

CHAPTER 8

PROJECT APPRAISAL

8.0 INTRODUCTION

Project appraisal both in financial and economic terms means different to different agencies. On the one hand financial appraisal of the project (investment) is in the interest of the funding agencies, which are looking for the project purely on investment point of the view. In other words, under financial analysis the project viability would work out the net earnings that are likely to accrue to the implementing organization. Towards this end, all costs to be incurred and all benefits likely to accrue are computed on a year-to-year basis over the entire project period (considered 20 years in the current study) using “Discounted Cash Flow (DCF) technique” to arrive at the Financial Internal Rate of Return.

Under Economic appraisal, criterion is entirely different. Hereunder, the costs and benefits accruing to the economy are assessed using with and without the project scenario to arrive at the Economic Internal Rate of Return (EIRR). In this Chapter only Phase I project appraisal is considered.

For introducing regular IWT services within the state Khawthlangtuipui river requires nearly Rs. 6.4 crore investment towards Dredging Works, Vessel cost, Navigational Aids cost, EIM cost and to construct terminal facilities. Item wise summary is given in **Table 8.1**:

Table 8.1

Capital Cost For Development Of Waterways In Khawthlangtuipui River					
S.No.	Description	Quantity	Unit	Rate (Rs.)	Capital cost Amount (Rs)
1	Capital Dredging (Stone)	0	m ³	6000	0
2	Capital Dredging (Soil/Sand)	2362.0	m ³	400	9,44,800
3	Construction of Terminal at Demagiri and Thegaduvar				5,81,11,776
5	Cost for Environmental Impact Management				14,30,000
6	Vessel Cost	3	Nos	7,00,000	21,00,000
7	Navigational Aids	52	Nos	25,000	13,00,000
	Total Cost				6,38,86,576

In the given circumstances, investment to revive appropriate IWT services within the State does not justify any financial or economic appraisal, keeping in view the short stretches under study.

Moreover, other benefits likely to accrue because of proper maintenance of the river stretches remain un-accounted in the current study, overall returns cannot be assessed.

8.1 FINANCIAL APPRAISAL

Financial appraisal which provides necessary guidelines from investor point of view has been carried out with the limited scope, that covers the capital investment towards development of Waterway facilities within Mizoram state and providing IWT terminal to facilitate traffic handling. It has been worked out using normative costs and benefits. All the costs and benefits are estimated using base year (2017-18) prices of various items or services. Broad details of the distribution of estimated capital costs of River Khawthlangtuipui are given in Table below:

Table 8.2 Year Wise Expenditure Of The Capital Cost

Cost/Year	2017-18	2018-19	2019-20
Capital Dredging	94,480	4,72,400	3,77,920
Construction of Terminal at Demagiri and Thegaduvar	62,94,178	3,07,55,888	2,10,61,710
Cost for Environmental Impact Management		7,15,000	7,15,000
Vessel Cost			21,00,000
Navigational Aids			13,00,000
Total	63,88,658	3,19,43,288	2,55,54,630

Capital investment on development in different years and other related norms used to arrive at to carry out project analysis are given as under:

Table 8.3

Distribution of Capital Cost	
2017-18	10%
2018-19	50%
2019-20	40%

In the current exercise since our investment is limited to development waterways and terminal within Mizoram, revenue have accordingly been assessed. Keeping in view the time involved for getting necessary permissions and construction period, three year period have been considered and the proposed IWT services are expected to commence from 2020-21 onwards. In this exercise to maintain waterways, annually about one per cent of the capital investment (covering waterways and terminals) has been considered. On revenue side, to meet waterway maintenance and terminal operations a collection of Rs. one hundred fifty per ton have been considered for vessel charge and storage charge as 50 rupees per ton.

Table 8.4

O&M of Cap.	1.0%
Average vessel charge	100 per tonn
Average storage charge	50 per tonn

With the suggested 2 Tonn vessel deployment in the river Khawthlangtuipui, on the given investment of Rs. 6.4 crores overall Financial Internal Rate of Return (FIRR) over a assumed period of twenty year worked out to 11.23%. Year wise detailed analysis is shown in table below:

Table 8.5 Project Appraisal (Financial) With 2 Tonne Vessel
(Rs. In Cr.)

