

**Diversion of Forest Land for Establishing Elephant Rescue and Rehabilitation Centre at Kottoor in
Thiruvananthapuram District**

Cost-Benefit Analysis

The project involves diversion of 57.0 hectare of forest land falling in Kottoor reserve in ABP Territorial Forest Range in Thiruvananthapuram Wildlife Division. Kerala Forest Department is the user agency in this case.

Detailed cost benefit analysis of the project has been carried out as per the guidelines issued by the Ministry of Environment, Forest and Climate Change as per No.7-69/2011-FC(Pt) dated 01.08.2017. The following criteria are taken into account in this analysis.

1. Direct Project Cost is Rs.105crores to be invested in 2 years. The present value of project cost is worked out based on discounting factor of 12%. Year wise investment is given below

Year	Investment (Rs. lakhs)
Year 1	7604.89
Year 2	3216.98

2. The project brings in direct benefit by way of different types of charges collected from visitors including entry fee, camera charges, sale of curios, collection from cafeteria, membership fee, sponsorship charges etc. The details have been worked out for 5 years and a terminal value calculated for the period beyond 5 years. The direct costs like animal maintenance cost, staff cost, electricity and water charges, cafeteria running cost, have been worked out and discounted at the rate of 12% to the present value.
3. Employment generated by the project is another direct benefit. For running of the Elephant Rescue and Rehabilitation Centre, 215 officers and staff would be required. This is the direct employment. Indirect employment is also generated in the form of persons engaged by suppliers, maintenance contract staff etc. These benefits are monetized and discounted to the present value in the analysis.
4. The cost of ecosystem services of the forest diverted is taken as the Net Present Value (NPV). Eventhough there is no habitat fragmentation due to the project, 50% of the NPV is computed as indirect cost due to this. Similarly 10% of the NPV is accounted towards loss of animal husbandry productivity including loss of fodder.
5. There is no human settlement in the forest proposed for diversion. So there is no cost factor related to resettlement and rehabilitation.
6. The cost of compensatory afforestation and its maintenance in future and soil and moisture conservation discounted to present value is added as cost. The benefits accruing from the compensatory forests over next 50 years, discounted to the present cost is added as benefit of the project. It is assumed that the ecosystem services provided by the compensatory forests is computed as NPV rate, 20 years from now discounted to present value.

7. Direct benefits from compensatory forests like timber and firewood, NWFP, ecotourism accruing over next 50 years are computed and discounted to present value.
8. The carbon sequestration benefits from compensatory forests are assumed to accrue after 20 years when the forest canopy closes. Carbon is valued at Rs 73 \$ /metric ton now. A rate of 200\$/metric ton after 20 years is projected and the amount is discounted to present value.

The detailed computation is annexed:

Estimation of Cost-Benefit ratio for Forest Diversion Project in connection with Elephant Rescue and Rehabilitation Centre at Kottoor.

A- Estimation of Cost of Forest Diversion								
Item								Amount in Rs Lakhs
1	Direct project cost							
	Direct investment in the project is Rs 10821.88 lakhs. This amount is invested in three eyars. The details of investment is given in Annexure 1. The amounts are discounted @12 percent to arrive at the present value.							
	Year 1	Year 2						
	7604.89	3216.98						
	0.893	0.797		Discounting @ 12 %				
	6791.167	2563.93306						
						Total		9355.09983
2	Ecosystem services losses due to proposed forest diversion							
		Area for NPV Calculation in Ha	Rate of NPV in Rs lakhs/Ha	Total NPV				62.415
		8.55	7.3	62.415				
3	Loss of animal husbandry productivity including loss of fodder							
		NPV	10 % of NPV					
		62.415	6.2415					6.2415
4	Cost of Human resettlement- In this project there is no resettlement cost							0
5	Loss of public facilities and administrative infrastructure (Roads, buildings, schools, dispensaries, electric lines, railways etc) on forest land, which would require forest land if these facilities were diverted due to the project- No such loss of public facilities in this case							0
6	Posession value of forest land diverted							
		NPV	30% of NPV					
		62.415	18.7245					18.7245
7	Cost of suffering to oustees- no such cost in this project							0

