7.3 Cost Estimate

7.3.1 Conditions and Assumptions for Cost Estimate

The following are the conditions and assumptions for the project cost estimate.

- 1) Project cost is estimated at the price level as of June 1997.
- Exchange rates used in the cost estimate are shown as follows: US\$ 1.0 = Birr 6.8 = J.Yen 114.7 (as of June 1997)
- 3) Construction works will be executed on contract basis through international competitive bidding. All the labor, materials and equipment required for the construction works will be provided by the contractors themselves.
- 4) Resettlement cost is estimated based on the rule, which is controlled by the Works and Urban Development Bureau, Region 14 Administration. Resettlement cost does not include land acquisition cost, because the whole land belongs to the Government of Ethiopia.
- 5) Engineering services, such as design and supervision, will be executed on international contract basis.
- 6) Cost is estimated in foreign currency and local currency portions. The foreign currency portion includes foreign labor wages, imported materials and equipment cost, international transportation cost and contractors' indirect cost. The local currency portion includes local labor wages, local materials cost, inland transportation cost, contractors' indirect cost, resettlement cost and administration cost.
- 7) Physical contingency is provided as 10% of the total of construction cost, resettlement cost, engineering services cost and administration cost.
- Price contingency is calculated based on the escalation rates of 3% per annum for foreign currency portion and of 6% for local currency portion.
- 9) Tax is included in the project cost estimate. Custom tax is estimated as 10% of CIF price of imported materials and 5% of net depreciation cost on CIF basis of imported construction equipment. Sales tax is estimated as 10% of net material price purchased domestically and 12% of net depreciation cost on CIF basis of imported construction equipment.

7.3.2 Unit Prices of Construction Works

(1) Labor Wage

The net wage of a daily common worker is Birr 8 for temporary employment in Addis Ababa. The prevailing labor wages in Addis Ababa are given in Table 7.3.1.

(2) Price of Construction Materials

Basic prices of some major construction materials are obtained through a simple market survey and from the Report on average retail prices of goods and services published by the Central statistical authority. The prevailing purchasing prices of major construction materials at Addis Ababa is given in Table 7.3.2.

(3) Operation Unit Cost of Construction Equipment

Assuming that contractors import the construction equipment, the operation unit cost of such equipment is estimated as listed in Table 7.3.3.

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(4) Unit Prices of Construction Works

Construction unit prices of major works are estimated through unit rate analysis and through comparison with the actual contract data. Unit prices of construction works are listed in Table 7.3.4. Breakdown of unit price of major construction works is given in Table 7.3.5.

		Kechei	ne river	Ba	ntyiketu riv	ver	
Work item	Unit	Kechene	Kostre	Bantyi.	Channel	Urban	Total
		weir	regul.	regul.	improv.	drainage	
			pond	pond		improv.	
1. Work quantities							
1.1 Clearing and stripping	m2	6,000	9,400	34,500	13,450	6,600	69,950
1.2 Excavation, common	m3	6,200	24,500	74,100	0	7,200	112,000
1.3 Excavation, river bed	m3	0	0	0	10,500	0	10,500
1.4 Excavation, rock	m3	10,200	9,600	19,800	10,000		49,600
1.5 Backfill	m3	1,400	1,400	1,600	10,100	5,500	20,000
1.6 Embankment	m3	0	700	7,300	400	0	8,400
1.7 Wet masonry	m3	0	3,300	5,500	6,100	0	14,900
1.8 Gabion mattress	m3	200	1,200	2,100	300	0	3,800
2. Quantities to be produced							
2.1 Clearing and stripping	m3	1,200	1,880	6,900	2,690	1,320	13,990
2.2 Excavation, common	m3	6,200	24,500	74,100	0 0	7,200	112,000
2.3 Excavation, river bed	m3	0	0	0	10,500	0	10,500
2.4 Excavation, rock	m3	16,830	15,840	32,670	16,500	0	81,840
(Swell factor= 1.65)							
3. Quantities to be diverted							
3.1 Soil, common	m3	1,400	j 2,100	8,900	10,500	5,500	28,400
3.2 Rock	m3	200	4,500	7,600	6,400	0 0	18,700
4. Quantities to be disposed		1					
4.1 Clearing and stripping	m3	1,200	1,880			1,320	13,990
4.2 Excavation, common	m3	4,800	22,400	65,200	-10,500	1,700	83,600
4.3 Excavation, mud	m3	0		· • •	0 10,500	1 1	10,500
4.4 Excavation, rock	m3	16,630	11,340	25,070	$D_{ }^{i} = 10,100$	0 0	63,140
Total of 4.							171,230

Table 7.2.1 Estimated Material Volume to be Disposed

Note: The volume is calculated based on estimated work quantities.

No.	Jan.	Feb.	Mar.	Apr.	May	Jun.	Jul.	Aug.	Sep.	Oct.	Nov.	Dec.	it: day) Total
a.	Number	of days	·	_				<u> </u>	<u>, I</u>				
	31	28	31	30	31	30	31	31	30	31	30	31	365
b <i>.</i>	Sunday((*1)											
	4	4	5	4	5	4	4	5	4	4	5	4	52
c.	National	l Holida	y(*2)										
	3	0	1	3	3	0	1	0	2	0	0	0	13
d.	Number	of days	when da	aily preci	pitation	is more	than 20	mm(*3)					
	0	1	I.	1	2	2	3	4	3	1	0	0	18
e.	Monthly	rate of	Sunday	and Nati	onal Ho	liday(= (b.+c.)/a	.)					
	23%	14%	19%	23%	26%	13%	16%	16%	20%	13%	17%	13%	18%
f.	Estimate	ed work	suspensi	ion days	(= b.+c.	+d.x(1-e	.))						
	7	5	7	8	9	6	8	8	8	5	5	4	80
g.	Workab	le days (= af.)										
	24	23	24	22	22	24	23	23	22	26	25	27	285

Table 7.2.2 Estimated Workable Days

Note: (*1) International calender of 1998

(*2) Number of days is given based on the Ethiopian calender of 1997-1998. Please refer to Table 7.2.3.

(*3) The number of days is given on an average calculated based on the daily precipitation data in Addis Ababa for 46 years from 1951 to 1996.

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Table 7.2.3	National	Holiday	in	Ethiopia
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No.	Date		Name of Holiday
1.	January	7	Ethiopian Christmas
2.	January	19	Ethiopian Epiphany
3.	January	28	Id Al Fater (Ramadan)
4.	March	2	Victory of Adwa
5.	April	6	ld Al Adaha (Arafa)
6.	April	9	Ethiopian Easter
7.	April	17	Ethiopian Good Friday
8.	May	1	International Labour Day
9.	May	5	Patriots Victory Day
10.	May	28	Down Fall of the Dergue
11.	July	6	Birth of the Prophet Mohammed (Moulid)
12.	September	11	Ethiopian New Year
13.	September	27	Maskal (The Finding of the True Cross)
Note:	The dates a	re giv	en based on the Ethiopian calender of
	1997-1998.		

Temporary works No. Temporary works for the Kechene weir 1. Access road Primary access L= 120m Access point= 100m southwest from the proposed weir site, on the Abera Gizaw Street L: From the access point downhill to the proposed weir site along the right bank of the Kechene river Secondary access L= 500m (L1= 300m, L2= 200m) Access point= 100m southwest from the proposed weir site, on the Abera Gizaw Street L1: from the access point to the north along the right side bank of the river L2: from the end of L1 to the proposed weir site across the river to the left side river course 2) Dewatering (for river stream) Pipe culvert through the whole construction work stage at the secondary access road crossing point Half closure of river stream for excavation work of left bank, stone work and concrete works of sub weir, stilling basin and left side main weir body Pipe aqueduct for excavation work of right bank and concrete works of right side. main weir body, from the downstream tip of the said pipe culvert to the downstream tip of the sub weir 2. Temporary works for the Kostre regulating pond 1) Access road Two approaches One (L= 20m) from the Dejazmach Haile Silase Street Another (L= 20m) from the Graz. Inku Silase Bantyidagn Street 2) Dewatering Half closure of river stream for the embankment and inlet dike works (L= 200m) 3) Relocation Relocation of a power line and supporting poles (L= 170m) Temporary works for the Bantyiketu regulating pond 3. Access road An approach (L= 20m) from the Yohanis Street 2) Dewatering Some cover pipes and extension to the river for pond excavation work, for hot spring Half closure of river stream for the embankment and inlet dyke works (L = 900m)3) Relocation Relocation of sewerage pipe line (L= 900m) with 10 manholes Temporary works for the Bantyiketu river channel improvement 4. 1) Dewatering Half closure of river stream for the excavation and wet masonry works 2) Relocation Relocation of sewerage pipe lines 5. Temporary works for the urban drainage improvement 1) Traffic control Some traffic control works, such as raising up sign board showing "Under construction" and setting demarcation pegs around work site

Table 7.2.4 Major Temporary Works at Each Work Site

Table 7.3.1 Labor Wage

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No.	Particular	Unit	<u>F.C.</u>	<u>L.C.</u>
			(US\$)	(Birr)
1. For	eman	man-day	0	80
2. Ope	erator	man-day	0	60
3. Ass	istant operator	man-day	0	45
4. Dri	ver	man-day	0	30
5. Me	chanic	man-day	0	80
6. Ele	ctrician	man-day	0	70
7. Rig	ger	man-day	0	60
8. We	lder	man-day	0	60
9. Rel	oar worker	man-day	0	40
10. Plu	mber	man-day	0	60
11. Ca	rpenter	man-day	0	40
12. Pla	-	man-day	0	40
13. Co	ncrete worker	man-day	0	40
14. Ma	ison	man-day	0	45
15. Pa	vement worker	man-day	0	55
16. Bo	ring worker	man-day	0	40
17. Gr	out worker	man-day	0	40
18. Tu	nnel worker	man-day	0	40
19. Dr	iller	man-day	0	40
20. Bl	aster	man-day	0	60
21. Sk	illed labor	man-day	0	30
22. Co	ommon labor	man-day	0	10
23. En	gineer, senior	man-month	0	1,850
24. Er	igineer, junior	man-month	0	1,290
25. Te	chnician, senior	man-month	0	1,050
26. Te	chnician, junior	man-month	0	710
27. St	irveyor	man-month	0	600
28. Di	raftman	man-month	0	500
29. Ty	/pist	man-month	0	600
-	ffice clerk	man-month	0	500
31. C	ook	man-month	0	300
32. M	aid	man-month	0	250
33. N	ight keeper	man-month	0	250

Note: The value indicates the prevailing wage at Addis Ababa. Price level; June 1997, US\$ 1.0 = Birr 6.8 = J.Yen 114.7

			Net	<u>price</u>	<u><u>T</u>a</u>	<u>ax</u>	Total	price
<u>No.</u>	Materials	<u>Unit</u>	<u>F.C.</u>	<u>L.C.</u>	<u>F.C.</u>	<u>L.C.</u>	<u>F.C.</u>	<u>L.C.</u>
			(US\$)	(Birr)	(US\$)	(Birr)	(US\$)	(Birr)
1. Gasoli	ne	lit.	0.39	0	0	0	0.39	0
2. Gas oi	l (=Light oil)	lit.	0.29	0	0	0	0.29	0
3. Electri	c power	kWh	0	0.16	0	0.02	0	0.18
4. Lubric	ant	lit.	0	8.2	0	0.8	0	9
5. Grease	•	kg	0	31	0	3	0	34
6. Portlar	nd cement	kg	0	0.45	0	0.05	0	0.5
7. Reinfo	orcing bar, deformed	kg	0.54	0	0.05	0	0.59	0
8. Bindin	ig wire	kg	0	9.1	0	0.9	0	10
9. Annea	led iron wire	kg	0	9.1	0	0.9	0	10
10. Nail		kg	0	9.1	0	0.9	0	10
11. Steal p	blate	kg	0	9.1	0	0.9	0	10
12. Chann	el steel	kg	0	9.1	0	0.9	0	10
13. Angle	steel	kg	0	9.1	0	0.9	0	10
14. H-Sha	pe steel	kg	0	9.1	0	0.9	0	10
15. Steel s	heet pile	kg	0	9.1	0	0.9	0	10
16. Dynan	nite, in open	kg	18.4	0	1.8	0	20.2	0
17. Dynan	nite, in tunnel	kg	18.4	0	1.8	0	20.2	0
18. ANFO	powder	kg	5.8	0	0.6	0	6.4	0
19. Electri	c detonator	no.	4	0	0.4	0	4.4	0
20. Timbe	r, plank	m3	0	2,909	0	291	0	3,200
21. Timbe	r, square	m3	0	2,636	0	264	0	2,900
22. Timbe	r, log	m3	0	2,364	0	236	0	2,600
23. Plywo	od	m3	602	0	60	0	662	0
24. Form e	oil	lit.	0	7.3	0	0.7	0	8
25. Brick		m3	0	364	0	36	0	400
26. Galvar	nized iron pipe, 1/2in	m	0	7.3	0	0.7	0	8
27. Galvar	nized iron pipe, 1in	m	0	14.5	0	1.5	0	16
28. Galva	nized iron pipe, 1+1/2in	m	0	23	0	2	0	25
29. PVC p	pipe, 2in	m	0	7.3	0	0.7	0	8
30. PVC p	pipe, 4in	m	0	22.7	0	2.3	0	25
31. Aggre	gate, fine (= sand)	m3	0	76.4	0	7.6	0	84
32. Aggre	gate, coarse	m3	0	91	0	9	0	100
33. Crush	er-run	m3	0		0	9	0	100
34. Stone		m3	0		0		0	50
	mixed concrete, 160kg	m3	0		Ő		Ő	548
	mixed concrete, 240kg	m3	0		Ő		Ő	609
•	mixed concrete, 240kg, at seite		Ő		0		ů 0	703
38. Water	÷.	m3	Ő		0 0		Ő	

Note: - Total price indicates the prevailing purchasing price at Addis Ababa as of June 1997.
- US\$ 1.0 = Birr 6.8 = J.Yen 114.7

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					ost*1)	Tax	(*2)	<u>Total c</u>	cost ^{*3)}
<u>No.</u>	Equipment	<u>Class</u>	Unit	<u>F.C.</u>	<u>L.C.</u>	<u>F.Ç.</u>	<u>L.C.</u>	<u>F.C.</u>	<u>L.C.</u>
				(US\$)	(Birr)	(US\$)	(Birr)	(US\$)	(Birc)
1. Bulld		Hton	Hour	19.45	18.71	1.90	0.00	21.36	18.71
2. Bulld		15ton	Hour	25.87	24.89	2.53	0.00	28.41	24.89
3. Bulld		21ton	Hour	42.81	41.17	4.19	0.00	47.00	41.17
4. Bulld		32ton	Ноиг	57.49	61.12	5.19	0.00	62.68	61.12
	loser w/ripper	21ton	Hour	45.81	47.24	4.25	0.00	50.06	47.24
	loser w/ripper	32ton	Hour	56.64	60.22	5.31	0,00	61.75	60.22
7. Back		0.35m3	Hour	12.31	10.97	1.27	0.00	13.58	10.97
8. Back		0.60m3	Hour	17.72	15.78	1.83	0.00	19.55	15.78
9. Back	ihoe	0.70m3	Hour	22.70	20.22	2.34	0.00	25.05	20.22
10. Whee	el loader	1.4m3	Hour	15.60	15.17	1.52	0.00	17.12	15.17
11. Whee	el loader	2.3m3	Hour	23.94	24.11	2.26	0.00	26.20	24.11
12. Dum	p truck	8ton	Hour	9.46	10.59	0.81	0.00	10.27	10.59
13. Dum	p truck	10ton	Hour	10.85	12.14	0.93	0.00	11.78	12.14
14. Cargo	o truck	4ton	Hour	5.76	6.10	0.52	0.00	6.28	6.10
15. Cargo	o truck	Ston	Hour	9.07	9.61	0.82	0.00	9.89	9.61
16. Carge	o truck, w/crane	4ton/2ton	Hour	7.04	7.23	0.65	0.00	7.70	7.23
17. Truel	k crane, hyd.	15-16ton	Hour	22.47	22.69	2.12	0.00	24.59	22.69
18. Whee	el crane	25ton	Hour	34.28	32.92	3.36	0.00	37.63	32.92
19. Giant	t breaker, hyd.	1300kg	Day	92.60	58.89	11.33	0.00	103.93	58.89
20. Craw	vler drill, hyd.	150kg	Hour	68.88	63.33	6.96	0.00	75.84	63.33
21. Moto	or grader	3.1m	Hour	19.23	19.45	1.81	0.00	21.04	19.45
22. Maca	adum rotter	10-12ton	Hour	11.36	12.11	1.02	0.00	12.39	12.11
23. Tite (roller	8-20ton	Hour	12.84	13.69	1.16	0.00	14.00	13.69
24. Tamp	per	80kg	Hour	0.94	0.74	0.10	0.00	1.04	0.74
25. Agita	ator truck	3.2m3	Hour	8.81	8.56	0.86	0.00	9.66	8.56
26. Sprin	nkler truck	6kl	Hour	8.43	8.49	0.80	0.00	9.23	8.49
27. Subn	nersible pump	50mmx10m	Day	0.96	1.25	0.07	0.00	1.03	1.25
28. Diese	el generator	5kVA	Day	4.59	4.03	0.48	0.00	5.07	4.03
29. Diese	el generator	10kVA	Day	8.38	7.37	0.87	0.00	9.25	7.37
30. Diese	el generator	25kVA	Day	17.42	16.68	1.71	0.09	19.13	16.68
31. Diese	el generator	45kVA	Day	20.73	19.84	2.04	0.00	22.76	19.8 4
	el generator	100kVA	Day	30.84	29.53	3.03	0.00	33.87	29.53
	el generator	200kw	Day	58.68	60.27	5.45	0.00	64.13	60.27
	el generator	250kw	Đay	75.52	77.57			82.54	77.5
	concrete mixer	0.2m3	Day	24.55	26.76			26.72	26.70
	crete backet, man.	1.0m3	Day	50.66				55.50	50.3
	crete vibrator	38mm	Day	2.06			0.00	2.27	1.90
	ine welder	250A	Day	9.35	9.29			10.25	9.29

Table 7.3.3 Unit Operation Cost of Construction Equipment

Note:

*1) - Cost includes depreciation cost and maintenance cost of the equipment.

*2) - Tax includes custom and sales taxes.

*3) - Cost is estimated assuming that the equipment is imported and operated by contractors.

- Price level; as of June 1997, US\$ 1.0 = Birr 6.8 = J. Yen 114.7

Table 7.3.4 Unit Price of Construction Works

			Net p	rice	Ta	<u>x</u>	Total un	it price
Work item	Work description	<u>Unit</u>	<u>F.C.</u> (USS)	<u>L.C.</u> (Birr)	<u>E.C.</u> (US\$)	<u>L.C.</u> (Birr)	<u>F.C.</u> (US S)	<u>L.С.</u> (Віа)
I. Farthworks	<u>, 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1</u>							
 Clearing and stripping 	cut.t=20cm, dozing, load., h.=7.5km, unload., spread.	m2	1.1	1.6	0.1	0.0	1.2	1.6
1.2 Excavation, common	excavation, load., haul.=7.5km, unload., spread.	m3	5.4	8.1	0.3	0.0	5.7	8.1
1.3 Excavation, rock	excavation, loading, haul.=5km, unloading	m3	12.7	14.9	0.9	0.0	13.6	14.9
1.4 Excavation, river bed	excavation, load, haul.=7.5km, unload, spread.	n+3	4.5	53.3	0.2	0.0	4.8	53.3
1.5 Backfilling	spreading, compaction	пъЗ	0.5	0.8	0.0	0.0	0.5	0.8
1.6 Embankment	spreading, compaction	m3	0.5	0.8	0.0	0.0	0.5	0.8
1.7 Tree vegetation work	purchase, hauling, planting	m2	0.1	5.5	0.0	0.2	0.1	5.7
2. Concrete works	• • • • •							
2.1 Mass concrete, 160kg	ready mixed, haul, placing, crane, compact., curing	m3	18.7	744.4	1.2	56.7	19.9	801.1
2.2 Ordinary concrete, 240kg	ready mixed, haul, placing, crane, compact, curing	m3	18.7	823.7	1.2	62.4	19.9	886.1
2.3 Form, for concrete	plywood, setting, oil painting, removal	m2	10.3	54 2	0.8	1.6	11.L	55.8
2.4 Reinforcing bar, deform.	deformed, cutting, bending, assebling	kg	0.9	0.4	0.1	0.0	0.9	0.4
2.5 Shotcrete	purchse, houling, placing	m2	6.3	127.2	0.3	9.7	6.6	136.9
2.6 Filter mat	purchase, hauling, setting	m2	10.1	1.5	1.0	0.0	11.1	1.5
3. Masonry works	•							
3.1 Wet masonry	mortal 1:4, royalty, haul, unload, masonning	m3	0.0	393.0	0.0	24.2	0.0	417.2
3.2 Gabion mattress	incl. wire net, royalty, haul., unload, masonning	m3	9.3	201.9	0.6	11.7	9.9	213.6
3.3 Gravel metalling	crushee run, spreading, compaction	m3	0.3	152.2	0.0	11.1	0.3	163.3
3.4 Weep hole	iron pipe, dia = 50mm, cutting, setting	no.	0.0	14.7	0.0	1.3	0.0	16.0
4. Metal works								
4.1 Flap gate	stainless steel, install, paint, 1.5m x 1.5m class	kg	41.0	34.0	4.0	0.0		34.0
4.2 Structural steel works	section steel, process, assembl., weld., for bridge	kg	10.1	0.9	0.0	0.9		1.8
4.3 Iton pipe, dia.= 1,000mm	upto install, incl. piping upto valve	m	0.0	4,246.0	0.0	307.0	0.0	4,553.0

Note: Price level; June 1997, US\$ 1.0= Birr 6.8= J.Yen 114.7

Tax includes custom and sales taxes.