S.No.	Year	Expenditure			Revenue			Net Earnings
		Capital	O&M	Total	Terminal & Waterways	Others	Total	
1	2017	0.63		0.63			0	-0.63
2	2018	3.19		3.19			0	-3.19
3	2019	2.55		2.55			0	-2.55
4	2020		0.064	0.064	0.37	0.18	0.55	0.486
5	2021		0.064	0.064	0.6	0.2	0.8	0.736
6	2022		0.064	0.064	0.62	0.21	0.83	0.766
7	2023		0.064	0.064	0.64	0.22	0.86	0.796
8	2024		0.064	0.064	0.66	0.23	0.89	0.826
9	2025		0.064	0.064	0.68	0.24	0.92	0.856
10	2026		0.064	0.064	0.75	0.25	1	0.936
11	2027		0.064	0.064	0.784	0.26	1.044	0.98
12	2028		0.064	0.064	0.818	0.27	1.088	1.024
13	2029		0.064	0.064	0.852	0.29	1.142	1.078
14	2030		0.064	0.064	0.886	0.3	1.186	1.122
15	2031		0.064	0.064	1	0.33	1.33	1.266
16	2032		0.064	0.064	1.044	0.35	1.394	1.33
17	2033		0.064	0.064	1.088	0.37	1.458	1.394
18	2034		0.064	0.064	1.132	0.39	1.522	1.458
19	2035		0.064	0.064	1.176	0.41	1.586	1.522
20	2036		0.064	0.064				1.716
							FIRR:	11.23%

8.2 ECONOMIC APPRAISAL

The economic analysis of a project is carried out by determining the economic cost involved in the project and economic benefits being accrued with the development of project. The economic cost benefits associated with a project ultimately lead to EIRR computation. For the present IWT project, economic cost and benefits have been illustrated in the following paragraphs.

Economic Cost

For EIRR computation, economic cost has been taken as two-third of the total cost of the project; one – third being the taxes and duties which represent transfer payments. The total cost for any infrastructure project consists of capital cost during the construction period and operational & maintenance costs over the project life. Based on the current practices being followed during major EPC contract, it is assumed that the project would be completed over a construction period of 3 years.

On the basis of cost estimates carried out for the entire waterway in Chapter-7, the total cost consisting of Capital cost and O & M cost and finally economic cost have been worked out.

Table 8.6 Economic cost of the project with 2 Ton vessel

(Rs. In Cr.)

Economical Cost of the Project					
S.No.	Year	Expenditure			Economical Cost (In Cr)
		Capital	O&M	Total	
1	2017	0.63		0.63	0.42
2	2018	3.19		3.19	2.13
3	2019	2.55		2.55	1.70
4	2020		0.064	0.064	0.04
5	2021		0.064	0.064	0.04
6	2022		0.064	0.064	0.04
7	2023		0.064	0.064	0.04
8	2024		0.064	0.064	0.04
9	2025		0.064	0.064	0.04
10	2026		0.064	0.064	0.04
11	2027		0.064	0.064	0.04
12	2028		0.064	0.064	0.04
13	2029		0.064	0.064	0.04
14	2030		0.064	0.064	0.04

15	2031		0.064	0.064	0.04
16	2032		0.064	0.064	0.04
17	2033		0.064	0.064	0.04
18	2034		0.064	0.064	0.04
19	2035		0.064	0.064	0.04
20	2036		0.064	0.064	0.04

Economic Benefit

The economic benefits that will accrue with the development of present waterway have been classified into following categories:

- Fuel Saving
- Carbon credit earned
- Employment Benefits
- Other Benefits such as accident , noise etc

Fuel saving due to IWT transportation of coal

IWT, being a fuel efficient mode of transportation, would generate enormous fuel saving compared to the alternative mode of road. A report done by NCAER, *Evaluation of Inland Vessel Building Subsidy Scheme*, has estimated fuel savings in the IWT mode. For the present waterway, NCAER report has been followed for fuel efficiency of IWT vis-à-vis road. For calculation of fuel savings, we have considered round trip with fully loaded cargo from the originating terminal while the return cargo is assumed to be empty. For IWT, the fuel efficiency is calculated for a 1000 t barge and barge operation taking place with infrastructural facilities of night navigation and mechanical operation. This gives fuel efficiency of 116 Tkm/litre in NW 1 and 88 Tkm/litre in NW 3 for fully loaded cargo. In the return journey, the empty barges consumes 20% less of fuel in the fully loaded operation and hence for the round trip the fuel efficiency is 97 Tkm/litre in NW1 and 73 Tkm/litre in NW 3 respectively. In the alternative scenario of roadways, a 15 t truck goes for 3 km when fully loaded and in return trip with empty truck the mileage works out to be 4 km. The fuel efficiency in case of road is given in Table Below. The fuel efficiency considered for canal portion is an average of the NW1 and NW3 IWT movements.