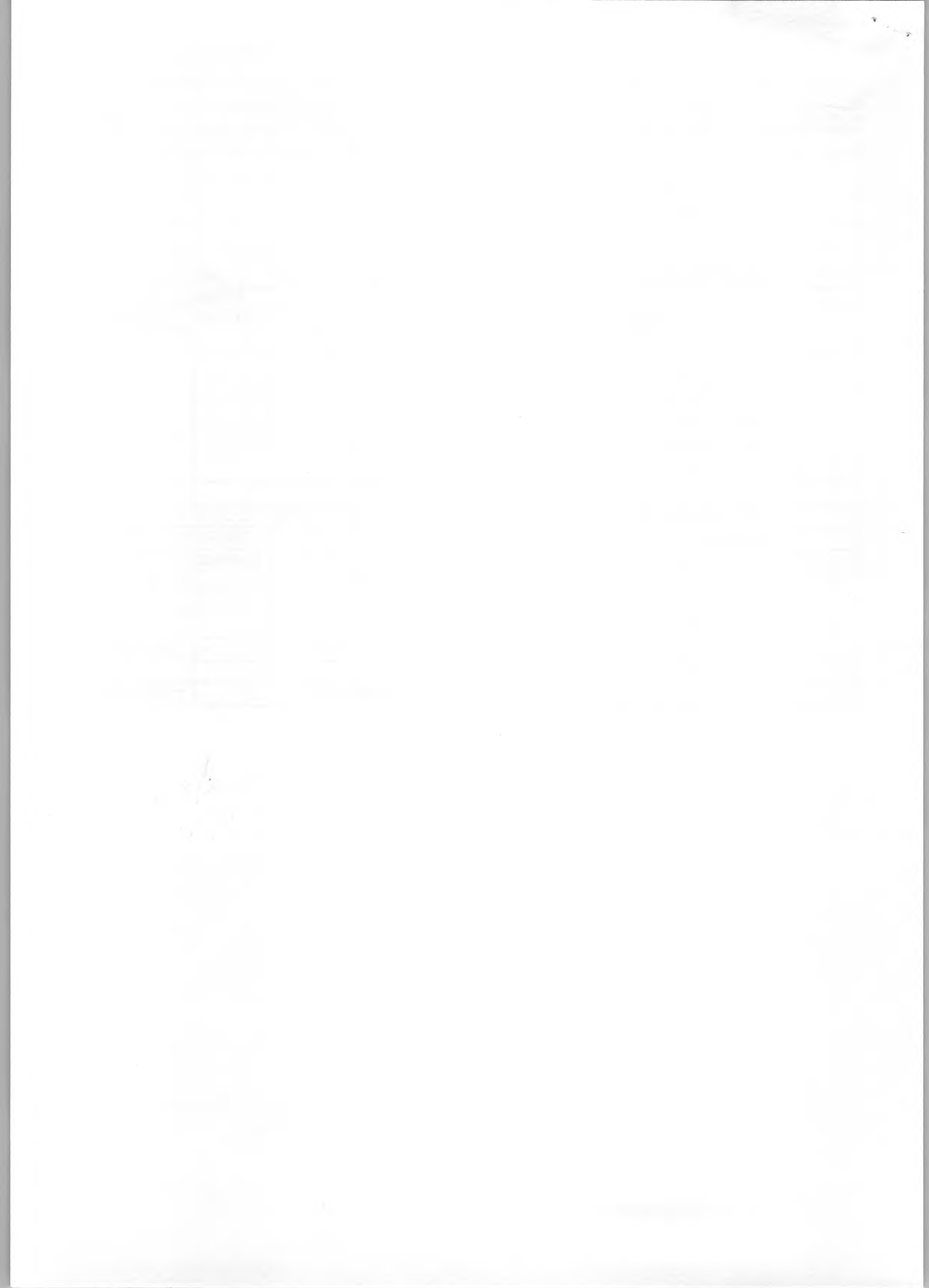
8	Habitat fragmentaion cost- In this project there is no case of habitat fragmentaion as the forest is an isolated patch and is not forming part of habitat of wildlife. However a cost value is assigned as per the cost norms							
		NPV	50 % of NPV					
		62.415	31.2075					31.2075
9	Compensatory afforestation and soil and moisture conservation cost							
	Area of the CA plantation on degraded forest land @ 30 % of the forest land diverted							
	Area in Ha	17.1						
	Year	Cost/ha	Total Cost	Discounting Factor @ 12 %	Dicounted cost			
	1	1.17	20.007	0.8929	20.8999			
	2	0.44	7.524	0.7972	8.3212			
	3	0.22	3.762	0.7118	4.4738			
	4	0.16	2.736	0.6355	3.3715			
	5	0.16	2.736	0.5674	3.3034			
				Total	40.3698			40.3698
						Total		9514.05813
	Computation of benefits of forest diversion							
1	Direct benefit from the project calculated based on the fee collected from the visitors including entry fee, fee for camera, income from cafeteria, parking fee, membership fee, sponsorship etc and accounting for operating cost, staff cost, animal feeding cost, etc							
	Year	Net Income from Operation	Discountin g factor	Discounted amount				
	1	0	0.893	0				
	2	0	0.797	0				
	3	0	0.712	0				
	4	0	0.636	0				
	5	0	0.567	0				