Table 7.3.5 Breakdown of Unit Price (1/10)

Yock item:	U1100 Clearing and stripping, h.=7.5km							
	cutting, t=20cm, clearing, dozing, loading, hat	uling 7.5k	in, unloadii <u>Total</u>	ng, spreading	F.C.		<u>L.C.</u>	
	m2 In local currency;	Birr	<u>10:01</u> 9.1		7,4		1.6	
	in foreign correctly;	US\$	1.3		1.1		0.2)	
x			100%		82%		18%	
) ty for calculation:	1000	m2						
Code	Description	<u>Unit</u>	Qʻty	F.C. po Unit price US\$	rtion Amount US\$	<u>L.C. po</u> <u>Unit price</u> Birr	<u>Amount</u> Birr	Remarks
abor								
cutting, buildozing)	C		0.727			80	58	
L0010	Foreman	m.d. इत.d.	0.727			60	4	
L0110	Operator	10.0.	0.075					
toading) L0010	Foreman	m.đ.	3.12			80	90	
L0110	Operator	ra.d.	0.11			60	7	
	Operator	10.0.	0.11					
(hauting, untosding) 1.0110	Operator	m.d.	5.66			60	340	
(spreading) LOI 10	Operator	m.d.	0.459			60	28	
B301	Miscellaneous cost for labor, Type 1		3%				16	
6,01	Sub-total						542	74
Material								
(cutting, buildozing)								
M010102	Gas oil (=Light oil)	lit.	81.2	0.29	24			
M010301	Lubricant	lit.	0.81			8 2	7	
(loading)								
M010102	Gas oil (=Light oil)	là.	76.4	0.29	22			
M010301	Lubricant	lit.	0.76			8.2	6	
(hauling, unloading)								
M010102	Gas oit (=Light oil)	fit.	474	0.29	137			
M010301	Lubricant	lit.	4.74			8.2	39	
(spreading)								
M010102	Gas oil (=Light oil)	lia.	46.9	0.29	14	ł		
M010301	Lubricant	lit.	0.47			8.2	.1	
B401	Miscellaneous cost for materials. Type 1		3%		e	5	2	
	Sub-total				203	\$	57	20%
Equipment								
(cutting, buildezing)								
E0101-11-210	Buildoser, 21ton	Hour	2 84	42.8082183	{2	2 41.1733687	• 117	
(loading)			4.10		7	8 15.7840678	5 69)
	Backhoe, 0.60m3	Hour	4.39	17.7197523	1	6 12.7649078	5 V1	•
(bauling, unloading)			76.	10.0307051		4 12.1407725	5 430)
	Dump truck, 10ton	Hour	33.4	10.8497854		• •=••••••••		•
(spreading) E0101-11-21(Bulldoser, 21ton	Hour	1.6	42 8082183	7	0 41.1733683	7 6	8
B501	Miscellaneous cost for equipment, Type 1 Sub-total		ło	é	2 67	10 73	2 70	1 14 73
	Total				87	16	1.30	13 I I I I I I I I I I I I I I I I I I I
8601	Overhead, Type 1		259	i.	21	19	33	26
T 1.1	our 1000 m2				1.04	25	L.6.	1 9
Total	per 1000 m2					.1		.6
Unit price	per 1 m2				•	• •	•	

Note:

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Price level; June, 1997, US\$ 1.0= Birr 6.8

Tax is excluded in the unit price.

Table 7.3.5 Breakdown of Unit Price (2/10)

Work item:	U1200 Excavation, common, h.=7.5km							
•	excavation, loading, hauling 7.5km, unloadin m3	g, spreadir	ig Total		<u>F.C.</u>		<u>1.C.</u>	
	in local currency;	Віл	44.8		36.7		<u>1</u> 8.1	
. (in foreign currency;	US\$	6.6		5.4		1.2))
			100%		82%		18%	
Oty for calculation:	200) m3				· -		
Code	Description	Unit	Qʻtx	<u>E.C. po</u> Unit price	rtion Amount	L.C. po Unit price	rtion Amount	Remarks
		<u></u>	***	USS	USS	Birr	Bin	ICCIDALE 3
abor								
cutting, bulldozing) £0010	Foreman	m.d.	0.727			80	58	
L0110	Operator	m.d.	0.073			60		
loading)								
L0010	Foreinan	m.d.	1.12			80	90	
L0110	Operator	m.d.	0.11			60	7	
bauling, unloading) L0110	Operator	m.đ.	5.66			60	340	
(spreading)	~ F		2.00					
LOHO	Operator	m.d.	0.459			60	28	
B 301	Miscellaneous cost for labor, Type 1		3%				16	
	Sub-totat						542	8%
4 - 4								
Material cutting, buildozing)								
	Gas oil (=Light oil)	lit	74.9	0.29	22			
M010301	Lubricant	hit	0.75	0.27	**	8.2	6	
leading)								
M010102	Gas oil (=1.12bt oil)	tia.	76.4	0.29	22			
M010301	Lubricant	lit.	0.76			8.2	6	
baahng, unloading) M010102	Gas oil (=Light oil)	lit.	474	0.29	137			
M010301	Lubricant	ht.	4 74	V.,	•	8.2	39	
spreading)						•	• •	
M010102	Gas oil (=Light oil)	lit.	46.9	0.29	14			
M010301	Lubricant	lit.	0.47			8.2	4	
B 401	Miscellaneous cost for materials, Type 1		3%		6		2	
	Sub-total				201		57	20%
Quipment								
cutting, bulldozing) F0101.11.710	Bulldoser, 21ton	Hour	262	42.8082183	112	41.1733687	108	
loading)		1100	2.02	12.0002103	112	100101111	103	
	Backhoe, 0.60m3	Hour	4.39	17.7197523	78	15.7840678	69	
(hauling, unloading)				_				
	Dump truck, 10ton	Hour	35.4	10.8497854	.384	12.1407725	430	
(spreading) E0101-11-210	Bulldoser, 21ton	Hour	1.64	42.8082183	70	41.1733687	68	
8501	Miscellancous cost for equipment. Type 1 Sub-total		3%		19 664 864		20 695 1,293	73%
					004		1,473	100%
8601	Overhead, Type 1		25%		216		323	
Total	per 200 m3				1,080		1.616	
Unit price	per 1 m3				5.4		8.1	

Tax is excluded in the unit price.

Table 7.3.5 Breakdown of Unit Price (3/10)

Work item:	U1400 Excavation, river bed, h.=7.5km							
	excavation, loading, hauting 7.5km, unloading	ig, spreadir	-		-			
Unit of work q'ty:	m3	•	<u>Total</u>		<u>F.C.</u>		<u>LC</u>	
Unit price (Net):	in local currency;	Birr	84.2		30.9		53.3	
(in foreign currency;	US\$	12.4 100%		4.5 37%		7.8)	1
			100%		31%		63%	
Q'ty for calculation:	20	0 m3		F.C. po	dian	<u>LС.</u> ро	dian	
Code	Description	<u>Unit</u>	Oty	Unit price US\$	Amount US\$	Unit price Birr	Amount Birr	<u>Remarks</u>
Labor		•						
(excavation, man pow						0.0	1 (00	
L0010	Fotemaa	in d.	21			80	1,680	
L0620	Common labor	m d.	210			10	2,100	
(short hauling, max.=	F		10			0.0		
L0010	Foreman	m.d.	19			80	1,520	
L0620	Common labor	m.d.	190			10	1.900	
(loading)	6							
L0010	Foreman	m.d.	1.12			80	90	
L0110	Operator	m.d.	0.11			69	7	
(hauling, unloading)	0							
E0110	Operator	m. d .	5.66			60	340	
(spreading)	A	-				~~		
£0110	Operator Manufic and the transferred to the transfe	m.d.	0.459			60	28	
8301	Miscellaneous cost for labor, Type 1		3%				230	50.0
	Sub-total						7,893	59%
Material								
(loading)								
MOI0102	Gas oil (=1.ight oil)	tit.	76,4	0.29	22			
M010304	Lubricant			0.29	22	8.2	6	
	4.004 A. 40 H	tit.	0.76			õ. 2	0	
thavling, unloading) M010102	Ger oil t-Liabroils	1 14		A 10	113			
	Gas oil (=Light oil)	tit.	474	0.29	137	0 7	7/1	
M010304	Lubricant	lit.	4.74			8.2	39	
(spreading) M010102	Gas oil (=1.ight oil)	15	46.9	0.29	14			
M010301	Cas on (= 1.1gin (iii) Lubricant	lit. lit	-40.9	0.29	14	8.2	4	
		iii.	0.17					
B401	Miscellaneous cost for materials, Type 1 Sub-total		3%		5 178		। 50	9%
Equipment (loading)								
E0202-21-060	Backhoe, 0.60m3	Hour	4.39	17.7197523	78	15.7840678	69	
(hauling, unloading) E0301-12-110 (spreading)	Dump truck, 10ton	Hoor	35.4	10.8497854	384	12.1407725	430	
	Bulldoser, 21ton	Hosr	1.64	42 8082183	70	41.1733687	68	
8501	Miscellaneous cost for equipment, Type 1 Sub-total		3%		16 548		17 584	
	Tota)				726		8.527	
B601	Overhead, Type 1		25%		182	:	2,132	
T 1	300 3				000		10 100	
Total Unit price	per 200 m3 per 1 m3				908 4.5		10,659 53.3	

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Q'ty for calculation: <u>Code</u>					80%		20%	
		00 m3						
	Description	Unit	ϘΊϒ	<u>F.C. po</u> Unit price US S	<u>rtion</u> <u>Amount</u> US S	L.C. por Unit price Birt	<u>stion</u> Amount Birr	Remarks
Labor								
(spreading)								
L0010 F	foreman	m.d.	0.025			80	2	
L0110 C	Operator	rn.d.	0.252			60	15	
(compaction)							_	
	Foreman	m.d.	0.013			80	1	
L0110 C	Operator	m.d.	0.13			60	8	
1.0620 (Common labor	m.đ.	0.5			10	5	
	Miscellaneous cost for labor, Type 1 Sub-total		3%-				1 32	9%
Material								
(spreading)								
	Gas oil (=Light oil)	lit.	19.3	0.29	6			
	Lubricant	lit	0.193	н		8.2	2	
(compaction)								
	Gas oil (=Light oil)	tii.	3.67	0.29	1			
	Lubricant	tit.	0.037			8.2	0	
	Miscellaneous cost for materials. Type 1 Sub-total		3%	ŕ	0 7		0 2	
Equipment								
(spreading)								
	Bulldoser, 15ton	Hou	r 0.9 9	9 25.8739645	26	24.8858355	25	
(compaction)					-		7	
£0802-12-020	Tire roller, 8-20ton	Hou	r 0.5	1 12.843589		13.6864442	,	

Table 7.3.5 Breakdown of Unit Price (4/10)

B501	Miscellaneous cost for equipment, Type 1 Sub-total	3%	1 33	1 33	76%
	Tetal		40	66	100%
8601	Overhead, Type I	25%	10	17	
Total Unit price	per 100 m3 per 1 m3		50 0.5	83 0.8	
Note:	Price level; June, 1997, US\$ 1.0= Birr 6.8	Tax is excluded in the	2 unit price.	· · · · · · ·	

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Table 7.3.5 Breakdown of Unit Price (5/10)

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Work item:	J2210 Mass concrete (160kg), crane							
	edy mixed, hauling, placing by crane, compa-	ction, curi						
	m3		<u>Total</u>		<u>E.C.</u>		<u>L.C.</u>	
	n local currency;	Віп	871.6		127.2		744.4	
(i	n foreign currency;	US\$	128.2		18.7		109.5)	
			100%		15%		85%	
Q'ty for calculation:	10	m3		F.C. po	rtion	L.C. po	rtion	·
Code	Description	<u>Unit</u>	Q'ty	Unit price US\$	Amount US\$	Unit price Birr	Amount Birr	Remarks
Labor								
hauling)							0	
	Operator	m.d.	0.86			60	52	
placing, compaction)	_							
	Foreman	m.d.	0.18			80	14	
L0410	Concrete worker	m.d.	1.25			40	50	
LOLIO	Operator	m.d.	0.37			60	22	
L0620	Common labor	m.d.	1.63			10	16	
(curing)								
	Common labor	m.d.	0.73			10	7	
8301	Miscellaneous cost for labor, Type 1		3%				5	
	Sub-total						167	2%
Material								
(hauling)								
	Ready mixed concrete, 160kg	m3	11			498	5.478	
M010102	Gas oil (≖Light oil)	let.	41.7	0.29	12			
M010301	Lubricant	lit.	0.417			8.2	3	
(placing, compaction)	i							
	Gas oil (=Light oil)	lit.	14.85	0.29	4			
M010301	Lubricant	bt.	0.149			8.2	1	
E0401-11-050	Miscellaneous cost for materials, Type 1 Sub-total Agitator truck, 3.2m3 Crawler crane, 50ton Concrete backet, man., 1.0m3	Hour Hour Day	1.36	8.80792882 59.4716305 50.6615385	81	8.56116092 66.4129543	90	
B501	Miscellaneous cost for equipment, Type 1 Sub-total Total		39		13. 15)	4 141 5,955	1 454 5 1004
B601 Total	Overhead, Type 1 per 10 m3		259	ŕ	3 18		1, 489 7.441	ł
Unit price	per 1 m3				18.	7	744.4	ŀ



Table 7.3.5 Breakdown of Unit Price (6/10)

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	U2230 Ordinary concrete (240kg), crane							
	redy mixed, hauling, placing by crane, comp	paction, curi			FC			
• •	m3 in local currency;	8in	<u>Total</u> 950.9		<u>F.C.</u> 127.2		<u>L.C.</u> 823.7	
	in foreign currency;	US\$	139.8		18.7		121.1)	
(In search concest,	034	100%		13%		87%	
Q'ty for calculation:		10 m3						
<u>Code</u>	Description	<u>Unit</u>	Qa	F.C. po Unit price USS	rtion Amount USS	L.C. po Unit price Birr	<u>rtion</u> <u>Amount</u> Birr	<u>Remarks</u>
Labor								
haoling) 1.0110	Operator	m đ.	0.86			60	52	
placing, compaction)			0.10			80	14	
L0010	Foreman	m.đ. m.d.	0.18			40	50	
1.0410	Concrete worker	m.d.	0.37			40 60	22	
1.0110 1.0620	Operator Common labor	m.d.	1.63			10	16	
(curing)	Constront Book							
L0620	Conumon labor	m d.	0.73			10	7	
B 301	Miscellaneous cost for labor, Type 1		3%				5 167	2%
	Sub-total						107	270
Material (hauling)								
M180503	Ready mixed concrete, 240kg	m3	н			554	6,094	
M010102	Gas wil (=Light oil)	lit.	41.7	0.29	12			
M010301	Lubricant	bit.	0.417			8.2	3	
placing, compaction								
M010102 M010301	Gas oil (=Light oil) Lubricant	lit. lit.	14.85 0.149		4	8.2	ł	
B401	Miscellancous cost for materials, Type 1 Sub-total		3%		0		183 6,282	84%
					•		•,•••	2
Equipment (placing, compaction	`							
F0902-12-032	Agitator truck, 3.2m3	Hour	4.3	8.80792882	38	8.56116092	37	
E0401-11-050	Crawler crane, 50ton	Hour		59.4716305		66.4129543	90	
	Concrete backet, man., 1.0m3	Day	0.2	50.6615385	10	50.32	10	
B501	Miscellaneous cost for equipment, Type I Sub-total		3%		4 133		4 141	
	Total				150)	6,590	100%
B601	Overhead, Type I		25%	b	3		1,647	
Total Unit origin	per 10 m3				18 18.		8,237	
Unit price	per I m3				10.	,	823.7	

7 - 24

Table 7.3.5 Breakdown of Unit Price (7/10)

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Code: Work item: Description: Jnit of work q'1y:	U2100 Form, for ordinary concrete plywood, setting, oil painting, removal in2		Total		<u>F.C.</u>		<u>L.C.</u>	
Jnit price (Net):	in local currency;	Віл	124.3		70.2		54.2	
	(in foreign currency:	USS	18.3		10.3		8.0)	
			100%		56%		44%	
Q'ty for calculation:		00 m2		F.C. po	rtion	<u>L.C. po</u>	rtion	
Code	Description	<u>Unit</u>	Ωία	Unit price US\$	Amount US\$	Unit price Birr	Amount Birr	<u>Remarks</u>
Labor								
L0010	Foreman	m.đ.	3.2			80	256	
L0320	Carpenter	in.đ.	45.5			40	1,820	
L0620	Common labor	m.d.	21.5			10	215	
L0110	Operator	m .đ.	1.97			69	118	
B301	Miscellaneous cost for labor, Type 1		3%				72	
	Sub-total						2,481	251
Material								
M060500	Plywood	m3	0.88	602	530			
M060200	Timber, square	m 3	0.44			2636	1,160	
M030303	Nail	kg	2			9.1	18	
M070310	Form oil	ta.	50			7.3	365	
M010102	Gas oil (=Light oil)	ht	92.7	0 29	27			
M010301	Lubricant	bit.	0.927	0.29	21	8.2	8	
8401	Miscellaneous cost for materials, Type 4 Sub total		19		17 573		47 1,597	554
Equipment								
E0402-22-016	5 Truck crane, hyd , 15-16ton	Hour	10.9	22.470504	245	22.6902998	247	
8501	Miscellancous cost for equipment, Type 1 Sub-total		3%		7 252		7 255	
	Total				826	,	4,333	100
B601	Overhead, Type t		25%		206	i	1,083	
Total	per 100 m2				1,032		5,417	
Unit price	per l m2				10.3)	54.2	

Table 7.3.5	Breakdown of Unit Price (8/10)	

fork item: R escription: d init of work g'ty: k init price (Net): in	12300 teinforcing bar, deformed eformed, cutting, bending, assebling g a local currency; n foreign currency;	Birr US S	<u>Total</u> 6.3 0.9 100%		<u>F.C.</u> 5.9 0.9 94%		<u>L.C.</u> 0.4 0.1) 6%	
ty for calculation:	1900	kg						
Code	Description	Unit	Ωτε	<u>F.C. 90</u> Unit price USS	Amount US\$	L.C. po Unit price Birr	<u>Amount</u> Birr	<u>Remarks</u>
abor (utting, bending)								
	Rebar worker	m.d.	2 25			40	90	
	Common labor	md.	1.5			10	15	
assembling)		m.d.	3.75			40	150	
	Rebar worker Common Jabor	m.u. m.d.	3.25			10	33	
	Operator	m.đ.	0.098			60	6	
	Miscellaneous cost for labor. Type 1 Sub-total		3%				9 302	6%
Material								
hauling)	Detroposition from Auformand	kg	1200	0.54	648			
	Reinforcing bar, deformed Gas oil (=Light oil)	ng lit	4.62		1			
	Lubricant	bit.	0.046			8.2	0	
	Miscellaneous cost for materials, Type 2 Sub-total		5%		31 681		0 0	
Equipment								
(placing, compaction)	Truck crane, hyd., 15-16ton	Hour	0.544	22.470504	1.	2 22.6902998	12	
8501	Miscellaneous cost for equipment. Type 1 Sub-total		39	ŧ		0 3	(
	Total				63	4	31:	5 100%
B601	Overhead, Type I		259	ł	17	4	75)
Total	per 1000 kg				86	8 9	.39- 0	

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Table 7.3.5 Breakdown of Unit Price (9/10)

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Code: Work item:	U3100 Wet masonry							
Description:	mortal 1:4, royalty, hauling, unloading, mason	ning	T . •					
Init of work q'ty:	m3		<u>Total</u>		<u>F.C.</u>		<u>LC.</u>	
Init price (Net):	in local currency;	8in	393.0				393.0	
	(in foreign currency;	USS	57.8		-		57.8)	
			100%		0%		100%	
ty for calculation:	10	m3		<u>E.C. p</u>	ortion	L.C. p	vition	
<u>Code</u>	Description	<u>Uoit</u>	Qùy	Unit price USS	Amount US\$	Unit price Birr	Amount Birr	<u>Remarks</u>
abor								
(stone pitching)	Maria					45	236	
L0420	Mason	m.d.	5.25			43	102	
1.0620	Common labor	nr.d.	10.2			10	102	
mortaring)		_					100	
L0410	Concrete worker	m d.	4,5			40	180	
L0620	Common labor	m.d.	9			10	90	
filling behind)								
L0620	Common labor	m.d.	1.7			01	17	
B301	Miscellaneous cost for labor, Type 1		3%				19	
	Sub-total						644	209
Material								
(stone pitching)								
M180302	Stone	m3	11.3			46	520	
(mortaring)		116.7	11.7			10		
M180505	Ready mixed concrete, 240kg, at seite	m3	2.75			639	1,757	
	NEAUY BRACO CORCICE, 240Kg, 21 SCRC	E (), Y	2.13			0.9	1,1,11	
(filling behind) M180302	Stone	m3	2.26			46	104	
B402	Miscellaneous cost for materials. Type 2 Sub-total		5%				119 2,500	
Equipment								
B 501	Miscellaneous cost for equipment, Type 1 Sub-total		39	2				
	Τοταł						3,14	4 10
B 601	Overhead, Type I		250	8			78	6
T . I							• • •	0
Total Unit price	per 10 m3 per 1 m3						3.93 393.	
Note:	Price level; June. 1997, USS 1.0= Birr 6.8		Tax is ex	cluded in the	unit price.			