Table 8.7

	Fully loaded single trip Tkm/litre	Round trip Tkm/litre	Fuel Saving Litre/Tkm
Road	45	26	
IWT	104	85	0.027

The following assumptions have been considered for calculation of fuel savings.

Table 8.8

Crude oil	54.8 \$
Real price per litre in Rs	56
Market price per litre in Rs	58
Economic price per litre in Rs(2/3 of real price)	37

The economic benefits on this account for this project have been calculated for next 20 years in terms of Rs. Cr in tables referenced as given below.

Table 8.9 Fuel saving in terms of Rs in Cr

Fuel Saving with the Project					
S.No.	Year	Traffic Movement in Million tonne-Km	Fuel Saving in Million Litre	Fuel Saving in Million Rs	Fuel Saving in Cr Rs
1	2017	0.0000	0.00	0.00	0.00
2	2018	0.0000	0.00	0.00	0.00
3	2019	0.0000	0.00	0.00	0.00
4	2020	0.0000	0.00	0.00	0.00
5	2021	0.4000	0.01	0.40	0.04
6	2022	0.4211	0.01	0.42	0.04
7	2023	0.4423	0.01	0.44	0.04
8	2024	0.4634	0.01	0.46	0.05
9	2025	0.4846	0.01	0.48	0.05
10	2026	0.5057	0.01	0.51	0.05
11	2027	0.5386	0.01	0.54	0.05
12	2028	0.5716	0.02	0.57	0.06
13	2029	0.6045	0.02	0.60	0.06
14	2030	0.6375	0.02	0.64	0.06
15	2031	0.6704	0.02	0.67	0.07
16	2032	0.7158	0.02	0.72	0.07
17	2033	0.7611	0.02	0.76	0.08
18	2034	0.8065	0.02	0.81	0.08
19	2035	0.8518	0.02	0.85	0.09
20	2036	0.8972	0.02	0.90	0.09

Carbon credit earned due to saving on fuel consumption in IWT movement compared to the road

Saving of fuel consumption have a commensurate saving of CO2 emission. This CO2 equivalence savings on fuel consumption when quantified using market instruments is referred to as carbon credit earned. The following parameters have been considered for calculation of carbon credit earned.

Table 8.10

CO2 equivalent fuel saving (in tone)	3.2	Per ton of fuel saved*
Density of diesel	0.82	Kg/litre
Euro value	12	Per tone of CO2 saved
Rs/Euro	74	

0.82 Kg of diesel equals to 1 Lt of diesel		
1 Kg of diesel equals to 1.219512195 Lt of diesel		
1000 Kg(1 tonn) equals to 1219.512195 Lt of diesel		
CO2 equivalent fuel saving	0.002	per Lt of fuel
Euro Value	0.03	per Lt of fuel
Rs	2.01	per Lt of fuel

The economic benefits on this account for the project have been calculated for next 20 years

Table 8.11 Carbon Credits Earned in terms of Rs in Cr

Carbon Credits Earned with the Project					
S.No.	Year	Traffic Movement (In Million Km)	Fuel Saving in Million Litre	CO2 equivalent fuel saving (In Million Rs)	CO2 equivalent fuel saving (In Cr Rs)
1	2017	0.0000	0.00	0.00	0.0000
2	2018	0.0000	0.00	0.00	0.0000
3	2019	0.0000	0.00	0.00	0.0000
4	2020	0.0000	0.00	0.00	0.0000
5	2021	0.4000	0.01	0.03	0.0025
6	2022	0.4211	0.01	0.03	0.0027
7	2023	0.4423	0.01	0.03	0.0028
8	2024	0.4634	0.01	0.03	0.0029
9	2025	0.4846	0.01	0.03	0.0031
10	2026	0.5057	0.01	0.03	0.0032
11	2027	0.5386	0.01	0.03	0.0034

12	2028	0.5716	0.02	0.04	0.0036
13	2029	0.6045	0.02	0.04	0.0038
14	2030	0.6375	0.02	0.04	0.0040
15	2031	0.6704	0.02	0.04	0.0043
16	2032	0.7158	0.02	0.05	0.0045
17	2033	0.7611	0.02	0.05	0.0048
18	2034	0.8065	0.02	0.05	0.0051
19	2035	0.8518	0.02	0.05	0.0054
20	2036	0.8972	0.02	0.06	0.0057

Employment Benefits

The employment benefit for any project can be calculated in terms of man-years of employment. In which firstly total man year for construction as well as operation period of the project can be calculated. Then annual social profit per man- year of employment generation is taken as one third of the difference between industrial unskilled wages and the agricultural labour wages is taken.