	6	2382.984	0.507	1208.17289				
	7	2740.43	0.452	1238.67436				
	8	3151.49	0.404	1273.20196				
	9	3624.22	0.361	1308.34342				
	10	4167.85	0.322	1342.0477				
			Total	6370.44033				6370.4403
2	Economic benefits due to direct and indirect employment due to the project.-The project is estimated to generate 215 employment when become fully operational. The benefit is worked out and discounted							
	Year	Benefit to the employees	Discounting factor	Discounted Benefit				
	1	319.8	0.893	285.5814				
	2	394	0.797	314.018				
	3	478.8	0.712	340.9056				
	4	592.8	0.636	377.0208				
	5	725.16	0.567	411.16572				
	6	833.93	0.507	422.80251				
	7	959.02	0.452	433.47704				
	8	1102.87	0.404	445.55948				
	9	1268.3	0.361	457.8563				
	10	1458.55	0.322	469.6531				
				3958.03995				3958.03995
3	Economic benefits due to compensatory afforestation- it is presumed that the compensatory afforestation forest will accrue benefits in the form of fodder from 10th year onward, timber , NWFP etc from the 20th year etc. The following computation is made							
3.1	Value of timber and fuel wood- It is assumed that the forest produces .5 cu.m of timber annually /hectare from 20th year onwards, valued at Rs .5 lakh per cu.m							

	year	Timber & F.W in Cu.M.	Value per cu.m	Total Value	Discountin g factor	Discounte d amount		
	21	20	0.5	10	0.0926	0.926		
	22	20	0.55	11	0.0826	0.9086		
	23	20	0.605	12.1	0.0738	0.89298		
	24	20	0.665	13.3	0.0659	0.87647		
	25	20	0.732	14.64	0.0588	0.860832		
	26-30	50	1.17	58.5	0.0334	1.9539		
	31-35	50	1.89	94.5	0.0189	1.78605		
	36-40	50	3.05	152.5	0.0107	1.63175		
	41-50	50	4.96	248	0.0035	0.868		
					Total	10.70458		10.704
3.2	Value of NTFP- it is assumed that from 20th year onward NTFP @ 200 kg valued at Rs 100/kg will be colelcted.							
	year	Quantity of NTFP in Kg	Value perKg	Total Value	Discountin g factor	Discounte d amount		
	21	200	0.001	0.2	0.0926	0.01852		
	22	200	0.0015	0.3	0.0826	0.02478		
	23	250	0.002	0.5	0.0738	0.0369		
	24	300	0.0025	0.75	0.0659	0.049425		
	25	350	0.003	1.05	0.0588	0.06174		
	26-30	1000	0.0048	4.8	0.0334	0.16032		
	31-35	1000	0.00778	7.78	0.0189	0.147042		
	36-40	1000	0.01253	12.53	0.0107	0.134071		
	40-50	2500	0.02235	55.875	0.0035	0.195563		
					Total	0.828361		0.8283
3.3	Value of ecotourism-It is assumed that the forest will provided ecotourism benefits from 11th year onwards							
	Year	No. of Visitors	Visitor fee	Amount in Rs lakhs	Discountin g factor	Discounte d amount		
	11	20000	0.00025	5	0.2875	1.4375		
	12	20000	0.00025	5	0.2567	1.2835		
	13	22000	0.0003	6.6	0.2293	1.51338		
	14	22000	0.0003	6.6	0.2046	1.35036		
	15	25000	0.0005	12.5	0.1827	2.28375		
	16-20	125000	0.001	125	0.1037	12.9625		
	21-25	125000	0.0015	187.5	0.0588	11.025		
	26-30	125000	0.00175	218.75	0.0334	7.30625		
	31-40	200000	0.002	400	0.0107	4.28		