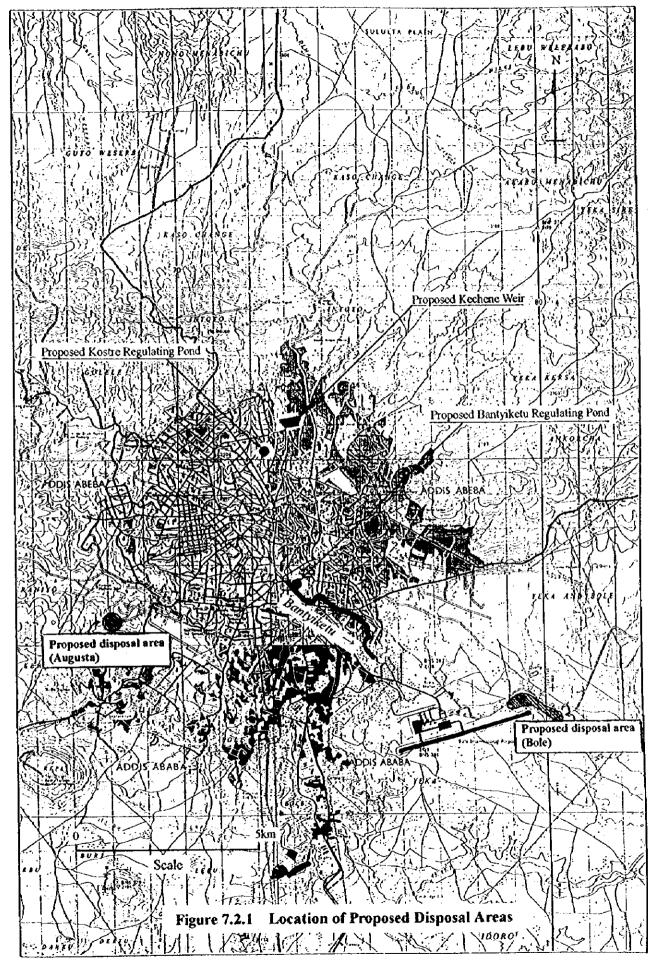
Unit of work q'ty: Unit price (Net):	U3200 Gabion mattress including wire net, royalty, hauling, unloading rn3 in local currency; in foreign currency;	g, masonn Birr USS	ing <u>Total</u> 265.0 39.0 100%		<u>E.C.</u> 63.1 9.3 24%		<u>L.C.</u> 201.9 29.7) 76%	
Q'ty for calculation:		m3						· · · · · · · · · · · · · · · · · · ·
Code	Description	<u>Unii</u>	Q'ty	E.C. po Unit price US\$	<u>rtion</u> <u>Amount</u> US\$	<u>L.C. pr</u> <u>Unit price</u> Birr	<u>Amount</u> Birr	<u>Remarks</u>
Labor	······································					0.1		
£.0010	Foreinan	m.d.	0.3			80	24	
1.0420	Mason	m.d.	2 5			45	113	
1.0620	Common labor	m.d.	2.25			10	23	
1.0110	Operator	m.d.	0.532			60	32	
B301	Miscellaneous cost for labor, Type 1 Sub-total		3%				6 197	15%
Material			50			9.1	455	
81030302 81180302	Annealed iron wire Stone	kg m3	5,7			9.1 46	433	
M010102	Gas oil (=).ight oilt	ia.	33.1	0.29	10	40	202	
M010301	Lubricaat	ອ້າ.	0.331	<u> </u>		8.2	3	
B 401	Miscellaneous cost for materials, Type 1		3%		0		22	
	Sub-total				10		742	64%
Equipment E0202-21-060	Backhee, 0.60m3	Hour	1.9	17,7197523	34	15.7840678	30	
B501	Miscellaneous cost for equipinent, Type 1 Sub-total		3%		1 35		 31	21%

Table 7.3.5 Breakdown of Unit Price (10/10)

Total 45 969 100% 8**6**91 Overhead, Type 1 25% 11 242 per 6 m3 per 1 m3 56 1,211 Total 9.3 201.9 Unit price Note: Price level; June, 1997, US\$ 1.0= Birr 6.8 Tax is excluded in the unit price.

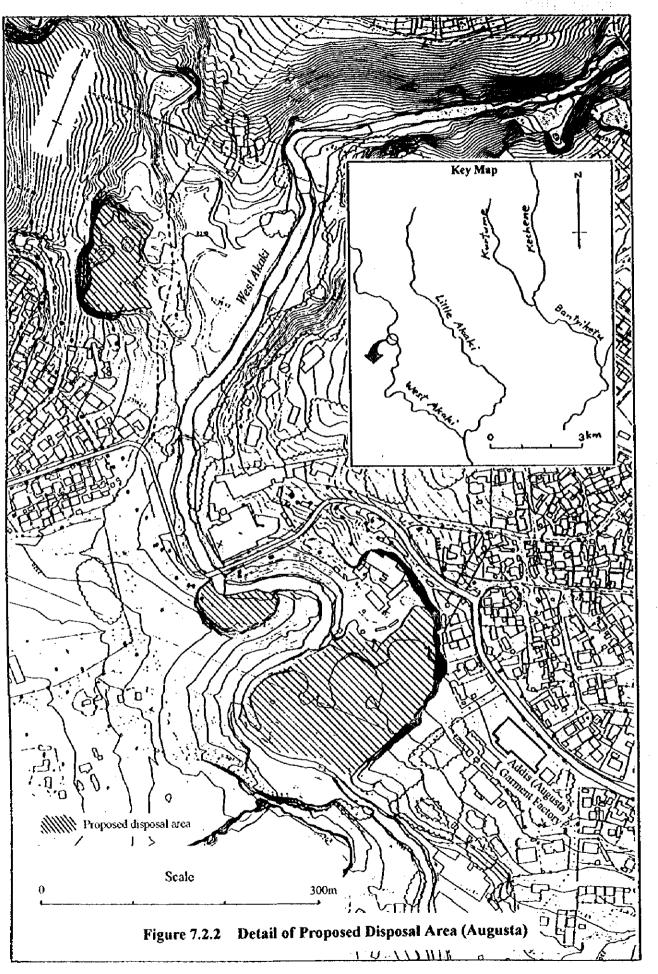
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Work item	Work	r			·	r	20			·	T ····						1		20				13		r
	quantity	J	F	м	A	м)	ł	A	\$	0	N	D	J	F	м	۸	М	3	1	A	5	0	N	D
I. Contract and preparatory v	vorks				ļ														ļ						ĺ
 Work contract 												ļ												Ì	
2) Preparatory works							ĺ																		
2. Kechene weir					 			 	-	 			`									1	-	1	1
1) Excavation works	Excavation 16,000 m3 Concrete											R													
2) Concrete works	10,000 m3																								
3) Miscellaneous works																									
3. Kostre regulating pond	Excavation	-	 	Ī		ĺ			1-		1-	-				-									
1) Excavation works	34,000 m3				Ŋ	i: T		h T		; 	1														
2) Masonry works	Wet masonry 3,300 m3																								
3) Miscellaneous works																									
4. Bantyiketu regulating pon	d			+-	1-		-	-	-†-	1-	-		-	-		•		-			-		1-	- -	Ť
• • •	Execution								.	3.5.2	Į.				- 	RAG	5 F 16 7	3445		<u> </u>	, j		23	ļ	
 Excavation works 	94,000 m3								1	<u>ăQ</u>			÷ŕ				ų.		Ť	Ť	i i	V.	<u>6</u>		
	Wet masonry													1						ļ	ļ	ł	7.39	1	
2) Masonry works	5,500 m3																								
3) Miscellaneous works																								: ; ;	
5. Bantyiketu river channel i		-1-	- -	Ì	Ì			- †-		-† i		-		- -		- F		-	- 1	1	-		1	ļ	
	Wet masonry	ł											ļ	1		। एष्ट्री	। বৃহন								
1) Flood wall	5,800 m3						1							ł	10	<u></u>	<u>191</u>	<u>ැ</u>	80						
	Concrete							1		ĺ			ļ	ļ	1	1									125
2) Slope protection	2,000 m3					ļ	ļ		1				ļ		ł			Ì						<u>::::</u> i	93
	Excavation				ĺ										i 1998	5	w.	<u>।</u> इ.स.	<u> </u>		. i				
3) Channel excavation	20,000 m3	1		Ì				1							010		<u>980</u> 1								
4) Associated works	Wet masonry 300 m3	;											1												
				_						_				-											ł
6. Urban drainage improver	nent Excavation																					l			
1) Drainage excavation	7,000 m.	3																					<u>)</u>	ĺ	
2) Concrete works	Concrete 1,300 m	3																					L COR T	1	
3) Grating works	Steel 86 to	n [X IX	 20)				l F	 /			

Note: June, July, August and September: Rainy season

- Construction of upper facilities will be commenced prior to downstream facilities.

Figure 7.2.3 Construction Schedule

THE STUDY ON ADDIS ABABA FLOOD CONTROL PROJECT

CHAPTER 8

ORGANIZATION AND INSTITUTION

THE STUDY

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ON

ADDIS ABABA FLOOD CONTROL PROJECT

IN

THE FEDERAL DEMOCRATIC REPUBLIC OF ETHIOPIA

CHAPTER 8 ORGANIZATION AND INSTITUTION

Contents

8.	O	RGANIZATION AND INSTITUTION	- 8-1
8.1	(General	- 8-1
8.	1.1	Structural Measures	- 8-1
8.	1.2	Non-structural Measures	- 8-1
8.2	O	rganization and Institution	- 8-2
8.	.2.1	Required Organization and Institution for Project Implementation	- 8-2
8.	2.2	Roles and Development of Each Organization	- 8-3
8	.2.3	Detail Job Description of Addis Ababa River Management Authority	- 8-6
8	.2.4	Institutions for Non-Structural Measures	- 8-8
8.3	0	peration and Maintenance	- 8-9

List of Figures

*

·

8.2.1	Overall Organization Chart for Project Implementation	8-11
8.2.2	Proposed Organization of Addis Ababa River Management Authority	8-12
8.2.3	Community Organization for Flood Fighting and Social Education Systems	8-13

8. ORGANIZATION AND INSTITUTION

8.1 General

The major river systems of the Bantyiketu, Kebena, Little Akaki and West Akakki, and Hanku rivers have been managed by the Region 14 Administration. The existing AFCPO under the Steering Committee directly administrates and manages all flood control facilities of the above mentioned rivers.

On the other hand, the following are major proposed components of the priority projects that are to be newly incorporated in the river management.

8.1.1 Structural Measures

- 1) Bantyiketu river
- Channel improvement (consisting mainly of widening of the existing river channel, construction of floodwalls and protection works of bank slopes) and
- Construction of Bantyiketu regulating pond.
- 2) Lower Kebena river
- Stope protection works.
- 3) Kechene river
- Construction of Kostre regulating pond,
- Construction of Keehene weir with orifice and
- Construction of floodwall.
- 4) Urban drainage
- Construction of road side-ditch with grating and
- Others

8.1.2 Non-Structural Measures

1) Authorization of river zone and regulation of illegal activity(garbage disposal, utilization of river area for private use and construction of private facilities in river area) for river management, and

2) Flood warning system, flood fighting system and social education for flood risk management.

8.2 Organization and Institution

8.2.1 Required Organization and Institution for Project Implementation

The priority projects would be a pilot for flood control and damage mitigation measures in not only Addis Ababa but also Ethiopia. It is expected that through implementation of the priority projects, a lot of staff who can apply the basic technologies to the flood control and damage mitigation measures be provided to the country.

Required organizations including community level as a participation of inhabitants need to be established for an implementation of the priority projects and river management, and the subsequent projects in the master plan.

Figure 8.2.1 shows the proposed overall organization for project implementation. Figure 8.2.2 shows the proposed organization of Addis Ababa River Board and Addis Ababa River Management Authority.

(1) Addis Ababa River Board

Addis Ababa River Board to be newly organized is entirely responsible for project implementation.

The President of Region 14 Administration designates and authorizes Addis Ababa River Board that is entirely responsible for project implementation of long, medium and short terms structural and non-structural measures on flood prevention, urban drainage, and resettlement in Region 14 Administration.

The President chairs the board that is organized by heads of the concerned Bureaus and Authorities of Region 14 Administration. Addis Ababa River Board takes charge of coordination with all relevant governmental agencies and regional organizations in implementing the project.

(2) Addis Ababa River Management Authority

A new organization of Addis Ababa River Management Authority needs to be established by reorganizing the existing AFCPO and assigning staff required for execution of the project and river management. Under the direction of the Addis Ababa River Board, Addis Ababa River Management Authority functions as the Executing Body of the project.

Addis Ababa River Management Authority is designated and authorized by Region 14 Administration that is responsible for implementations of river management, flood prevention and urban drainage projects, and resettlement with administrative power.

This Authority is functionally and institutionally same with those of AAWSA (Addis Ababa Water Supply and Sewerage Authority) and AARA (Addis Ababa Road Authority) in the Region 14 Administration. The budget of AARMA is all covered by Region 14 Administration. Required personnel numbers will be around 50.

Consultants are to be employed to assist the implementation of the priority projects including basic design, detailed design and construction supervision. The construction system will be a full contracting basis through an international competitive bidding.

(3) Community Organizations

Each community with guidance by AARB and AARMA basically operates the flood fighting and social education systems in the non-structural measures. A participation of inhabitants is requisite for the system operations.

Figure 8.2.3 presents the organization and communication chart for the community organization. For this purpose, required institutional support needs to be established in line with the regulations of Region 14 Administration.

8.2.2 Roles and Development of Each Organization

Roles of each organization are specified as follows.

Addis Ababa River Board (AARB)

Overall management and coordination with relevant organizations:

- Coordination with relevant organizations,
- Formulation of institutional system,
- Establishment of required organization,
- Financial arrangement,
- Arrangement of social education,
- Land acquisition, and
- Others.

Addis Ababa River Management Authority (AARMA)

For implementation stage:

- Overall river management,
- Investigation, study and detailed design of construction works,
- Preparation of tender document,
- Tendering,
- Resettlement, and
- Construction supervision,

For operation and maintenance stage:

- River management for structural and non-structural measures,
- Operation and maintenance for the rivers and river structures, and
- Direction and guidance of flood fighting and social education for flood risk mitigation.

Zone and Wereda

- Direction and supervision of flood fighting system under the direction of Investigation and Survey Division of AARMA, and
- Direction of social education for rivers and flooding under the direction of Administration Division of AARMA.

Kebcle and Community

- Operation of flood fighting system (self defense by community level), and
- Social education for rivers and flooding.

Establishment of these organizations needs to be progressed with required institutional development in line with the regulations and institutions of the Region 14 Administration. The organizations of the project implementation need to be developed according to the following three stages.

(1) Preparatory Stage

In order to mobilize the project smoothly, AARB establishes AARMA organization as required in minimum and assigns a group of staff and commences the preparatory works immediately after JICA study. AARB takes an initiative for all activities in the preparatory stage.

The staff is selected from various sectors in Region 14 Administration including some of the counterpart personnel of the present JICA study team. The major tasks in the preparatory stage are as follows:

- Detailed implementation program for priority projects,
- Budget arrangement,
- Establishment of AARMA organization,
- Formulation of institutional system of AARMA
- Institution for the river zone and illegal activity,
- Institution for flood risk management (flood warning and fighting) and social education, in cooperation with Zone/Wereda, and
- Direction of establishment of community organization.

(2) Implementation Stage

The required organization is fully established based on the detailed implementation program prepared in the preparatory stage. AARB takes charge of coordination and management for the project implementation. On the other hand, AARMA mobilizes as the executing body for project implementation. Major tasks in this stage are as follows.

AARB

- Coordination with relevant organizations,
- Employment of consultants,
- Coordination and management for detailed design and construction works,
- Land acquisition, and
- Coordination and management for non-structural measures.

AARMA

- River management,
- Carrying out detailed design and preparation of tender documents,

- Resettlement,
- Tendering for construction works,
- Construction supervision, and
- Activities of non-structural measure in cooperation with relevant organizations and communities.

The organization of AARMA needs at least the following technical key staff.

- Project manager,
- River management staff,
- Administrative and finance officers,
- Officers for resettlement,
- River engineer,
- Design engineer,
- Hydrologist,
- Surveyor, and
- Quality control engineer.

(3) Operation and Maintenance Stage

Activities of operation and maintenance for river and river structures starts just after the completion of the priority projects. AARMA takes charge of operation and maintenance work for structural measures.

For non-structural measures, AARMA also takes charge of operation and management in cooperation with relevant organizations. Division of River Management and O/M in Figure 8.2.2 is mainly in charge of O/M for structural measures of river and river structures and for non-structural measures.

The following key personnel needs to be additionally assigned for river management, and operation and maintenance (O/M) of the completed priority projects.

- Personnel for river management including non-structural measures, and
- Personnel for operation and maintenance of river and structures.

8.2.3 Detail Job Description of Addis Ababa River Management Authority

Major jobs of the respective divisions in AARMA are specified in the following.

(1) Administration and Finance Department

This department consists of 2 divisions of Administration and Finance. Major jobs are as follows:

Administration Division

- Administration of general matters in the office and staff, and
- Arrangement of social education of people for rivers and flooding.

Finance Division

- Arrangement and management of financial matters in the office.

(2) Planning and Design Department

There are 3 divisions of Resettlement, Survey and Investigation, and Planning and Design Division. Major tasks are specified as follows:

Resettlement Division

- Investigation of areas that are subject to damage by flooding,
- Preparation of questionnaire for objective people,
- Categorization of type of houses and transfer document to Planning and Design Division, and
- Implementation of resettlement works.

Survey and Investigation

- Carrying out surveys consisting of river section, hydrological matters and construction works,
- Observation and collection of meteorological and hydrological data,
- Analysis of data and operation of flood warning, and
- Issuance order for flood fighting under the direction of AARB and AARMA.

Planning and Design Division

- Planning of river improvement works including related works and building,
- Design for the above, and
- Preparation of tender document for construction works of flood control and resettlement.

(3) Operation Department

The operation department consists of 2 divisions of Procurement and Supervision, and River Management and O/M. Major tasks are as follows:

Procurement and Supervision Division

- Assistance AARB to employ consultant,
- Carrying out tendering, and
- Supervision of construction works and preparation of completion report.

River Management and O/M Division

- Assistance Law Section of Region 14 Administration for institutional matters of river management and flood risk management,
- River management, and
- Operation and maintenance of the completed works.

8.2.4 Institutions for Non-Structural Measures

In addition to the institutional setup for the respective organizations required for project implementation, the following institutional systems are established for the nonstructural measures.

(1) Institutions for River Zone

For authorization of the river zone, an institutional support with bylaw is required for an overall river management system. The concerned law-section in the Region 14 Administration and Addis Ababa River Management Authority which are directed by Addis Ababa River Board, take charge of these institutional matters in accordance with the regulations of Region 14 Administration. The following are the required institutional support items:

- Designation of the highest responsible administrator (President) in the river management for rivers and river structures,
- Rivers, river stretches and river widths to be designated,
- Regulation of land use in the riverine area
- Permission system for utilization and construction of facilities in the river zone, and

- Regulation of and penalty for illegal activities such as illegal utilization of river zone, and garbage and soil disposals.

(2) Institutions for Flood Warning and Flood Fighting System

To operating the flood warning system needs required institutional system in relation with flood fighting system that is to be operated by community organizations.

From the above, the following major matters are authorized by the regulations and institutions of the Region 14 Administration.

For Flood Warning System

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- System and flowchart of information and warning, and
- Relationship with related organizations.

For Flood Fighting System

- Community organization for flood fighting,
- Communication system and flood fighting activities (flood fighting plan),
- Organization and responsibility of community (flood fighting team),
- Responsible administrator of each community (leader of flood lighting team),
- Annual training of flood fighting activities,
- Installation of storage house for flood prevention works,
- Designation of location of safety shelter and evacuation route in emergency case,
- Commendation system for outstanding community,
- Sharing of cost for activities, and
- Opening of public hearing.

For Social Education

- Seminar for community leaders,
- Seminar for people in each community,
- Campaign through TV and radio,
- Designation of River Day and annual River Festival (Love River),
- Annual demonstration of flood fighting activity, and
- Commendation system for outstanding community.

8.3 Operation and Maintenance

As described in the above section 8.2, AARMA under the direction of AARB is responsible for overall management for all completed river structures and established

non-structural measures in the priority projects. Activity on operation and maintenance starts immediately after the completion of the priority projects. River Management and O/M Division in AARMA as shown in Figure 8.2.2, takes charge of operation and maintenance for completed works and non-structural measures.

Operation is an efforts to manage river and river structures for their multi functions. Maintenance is an efforts to conserve functions of river and river structures in good condition including activities of rehabilitation works. In this regard, main task after completion of the priority projects is river management consisting of the following jobs.