Industrial wages	500	per day
Aggricultural wages	200	per day
Difference	300	per day
Socio Economic profit	100	
Total man days	300	per year
Total Benefit	30000	Rs per manyear

Table 8.12 Employment Benefits in terms of Rs in Cr

Employment Benefits from the Project				
S.No.	Year	Employment Manyear	Employment Benefit in Rs	In Cr
1	2017	100	3000000	0.3
2	2018	200	6000000	0.6
3	2019	200	6000000	0.6
4	2020	300	9000000	0.9
5	2021	50	1500000	0.2
6	2022	50	1500000	0.2
7	2023	50	1500634	0.2
8	2024	50	1501268	0.2

9	2025	50	1501903	0.2
10	2026	50	1500000	0.2
11	2027	50	1500988	0.2
12	2028	50	1501976	0.2
13	2029	50	1502965	0.2
14	2030	50	1503953	0.2
15	2031	50	1500000	0.2
16	2032	50	1501361	0.2
17	2033	50	1502722	0.2
18	2034	50	1504082	0.2
19	2035	50	1505443	0.2
20	2036	50	1500000	0.2

Other Benefits

There are other benefits associated with transportation activities and these benefits have been in terms of average external costs due to accidents, noise pollution, infrastructure, wear and tear cost and congestion cost etc. The benefits have been quantified by inland navigation authority of Netherland in terms of euro/1000 TKM for road and IWT mode of transportation as given below.

Table 8.13 Fuel saving in terms of Rs in Cr

Kind of Cost	Road	IWT
Accident	5.44	0
Noise	2.14	0
Pollution	7.85	3
Infrastructure	2.45	1
Traffic Jam	5.45	Negligible
Total	23.33	
Difference of cost compared to road transport		19 Euro/ 1000 Tonne-Km
External cost saved by not transporting 1000 tonne-km on the road		19 Euro

Taking 1 Euro as 75 Indian Rs

Table 8.14 Other Benefits in terms of Rs in Cr

Other Benefits from the Project				
S.No.	Year	Traffic	Other	In Cr

		Movement (In Million Km)	Benefits (In million)	
1	2017	0.0000	0.00	0.0000
2	2018	0.0000	0.00	0.0000
3	2019	0.0000	0.00	0.0000
4	2020	0.0000	0.00	0.0000
5	2021	0.4000	0.60	0.0600
6	2022	0.4211	0.63	0.0632
7	2023	0.4423	0.66	0.0663
8	2024	0.4634	0.70	0.0695
9	2025	0.4846	0.73	0.0727
10	2026	0.5057	0.76	0.0759
11	2027	0.5386	0.81	0.0808
12	2028	0.5716	0.86	0.0857
13	2029	0.6045	0.91	0.0907
14	2030	0.6375	0.96	0.0956
15	2031	0.6704	1.01	0.1006
16	2032	0.7158	1.07	0.1074
17	2033	0.7611	1.14	0.1142
18	2034	0.8065	1.21	0.1210
19	2035	0.8518	1.28	0.1278
20	2036	0.8972	1.35	0.1346

Results of EIRR

The cost involved and the benefits accrued spread over different time periods, needs to be discounted to the base year. Internal rate of return (IRR) is that discount rate at which the present value (PV) of cost equals the PV of the benefits. In Economic IRR (EIRR), the economic costs and benefits are only considered.

Table 8.15 EIRR for the project

EIRR for the Project				
S.No.	Year	Economic Cost	Economic Benefits	Net cash flow
1	2017	0.42	0.30	-0.12
2	2018	2.13	0.60	-1.53
3	2019	1.70	0.60	-1.10

4	2020	0.04	0.90	0.86
5	2021	0.04	0.25	0.21
6	2022	0.04	0.26	0.22
7	2023	0.04	0.26	0.22
8	2024	0.04	0.27	0.23
9	2025	0.04	0.27	0.23
10	2026	0.04	0.28	0.24
11	2027	0.04	0.29	0.25
12	2028	0.04	0.30	0.25
13	2029	0.04	0.31	0.26
14	2030	0.04	0.31	0.27
15	2031	0.04	0.32	0.28
16	2032	0.04	0.33	0.29
17	2033	0.04	0.35	0.30
18	2034	0.04	0.36	0.31
19	2035	0.04	0.37	0.33
20	2036	0.04	0.38	0.34
			EIRR	8%