	41-50	200000	0.004	800	0.0035	2.8		
					Total	46.24224		46.24
3.4	Value of ecological services of forests. This is NPV. The forest is expected to fully serve ecological functions from 20th year onward.							
	Value of NPV after 20 years @ Rs 40 lakhs per ha				17.1	40	684	
	Discounting factor						0.0926	
	Discounted value						63.3384	63.3384
3.5	carbon sequestration value- It is estimated that 1 ha of fully stocked forest stock 2.195 MT of carbon and the market rate is 73 \$ per MT now. After 20 years it is assumed that the carbon value will increase to 200\$ per MT							
	Carbon stock of 17.1 ha of forest after 20 years.				17.1	2.195	37.5345	
	Value in \$						7506.9	
	Value of carbon in Rs lakhs						5.404968	
	Discounting factor						0.0926	
	Discounted value						0.5005	0.5
						Total		10450.091
					Benefit/Cost			1.09838418





Annexure-1: Elephant Rehabilitation Centre-Kottoor-Phasing out of Capital Expenditure					
	Category	Total Cost in Rs	Phase I (Rs)	Phase II (Rs)	Remarks
1	Building Civil Works+				
i.	Crematorium	11517283	11517283		
ii.	Drivers Amenity	1024702	1024702		
iii.	Elephant Feeding Complex (Kitchen and Store)	8622381	8622381		
iv.	Entrance Plaza	9471500	9471500		
v.	Hand Rearing Centre	5005318	5005318		
vi.	Hostel Dining Block	2889211	2889211		
vii.	Ladies Hostel	4675105	4675105		
viii.	Mahout Bachelor Accommodation	11423507	11423507		
ix.	Mahout Night Shelter	3232916	3232916		
x.	Men's Hostel Block	8940245	8940245		
xi.	Museum	29984960	29984960		
xii.	Officer's Quarters	8990604	8990604		
xiii.	Research and Training Institute	17984047	17984047		
xiv.	Staff Quarters, Type A	12001485	12001485		
xv.	Toilet Block	2559000	2559000		
xvi.	Veterinary Clinic	12349161	12349161		
xvii.	Staff Quarters, Type B	12476000	12476000		
xviii.	Mahouts Family Quarters	30568000	30568000		
xix.	Dung Recycling Unit	4074000	4074000		

xx.	Admin Block	8053000	8053000		
xxi.	Viewing Deck	443522	443522		
xxii.	Cafeteria	7476317	7476317		
xxiii.	Electrical Sub Station	1523823	1523823		
xxiv.	Pump House (8 no's)	1139984	1139984		
xxv.	Effluent Treatment Plant Tank	7335374	7335374		
xxvi.	Plant Room	486121	486121		
xxvii.	Sump Water Tank 1	722581	722581		
xxviii.	Sump Water Tank 2	165549	165549		
xxix.	Overhead Water Tank	2465028	2465028		
xxx.	Culvert	207644	207644		
xxxi.	Open Exhibition	2617982	2617982		
xxxii.	Watch tower	2985291	2985291		
xxxiii.	Retaining wall	8121787	8121787		
xxxiv.	Main gate	129305	129305		
2	Enclosure(Fencing)+				
		₹ 20,11,53,512	₹ 14,73,07,610	₹ 5,38,45,902	
3.a	Boundary Fencing	₹ 15,68,13,497	₹ 7,84,06,748.50	₹ 7,84,06,748.50	
3.b	Chain link fencing	₹ 33,80,268	₹ 33,80,268		
3.c	Compound Wall	₹ 24,40,192	₹ 24,40,192		
3.d	Railing	₹ 1,11,23,569		₹ 1,11,23,569	
4	Tethering Shed+	₹ 4,24,59,856	₹ 2,51,77,955	₹ 1,72,81,901	
5	Renovation Of Existing Buildings+	₹ 3,02,73,993	₹ 3,02,73,993		