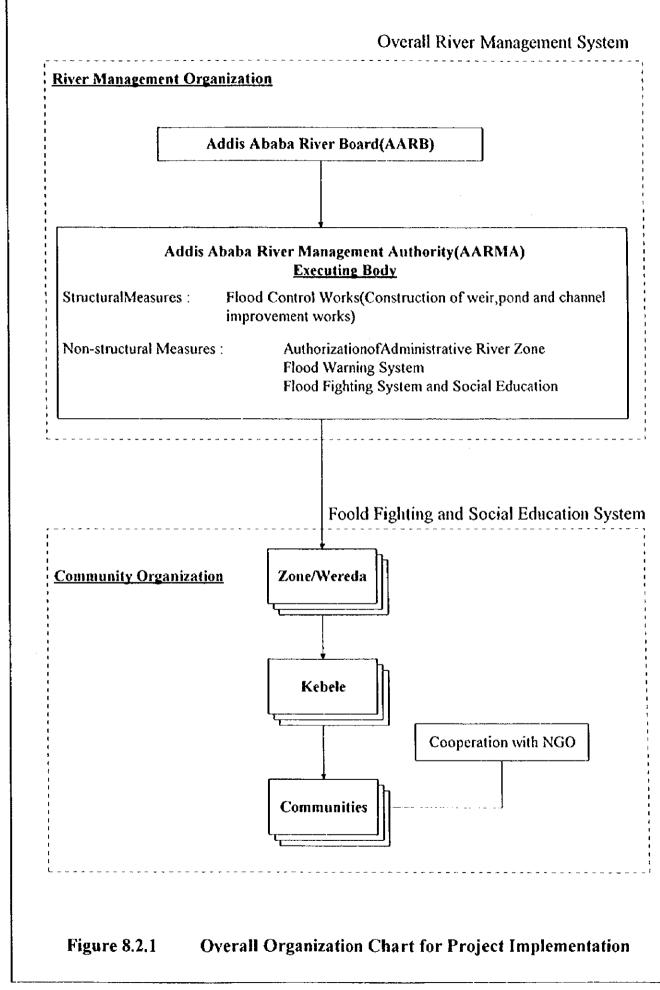
Structural measures

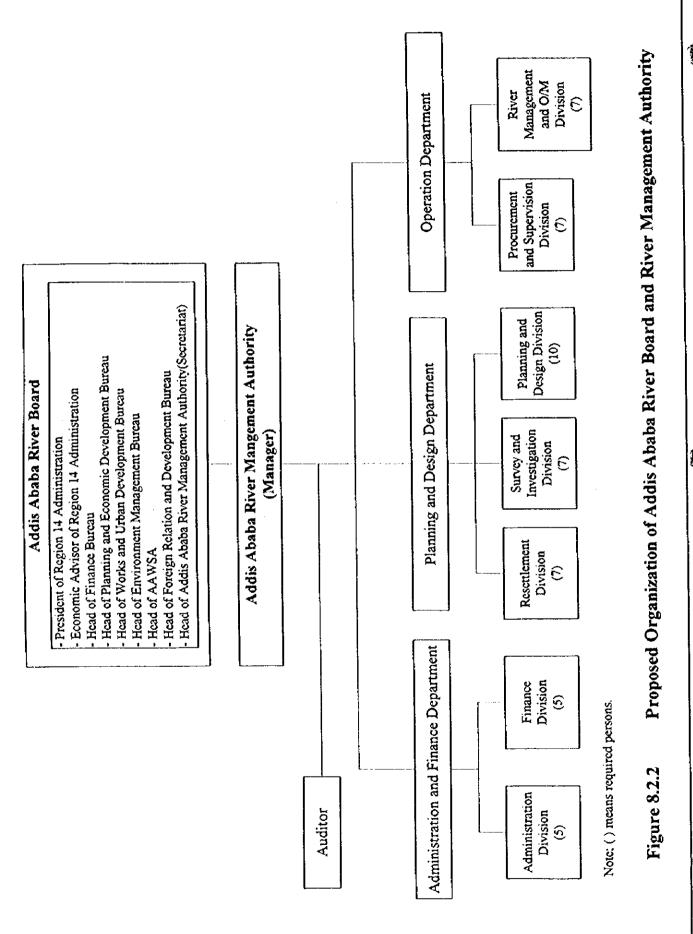
- Inspection and monitoring of river channels and structures,
- Inspection and monitoring against illegal activities,
- Operation of river structures,
- Maintenance of river channel and river structures,
 - Grass cutting of river banks
 - Removal of obstacles from river courses
 - Refilling of scour pits
 - Small repair works
 - Others
- Rehabilitation works, and
- Maintenance of equipment.

Non-structural measures

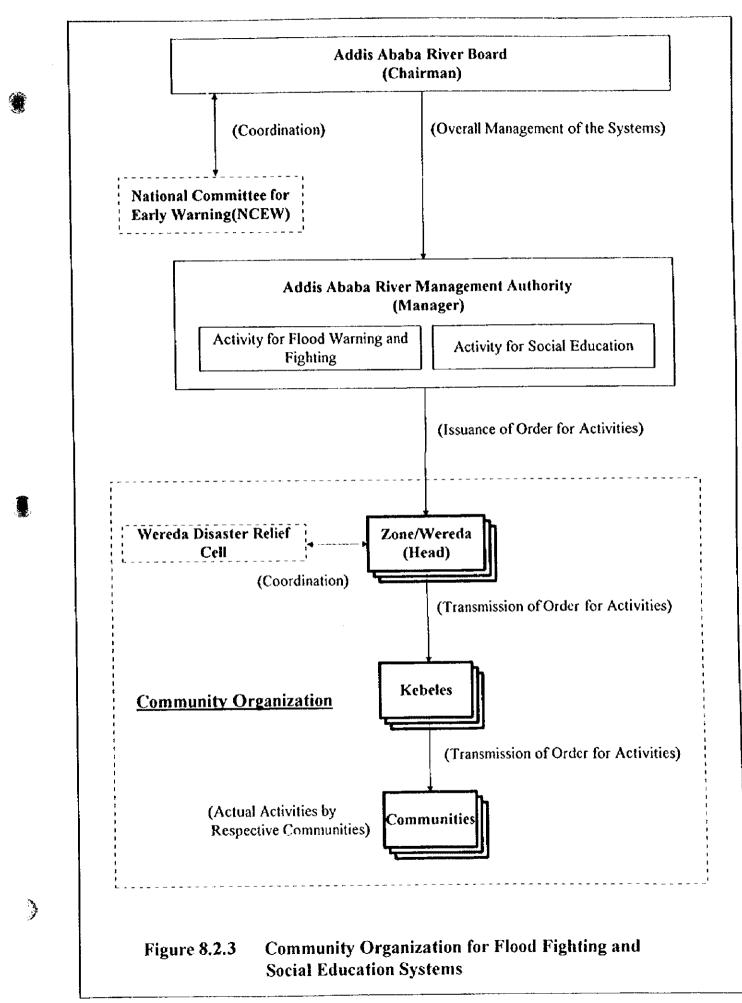
- Inspection and monitoring of administrative river zone and illegal activities, and
- Operation and maintenance of flood warning and flood fighting systems.

The detail operation and maintenance manual for the priority projects will be prepared in due time of the subsequent detailed design stage.





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THE STUDY ON ADDIS ABABA FLOOD CONTROL PROJECT

CHAPTER 9

PROJECT COST

THE STUDY ON ADDIS ABABA FLOOD CONTROL PROJECT IN THE FEDERAL DEMOCRATIC REPUBLIC OF ETHIOPIA

CHAPTER 9 PROJECT COST

Contents

9.	PR	OJECT COST9-1
9.1	Gei	neral9-1
9.2	Pro	ject Cost 9-1
9.2	.1	Project Cost9-1
9.2	2.2	Construction/Installation Cost9-1
9.2	2.3	Resettlement Cost9-1
9.2	2.4	Engineering Services Cost9-1
9.2	2.5	Administration Cost9-1
9.2	2.6	Annual Disbursement Schedule9-2
9.2	2.7	Annual O&M Cost9-2

*

List of Tables

۲

9.2.1	Project Cost	9-3
9.2.2	Breakdown of Construction Cost of Structural Measures	9-7
9.2.3	Breakdown of Installation Cost of Non-structural Measures	9-17
9.2.4	Breakdown of Resettlement Cost	9-19
9.2.5	Breakdown of Engineering Services Cost	9-20
9.2.6	Breakdown of Administration Cost for Structural Measures	9-24
9.2.7	Breakdown of Administration Cost for Non-structural Measures	9-25
9.2.8	Annual Disbursement Schedule	9-26
9.2.9	Breakdown of O&M Cost for Structural Measures	9-27
9.2.10	Breakdown of O&M Cost for Non-structural Measures	9-28

9. PROJECT COST

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9.1 General

Initial investment cost for structural measures comprises 1) construction cost, 2) engineering service cost, 3) resettlement cost, 4) administration cost, 5) physical contingency and 6) price contingency. Initial investment cost for non-structural measures comprises 1) installation cost, 2) administration cost, 3) physical contingency and 4) price contingency.

Annual operation and maintenance (O&M) cost comprises those of structural measures and non-structural measures.

9.2 Project Cost

9.2.1 Project Cost

Project cost is estimated in Table 9.2.1.

9.2.2 Construction/Installation Cost

Breakdown of construction cost of structural measures is given in Table 9.2.2. Breakdown of installation cost of non-structural measures is given in Table 9.2.3.

9.2.3 Resettlement Cost

Breakdown of resettlement cost is given in Table 9.2.4.

9.2.4 Engineering Services Cost

Breakdown of engineering services cost is given in Table 9.2.5.

9.2.5 Administration Cost

Breakdown of administration cost for structural measures is given in Table 9.2.6. Breakdown of administration cost for non-structural measures is given in Table 9.2.7.

9.2.6 Annual Disbursement Schedule

Annual disbursement schedule including price escalation is given in Table 9.2.8.

9.2.7 Annual O&M Cost

Breakdown of annual O&M cost of structural measures is given in Table 9.2.9. Breakdown of annual O&M cost of non-structural measures is given in Table 9.2.10.

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Summary Item	F.C.	<u>(Unit: US\$,</u> L.C.	Total
Structural measures			
1. Construction cost			
1) Kechene weir	724	1,700	2,424
2) Kostre regulating pond	405	397	802
3) Bantyiketu regulating pond	967	707	1,674
4) Bantyiketu river channel improvement			
- Flood wall	33	548	581
- Slope protection	635	495	1,130
- Channel excavation	224	128	352
 Associated works 	0	103	103
Sub-total of 4)	892	1,274	2,160
5) Urban drainage improvement	1,338	321	1,659
Sub-total of 1.	4,326	4,399	8,72
2. Engineering services cost	1,780	61	1,84
3. Resettlement cost	0	30	31
4. Administration cost	269	749	1,013
<u>Sub-total of (1 4.)</u>	<u>6,375</u>	5,239	<u>11,61</u>
5. Physical contingency	635	526	1,16
Sub-total of (1 5.)	<u>7,010</u>	<u>5,765</u>	12,77
6. Price contingency	718	1,243	1,96
Total of (1 6.)	7,728	7,008	14,73
Non-structural measures			
1. Installation cost			
1) River zone	0	189	18
2) Flood warning system	64	92	15
3) Flood fighting system	3	79	8
4) Social education	0	5	
Sub-total of 1.	67	365	43
2. Administration cost	3	49	4
<u>Sub-total of (1 2.)</u>	<u>70</u>	<u>414</u>	<u>48</u>
3. Physical contingency	7	41	ć
<u>Sub-total of (1 3.)</u>	<u>77</u>	<u>455</u>	<u>5.</u>
4. Price contingency	7	85	9
Total of (1 4.)	84	540	62
Total of structural and non-structural measures			
Project cost	<u>7,812</u>	<u>7,548</u>	<u>15,3</u>

Table 9.2.1 Project Cost (1/4)

Note: Price level; June 1997, US\$ 1.0 = Birr 6.8 = J.Yen 114.7

- Tax is included in the cost.

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Nule: Price level; June 1997, USA 1.09 Birt 6.X = J.Yen 1.4.7 Tax is included in the cost. • Engineering secretes cast and administration cost are alreated to each component on the ratio of construction cost.

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Yare (evel; June 1997, USS 1.0 = Burr 6.8 = J. Yen 114.7
 Tax is included in the cost.
 Administration cost is allocated to each component on the ratio of inviallation cost.

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(3/4)
Cost
Project
Table 9.2.1

(Unit: USS, thousand) S. Urban Jrain, imp. [Intal.of (1 - 5.)	and works Sub-total of 4
	 Reintyrkein envellanden im pervennenti D. Elved wahl Markeinein Markeinein Markeinein Markeinein
Itemized Cost of Structural Measures by Component	CONDENSITY J. KNYKON WOL 2. KINKEL DENN J. BAUKEL DENN

Total	20211 2022 19211 2022
ų	5,921 97 27,9 27,9 27,008
5 1	228 230 272 272 272
dal F	2.02 2.14 2.45 2.45 2.45 2.45 2.45 2.45 2.45 2.4
н И	97
LC Total EC LC Total	1.645 0.04 0.110 2.110
u ع	2,8441 1. 5466 2. 3,708 2.
191 J.	1,746 2, 19 19 242 2,005 3,
	1,045 1,746 2 527 19 60 0 79 242 1,701 2,006 3
-	4 8 0 5 8
Telet	₫~°°ãŽ
	-
	8 x + x <u>8</u>
LC Tot	2 ° ° ° 2 2
1 1 1 1	288 286 0 1,167 1,913 2,31
	- 125 - 125 - 125 - 121 - 121
	780 275 275 14 14 14 14
	791 146 146 140 140 140 140
end well L.C. Total	250 250 250 250 250 250 250 250 250 250
1.0	ទម្មិនរដ្ឋ
되었 지역 지역	
Tead	
, I (80 9 02 03 03 11
L L	0X 1,1X0 03 407 04 0 18 62 18 62 18 20
1.1	2011 1 800,1 022 8 203 1,0 9 0 0 1 2 1,0 8 1 1 81 8 1,0 1 81 1 81 1 81 1 81 1 81 1 81 1 81 1 8
FC LC Tour EC LC Thur EC LC	+24 0.04,1 MOL 0.02 7.04 MOL 0.02 7.04 MOL 7.72 0.02 7.04 MOL 0.02 0.04 0.05 0.04 0.05 0.
L L	** ** **
1 CM	28283
ປ.1 ປະ	
ر ش ا	840 840 1.86
	2 3 N
E	revices of previces of cost a cost of (1 4
≗	Conservation cost Engineering services cost Resettlement cost Administration cost Sigbiotetal of (14.)
	L. Cunst 2. Engin 3. Reset 4. Admi-
1	

9 - 5

Yare revertatione 1997, USS 130 a Burrin K a J. Yen 114.7
 Tax is included in the cost.
 Each item includes the physical and price contripension.

2 2 Z (Unit: UNS, threasing) <u>Thalo(0,-4)</u> F.C. <u>I.C. Taul</u> 肾早夏 a n z e - r 2. Fluck writers xx 3. Flored infinite rep. 4. Signal education F.C. 1.C. Trop1 F.C. 1.C. Jonal F.C. 1.C. Total ч. - r-.... 헐말촱 α - ***** 3 Ω ξ គ្មី ជ អ្ន Itemized Cost of Non-structural Measures by Component ក្ខខាទ្ធ × - × 0 248 248 1 23 24 248 1 275 276 F.C. L.C. Tanal Administration cost Sub-total of (1, + 2.) COMPANIE tem Installation cost

Nue: - Vrice Level, June 1997, USS 110 = Birr A.K. e J.Yen 114.7 - Taxis included in the cost. - Each item includes its physical and proce counteerbols.

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Item	F.C.	L.C.	Total
Structural measures		. <u></u> ,	· ·
<u>Foreign fund</u>			
1. Construction cost (Net)	5,045	5,561	10,606
2. Engineering services cost (Net)	2,105	75	2,180
<u>Sub-total of (1 2.)</u>	7,150	<u>5,636</u>	<u>12,786</u>
Internal fund			
3. Resettlement cost (incl. Tax)	0	37	37
4. Administration cost (incl. Tax)	320	972	1,292
5. Tax for 1. & 2.	258	363	621
<u>Sub-total of (3 5.)</u>	<u>578</u>	1,372	<u>1,950</u>
Total of (1 5.)	7,728	7,008	14,736
Non-structural measures			
Foreign fund			
1. Installation cost (Net)	<u>73</u>	<u>447</u>	<u>520</u>
Internal fund			
2. Administration cost (incl. Tax)	3	62	65
3. Tax for 1.	8	31	39
Sub-total of (2 3.)	<u>11</u>	<u>93</u>	<u>104</u>
Total of (1 3.)	84	540	624
Total of structural and non-structural measure	5		
<u>Foreign fund</u>	<u>7,223</u>	<u>6,083</u>	<u>13,306</u>
<u>Internal fund</u>	<u>589</u>	<u>1,465</u>	<u>2,054</u>
Project cost	7,812	<u>7,548</u>	15,360

Table 9.2.1Project Cost (4/4)

Note: Price level; June 1997, US\$ 1.0 = Birr 6.8 = J.Yen 114.7

- Each item includes of its physical and price contingencies.

- *Foreign fund* includes the cost which may be assisted by foreign fund in the future.

- Internal fund includes the cost which should be burdened by the Government of Ethiopia.

1/10)
C
Measures
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Cost of Structur
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Construction
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Breakdown o
Table 9.2.2

Cost
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Worklass Los E.C. District state Cost E.C. Los Cost E.C. Los Cost E.C. Los Cost E.C. Los Cost Cost <thcost< th=""> Cost Cost</thcost<>			Unit of				X) ANNAURT (X	1.000)		Γ		Amount (x	1.000	
Programmery work** Ls Main properies Ls Main properies Ls Main properies Ls Ls <thls< th=""> Ls <thls< th=""></thls<></thls<>	Work item	Unit	FC.	J.	a	EC. USSI	(Birr) o	;:	<u>Tocul</u> (USS)	XIO	CISS CISS	<u>) (1817) ec</u>	(SSU) 6	Total (UNS)
$ \begin{array}{c c c c c c c c c c c c c c c c c c c $	 Preparatory works², 	L.S.	2			ন্ধ	086		52		স্থ	퀅	म	জ
$ \begin{array}{c c c c c c c c c c c c c c c c c c c $	2. Earthworks					1		-	3		, c	¥.	ř	-
$ \begin{array}{c c c c c c c c c c c c c c c c c c c $	2.1 Cleaning and stripping	겉	-	1.6	000 0	r ;	2 €	i r	xç		2 5	C 201	4 <u>6</u>	
$ \begin{array}{c c c c c c c c c c c c c c c c c c c $	2.2 Excavation, common	Υ. L	4.5	×	6.200	2	7.	`	3		2		ìř	2
$ \begin{array}{c ccccccccccccccccccccccccccccccccccc$	2.3 Excavation, rock	2	12.7	6.41	10.200	2	ŝ	22	5		1	ť		į
$ \begin{array}{c ccccccccccccccccccccccccccccccccccc$	2.4 Excavation, river bed	ę.u	4.5	5.1.3	0	Ö	c	0	ਰ	0	5	э -	5	
$ \begin{array}{c ccccccccccccccccccccccccccccccccccc$	2.5 Backfill	с Г	0.5	0.8	87			0		8			<u> </u>	
$ \begin{array}{c c c c c c c c c c c c c c c c c c c $	2.6 Embankment	Ĕ	0.5	0.8	C	0	•	0	°,	82	5	- (¢_¢	~ `
$ \begin{array}{c c c c c c c c c c c c c c c c c c c $	2.3 Tree vegetation works	겉	0	5.5	26,400	~.	571		7	Ş	⇒ ¦	⊃ ;	э 1	- ;
Sub-total of 2. Sub-total of 2. Sub-total of 2. D1 D2 D2 <thd2< th=""> <thd2< th=""> D2 D2<td>2.8 Other works "</td><td>Ľ.S.</td><td></td><td></td><td></td><td>17</td><td>2</td><td>÷.</td><td></td><td></td><td>12</td><td>£ }</td><td>с <u>с</u></td><td></td></thd2<></thd2<>	2.8 Other works "	Ľ.S.				17	2	÷.			12	£ }	с <u>с</u>	
Concrete works m3 1K7 7444 9.240 173 5.57K 1.012 1.185 0	Sub-total of 2.			·		ন্থ		51				3]	3	1
3.1 Concrete, mass m^3_1 18.7 7444 9.240 173 5.878 1011 1.185 9.266 111 22 23 951 1001 155 926 100 162 21 33 5 Concrete, mass 113 9.266 111 22 23 951 1102 1232 3100 9255 113 22	3. Concrete works			-		1	ļ				``	<	~~<	1
$ \begin{array}{c ccccccccccccccccccccccccccccccccccc$	3.1 Concrete, mass	Ê	18.7			. (0,878	1.0.1	(2) ·			2 1 1	ŕ	č
3.3 Ferm work m2 0.0 54.2 3.400 79 200 70 700	3.2 Concrete, reinforced	Ê	8.7	21128		17	ē i	<u>-</u>	101		7 F	2		1 -
3.4 Reinfortung bur kg 0.9 0.4 27.500 23 11 2	3.3 Form work	ę	0.5		00x -		S :	2	2 8	`	_	ç r	ā īc	- '
3.5 Shotcore n_2^2 n_1^2 6.3 1772 3.000 2.1 4.8 0.1 0.0	3.4 Reinforung bur	2	0.0	0.4	27.500		=	n (r. <	.1 <	Š	
3.6 Filter mat m_2^2 $[0,1]$ $[1,3]$ $[0,0]$ $[0,0]$ $[1,2]$	3.5 Shoterete	잍	6.3	12 12 12 12 12 12 12 12 12 12 12 12 12 1	0091		****	6	ŝ	5 <	5 <	- <	ີດ	- ~
3.7 Other works ^{7,0} 1.8 2.8 8.50 125 155 155 127 155 127 191 14 Nameny works $m3$ 0.0 393.0 0 393.0 0 332.5 1275 1666 111 $2-27$ 380 121 181 224 280 127 191 11 Maanny works $m3$ 0.3 132.2 0 0.0 0.0 0.0 0.0 123 1200 111 $2-27$ 380 1232 191 11 4.4 Weep hole $m3$ 0.3 132.2 0	3.6 Filter mat	Ę	0	<u>.</u>	¢	c	Ç,	•		5	> '	> ;	5 r	
Sub-total of 3. Sub-total of 3. Massony works m3 0.3 93,0 0 0 0 0 1.207 191 1 4.1 Wer masony m3 0.3 132,2 201.9 200 2 4.0 0 0 1.207 191 1 4.2 Cancer metalling m3 0.3 132,2 0	3.7 Other works ¹³	L.S.				Ä	850	ž	5		r ¥ 🚊	1		Ý.
Masony works m3 0.0 $393,0$ 0 0 0 0 $1,297$ 191 1 4.1 Wer masory m3 0.3 $320,0$ 20 0	Sub-total of 3.					ion:		ŝ	ži l		<u><</u>	ł.	ij	4
4.1 Wer massory m3 0.0 30.0 0.0 <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td>•</td> <td> e</td> <td>4</td> <td></td> <td></td> <td>104</td> <td>104</td> <td>3</td>							•	e	4			104	104	3
4.2 Gablen matteres m3 9.3 2019 200 2 40 6 8 1.200 11 $$ 60 4.3 Gravel metalling m3 0.3 155.2 0	4.1 Wer masonry	Ê	0.0	0.01	0	0	•	67	0	0				2 *
4.3 Cravet metalling m_3^3 0.3 152.2 0 124 11 11 11 124 23 23 23 23 23 23 23 23 23 23 23 12 23 11 11	4.2 Gabion mattress	Ĩ.	6.0	201.9	8	613	ç '	¢	x	002.1		-1 < 4	ç <	3
4.4 Weep hole no. 0.0 1-17 0 0 4 1	4.3 Gravel metalling	Ş	0	152.2	0	0	0	0	57	50	5 <	> <	5 0	
4.5 Other works ¹¹ L.S. 2.5 Other works ¹¹ L.S. Sub-total of 4. Sub-total of 4. 2.2 ± 1.2 2.2 1.2 1.603 2.00 2.5 Meral works Sub-total of 4. 1.0 34.0 0.0	4.4 Weep hole	2	00	L + 1	0	0	э ·	5	5.	5	5 -		2	ſ
Sub-total of 4. Sub-total of 4. Meal works \pm <td>4.5 Other works</td> <td>L.S.</td> <td></td> <td>_</td> <td></td> <td>0</td> <td>•</td> <td>- 1</td> <td></td> <td></td> <td>- :</td> <td>1 503</td> <td></td> <td>i v č</td>	4.5 Other works	L.S.		_		0	•	- 1			- :	1 503		i v č
Merai works Merai works kg 410 34.0 0 0 0 0 0 21 17 3 5.1 Flap gate, standes steel kg 41.0 34.0 0.9 11.000 111 10 1 12 0 1	Sub-total of 4.					รัท โ	1]	-1	21		4	611		1
5.1 Flap gate. standers steel kg 41.0 34.0 10.0 0 0 0 0 5.2 Structural steel works kg 10.1 0.9 11.00 0	5. Metal works		:				<	<	<	202		17	17	Ċ
5.2 Structural steel works kg 10.1 0 10 0 0	5.1 Flap gate, stamless steel	<u>9</u>	0.14) () (2 2	5	2			•	- -	, -
5.3 from pipe. data = 1,000mm m 0.0 40.0 0 1 1 2 2 0 5.4 Other works ¹³ L.S. 123 11 1 1 123 12 1 5.4 Other works ¹³ L.S. 123 11 1 123 23 19 3 Total of (15.) Total total 1907. Unit price (evel) List.7 Total total 19.7 Unit price (evel) List.7 Total total total total 19.7	5.2 Structural steel works	ы Х	-				2 <	- c	1 2		ē		0	-
5.4 Other works ¹¹ L.S. 11 1 123 19 2 Sub-total of S. Sub-total of S. 10,785 1,584 2,272 3 3 Total of (15.) 10,785 1,584 2,272 3 3 3 1) Price level: June 1997. Unit price excludes tax. 10,785 1,584 2,272 3 3	5.3 Iron pipe, dia.=1.000mm	e	0.0	0.04		2	> •	5	;	>	• e		Ċ	-
Sub-total of S. 122 11 1 123 12 12 Total of (15.) Total of (15.) 6888 10.785 1.584 2.272 380 2.574 378 *1) Price level: June 1997. Unit price evclutes al.Y 10.785 1.584 2.272 380 2.574 378 Unit price evclutes al.X Unit price evclutes al.X 10.785 1.584 2.272 380 2.574 378	5.4 Other works	L.S.				=		0	-		1			ć
Total of (15.) Total of (15.) 384 2.272 380 2.574 378 *1) Price level: June 1997. *1. <	Sub-total of 5.					티	=	-1	1		4		4	ų
(ı.	Total of (1 5.)					SX3	10.785	1,584	2.272		380	2.574	378	75
				1]									
Unit price excludes tax.		n 114.7												
	Unit price excludes tax.													
	2) Preparatory works; 10% of total permanent works	f total p	crinanent wi	orks										

