut) link is dependent on the surplus of waters to be brought from Mahanadi and Godavari to the Krishna and Pennar rivers. Hence, some additional cost on the count will have to be added to the estimated cost of Pennar (Somasila) - Palar – Cauvery (Grand Anicut) link and some part of apportioned cost is to be deducted for Cauvery – Vaigai – Gundar link project. With the addition/deduction of such apportioned cost of the Pennar (Somasila) - Palar – Cauvery (Grand Anicut) link, the benefit cost ratio of 3.93 as worked out above independently for the link is likely to undergo a change.

It would be more realistic and appropriate to work out the benefit cost ratio for the Peninsular Rivers linking systems as a whole to determine the economic viability of the system in its totality. This will be done at DPR stage.

13.4 Internal Rate of Return

The internal rate of return worked out considering the annual benefits and apportioned cost of enroute water consumption is given in Table 13.1.

Table 13.1

Life of project	100 years
Construction period	10 years
Apportioned Cost of the project	Rs. 372230 lakh
Annual benefits	Rs. 164199 lakh
Maintenance cost @ 1% of I-Works (Apportioned)	Rs.3285 lakh

Year(s)	Cost	Benefit	Net Benefit	Discounting Factor		Present worth of net benefits	
	Rs. lakh	Rs. lakh	Rs. lakh	18%	20%	18%	20%
0	12010	0	-12010	1.000	1.000	-12010	-12010
1	45987	0	-45987	0.847	0.833	-38972	-38323
2	41045	0	-41045	0.718	0.694	-29478	-28503
3	40048	0	-40048	0.609	0.579	-24374	-23176
4	38887	0	-38887	0.516	0.482	-20057	-18753
5	38476	0	-38476	0.437	0.402	-16818	-15463
6	39357	0	-39357	0.370	0.335	-14579	-13181
7	39357	0	-39357	0.314	0.279	-12355	-10984
8	39488	0	-39488	0.266	0.233	-10505	-9184
9	37575	65680	28105	0.225	0.194	6336	5447
10	3285	98519	95234	0.191	0.162	18196	15381
11	3285	164199	160914	0.162	0.135	26055	21657
Continued up to 109th Year			160914	1.253	0.969	201550	155931
109	3285	164199	160914				
Total						22401	-13645

Internal Rate of Return = 18 + {2 x 22401 / (22401-(-13645))}
= 19.24 %