6	Parking, Trench renovation, Filling of existing trench	₹ 88,17,931	₹ 88,17,931		
7	Kraal+	₹ 5,66,03,786	1,61,15,216	4,04,88,570	
8	Solid Waste Management Unit				
	I. Biogas Plant	₹ 33,27,731	3327731		
	II. Paper Manufacturing Unit*	₹ 30,20,000	3020000		
	III. Compost	₹ 13,40,798	1340798		
	IV. Waste Collection Unit	₹ 12,30,000	1230000		
9	Water Conservation Pond+	₹ 1,83,48,820	18348820		
10	Check dam+	₹ 9,67,02,169		96702169	
11	Cafeteria (Equipment)*	₹ 5,32,925	532925		
12	STP (Equipment)	₹ 14,32,322	1432322		
13	Plumbing+	₹ 86,50,000	8650000		
14	Veterinary Clinic, Elephant Kitchen, Lab (Equipment)	₹ 1,83,07,838	18307838		
15	Crematorium (Equipment)	₹ 88,50,000		8850000	
16	Electrical Works+	₹ 5,43,58,167	5,43,58,167		
17	Landscaping And Afforestation+	₹ 1,30,83,116	13083116		
18	Developing Materials For Museum, Materials for interpretation*	₹ 3,89,82,768.00	23982768	15000000	
19	Research And Skill Development Centre, and other ERC Electronic (Equipment)	₹ 38,30,000	38,30,000		
20	Kitchen for Hostel and Dining (Equipment)	₹ 8,97,080	8,97,080		
21	Furniture	₹ 79,39,000	79,39,000		

22	ERC Vehicle	₹ 68,00,000	68,00,000		
23	ERC Road+	₹ 3,98,26,357	₹ 3,98,26,357		
	Total	₹ 1,08,21,88,428	₹ 76,04,89,569	₹ 32,16,98,860	



Annexure 2
The Estimation of year-wise direct income

Year - 1

Sl.No.	Item	Rate (Rs)	Number	Amount (Rs)	Remarks
1	Visitor entry fee	50	100000	5000000	
2	Vehicle Parking fee	20	20000	400000	
9	Income from cafeteria	100	75000	7500000	
10	Income from Training	1000	500	500000	
11	Trekking/Nature camp	3000	800	2400000	
12	Boating/rafting	50	5000	250000	
13	Income from sponsorchip	100000	5	500000	
	Grant from State/Central Governmnet			50130000	
	Total			66680000	

Year - 2

Sl.No	Item	Rate (Rs)	Number	Amount (Rs)	Remarks
1	Visitor entry fee	50	150000	7500000	
2	Vehicle Parking fee	20	30000	600000	
3	Income from cafeteria	120	112500	13500000	
4	Income from Training	1000	600	600000	
5	Trekking/Nature camp	3000	1000	3000000	
6	Boating/rafting	50	7500	375000	
7	Income from sponsorchip	100000	10	1000000	
8	Grant from State/Central Governmnet			61785000	
9					
10					
11					
12					
13					
	Total			88360000	

Year - 3

Sl.No	Item	Rate (Rs)	Number	Amount (Rs)	Remarks
1	Visitor entry fee	100	200000	20000000	
2	Vehicle Parking fee	30	40000	1200000	
3	Income from cafeteria	140	150000	21000000	
4	Income from Training	2000	720	1440000	
5	Trekking/Nature camp	3500	1200	4200000	
6	Boating/rafting	70	10000	700000	
7	Income from sponsorchip	200000	20	4000000	
8	Grant from State/Central Governmnet			68320000	
9					
10					