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Table 9.2.2 Breakdown of Construction Cost of Structural Measures (2/10)

								-	 Flood wall 	wall			
		Unit price	Ice			Amount (x 1,000)	1,000,1				Amount (x 1.000)	(000)	
Work JIST	iel L	SSS CSS	(Hirt)	210	<u> 고</u> [SS]	(Birt) eq		<u>Tetal</u> (USS)	21 0	USS)	(Birr) eq	ol (USS)	Land C ISS
	L.S.				র	쮜	ল	뒤		~1	316	ମ	গ
2. Earthworks	í		4	21,400		22	2	ŶŦ	0.55		ų		
2.1 Clearing and stripping	É		0			e e	c a	, j	2	rc	~ <	ċ	0
2.2 Excavation, common	έ	4	ź	21,100	ŝ,		×.	с. С.	ö	> <	> <	5	
2.3 Excavation, rock	£	12.7	() tr	008.01		5	<u>-</u>	707	0	0	0	5 0	
2.4 Excavation, river bed	Ē	4.4	5.1.3	¢	ē	0	0	0	0	0	0	0	
2.5 Backfill	É	0.5	0.8	009'1	-		0		10,100	v.	×		
2.6 Embankment	Ë	0.5	S.C	7,300	7	Ŷ	-	v.	0	0	0	0	
2.7 Tree vegelation works	É	Г. ⁰	¥. ¥.	0		¢	ō	0	¢	ö	0	0.4	
2.8 Other works	L.N.				69	\$	2	<u>2</u>				6	
Sub-total of 2.					۲ ا	501	뢰	110		의	끸	Ċ Å	-1
3. Concrete works									i		5	9	
3.1 Concrete, mass	é	18.7	7.44,4	c	0	0	0	8	511	<u>, 1</u>	ì.	ę «	1 <
3.2 Concrete, reinforced	ີ່ພ	18.7	C.N.2X	210	7	173	ři	2	07	Ö	.	5 <	
3.3 Form work	Ê	10.3	i.	1.300	-	2 2	<u>0</u>	r i	5	ວ່	> <	5 6	
3.4 Reinforcing bar	нў Д	0.9	0.4	0		0	<u>_</u>	2	5 <	5	- (5 0	
3.5 Shoterete	뎥	4 G	127.2	0	0	0 •	0,	0 (50			5 6	
3.6 Filter mat	덭	1,01	5.1	¢	2	0	0	5	5	5		ר כ	
3.7 Other works ¹¹	Ś			_	-	코 [7	•				6 3	, 1 <u>7</u> 2
Sub-total of 3.					ខ	3	9	ž.		4		ŧ	1
 Masonry works 								1		~		1362	2
4.1 Wet masonry	ê	0.0	393.0			29 i 19	815	×	202	5 6	1777		<u> -</u>
4.2 Gabion mattress	Ē	1.6	201.9	1100		1	2	č	3	-	5 <	· · ·	
4.3 Gravel metalling	Ê	5.0	222	э ·	0	0	0 0	00	S	20	> <	>`<	
4.4 Weep hole	ŝ	0.0	14.7	c	0	0	0	\$	5	5.		> ;	
4.5 Other works ¹⁰	×.				c 1	950 C	ž	4		\$		ţ	
Sub-total of 4.					81	귀	<u>×</u> -	ᆌ		~1	Ţ	5	
5. Metal works									1				
5.1 Flap gate, stainless steel	ц ж	41.0	34.0	500	C-1	- 1	(°, 1	1	0	5	⇒ <	5 0	
5.2 Structural steel works	2	10.1	0.0	c	ē	0	0	о ·	0			5 6	
5.3 Iron pipe, dia.=1,000mm	٤	0.0	0.945.4	¢	0	0	0	0	0			5 (
5.4 Other works "	Ľ.					ы	0	C4		÷ ·	د	5 ¢	
Sub-total of 5.	_				71	នា	-1			¢1		21	
Total of (1 5.)					910	4,402	676	1,586		к	3,510	515	546
					-					_			

Thee level: lone 1997.
 USS 1.0 = Birr 6.8 = J. Yen 114.7 Unit price excludes tax.
 2) Preparatory works: 10% of total permanent works
 3) Other works: 10% of billing amount

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Table 9.2.3

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Estimate of Net Cost Competent				4. Banty	ketu river	4. Kantyiketu river channel improvement	proverne	Γ	I, Bantyi	ketu river	4. Bantyiketu river channel improvement	meyond	Ę
				2) Slope	2) Slope protection				3) Kiver	3) Kiver channel excavation	cavation	1000	
		Unit price	1.0.1			AINAURT (X 1.000)	(<u>)</u>		·	ł			
Work item	Cuit	2 <u>1</u> 8	J J J J J J	<u>710</u>	Чŝ	(Birr) eq.(USS)		Total (USS)	ä	CISS DI SSI	(Birr) (11/05)	- USS)	a S
1. Preparatory works ²²	L.S.				71	2	ন্ধ	ধ		র	ž	<u>:</u>	
2. Earthworks		• •							ç	4	d	<	
2.1 Clearing and stripping	ę	- I - I	\$. 1	0 N]6 •	ci i	<u>.</u>	0 0	20	- c	> <	
2.2 Excavation, contrient	ŝ	7 v.	x		0		57	50	2		> <u>-</u>	;	
2.3 Excavation, rock	Ĩ	121	6.41		é	c (5 0	50			575	15	
2.4 Excavation, river bed	ш,	4	с. У		5.	-	5 4	57		; <	<u>s</u> <	i c	
2.5 Backfill	Ű,	0	0.0	20		00	5 c		S	o c	, c	C	
2.6 Embankment	Ê	0	5			0 <	5 0		}	, c	òc	c	
2.7 Tree vegetation works	Ë	ő	r. c.			<i>.</i>	5 0		>	2	, <u>-</u>	Ş	
2.K Other works ⁷⁵	L.N.				-	, <u>C</u>	5 CI	- 7		161	780	71	
		1			Ĩ	I	1						
ji. Concrete works 11 Concrete more	ł.u	18.7	7.44.4	¢	Ċ	0	0	0	0	0	0	Ö	
	1	5	1111	ć		844	7	55	0	0	C	Ö	
3.2 CORFERE, RUINICKA	1	0	3	00			\$ġ	148	0	.0	0	0	
		ć	¢	÷	ſ		+	622	0	ò	c	c	
2.4 Keinioreing bar	27					0571	185	543	0	0	0	0	
		¢					ŝ	102	0	0	0	Ċ	
A.O. Publicer mail	ž						ž	\$0 \$		0	0	0	
3.7 Other works	ŝ				, r	10.0	1.1.1	110		c	U	¢	
Sub-total of 3.					3		5			1	я	1	
4. Masonry works						4	~	-	C		¢	Ċ	
4.1 Wet masonry	Έ	0.0	0.0				5	5 3	5		¢	i c	
4.2 Gabion mattress	r, iii	6	6.101			2	ې د		2		v	, <u> </u>	
4.3 Gravel metalling	Ê	0	22.2			•	5.	5 ल			. c	- c	
4.4 Weep hole	é	0.0	1.4	Ç,			r. (r. ie	>		, c	~ <	
4.5 Other works ³⁴	ŝ				э <	ч;	> i	5 r		50	- v		
Sub-total of 4.							4	7		я	4	4	
5. Metal works	_	•					c	<	¢		V	C	
5.1 Flap gate, stanless steel	kç.	7	2.0	с -		0 (> <	5 <	> <	> <)	i c	
5.2 Structural steel works	kg	10.1	0.0				÷ ¢	5 4				o`⊂	
5.3 tron pipe, dia.=1.000mm	ε	0.0	4,246.0		0		⇒ ï	57	>		> <	ŚĊ	
5.4 Other works"	LS.				с 	0	5	\$ 1		57	> <		
Sub-total of 5.					cı 		C4	÷i T		R	я	4	
	_						, i			1010	192		

1) Price level: June 1997, USS 1.0 = Birr 6.8 = J.Yen 114.7

Unit price excludes tax. 2) Preparationy works: 10% of total permanent works *3) ()ther works: 10% of billing amount

Table 9.2.2 Breakdown of Construction Cost of Structural Measures (4/10)

	-			4) Associ	 Associated works 	s.			Sub-total of 4,	o[4.	Sub-total of 4,		ĺ
		Upit price"	T			Amount (x 1.000)	1.000)				Amount (x 1.000)	(000)1.8	
Work item	TUT	33	J L L	<u>2,0</u>	280 11	C Intro		<u>P</u> S	л. Ö	ม <u>ร</u> ิ	L LIN	ci (USS)	Tetal USS()
1. Preparatory works ¹⁴	LS.				¢1	স্থ	ð1 [−]	51		গ্ন		011	4 X
2. Eurthworks	(:		4				:	ç	r	-
2.1 Clearing and stripping	ie e	-	9. 	0		0	õ	0			-1	-	<u>×</u>
2.2 Excavation, common	Ê	÷,	ž	ò		0	0	0	0	ò	0	9	
2.3 Excavation, rock	Ê	12.7	0.7	c		0	0	0	10.000	5	6t i	8	67
2.4 Excavation, river bed	É	4.4	513	0	0	0	ō	0	0.50	47	Ŷ,	Ę.	<u>.</u>
2.5 Backfill	ĥ	0.5	30	c		0	c	5	10,100		x	1	
2.6 Embankment	é	0.5	0.8	c		0	0	0	8	0	c	5	
2.7 Tree vegetation works	뎚	0.1	5.5	0		0	o	0	0	0	0	0	
2.K Other works	L.S.				0	0	ö	0		61	74	0	50
Sub-total of 2.					ö	2	0	Q		i i i		21	
3. Concrete works				_			•						
3.1 Concrete, mass	Ê	18.7	7.44	Ó	•	0	0	ò	735	14	5.	ş	3
3.2 Concrete, reinforced	с́н	18.7	523.7	0		0	ò	0	ï	XI	877	1	E.
3.3 Form work	ä	10.3	7	0		0	0	¢	X,100	83	(1) (1)	8	¥.
3.4 Reinforcing bar	ž	0.9	1.0	C		o	0	0	2,48,900	215	×	7	ដ
3.5 Shotcrete	ä	6.3	127.2	0		0	0	ē	00010	62	1.259	83	3
3.6 Filter mat	97 97	1.01	1.5	G		с	0	5	006'6	8	S.	ā	0
3.7 Other works ^{1,4}	L.S.				0	0	9	5		617	515	¥	χ;
Sub-total of 3.					6	બ	ର	¢1		7]	쥙	ä	김
 Masenry works 													
4.1 Wet masonry	Ъ.	0:0	393.0	00	Ó	811	5	<u>•</u>	8	0	56.2	22	5
4.2 Gabion mattress	с; С	6.6	201.9	5	ö	0	5	¢	8	٣.	9	0	2
4.3 Gravel metalling	m3	0.3	1.5	Ċ	Ξ.	0	0	0	30	o	v.,		
4.4 Weep hole	ő	0.0	14.7	0	Ċ	0	Э	¢	097	0	5	~	
4.5 Other works ³⁴	L.S.				5	2	()	ন		0	248	2	97. 1
Sub-total of 4.					ā	2	<u>ः</u>	2		r * 1	22	Ş	루
5. Metal works													
5.1 Flap gate, stainless steel	kε	0.14	0.4	õ	0	0	0	¢	0	0	0	0	0
5.2 Structural steel works	kg K	10.1	0.0	0	ō	0	Ð	5	ੋ	0	c	0	0
5.3 Iron pipe, dia.=1,000mm	E	0.0	4,246,0	100	ō	ć.	62	62	8	0	4	ŝ	3
5.4 Other works ³³	LS.				ō	갂	ç	¢		c	ç	Ģ	¢
Nub-total of 5.				-	a			হ		3		ž	ž
Total of (1. • 5.)					3	454	96	36		803	8,205	1.202	2,036

USS 1.0 = Birr 6.8 = J.Yen 114.7
Usit price excludes tax.
*2) Preparatory works: 10% of total permanent works
*3) Other works: 10% of billing amount

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Table 9.2.2 Breakdown of Construction Cost of Structural Measures (5/10)