11					
12					
13					
	Total			120860000	

Year - 4

Sl.No	Item	Rate (Rs)	Number	Amount (Rs)	Remarks
1	Visitor entry fee	100	250000	25000000	
2	Vehicle Parking fee	30	50000	1500000	
3	Income from cafeteria	150	187500	28125000	
4	Income from Training	2000	840	1680000	
5	Trekking/Nature camp	3500	1400	4900000	
6	Boating/rafting	80	12500	1000000	
7	Income from sponsorship	200000	25	5000000	
8	Grant from State/Central Government			97635000	
9					
10					
11					
12					
13					
	Total			164840000	

Year 5

Sl.No	Item	Rate (Rs)	Number	Amount (Rs)	Remarks
1	Visitor entry fee	150	300000	45000000	
2	Vehicle Parking fee	50	60000	3000000	
3	Income from cafeteria	175	225000	39375000	
4	Income from Training	2500	960	2400000	
5	Trekking/Nature camp	4000	1600	6400000	
6	Boating/rafting	100	15000	1500000	
7	Income from sponsorship	200000	35	7000000	
8	Grant from State/Central Government			102541000	
9					
10					
11					
12					
13					
	Total			207216000	

Year 6

Sl.No	Item	Rate (Rs)	Number	Amount (Rs)	Remarks
1	Visitor entry fee	250	400000	100000000	
2	Vehicle Parking fee	100	8000	800000	
3	Income from cafeteria	250	350000	87500000	

4	Income from Training	3000	1200	3600000	
5	Trekking/Nature camp	4500	2000	9000000	
6	Boating/rafting	150	20000	3000000	
7	Income from sponsorship	200000	40	8000000	
8	Income from Accommodation facility	3000	5000	15000000	
8	Grant from State/Central Governmnet			100000000	
9					
10					
11					
12					
13					
	Total			326900000	