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2.7 Tree vegetation works m2 0.1 5.5 7 1 6 1,3 2.3 2.4 </td <td></td> <td>~</td> <td>c</td> <td>0.5</td> <td>ò</td> <td>3</td> <td>c</td> <td>0</td> <td>0</td> <td>-1</td> <td>5</td> <td>•</td> <td>•.</td>		~	c	0.5	ò	3	c	0	0	-1	5	•	•.
2.8 Oher works ¹⁰ L.S. 5 7 1 6 117 2.9 3.8 8.0broual orC. Sub-rotal orC. Sub-rotal orC. Sub-rotal orC. Sub-rotal orC. 2.1 1.1 2.2 1.5 2.2.1 2.0 3.1 3.1 Concrete, reinforced m3 1.8.7 8.2.1 1.050 2.8 5.1 1.27 2.93 3.4 4.0 1.93 7.660 1.126 1.4 3.1 3.1 Concrete, reinforced m2 10.1 1.3 8.2.1 1.050 2.4 3.4 4.0 1.93 7.660 1.126 1.4 3.1 3.2 Shorene m2 10.1 1.15 0 0.4 4.300 6.5 1.27 0 0.0 1.4 20 1.4 20 1.4 20 1.1 2.5 2.4 2.4 2.4 2.4 2.4 2.6 1.1 2.7 2.4 2.4 2.4 2.4 2.4 2.4 2.4 2.4 2.4 2.4 2.4 2.4 2.4 2.4 2.4 2.4 2.4 2	n works	ę	0		0	Ċ	¢	ō	0	٣.	145	21	친
Sub-total of 2. Sub-total		×				v,	~	~	\$	137	545	e.	133
$ \begin{array}{c ccccccccccccccccccccccccccccccccccc$	Sub-total of 2.) J	코	늬	સ	5	1111)	5
3.1 Concrete, mass m3 18.7 7444 31.5 6 2.34 34 40 193 7660 1.13 204 144 40 193 7660 1.13 204 144 20 134 203 244 431 305 34 462 307 134 203 344 430 135 204 144 400 135 204 144 20 35 500 134 20 365 131 232 204 144 40 105 101 115 0 101 115 0 101 115 0 101 115 0 101 115 0 101 115 0 101 10	Concrete works												
3.2 Concrete, reinforced m2 $1.8.7$ $22.3.7$ 1.050 20 8.5 12.7 1.095 101 3.3 Sourceus, reinforced m2 10.3 84.2 6.300 6.5 34.1 50 12.941 441 3.5 Sourceus m2 10.1 1.5 1.2 0.1 0.2 0.85 3.1 500 1005 11.7 2.22 3.6 bitter mat m2 10.1 1.5 0.1 0.1 1.5 0.0 0.0 0.0 0.0 1.717 2.22 3.7 Dister works m3 1.052 1.050 1.127 2.00 1.055 1.14918 2.02 3.7 Dister works m3 0.01 0.3 1.252 0 0 0 0.100 1.736 2.007 1.1095 1.056 2.007 1.1095 2.007 1.1095 2.007 1.1095 2.007 1.1095 2.007 1.1095 2.007 1.1095 2.007 1.1095 2.076 1.1056 <t< td=""><td></td><td>13</td><td>18.7</td><td>ママラク</td><td>5.12</td><td>S</td><td>20</td><td>Ż.</td><td>7</td><td>193</td><td>7,660</td><td>1.126</td><td>915.1</td></t<>		13	18.7	ママラク	5.12	S	20	Ż.	7	193	7,660	1.126	915.1
3.3 form work m2 10.3 5.300 6.5 3.41 5.00 15.3 2.07 1.005 101 3.4 Subrotation bar $n.2$ 10.3 1272 0 0 0 11.7 2.07 1005 101 3.6 Filter met $n.2$ 10.3 1272 0 0 0 11.7 2.22 2.01 10.7 11.7 2.20 10.05 11.7 2.2 3.7 Other works ¹⁰ 1.2 1.2 1.2 1.2 0 0 0 1.2 2.0 1.005 11.7 2.2 3.7 Other works ¹⁰ 1.2 0.0 3.330 1.272 0.0 0.0 1.272 2.00 1.272 2.00 1.272 2.00 1.272 2.00 1.2752 2.00 1.2752 2.00 1.2752 2.00 1.262 2.00 1.262 2.00 1.262 2.00 1.262 2.00 1.262 2.00 1.262 2.00 2.00 2.00 2.00 </td <td></td> <td>ć.</td> <td>18.7</td> <td>7.62%</td> <td>050,1</td> <td>3</td> <td>\$9<u>\$</u></td> <td>5</td> <td>4</td> <td>20</td> <td>2.94</td> <td>-</td> <td>66.t</td>		ć.	18.7	7.62%	050,1	3	\$9 <u>\$</u>	5	4	20	2.94	-	66.t
3.4 Keinforeing bar kg 0.9 0.4 6.5 1272 0.6 1.5 1.47 2.52 3.5 Shorenee 0.7 1.272 0.6 1.5 1.47 2.52 0.6 1.5 1.717 2.52 3.7 Other works 0.7 1.272 0.6 1.5 1.47 2.22 2.01 0.6 1.56 2.02 2.02 2.01 0.6 1.56 2.02 2.01 0.6 1.56 2.02 2.01 2.01 2.01 0.6 0.6 0.6 0.6 1.56 2.02 2.01	•••	ę	10.3	7	6,300	65	7	95	511	201	- (60) ⁻ I	191	295
3.5 Shorecee ni2 0.1 1.5 0		ŝ	0.9	1	2005	28	s.	÷.	<u>و،</u>	Ģ			į,
3.6 Filter mat nn_2 10.1 1.5 0 0 0 0 0 0 1.36 2.00 3.7 Other works" Sub-rotal of 3. Sub-rotal of 3. 1.7 0.6 1.361 2.32 2.01 0.6 1.366 2.00 0.5856 861 Masony works $m3$ 0.3 $1.52.2$ 0.0 $1.4.7$ 0.0 3.875 3.01 1.262 2.102 0.6 1.366 1.13 2.32 4.01 1.265 1.13 2.32 4.01 1.265 1.13 2.32 4.01 1.265 1.13 2.32 4.01 1.265 1.13 2.32 4.01 1.265 1.13 2.122 2.01 1.052 1.1265 2.122 2.01 1.052 1.1265 2.122 2.01 1.052 1.1265 2.122 2.01 1.052 1.1265 2.122 2.01 1.052 2.1122 2.02 2.012 2.012 2.012 2.012 2.012 2.012 2.012 2	·	ę	6.3	127.2	5	c	0	0	5	ż		4	1.5
3.7 Other works ¹⁰ L.S. 13 147 22 401 1686 200 Maxony works m3 00 393.0 0 0 0 0 14918 2102 Amony works m3 0.3 152.2 0 0 0 5 767 113 4.1 Were hole m3 0.3 152.2 0 0 0 5 767 113 4.2 Gabion matters m3 0.3 152.2 0 0 0 5 767 113 4.3 Gravel mealing m0 0 14.4 Weep hole 0.3 152.2 0 0 0 5 767 113 4.4 Coher works ¹⁰ L.S. 0.3 152.2 0 0 0 3 5 9 767 113 5.1 Flap works ¹⁰ L.S. L.S. 0 14.10 34.10 1055 114918 112 5.3 from provide kg 10.1 0.9 500 21 17 3 24 65 9 5 <t< td=""><td></td><td>ğ</td><td>0.1</td><td>1.5</td><td>ē</td><td>ö</td><td>0</td><td>5</td><td><u> </u></td><td>3</td><td><u>.</u></td><td>Ť</td><td>0</td></t<>		ğ	0.1	1.5	ē	ö	0	5	<u> </u>	3	<u>.</u>	Ť	0
Sub-rotal of A. Sub-rotal of A. Masony works $Main Main Main $		s,				s.	141	51		8	1.356	8	ř.
Masony works m3 0.0 $0.33.0$ 0 0 0 0 0 0 0 0 0 0 5.55 861 4.1 Wer masonry m3 9.3 201.9 0 0 0 0 0 5 767 113 4.1 Guison matrees m3 0.3 152.2 0 0 0 0 36 767 113 4.3 Gave meailing m3 0.3 152.2 0 0 0 0 21 21 24 36 767 113 4.5 Other works ¹⁰ L.S. Sub-total of 4. L.S. 0 0 0 0 0 21 17 3 24 65 87 12 23 23 93 51 10 0 0 0 0 0 21 12 23 93 51 12 23 93 51 12 53 51 12 53 12 53 12 53 12 53 12 53 12 53	Sub-rotal of 3.					2	1.613		র	4	X16 11		1
4.1 Wer masonry m3 0.0 9.3 201.9 0 0 0 0 0.56 767 113 4.2 Gabion matress m3 0.3 152.2 0 5 1 0 5 </td <td>Masonry works</td> <td></td> <td></td> <td></td> <td></td> <td>7</td> <td>1</td> <td></td> <td>5</td> <td></td> <td></td> <td></td> <td></td>	Masonry works					7	1		5				
4.2 Gabion matress m3 9.3 2019 0 0 0 0 0 0 0 0 0 0 0 11 4.3 Gravel metalling m3 0.3 152.2 0		É	0.0 0	0.5.05	5	÷		57	5	5		2	
4.3 Gravel metalling m^3 0.3 152.2 0 0 0 0 2 3 655 9 4.4 Weep hole no. 0.0 14.7 0 0 0 0 2 3 665 9 4.5 Observorks ¹⁰ L.S. 0.0 14.7 0 0 0 0 3 665 9 4.5 Observorks ¹⁰ L.S. 14.0 34.0 500 21 17 3 24 53 51 9 55 51 17 3 24 53 51 9 55 51 17 3 24 53 51 17 3 54 51 7 3 55 51 17 3 54 51 7 9 12 55 52 51 17 3 73 54 55 51 9 55 51 17 3 56 57 12 55 52 55 51 17 55 52 55 51 56 57 56		Ê	6.	5.102	0	¢`·	ə •	0	5	ç.	101		1
4.4 Weep hole no. 0.0 14.7 0 <th0< th=""> 0 0</th0<>	lling	Ê	0.3		0	¢ +	c :	0 0	5	5	° į	<u> </u>	
4.5 Other works ¹⁰ Sub-rotal of 4, Sub-rotal of 4, Sub-rotal of 4, Sub-rotal of 4, Sub-rotal of 4, Sub-rotal of 5, S.3 Iron pipe, dia=1,000mm L.S. 9, 9, 9, 10,1 0,0 0,		ż	00	1.1	ć	0	0	5	5-	57	a (¢
K. Metal works Sub-total of 4. Sub-total of 4. Sub-total of 4. Sub-total of 4. 6.1 Flap gate stankes steel kg 41.0 34.0 500 21 17 3 24 63 51 9 5.1 Flap gate stainless steel kg 10.1 0.9 86.200 871 78 11 87 12 87 12 5.3 from pipe, dia=1,000mm m 0.0 4,246.0 0 871 78 11 87 12 87 12 5.4 Other works ¹⁰ L.S. 0.9 86.200 871 78 11 87 982 87 12 5.4 Other works ¹⁰ L.S. 0.9 86.2 92 92 12 56 7 92 7 12 92 7 12 92 7 92 92 7 92 92 7 12 92 12 92 12 92 92 92 12 92 12 92 12 92 12 92 12		vi		_		o " i	э :	5	53		.00	460 1	
Merial works K. Merial works Merial						əl ^î	×	R	×	-			
5.1 Flap gate, standlets steel $\frac{3}{8}$ $\frac{4}{9}$ $\frac{3}{8}$ $\frac{4}{9}$ $\frac{3}{8}$ $\frac{4}{9}$ $\frac{3}{8}$ $\frac{3}{10}$ $\frac{3}{8}$ $\frac{3}{10}$ $\frac{3}{8}$ $\frac{3}{10}$ $\frac{3}{8}$ $\frac{3}{10}$ $\frac{3}{8}$ $\frac{3}{10}$ $\frac{3}{2}$ $\frac{3}{10}$ $\frac{3}{2}$ $\frac{3}{10}$ $\frac{3}{2}$ </td <td>Metal werks</td> <td></td> <td></td> <td>;</td> <td></td> <td></td> <td>5</td> <td>r</td> <td>ŕ</td> <td></td> <td>ÿ</td> <td>9</td> <td></td>	Metal werks			;			5	r	ŕ		ÿ	9	
5.2 Structural steel works kg 10.1 0.0 3.71 78 11 36.2 0.25 62 5.3 Iron pipe, dia =1,000mm m 0.0 $4.246.0$ 0 0 0 0 0 125 62 5.4 Other works ¹⁰ L.S. 0.0 $4.246.0$ 0 0 0 0 0 125 62 75 52 Sub-total of 5. L.S. 924 1.42 926 1.420 619 20 Total of (1 5.) Total of (1 5.) 1.319 1.978 291 1.610 4.130 28.144 4.132 "1) Prace level: June 1997. USS 1.0 = Birr 6.8 = J Yen 114.7 Unit price excludes tak. 201 1.978 291 1.610 4.130 28.144 4.132		~0	D	5			2 i		1 2		5	Ś	99
5.3 Iron pipe, dia=1,000mm m 0.0 4.246.0 0 0 4.25 0 5.4 Other works ¹⁰ L.S. 8.0 4.1 9.1 90 104 56 7 Sub-total of 5. Sub-total of 5. 1.5 926 1.429 619 920 Total of (1 5.) 1.5 926 1.429 619 920 -1) Prace level: June 1997. USS 1.0 = Birr 6.8 = J Yen 114.7 USS 1.0 = Birr 6.8 = J Yen 114.7 4,132			10.1	0.0	80.02	2/12	e '	- 1	2	797	ò	j	
5.4 Other works ¹⁰ L.S. wv 9 1 00 104 56 7 Nub-total of S. Nub-total of S. 9x1 102 15 926 1140 50 22 Total of (15.) 1.701 1.319 1.978 291 1.610 4,130 28,144 4,132 -1) Prace level: June 1997. USS 1.0 = Birr 6.8 = J.Yen 114.7 Unit prec excludes tax. 28,144 4,132		£	0.0	4,246.0	c	c	e	\$	5	5	Ş :	8	5
Sub-total of 5. 9x1 102 15. 926 1.1420 612 925 Total of (1 5.) 1.319 1.319 1.378 291 1.610 4,130 28,144 4,132 *1) Prace inveit June 1997, USS 1.0 = Birr 6.8 = J.Yen 114.7 USS 1.0 = Birr 6.8 = J.Yen 114.7 Unit proc excludes tax.		Ś				ŝ	ፍ	<u></u>	8	3	2		
Total of (1 5.) 1.319 1.978 291 1.610 4,130 24,132 -1) Prace invel: June 1997. -1) Prace invel: June 1997. -1.12 -1.12 -1.12 -1) Prace invel: June 1997. USS 1.0 = Birr 6.8 = J.Yen 114.7 Unit price excludes tax. -1.12	Sub-total of 5.		•			ክ	궑	거	<u>হ</u>	149	<u>51</u> 3	<u>ଟ</u> ୍ଟ	
Î	'fotal of (1. • 5.)					610.1	1,978	291	1,610	4,130	28,144	4,132	8,262
UND 1.0 = Dirto a sur or a lot of the lot of	17	- -											
	UNA I.O = OHE OLA = OLE CARACTERIA Data are as available for	Ì											
The Decomposition works 10% of total perphased works	 Utility price executes that Demonstrate works Demonstrate works 	al ore	manent wo	rks									

Table 9.2.2 Breakdown of Construction Cost of Structural Measures (6/10)

Estimate of Tax

Component	1uər				1. Kechene	ne weir				1				2. Kostre	2. Kostre regulating pond	puod						
			Unic tax						Amount	NIN								Amount	Į			
		Custom		5		Custom		Sales			lais.	ित्त		<i>د</i>	CUSICM		Sales		 - 	<u>1</u> 7(1)	130	Tatel
Werkitem	Ter.		ЧŞ	1	ð	<u>48</u> 2	ងខ្ញុំ	(Burn)	ي تو رزي ل	Tetal (TSS)	ភូរិ	<u>18</u>	Tetal (11SS)	<u>710</u>	LINS)	<u>75</u>	(Birr) ec	<u>eq.(1.85)</u> (Total (1188)	З S S S	18	SS)
1. Preparatory works ⁴	s,					1 160]	616-17	10.578	IXEC	1261	10.578	13.841		1.046	1.192	11,988	572.1	3.956	6100	5	100
2. Earthworks								2		ì	ļ		ţ	2		7 4 4	¥	þ	Ę	134	- 00	105
2.1 Cleaning and stripping	덭	0.018		0.00	000.9		Z	£.	<u>,</u>	6		r. ;		204.2		1 C 7 F		ŝ		1111	10	7.5.5
2.2 Excavation, common	ц.	0.089		0.028				7	5		6/N	<u>,</u>	ŝ	o s	10.1			2				037.5
2.3 Excavation, rock	Ē	N21-0	0.452	120.0		7.100	-	í í	9.	1919	X.976	ç.	1210.0	000'6	6) *	4.559	2 <	į <	5 2 4	e c	Ē	
2.4 Excavation, river bed	Ê	0.073		10.0			•	¢	c	0	c ·	0	0	2	⇒`:	- !	-	> <	5 2	> ¥		, ź
2.5 Backfill	Ê	0.000		0.001	4	<u> </u>	2 '	rr, (с (<u>,</u>	÷	<u> </u>	4 (8 P	<u>.</u>	2 :		> <	ž	÷	50	i f
2.6 Embankment	Ê	000		0.00				° į	•	с. ;	0	о ;	0		c 2	<u>c</u> <	- <		Ċ	1 <	Ö	0
2.7 Tree vegetation works	Ë	80	8	0.165	31.400			60 1 1	ę i	2 7	2	f					30		2	1 652	4	999
2.8 Other works	S.					0		LNT S	24			1 6 7			2 1 2 6	201	1 075	1 25	8	15.174	5	18,332
Sub-total of 2.						2			3		N.	đ						ł			1	
3. Concrete works	1	- 26.0		26,607				50 1 XXO	140,77	OPX TX	04011	11.041	88,101	0	ō	0	¢	0	0	0	0	ō
3.2 Concrete, mass	Ē			191.04		•	926	20.025	10,502	11.568	UXC I	10.592	11.975	210	7	177	13.096	1,926	2.103	2	1,926,1	13
	Ê							6.015	58X	1.52	146.2	\$X8	3.8.6	8	430,	118	1,108	163	1X	28 7	163	11
3.4 Beinforcing har	1	1900		0000	27,500	1.73		c	¢	20	1,761	¢	1.761	2,000	511	✔.	0	¢	v.	0 1 20	0	Ö.
3 × Character	e Fe	0.117		0.658	-			11, 477	5,129	2.617	0.0	\$ <u>.</u>	č, č,	0	õ	c	0	0	0	•	ō	6
3.6 Filter mat	É	8		0000			•	0	0	U	0	c	0	ö	0	0	0	0	õ	0	ó	0
3.7 Other works"	Ľ.					815		63,680	9.365	10.362	1,812	9,165	11.177		24	2	1,420	ŝ	6.2	2 2 2	8	
Sub-total of 3.						40 X	10.265	700-481	103.012	111.977	9.661	10-01	X12.23K		ଟ୍ଟ	2	년 신	201	N.		5]
4. Masonry works													•		•					c	1626 0	1 202
4.1 Wet masonry	Ē	0.000		24.175		с 	¢	c	C	0	0	0	0	3.300	0	o y	X27.07		(20) H	2 Y		11
4.2 Gabion mattress	Ê	0.175		11.684	ž				Ŧ	i i	<u></u>	1	107	3	2	Ê.	t (-	2		
4.3 Gravel metalling	Ë	0.005		11.124	<u> </u>	• •	•	с (c :	6	0 0	5 4	> <	5<	5 <	> <	~ <	; (> <	> c	20) C
4.4 Weep hole	ş	0.00	0000	00F	_		o	0	•	6-	<u>،</u> د		2	2		> :	0.200	042 1	0171	5	10-1	1441
4.4 Other works	Ś					4 ;	× !		J. ș		<u>1</u>	Ţ	9 8		i e	. 499	001.2 170	171	0.1.51	184	1 1	Š
Sub-total of 4.						키 			1		3	Ĩ.		•••	1						Ì	
5. Metal works								<	5	ē	<	ĉ	~	8	ŝ	c	c	c	C	1.000	Ö	2.000
5.1 Flap gate, stainless steel	<u>ц</u>	000 7		0000			> < 		2		~ <	2 456	7.456	3 -	0	• c	¢	ò	0	0	¢	0
5.2 Surretural steel works	3	0.000	0.000	000.0		-			e c	t	> c	í	Ċ	Ċ	c	• c	0	c	0	0	ò	0
5.3 fron pipe, dia.=1,000mm	£ '	000.0		~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~		> <	> <	2 90 90		, at t	> c	971	. ALL	<u>}</u>	200	. 0	. c	0	o	8	0	200
Contract works	Ċ,							068.01	1001	109	ò	i 9	Ş		8022	Ċ	ся	CI	CI	82.2	a	330
16 10 mol-one						×	×				4					1	I	I				
Total of (1 5.)						190'91	55X*61	522-142	116,356 136,189	1.36,189	***	95C'911 168'50	152,250		11.504	13,127	598,151	265.41	12,419	11.9.62	265-61	120.11
Note: =11 Price Level: [and 1047										1				1								

Proce twee: June 1997.
 USS 1,00 Birt 6,8 = J,Yen 114.7
 Preparatory works: 10% of total permanent works.
 Other works: 10% of billing amount

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(01/2)
Measures
of Structural
Cost of
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Breakdown o
Table 9.2.2

Estimate of Tax

Amount Amount Amount Total	L'Altmute of 14A Component	tent				A. Bantvike	ufu regu	tu regulating pond	ų						4. Hantyiketu 1) Phood wall	celu river (vall	channel in	 Hantyiketu river chunnel improvement Pland wall 	z				-7
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$ \begin{bmatrix} 1 \\ 1 \\ 1 \\ 1 \\ 1 \\ 1 \\ 1 \\ 1 \\ 1 \\ 1$			-	, xei tiu,							MIN	1.00	Total		_	Custom		Sale			Tetal	Total	
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Market Lange Lange <thlange< th=""> <th< td=""><td></td><td>ľ</td><td>(SSI)</td><td>01550</td><td>(Birr)</td><td></td><td>1001</td><td>((C)) 1000</td><td>107.61</td><td></td><td></td><td>150</td><td>2,8381</td><td>7.088</td><td></td><td>13</td><td>2</td><td>XOT UT</td><td>2007</td><td>12</td><td>2</td><td>ទ្ធ</td><td>1</td></th<></thlange<>		ľ	(SSI)	01550	(Birr)		1001	((C)) 1000	107.61			150	2,8381	7.088		13	2	XOT UT	2007	12	2	ទ្ធ	1
end antigram model	1. Preparatory works	ġ		_					•								3	F		150	Uur	~	223
		Ê	0.018		0.006			1 515		5	815 1	2,1.39	ò	2.160	3.550	1	<u>e</u> •	- - -	r. c		} <		C
	2.1 Ciccuring disk analysis	Ĩ	0.000		NC0.0		-	15 85		6	16.162	22.452	305	1:1:1	0	0	00		5 C	> c	> c	s c	ò
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	2.5 Excention Loss bed	Ē	0.073		0.025			5	0	0	c	o	ō	5		0		⊳ ç	2 4	256	÷۲		3.5
	5 C Bashfill	é	0000	-	0.002			2	er.	0	£.	5.	ō	7.		5	4	2 0	-, c	č	c	Ċ	0
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The interval int	2 7 Trive vecetation works	Ê	0.002		0.167					c	0	¢	ö		5	>	9 6		- c	, e	, <u>*</u>		95
main main <th< td=""><td>2.8 Other works "h</td><td>ŝ</td><td></td><td></td><td>_</td><td></td><td>1.577</td><td></td><td></td><td>-7</td><td></td><td>1.270</td><td>7</td><td>4</td><td></td><td>9 7</td><td>) <u>(</u></td><td>' Y</td><td>- 1</td><td>12</td><td>X6Y</td><td></td><td>. Q9</td></th<>	2.8 Other works "h	ŝ			_		1.577			-7		1.270	7	4		9 7) <u>(</u>	' Y	- 1	12	X6Y		. Q9
max m3 0.355 0.445 54.671 0	Sub-total of 2.		.=		_			• •		위	2.0	() () ()	1	2 2 4		Ī	1	1	-1	1	1	1	
mail D.XS Disks Model M	3. Concrete works						•		•	4		<	C	~ c	735	052	129	41,672	A.12X	6,749	0XX	6.128	7.008
Indeced min 0.3/5 0.84% C-3/6 1/1 1/10	3.1 Concrete, mass	ς'n	235.0		109.93					2		2	9.01			Ō	°	0	0	ō	¢	ō	0
$ \begin{array}{c ccccccccccccccccccccccccccccccccccc$	3.2 Concrete, reinforced	É	0.152		62.362					97.T	5		i ç	0121		0	0	0	0	0	c	Ó	0
Lu Lu <thlu< th=""> Lu Lu Lu<!--</td--><td>3.3 Form work</td><td>ŝ</td><td>100</td><td></td><td></td><td>~</td><td></td><td></td><td>-5</td><td></td><td></td><td></td><td>2</td><td>C</td><td></td><td>0</td><td>0</td><td>0</td><td>0</td><td>0</td><td>0</td><td>õ</td><td>0</td></thlu<>	3.3 Form work	ŝ	100			~			-5				2	C		0	0	0	0	0	0	õ	0
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value mil 0000 24.175 5.500 0 132.063 19.553 5.800 0 132.063 19.553 5.800 0 19.553 5.800 0	3.7 Other works ⁵³	r. L					ix o					, o	1917	348.6	_	285	58.	OFX SP	<u>6.74</u>	1424	<u> </u>	5.741	
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weating mil 0.000 0.001 1.100 0	4.2 Gabion matuess	ē	0.175								Ċ	c	0	0	c	6	C	0	c	¢	0	0 (00
No. 0.0000 0.000	4.3 Gravel metalling	£	000						; c	: с	Ċ	0	0	0	ö	õ	0	0	0	¢	с	0	
$ \begin{array}{c ccccccccccccccccccccccccccccccccccc$	4.4 Weep hole	Ч. С	0000								TOP		2.316	177		ς.	51	14,372	1111	2.137	ž	1	
-could of 4. - could of 4. • stainless steel kg • a 4.000 0000 0 0000 0 0 0 0 0 0 0 0 0 0 0	4,4 Other works						εş		-	ſ	26.450		25.178			31	2	(S)	57.53	23 JAX	5	9 7	
x samines steel kg 4.000 0.000 7.00 2.000 0 0 0 0 0 0 2.000 0 2.000 0 0 0	Sub-total of 4.																						-
unities area kg 4000 0000 0000 0000 0000 0000 0000 0	5. Metal works								0	0	Ċ		0	2,000	0		0	c	0	0	0	0 0	0 <
atalofs. kg 0.000 0.000 307.000 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	5.4 Flap gate, stainless steel	2	4.00%							Ċ	¢	c	0	G	0		¢	0	0	0	ə •	5	
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141 01 3. 121 0 12 12 12 12 12 12 12 12 12 12 12 12 12	5.4 Other works ³¹								0			ا ہ	a	8		<u></u>	0	CI	a	CI	c#	CH	ж ^т
23,002 33,649 212,16 54,165 73,12,16 15,165 56,051 15,16 73,25 73,212 94,457 23,002	Sub-total of 3,								•	,											1 474	10 000	
	Total of (1 5.)						21,00		9 212,263					19X11X		5			u Arre				

Note: "1) Price level: June 1997, USS 1.0 = Birr 6.8 = J. Yen 114.7 *2) Preparatory works; 10% of total permanent works *3) Other works; 10% of hilling amount

Table 9.2.2 Breakdown of Construction Cost of Structural Measures (8/10)

of To. -.

Estimate of Tax				Ì									ľ	14-20-20	ter avore of	and longer	 Remember of the second restriction of 					ſ
Сотронен	k n				4. Bantyil 2) Skine D	rotection	EI IONNERO	4. Bantyiketu river channel improvement 23 Skine orotection					<u>i e</u>	River ch	3) River channel excavation	wation						
			(1 ver 14)						Amenunt	Ŧ								Amount				ł
	, ,	Cuelon C	Ann tao Nates	ľ		Custom		Sales			lon	[ota]			Citetern		Sales					
Werk atens	Turi	11	1.1	14	л, <mark>о</mark>	9				Total 1 No	<u>น</u> ระ	42	Teel (188)	<u>viv</u>		ปรื	(Birri) eq.(USS)	Jerel JSS1 (USS)		L USS USS USS USS USS USS USS USS USS US	18	
	ŀ				Ī	127	444	12		17	4	2 7441	0,688		226	669	5	긔	1	5	쾨	592
1. Preparatory works	<u>í</u>										ļ					'		\$		¢	c	C
2.1 Clearing and stripoing	сц ш	0.018	0.0	0.006	0.900	178	4.76	6 .	Ŷ	7	t-13	¢	3	0	0	0 0	0 0	•	5.4	ə c	50	00
2.2 Excavation, compton	۳.	0.089		0.028	0	0	0	¢	0	0	0	ò	ō :	0 9	0 0	0.21	0			X, X00	ž	8.835
2,3 Excavation, rock	с ш	N.42N		0 024	ò	0	0	0	0	0	•	ð.,	5 ¢	0.000		25	33	- 2		2.594	0	2.633
2.4 Excavation, river bed	Em3	0.073		0.025	0	õ	0	0	0	6	• •	o i	5 6	2 < 1	è		2			c	ō	õ
2.5 Backfill	ũ	0.00		0.00	ò	5	0 (0	0	.	⇒ <	o [−] ¢	50		5	.		0	5	Ę	¢	1
2.6 Embankment	Ê	0.00		0.00	0 (0	0 4	0 <	ə c	3 6	> c	5 6) C	0	C	. 0	. 0	0	0	0	0	0
2.7 Tree vegetation works	ę	800	0.0	0.167	0	5	>;	c		5 ¥	s ç	5-	, î		6	919	05	~	Ĵ,	1.141	~	1.14%
2.8 Other works	L.S.					× 3	1 <u>1</u>	° 3	- 9	L OF	216	- 01	6ND		5.5.6	2(4)-9	긹		1 202	37 C	51	295
Sub-total of 2.					-	i.	7	z	2	1		<u>;</u>]]			ĺ	I					
3. Concrete works	1		31.2 0	20.407	C	c	0	C	0	c	¢	0	0	0	0	0	¢	0	¢	0	õ	0
3.1 Concrete, mass	Ê			40 GV	ð	111	190	58.932	8.666	5976	1,132	8,666	9.79%	0	¢	0	0	c	0	0	0	50
A.2. Concrete, remiorced	27			1.55	~	4.973	197	228.21	1.8%6	3,247	1111	1.886	8.220	C	¢	0	0	0	0	0	0 (50
2.4 Detector her		1900			- e i	15.051	911	0	0	239	15.200	õ	15,290	0	ö	0	0	0	5	> <	5 0	5 0
A Kennoreing car	<u></u>		0 144	0.650	00000		1.426	116.36	14,105	1.51	2.5%4	14 105	16.689	0	0	0	0	0	5	0	5 (5 <
S.D. Shotstele	i	1.00		0000			0	0	0	0	0.00.0	ō	000'	¢	ō	0	c	c	õ	0	5	5 (
		3	2	2		1.142	181	16,767	507 1	07%	1,525	2,466	166'5		¢	c	0	0	6	0	0 0	•
ALL OTHER WORKS	1		_			t4 \$2	4.208	205,481	11-12	015.15	297.85	11112	LNN SU		a	्	CI	Q	ਕ	¢i	a	2
		_																ł	;	4	~ 7	<
4. Masurey mores	ľ.	0.000	0.000	24.175		0	0	0	0	5	c	c	0	0	0	0	0	•	÷ č	5 <	5 0	5 6
1.2 Cabion matthes	Ĩ	0.175		11.684	0	0	0	¢	0	0	0	0	ö	0	5	5	с ;;	> :	5	> <	20	00
4.1 Cravel metalling	Ĩ	0.00		11.124		0	0	0	0	6	0	õ	¢	2.	0 :	•	5. °	÷.	4 4	> <	ç	
4.4 Weep hole	é	0.000		00t. 1	091-1		0	1,898	ŝ	279	0	120	279	5	p :		> :	> v	⊃"¥	> c	ÿŤv) v
4.4 Other works	L.S.					0	0	9	آ	č,	o :	X (A J		⊃`<	20	277	r J	. 7	¢	J	4
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5. Metal works							<	¢	c	3	c	0	0	C	0	0	0	¢	0	0	0	0
5.1 Flap gate, stauless steel	ž	8	0.00	0000		5 d	2 0	> <	20	o" ⊂	• c	i c	Ċ	6	0	c	0	0	ō	0	Ş	0
5.2 Structural steel works	ÿ	0000		00610	53	5 ¢		> <	• •	5 6	> ¢	ō	00	i e	0	¢	0	0	0	0	ô,	0
5.3 Iron pipe, dia 1,000mm	ε	0000	0.00	NN: NN:	5			• <	0 0	i d	• c	0	6		÷	0	0	0	0	0	0	0
5.4 Other works	L.S.				_	50	00	0	ð) ¢	0	Q	Ø		Cł	0	сł	8	öľ	ci	Ċł	ਕ
5. 10 101-005						N	4	4	i	- - ·		- • ·								100	140)	1.067
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View +11 Price Jauni: filme 1907]																		

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Estimate of Tax

ESURATE OF LAN					L. Kantvil	kelu river.	channet in	Bantivikely river shannel improvement	-				F	Buntvike	u river ch.	4. Bantyiketu river channel improvement	rovement				
	ŧ			<u>.</u>	4) Avertis	Associated works							ž	Sub-total of 4.	4						T
			העין נשי וי		Γ				Amoun	Int.							Алыни			T. Sec.	
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Work Hem	Tur,			J J	20	មន៍		Un un	1(188)	 1997 1987	មន្ត្រី មន្ត្រី			JŜ	2 2 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3	(Birr) est	645(1,NS) (USN)	120	(ISS)	(SSI)
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2 2 Excavation, common	Ű	0.0X0		0.02X	0	o	0	¢	0	0	0	8	0	0	0	•	• ;	5	> ç	- ×	0 C 0
2 3 Excavation, rock	Ĕ	0.428		0.024	0	ō	0	9	0	0	0	0	Ċ		4.500	3	9	000 1	000°0	Ē	0.000
2.4 Excavation, river bed	μĴ	0.073	0.174	0.02.5	0	õ	0	0	c	≎	0	0	0	767:		101	? '	202		F.	400.7
2.5 Backfill	n.	0.009		0.002	0	0	ن ا	•	0	¢	0	0	0	5	1	2	• •	1	i i	•, c	2
2.6 Embankment	Ê	0.00		0.00	0	0	0	0	0	¢	0	0	ö	÷	-	- :	э:	>_<	<u>.</u> .	> <	20
2.7 Tree vegetation works	잍	100.0	0.004	0.167	0	0	3	э.	0	. -	0 1	57	s e	S g	> <u>-</u>	r ç	3 3	, , ,	256 1	50	274.1
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3. Concrete works								:	:		5	~	<	140	109	C715	301.5	0740	XX0	6.128	7.008
3.1 Concrete, mass	ш.	0.352		\$6.697		5	с ·	÷.	э :	37	- <	5 6	> 0				1 6.45	0 465	201	× 666	200
3.2 Concrete, reinforced	e	232.0		62.362		ō.	0	0	0	0	5	57	50		1.92			LVC	5 1 1 5 1 1	1 KKP	022.5
3.3 Form work	겉	110.0		1.55.1	ੱ	0	0	¢	0	6	3	5 (57		104.1	1.0.1	100.1			0.001	00. 1
3.4 Reinforcing bar	લુ	0.063		0.00	0	0	¢	¢	o	0	0	S	5	100.61		0.01		10331	222	1001 21	16.690
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3.7 Other works ¹	, S					0	0	0	0	57	э (67	; 7	100			270 CT	24.75	30 722	13 261	21 504
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4.2 Gabion mattress	ŝ	0.175		11.6%	0		0	0	0	5	⇒ <	5 6	2 4	Ë			2	, 0V		40	67
4.3 Gravel metalling	ε	0.005		11.124	ີ	ò.	¢	0	0	2	э (5 6) (5 4	2 0	1 NUM 1		044	• c	170	000
4.4 Weep hole	ë	0.00	000 000	1.300	ం		3	>	0	5	с (2	2	57	> <u>c</u>	0-1 31			ž	1.0	22.2
4.4 Other works"	L.S.						2 (í.	<u>à</u>	701	> <	2	à i	- 3	: g	202 824			6	24.7%1	0.40
Sub-total of 4.		-				эī Г)	1210			я			3	1	-			ļ		
5. Metal works							ć	<	c	ē	c	- E	0		0	0	0	0	0	o	0
5.1 Flap gate, stainless steel	ы, ж	4.000	0.00	00000	> <	> <				o" é			• •	0	a	0	Э	0	0	0	ò
5.2 Structural steel works	S,	0.00		004.0			2 <	014.05	2 2 2	1 515	, ,	1515	1515	Ċ	0	30.700	4,515	1515	¢	515 7	÷11; †
5.3 Iron pipe, dia.=1.000mm	٤	800		307.000	3	_	> <	0.00			а с		151	c		3.070	157	151	0	151	451
5.4 Other works 31	Ľ.					5.0	> <		1 0,65		.	990 T	1066	c	0	33.770	1.966	1.966	CI	4.966	26.7
Sub-total of 5.						э —	ĸ			r	×			N	4	ļ			I		
Total of (1 5.)						•	0	124,34	6,753	6,753	•	6,753	6,753	506.14	1111	t\$\$ ⁵ 927	70,081	12.1	221,45	70,081	201204
				1									1								
Very #12 December of 1007																					

Note: *1) Price Fevel: June 1997. USS 1.0 = Birt 6.8 = J. Yen 114.7 *2) Preparatory works: 10% of total permanent works *3) Other works: 10% of billing amount

Table 9.2.2 Breakdown of Construction Cost of Structural Measures (10/10)

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Estimate of Tax

$ \begin{array}{ c c c c c c c c c c c c c c c c c c c$	Component	ent.			Ċ.	D, Urban di																	
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$ \begin{array}{ c c c c c c c c c c c c c c c c c c c$		1	Custom		, ·	L		 . "	-Slak	ľ						 			121		11	Total	
water List List <thlist< th=""> List List <t< td=""><td>Work item</td><td></td><td></td><td></td><td>ļ</td><td></td><td></td><td>1<u>8</u></td><td>5</td><td></td><td></td><td></td><td>1381</td><td></td><td>-</td><td>(ISSI)</td><td></td><td>0.050</td><td>(38)</td><td>(UNS)</td><td>(USS)</td><td>((()))</td></t<></thlist<>	Work item				ļ			1 <u>8</u>	5				1381		-	(ISSI)		0.050	(38)	(UNS)	(USS)	((()))	
end entroping res 0.000 0.001 0.011 0.001	1 Prenaratory works **						1.27		N.X.N	(Y.	1	102-1	2.769	4.470	9.914	<u>177</u>	165.463	1 2-0	1.1	X			
Open entroping and en	1 Fiarthworks		• /									į	,			010 1	0.5	ł.y	110	4.337	Tý	4.39	
min min model	2 Classics and stripping	e e		100	0.00	6.600	611	ŝ	07	¢	š	ŝ	\$		AC7.1				015.45	11.017	191	30,39	
Minute Minut Minut Minut <td></td> <td></td> <td></td> <td>514</td> <td>0.02%</td> <td>7.00</td> <td><u>ک</u></td> <td>17</td> <td>g</td> <td>9</td> <td>14.5</td> <td>2.12</td> <td>9,</td> <td>112.5</td> <td>9.069</td> <td>2067</td> <td>0 () ((</td> <td></td> <td></td> <td></td> <td>ľ</td> <td>17 82</td>				514	0.02%	7.00	<u>ک</u>	17	g	9	14.5	2.12	9,	112.5	9.069	2067	0 () ((ľ	17 82	
	2.2 CAUSAGOR, CUITHOU			0.45	1-0.0	0	0	0	¢	0	¢	c	õ	¢	5	22,419	8. T	ŝ	170	202	20	19.0	
		ì	200		0 00	c	ĉ	¢	0	¢	c	c	Ċ	0	167	1,877	je i	S. 1	22.		<u>`</u>	3	
Math Math <th< td=""><td>2.4 Excavation, river red</td><td>Ê</td><td></td><td></td><td></td><td>00</td><td>ç</td><td>1</td><td>=</td><td>* 2</td><td>ŝ</td><td>177</td><td>41</td><td>179</td><td>181</td><td>460</td><td>ç</td><td>r. (</td><td>ç :</td><td>Ī</td><td>. 7</td><td>35</td></th<>	2.4 Excavation, river red	Ê				00	ç	1	=	* 2	ŝ	177	41	179	181	460	ç	r. (ç :	Ī	. 7	35	
Max Max <td></td> <td>Ê</td> <td>2000</td> <td></td> <td>200</td> <td>0</td> <td>C</td> <td>i c</td> <td>c</td> <td>c</td> <td>Ē</td> <td>¢</td> <td>ö</td> <td>0</td> <td>76</td> <td>191</td> <td>-</td> <td>c4 -</td> <td></td> <td>2</td> <td>1</td> <td>10</td>		Ê	2000		200	0	C	i c	c	c	Ē	¢	ö	0	76	191	-	c4 -		2	1	10	
Construct Ref Conc	2.6 Embanknieni	έ.	200.0			> <	5.S	Ċ	. 0	0	Ċ	0	ò	0	5	ģ	1,400	2TX	7.4	651	8		
Mile Lis Tim Lis Tim Lis Lis <thlis< th=""> <thlis< th=""></thlis<></thlis<>	2.7 Tree vegetation works	Ē	70.0	3	102.7	>	> -	2	ř	-	Ş	772	7	281	1.44	\$ 20¢	55	140	9 T.	09%*X	3	20 20	
ald of 2. mile mile <thmile< th=""> mile</thmile<>	2.8 Other works	Ľ.					0.00		į	' =	, i	, S	=	3.056	16, 355	12.25	10-1	ş	81	전지		5	
Mix Mix <th mix<="" td="" th<=""><td>Sub-total of 2.</td><td></td><td></td><td></td><td></td><td></td><td>Ī</td><td></td><td>1</td><td>7</td><td></td><td>1</td><td>ł</td><td></td><td></td><td></td><td>1</td><td></td><td></td><td></td><td></td><td></td></th>	<td>Sub-total of 2.</td> <td></td> <td></td> <td></td> <td></td> <td></td> <td>Ī</td> <td></td> <td>1</td> <td>7</td> <td></td> <td>1</td> <td>ł</td> <td></td> <td></td> <td></td> <td>1</td> <td></td> <td></td> <td></td> <td></td> <td></td>	Sub-total of 2.						Ī		1	7		1	ł				1					
Mit 0.385 0.445 0	3. Concrete works									3434	5.00	771	909 -	3 003	3.622	8.605	515,5412	85,795	065'16	12,317	\$5.795	38, 11	
circle col m3 0.552 0.445 0.533 1.257 7.301 1.257 7.301 1.377 4.701 5.073 4.704 5.071 1.5735 4.704 5.071 1.5735 4.704 5.071 1.5735 4.704 5.071 1.5735 4.704 5.071 1.5735 4.704 5.071 1.5735 4.704 5.071 1.5735 4.704 5.071 1.5735 4.704 5.071 1.5735 4.704 5.071 1.5735 4.704 5.731 1.240 7.70 7.701 1.57584 2.6202 0 <th0< th=""> <th0< th=""></th0<></th0<>	3.1 Concrete, mass	Ê		0.213	\$6.697	1	Ē	2	1/,X00	0.0	-/.0			AUG 61	300	1016	-29	12.739	35.755	4,274	32.730	10.11	
Part Ro 0.013 0.108 1.550 0.000 0.000 1.550 0.00 0.001 0.011 <th0.011< th=""> <th0.011< th=""> 0.011<</th0.011<></th0.011<>	3.2 Concrete, reinforced	Ĩ		0 14	62.367	1,050	10	5X3	()	- v.	01010	ŝ	A-0-2	000 01		1011	21.077	702 7	8,007	15,705	4,704	20.49	
Even Rg Dows D	1 3 Form work	é		0,168	1.581	¢. 300	3 X6X	1.058	6.973	1417		0.56.17	9	. v. o					1	1 500	ō	21.50	
mc 0.117 0.117 0.118 0.000 0.	1.4 Periodomios har	ŝ		0.001	0.000	20, 10	10.4	\$;	c	c	ŝÿ	61 - 7	5	4			200 F 200 F	, 11 C	21120	1 112	10-26	50 CC	
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Mail of 3. Mail of	3.7 Other works	ŝ			_		0.56		119.0	10.0	10:05 11	11 749	× (U) × i	16.853	54.917	10126	000,000	154.719	3	2 2	21.2	0 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1	
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mile mile <th< th=""><th>4.1 Wet masonfy</th><th>ε. Έ</th><th>0000</th><th>0000</th><th></th><th>5</th><th>5 0</th><th>> <</th><th></th><th></th><th>÷÷</th><th>. c</th><th>0</th><th>0</th><th>646</th><th>1.599</th><th>000.00</th><th>0.5.6</th><th>8,128</th><th></th><th>6.5.9</th><th>8.79</th></th<>	4.1 Wet masonfy	ε. Έ	0000	0000		5	5 0	> <			÷÷	. c	0	0	646	1.599	000.00	0.5.6	8,128		6.5.9	8.79	
weating m3 0.000 0.001 11.1.1.0 0 0 0 1 1.898 279 279 0 0 0 1 1.898 279 279 0 0 0 1 1.898 279 279 0 0 0 0 0 1.898 279 279 2.933 0.143 2.297 5.983 0.143 2.297 5.983 0.143 2.297 5.983 0.143 2.297 5.983 0.143 2.297 5.983 0.143 2.297 5.983 0.143 2.297 5.983 0.143 2.297 5.983 0.143 2.495 0 <th< th=""><th>4.2 Gabion matures</th><th>e.</th><th>0.17</th><th>0.421</th><th>100</th><th>5.4</th><th>5 <</th><th>5 0</th><th>. c</th><th>> <</th><th>c</th><th>Ċ</th><th>0</th><th>0</th><th>0</th><th>¢</th><th>1</th><th>67</th><th>6</th><th>0</th><th>4</th><th>ব</th></th<>	4.2 Gabion matures	e.	0.17	0.421	100	5.4	5 <	5 0	. c	> <	c	Ċ	0	0	0	¢	1	6 7	6	0	4	ব	
No. 0.000 0.000 0.000 0.000 0.000 0.000 0.014 227 5.983 6.143 5.983 6.143 5.983 6.143 5.983 6.143 5.993 6.143 6.123 6.126 6.1	4.3 Gravel metalling	r.u	0.003	0.01	11.124	Ś	5 4	2 4	s c	- C	c	• 0	ē	0	0	0	868.1	6.7	279	0	279	5	
Ories L.N. 0 0 0 0 2.33 1.779 4.75 cs. 12 2.492 2.68.12 1.733 4.75 cs. 12 2.492 2.68.12 0.000 0 0 0.000 0	4,4 Weep hole	ż	0.000	0.000	3	5	50		• <		c	; c	Ċ	Ċ	5	991	40.684	5,943	6,143	5	1.86	6210	
-local of 4	4.4 Other works"	نې د					5			> <	5 2	> <	ċ		121	1 750	4:7,522	65,812	67.571	107	518 59	ç Ş	
c stantices steel kg 4.000 0.000 5.000 0 0 2.000 0	Sub-total of 4.						ĊŦ	<u>-</u> 1	ы	я	ਸ਼ ਹ	4	eł –	Я	1		ļ	ļ					
Aniless stel kg 4.000 0.000	5. Metal works							c	c	c	č	ŝ	č	3 000	6.000	0	0	°	ö	6.00 00	0	6.00	
cel works ks 0.000 0.000 0.000 0.000 0.000 4.515 4.515 0 4.515 a=1000mm m 0.000 0.000 0 0 0 0 0 4.515 4.515 0 4.515 a=1000mm m 0.000 0.000 0 7.758 1.141 1.141 200 1.141 1.341 6.00 0 1.1518 1.738 6.00 1.738 a=1000mm m 0.000 0.000 0 7.758 1.141 1.141 200 1.141 1.341 6.00 0 1.1818 1.738 6.00 1.171 anilof5 L.S. 1.141 1.200 1.2560 2.2500 1.2560 1.2560 1.2760 1.2711 6.000 1.171 1.0117 6.000 1.0117 6.000 1.0117 6.000 1.0117 6.000 1.0117 6.000 1.0117 6.000 1.0117 6.000 1.0117 6.000 1.0117 6.000 1.0117 6.000 1.0117 6.000 1.0117 6.000 1.0117 6.000 1.0117 6.0117 1.0117 6.000 1.0117 1.0117 6.000 1.01117 6.0117 <t< td=""><td>5.1 Flap gate, stainless steel</td><td>к Х</td><td>4.000</td><td></td><td>000</td><td></td><td>8</td><td>> <</td><td></td><td>0.00</td><td>000 11</td><td>2</td><td>1 400</td><td>SOF 11</td><td>0</td><td>0</td><td>OXF"LX</td><td>29%71</td><td>12,8651</td><td>Ċ</td><td>12,865</td><td>180</td></t<>	5.1 Flap gate, stainless steel	к Х	4.000		000		8	> <		0.00	000 11	2	1 400	SOF 11	0	0	OXF"LX	29%71	12,8651	Ċ	12,865	180	
a=1,000mm m 0.000 307.000 00 00 0 0 0 0 7.758 1.141 1.141 200 1.141 1.341 600 0 11.818 1.738 1.738 600 1.738 2.00 0 7.758 1.141 1.141 200 1.4790 0 1.4790 0 1.249 0 0 1.249 2.0117 1.0417 1.0417 1.0417 1.0417 1.0417 1.0417 all of 5. all of 5	5.2 Surretural steel works	냋	0.000		800		5	2	nuc i			2 <			Ċ	c	30.700	4.515	4,515	0	4,515	4.51	
20 0 7.75% 1.141 1	5.3 Iros pipe, dia.=1,000mm	ε	0000		00,000	0	ē	c		2	5	2		1 241	, QS		11.818	1.738	N.7.1	ĝ	1.738	2,338	
ul of 5. 13,580 5,124 207,085 30,454 35,578 18,704 30,454 49,158 109,052 85,499 353,454 195,007 267,499	5.4 Other works	LS.					8	0	7.7.8				() () () () () () () () () () () () () (2027	÷	179.008	10117	10112	6.600	19,117	16 25	
13,580 5,124 207,085 30,454 35,578 18,704 30,454 49,158 109,052 85,955 1,818,995 267,499 353,454 195,007 267,499	Sub-total of 5.	•				-	8027	a	<u> </u>	<u> </u>				1		:1							
									200 200	131.05	26 674	10.00	F)F VL	10.15K	109.052	826 SK	566'81X'1	WL, TAS		195,007	267,4W	462.506	
	Total of (1 5.)						13,580		S40*/ 07														