Income from year 7 onwards is estimated at
annual increase of 15 %

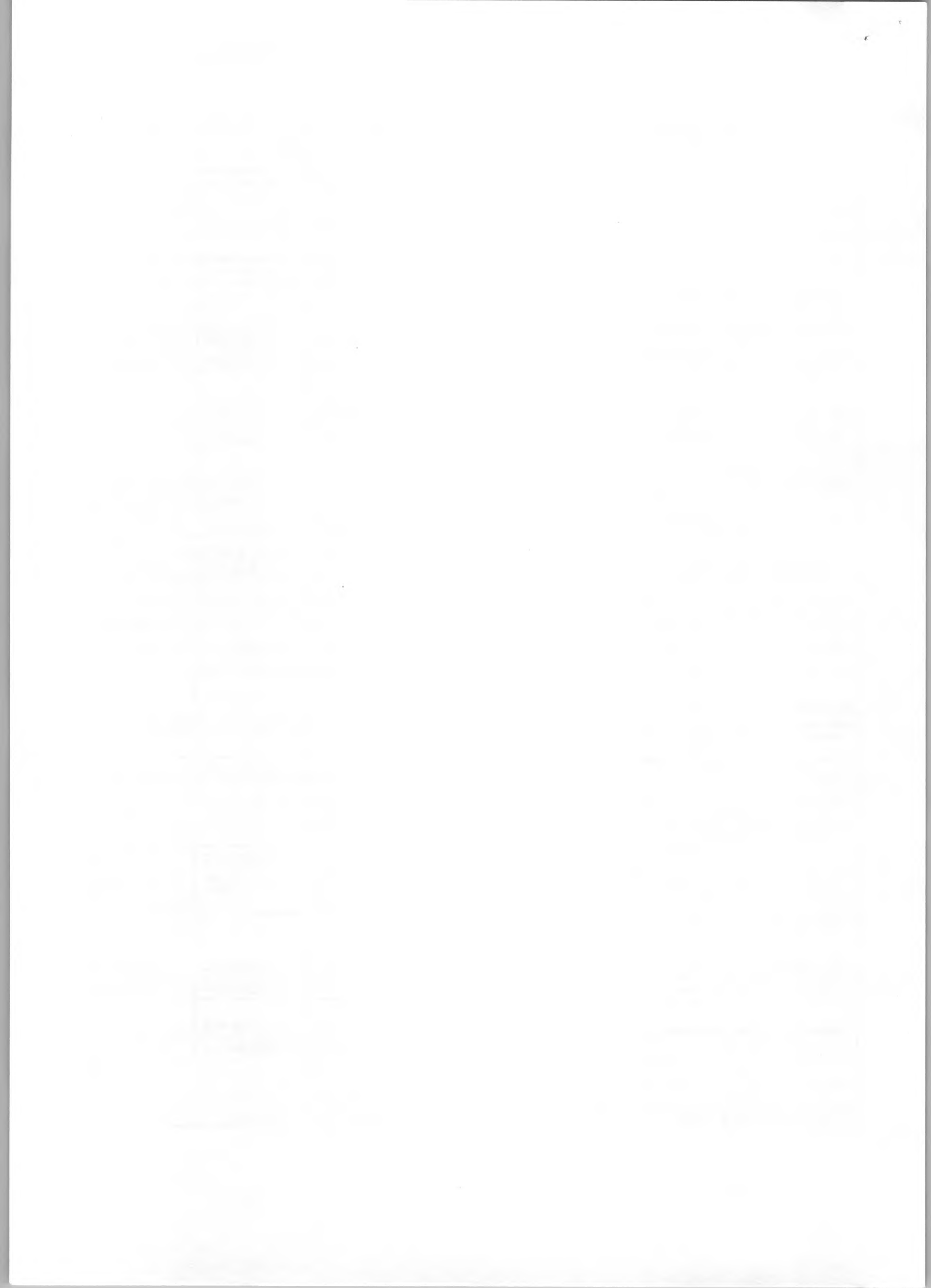




Computation of net Income

Operating Statement			Year 1	Year 2	Year 3	Year 4	Year 5
Income from ERRC			66,680,000	88,360,000	120,860,000	164,840,000	207,216,000
Total Revenue			66,680,000	88,360,000	120,860,000	164,840,000	207,216,000
Cost of operating							
Staff cost			31,980,000	39,400,000	47,880,000	59,280,000	72,516,000
Elephant Maintenance cost			13,200,000	20,160,000	34,080,000	52,560,000	62,200,000
Electricity			500,000	700,000	1,000,000	1,300,000	1,500,000
Vehicle Maintenance costs			2,000,000	2,500,000	3,000,000	3,500,000	4,000,000
Procurements of implements			1,000,000	1,200,000	1,500,000	1,700,000	2,000,000
Building maintenance cost			2,000,000	2,200,000	2,500,000	2,800,000	3,000,000
Uniform and other provisions			1,000,000	1,200,000	1,400,000	1,700,000	2,000,000
Running cafeteria			10,000,000	15,000,000	22,500,000	34,000,000	51,000,000
Training expenses			3,000,000	3,500,000	4,000,000	4,500,000	5,000,000
Other expenses			2,000,000	2,500,000	3,000,000	3,500,000	4,000,000
Total Operating costs			66,680,000	88,360,000	120,860,000	164,840,000	207,216,000
Operating profit			-	-	-	-	-

Operating statement			Year 6	Year 7	Year 8	Year 9	Year 10
Income from ERRC			326,900,000	375,935,000	432,325,250	497,174,038	571,750,143
Total Revenue			326,900,000	375,935,000	432,325,250	497,174,038	571,750,143
Cost of operating						-	
Staff cost			83,393,400	95,902,410	110,287,772	126,830,937	145,855,578
Elephant Maintenance cost			71,530,000	82,259,500	94,598,425	108,788,189	125,106,417
Electricity			1,725,000	1,983,750	2,281,313	2,623,509	3,017,036
Vehicle Maintenance costs			4,600,000	5,290,000	6,083,500	6,996,025	8,045,429
Procurements of implements			2,300,000	2,645,000	3,041,750	3,498,013	4,022,714
Building maintenance cost			3,450,000	3,967,500	4,562,625	5,247,019	6,034,072
Uniform and other provisions			2,300,000	2,645,000	3,041,750	3,498,013	4,022,714
Running cafeteria			58,650,000	67,447,500	77,564,625	89,199,319	102,579,217
Training expenses			5,750,000	6,612,500	7,604,375	8,745,031	10,056,786
Other expenses			4,600,000	5,290,000	6,083,500	6,996,025	8,045,429
Total Operating costs			238,298,400	274,043,160	315,149,634	362,422,079	416,785,391



Operating profit			88,601,600	101,891,840	117,175,616	134,751,958	154,964,752