*!) Prace level: June 1997.
 USS 1.0 = Bhr 6.8 = J.Yen 114.7
 *2) Preparatory works; 10% of total permanent works
 *3) Other works; 10% of billing amount

Note:

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Table 9.2.3 Breakdown of Installation Cost of Non-structural Measures (1/2)

Estimate o	f Net Cost
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		Unit pr	ice'			Amount (x 1		
Work item	Unit	<u>F.C.</u>	<u>I.C.</u>	Qʻiy	<u>F.C.</u>	<u> </u>	-	<u>fetat</u>
		<u>(US\$)</u>	(Bin)		(USS)	(8ंग) स्व	<u>(USS)</u>	(USS)
1. River zone			1					
1.1 Staking, @10m, both sides	m	00	28.0	38,800	0	1,086	160	160
1.2 Other works ²²	L S.				0	109	16	10
Sub-total of L					<u>0</u>	<u>1,195</u>	176	170
2. Flood warning system								
2.1 Rainfall observatory station	60.	2,000.0	14,000.0	3	6	42	6	1
2 2 Walkie-talkie	set	600.0	0.0	3)	2	0	o'	
2.3 System line	m	0 8	3.0	5,300	r 1	16	2	
2.4 Support, @12m	no.	0.0	325.0	412		144	21	2
2.5 Tower with siren	no.	4,000.0	34,000.0	ю		340	50	9
2.6 Staff gauge, 3m	no.	50.0	100.0	10	1	1	0	
2.7 Other works ²⁰	LS	!			5	54	8	1
Sub-total of 2.					<u>58</u>	<u>597</u>	<u>88</u>	14
3. Flood fighting system								
3.1 Storage house, 35m2	ň ə.	0.0	40,000 0	5	0	200	29	
3.2 Walkie-talkie	set	600.0	0.0	5	3	0	0	i
3.3 Sand bag/Scoop/Handy light/								
Helmet/Raincoat/etc.	LS	0.0	50,000.0		6 0		37	Į į
3.4 Other works ^{*2*}	LS				0	1	7	1
Sub-total of 3.	1				3	<u>495</u>	73	
4. Social education								
4.1 Blockboard	no.	0.0			s c		1	J
4.2 Sign board, against illegal act.	no.	00	750.0	Z Z			2	•
4.3 Other works ^{*2}	L. S.	1	•	1			0	
Sub-total of 4						28	Ŧ	
Total of (F 4.)			Ì		61	2,314	340	

Note: *1) Frice level Jane 1997. US\$ 1.0 = Birr 6 8 = J.Yen 114.7

Unit price excludes fax. *2) Other works; 10% of billing amount

Table 9.2.3 Breakdown of Installation Cost of Non-structural Measures (2/2)

Estimate of Tax

			nit tax ^{*1)}			- <u>-</u>			Amo	unt I			
		Custom		les	~	Custom		<u>S3k</u>		I	<u>Tetal</u>	Total	
Work item	Unit		<u>F.C.</u>	<u>LC.</u>	Qʻty	<u>F.C.</u>	<u>F.C.</u>	<u>_LC</u>		Total	<u>F.C.</u>	<u>L.C.</u>	Tota
		<u>(US\$)</u>	(US\$)	(Birr)		(USS)	(US\$)	(Birr) (q (USS)	(US S)	(US S)	(US\$)	(USS
1. Administrative river zone													
 I.1 Staking, @10m, both sides 	m	0.0	0.0	2.0	38,800	0	0	77,600	11,412	13,412	0	11,412	11,43
1 2 Other works ¹²	LS					o	0	7,760	1.141	1.141	0	1.141	1.1
Total of 1.						Q	Q	<u>85,360</u>	12.553	12.553	Q	12,553	12,5
2. Flood warning system													
2.1 Raiafall observatory station	пο.	200.0	00	1.050.0	3	600		3.150	463	463	600	463	1.0
2 2 Walkie-talkie	54	60.0	0.0	0.0	3	180		0	0	0	180	0	- 1
2.3 System line	m	0.08	0.0	0.1	5.300	424	0	530	78	78	424	78	5
2.4 Support. @12m	no.	00	0.0	25.0	-442	0	0	11,050	1.625	1,625	0	1.635	1.6
2.5 Tower with siren	no.	400.0	0.0	1,080.0	10	4,000	0	10,800	1.588	1.588	4.000	1,583	5,5
2.6 Staff gauge, 3m	no.	5.0	0.0	50	10	50	0	50	7	7	50	7	
2 7 Other works ^{*≥}	1.5.					525	0	2,558	376	376	525	376	9
Total of 2.						<u>5,779</u>		28,138	4,138	4.138		4,135	9,9
3. Flood fighting system													
3.1 Storage house	Ino.	00	0.0	2,000.0	5	0	1 0	10.000	L471	1.471	0	1.474	1.4
3.2 Walkie-talkie	set	60.0	00	00	5	300	0	0	0		300	0	3
3.3 Sand bag/Scoop/Handy light/			1				· ·						
Helmet/Raincoat/etc.	1.5	0.0	0.0	5,000.0	5	0	0	25,000	3.676	3,676	0	3.676	3.6
3.4 Other works ^{*2}	LS		1			30	0	3,500	515	515		515	5
Total of 3.			Í			330		<u>38,500</u>	<u>5.662</u>	5.662	<u>330</u>	5,662	<u>5.9</u>
4. Social education													
41 Blackboard	no.	1 00	1 0.0	200.0	5	0	0	1.000	147	147	l o	147	
4.2 Sign board, against illegal act	no.	0.0	00	70.0	•			1,400	206	206		206	
4.3 Other works ^{*2}	LS		1		1	0	0	240	35	35		35	
Total of 4.			1			<u>0</u>	1	2.640	388	388		388	•
Total of (1. • 4.)						6,109	0	154,638	32,741	22,741	6,109	22,741	28,

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Table 9.2.4 Breakdown of Resettlement Cost

Breakdown of unit cost

				Kind of I	nousa		
lo. Item		Unit	Chika	C. block	Brick	Stone	Total
onditions for estimate							
 Number of houses per 10,000m2 		no.	30.0	20	20	2.0	36.0
Averaged floor space per house		m2	44	44	67	67	
1. Compensation							
1) House							
 Construction cost 		Birr/m2	450	1,000	1,200	1,500	
 Averaged passing time 		year	30	20	30	30	
 Annual depreciation ratio 			1.00%	0.50%	0.25%	0.25%	
 Present value, unit 		Birdin2	333	905	1.113	1,391	
 Present value per house 		Bin	14,646	39,803	74,584	93,229	
2) Wet masonry wall							
 Total floor space per 10,000m2 		m2	1.320	88	134	134	1,676
Estimated net residencial area		ao?					5,000
- Estimated occupying space		m?	3,938	263	400	400	5,000
- do -, per house		m2	131	(31	200	200	
 Estimated wall length per house 		RI	23	23	28	28	
- Estimated wall height		m	2	2	2	2	
 Estimated wall width 		m	0.5	0.5	0.5	0.5	
 Estimated wall volume per house 		m3	23	23	28	28	
- Construction cost		Birt/m3	150	150	150	150	
- Averaged passing time		уеаг	30	30	30	30	
- Annual depreciation ratio		J	0.50%	0.50%	0.50%	0.50%	
 Present value, unit 		Birt/m3	129	129	129	129	
 Present value per house 		Birr	2,957	2,957	3,649	3,649	
3) Tree		011	6.757	-12-17			
- Estimated number of trees		no.	3	3	4	6	
- Unit value of tree, Eculy ptu		Birr	200	200	200	200	
 One value of tree, itenypto Present value per house 		Barr	600	600	800	1,200	
-		17411	000	1.00			
 4) Yearly crop Estimated cropping area 		m2	75	75	100	200	
		Birr	700		700	700	
 Compensation unit price per ha Property alus pur house 		Birr	5		7.00	14	
Present value per house		Bar	18.209		79,040	98,093	
Sub-total, $(1) - 4$	5%	Birr	910		3,952	4,905	
5) Transportation 6) Miscellaneouse	15%	Birr	2,731	6,505	11,856	14,714	
Total, 1) - 6)	1.176	Birc	21.850		94,848	117,711	
		DIG	\$1.0.90	32,038	74,040		
2. Demolition			2.0	2.0	2.0	2.0	
- Estimated height of house		m m3	2.0		134	134	
- Estimated volume of house					162	134	
- Demot, vol. of house & wall per house		n] Contra	111		53	53	
 Unit demolition cost, hauling=7.5km 		Bin/m3	53	-			
- Demolition cost per house		Birr	5,878	5,878	8,601	8,601	
3. Construction of new house apartment		D		16	16	16	
 Local hotel room charge per night 		Birr	16				
 Suppose: the room= 4m x 3m 		m2	12 6 12		12 (12)	12	
- Hotel charge for 3 yeays		Birr	17,520		17,520	17,520	
 Estimated bailding constructioncost 		Birr	17,520		17,520	17,520	
 Building construction cost per m2 		Birr	1.460		1,460	1,460	
 Floor area per house hold=4m x 4.5m 		m2	18		18	18	
 Building construction cost per house here 	əld	8irr	17,520	17,520	17,520	17,520	
3. Total							
 Total cost per house 		Birr	45,249		120,968	143,832	
 Cost per 10,000m2 		Birr	1,357,46		241,937		2,037,93
 Cost per in2 		Birr	136	5 15	24	29	20

Resettlement cost

			Unit	price			Am	ount	
<u>No.</u>	head	Unit	<u>F.C.</u>	<u>L.C.</u>	Qʻiy	<u>F.C.</u>	<u> </u>	<u>C.</u>	<u>Total</u>
			(US\$)	(Birr)		(USS)	(Bist)	eq (US\$)	(USS)
1. Resettlement cost		m2	0	204	1.000	0	204,000	30,000	30.000

Note: - Price level; June 1997 - US\$ 1.0 = Birr 6.8 = J.Yen 114.7

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Table 9.2.5 Breakdown of Engineering Services Cost (1/4)

Estimate of Net Cost

			Unit pr					L (x 1,000)	
0,	Liew	Uoit	<u>F.C.</u>	L.C.	Qa	<u>F.C.</u>		<u>. C</u>	Total
			(US\$)	(Bia)		(US S)	(Bin)	equivalent (US\$)	(US S)
1. Detailed	design ²								
	nuneration								
	eign expert								
	feam leader (Flood control)	M/M	000,01	(0)	1	10	(0)	0	1
	lydrologist/hydraulic engineer	M/M	10,000	(0)	3	30	(0)	0	3
- [Design engineer-A	M/M	10,000	(0)	6	60	(0)	0	6
	Design engineer-B	M/M	10,000	(0)	2	20	. (0)	Q,	2
- 8	ingineering geologist	M/M	10,000	(0)	2	20	(0)	0	2
- (Construction plan/Cost estimator	M/M	10,000	(0)	2	20	(0)	0	2
- 9	Specification specialist	M/M	10,000	(0)	2	20	(0)	0	2
	Senior surveyor	M/M	10,000	(0)	4	40	(0)	0	4
	nstitutional expert	M/M	10,000	(0)	12	120	(0)	0	12
9	Sub-total of foreign expert				34	340	(0)	0	34
	al expert								
	Design engineers	M/M	0	(1,500)	8	Û	(12)		
	Surveyors	M/M	0	(1,000)	12	0	(12)	2	
	Draftmen	M/M	0	(750)	20	0	(15)		
5	Sub-total of local expert				40	0	(39)	6	
5	Sub-total of 1)					340	(39)	6	34
2) Tra	nsportation								
- 1	nternational air fare	round	10,000	(0)	9	90	(0)	0	ç
- 4	Allowance for foreign consultants	day	100	(0)	1,020	102	(0)	0	10
- \	/ehicle rental charge (incl. drivers)	unit/day	100	(0)	540	54	(0)	0	-
5	Sub-total of 2)					246	(0)	0	24
3) Fiel	M/Laboratory test								
- E	Boring	m	0	(600)	300	0	(180)	26	
- 1	lydraulic model test	L.S.				85	(0)	0	1
5	Sub-total of 3)					85	(180)	26	I
4) Rej	port binding								
	100pages x 30vol.	page	0	(1.82)	9.000	0	(16)	2	
•	sipment (depreciation basis)								
	Computer	unit/day	8	(0)	1,020	8	(0)		
	Fotal station	unit/day	36	(0)	120	4	(0)		
	Theodolite	unit/day	5	(0)	120	L	(0)		
	Leveling instrument	unit/day	3	(0)	120	0			
- 1	Photo copy machine	unit/day	0	(182)	180	0	(33)	5	
	Sub-total of 5)					В	(33)	5	
	fice running cost								
-	Office	monih	0	(682)	6	0	(4)) 1	
7) Ov	rethead (100% of foreign expert)	L.S.	100%	1007		340	(0)	0	3

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Table 9.2.5 Breakdown of Engineering Services Cost (2/4)

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	te of Net Cost		<u>Unit pri</u>	çç'''			Amount	(x 1,000)	
<u>Yo.</u>	liem	<u>Unit</u>	<u>F.C.</u> (US \$)	<u>L.C.</u> (Birr)	Qiy	E.C. (US\$)	<u> </u>	.C. equivalent (US\$)	<u>Total</u> (US S)
2. (Construction supervision								
	t) Remuneration								
	Foreign expert								
	 Team leader (Flood control) 	M/M	10,000	(0)	2	23)	(0)	0	2
	- Design/supervision engineer-A	M/M	10,000	(0)	24	240	(0)	0	2.
	 Design/supervision engineer-B 	M/M	10,000	(0)	4	40	(0)	0	4
	Sub-total of foreign expert				30	300	(0)	0	30
	Local expert						(23)		
	 Design engineers 	M/M	0	(1,500)	48	0	(72)	11	
	- Surveyors	M/M	0	(1,000)	12	0	(12)	2	
	- Drivers	M/M	0	(900)	12	0	(11)	2 t4	
	Sub-total of local expert				72	0	(95)	[4	
	Sub-total of 1)					300	(95)	14	3
	2) Transportation					•	(0)	0	
	- International air fare	round	10,000	(0)	3	30	(0)	0	
	3) Report binding			(1.85)	9,000	0	(16)	2	
	- 300pages x 30vol.	page	0	(1.82)	9,000	0	(10)	Ŀ	
	4) Equipment	unit	26.000	(0)	1	26	(0)	0	
	- Vehicle (4WD)	unit	3,500	(0)	, L		(0)		
	Computer	unit	1.700	(0)		2	• •		
	Theodolite	មការ មករដ	1,100	(0)	i	-	(0)		
	 Leveling instrument Photo copy machine 	unit មករា	3,500	(0)		4			
	Sub-total of 4)					37	(0)	0	
	5) Office running cost								
	- Office	month	0	(682)	12	0	(8)	1	
	6) House rental charge		1 000		••	72	(0)	• 0	
	- House	inoeth	3.000	(0)	24		•		
	7) Overhead (100% of foreign expert)	l. S .	100%	100%		300) (0) ()
	Total of 2.					739) (119) 17	7
	Total of (1 2.)					1,763	(392) 5	5 1,

Note: *1) - Price level; June 1997, US\$ 1.0 = Birr 6.8= J. Yen 114.7

Unit price excludes tax.
 *2) - Cost is estimated assumed that all the services are carried out and completed in Ethiopia for six months.

Table 9.2.5 Breakdown of Engineering Services Cost (3/4)

Estimate of Tax

				uit tax ^{*a}					• - • • • • •	<u>Am</u>				
			<u>Caston</u>	<u>Sa</u>			Custom		Sat			Tol		
0	<u>Item</u>	<u>Unit</u>	<u>EC</u>	<u>F.C.</u>	LC.	Qʻty	<u>F.C.</u>	EC.	<u> </u>		Total	<u>F.C.</u>	<u>L.C.</u>	Tota
			(US\$)	(US\$)	(Bin)		(US S)	(US\$)		equiv. {US\$5	(US\$)	(US\$)	(US\$)	(USS
L. Detaile	Ancien											<u> </u>		
	emuneration													
	oreign expert													
	Team leader (Flood control)	M/M	0	0	{ 0}	1	0	0	(0)	0	0	0	0	
	Hydrologisthydraulic engineer	MM	ů.	ŏ	(0)	j	ŏ		(0)	ŏ	ŏ	ŏ		
	Design engineer A	MM	å	ŏ	(0)	6	ő	-	(0)	ŏ	õ	ŏ	-	
	Design engineer-B	MM	ő	ŏ	(0)	2	ő		(0)	ŏ	ŏ	ő		
	Engineering geologist	MM	ŏ	ŏ	(0)	2	ő	-	(0)	ŏ	ŏ	ŏ	-	
	Construction plan/Cost estimator	M/M	ŏ	ŏ	(0)	2	ŏ		(0)	ŏ	0	ŏ	-	
	Specification specialist	MM	ŏ	ŏ	(0)	2	ŏ	•	(0)	0	ŏ	ŏ	•	
•	Senior surveyor	M/M	ŏ	ő		4	0	-	(0)	0	ŏ	ŏ		
	•	M/M	ŏ	0	10)	12	0	-		0	0	ŏ	-	
•	Institutional expert	25.22	v	0	107	34	0	•	(0)	0	0	0	•	
	Sub-total of foreign expert					.54	v	0	(0)	U	v	U	0	
	ocal expert				.0.		•						•	
	Design engineers	MM	0	0	(0)		0	-	(0)	0	0	0	-	
•	Surveyors	M/M	0			12	0		(0)	0	0	0	-	
•	Draftmen	MM	0	0	(0)	20	0		(0)	0	0	0		
	Sub-total of local experi-					40	0	0	(0)	0	0	0	0	
	Sub-total of 1)						0	0	(0)	0	0	0	0	
2) T	ransportation													
	International air face	round	0	0	(0)	9	0	0	(0)	0	0	0	0	
	Allow ance for foreign consultants	day	0	0	(0)	1.020	0	0	(0)	0	0	0	Û	
•	Vehicle rental charge (incl. drivers)	unit/Jay	0	10	(0)	540	0	5,400	(0)	0	0	5,400	0	5,
	Sub-total of 21						0	5,400	(0)	0	0	5.400	0	5.
318	eld1.aboratory test													
•	Boring	DR.	0	0	(0)	300	0	0	(0)	0	0	0	0	
-	Hydraulic model test	LS					0	0	(0)	0	0	0	0	
	Sub-total of 3)						0	0	101	0	0	0	0	
4) R	eport binding													
-	MOpages x Moot	page	0	0	(0.18)	9.000	0	0	11,630)	238	238	0	238	
	quipment (depreciation basis)													
	Computer	unit∕day	0		£6 53)				(6,651)	980	980	498		1.
•	Total station	unit/day	0		(29.4)				(3,526)	518	518	216		
	Theodolite	unitiday	0		(4 08)				(490)	72	72			
•	Leveling instrument	unit/Jay	0	• • •	{2.45}				(294)	43			-	
	Photo copy machine	unit/0 ;y	0	0	(18)	180	ŋ	0	(3,240)	176	476	0	476	
	Sub-total of 5)						0	672	(14,210)	2,090	2,090	672	2.090	2
	Nfice running cost													
	Office	ស តភា ពា	0	0	(68)	6	0	0	(498)	60	60	0) 60	
7) (Nethead (100% of foreign expert)	LS.	100%	100%	100%		0	• •	10)	0	0	c) 0	
	of i.													

Table 9.2.5 Breakdown of Engineering Services Cost (4/4)

Estimate of Tax

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				1111 <u>-</u>			<u> </u>			<u></u> Amo	unt			
			Custom	<u></u>			Custom		Sat			Iota	· · ·	
<u>.</u>	<u>kcm</u>	<u>Unit</u>	<u>E.C.</u> (US S)	<u>E.C.</u> (USS)	<u>L.C.</u> (Bin)	Qity	<u>E.C.</u> (US\$)	<u>E.C.</u> (US S)	<u> </u>	cquiv. (USS)	<u>Total</u> (US\$)	E.C. (US\$)	<u>L.C.</u> (US S)	<u>Total</u> (USS)
2. Coas	truction supervision													
1)	Remuneration													
	Foreign export													
	 Team leader (Flood control) 	M/M	0	0	(0)	2	0	0	(0)	0	0	0	0	
	 Design/supervision engineer-A 	M/M	0	0	(0)	24	0	0	(0)	0	0	0	0	
	 Design/supervision engineer-8 	M/M	0	Ø	(0)	-1	0	0	(0)	0	0	0	0	
	Sub-total of foreign expert					30	0	0	(9)	0	0	0	0	
	Local expert													
	 Desiga engineers 	M/M	0		(0)	43	0	0	(0)	0	0	0	0	
	- Surveyors	M/M	0		(0)	12	0	0	(0)	0	0	0	0	
	Drivers	M/M	0	0	(0)	12	0	0	(0)	0	0	0	0	
	Sub-total of local expert					72	0	0	(0)	0	0	0	0	
	Sub total of 1)						0	0	(0)	0	0	0	0	
23	Transportation													
	 International air fare 	round	0	0	(0)	3	0	0	(0)	0	0	0	0	
3)	Report binding													
	- 300pages x 30vol.	page	0	0	(0.18)	9.000	0	0	(1.620)	238	238	0	238	2
4)	Equipment													
	 Vehicle (4WD) 	unit	2.600					0	(0)			2.600	0	2,6
	- Computer	មកដ	350					0	(0)			350	0	3
	- Theodolite	unit	170					0	(0)			170	0	1
	 Leveling instrument 	មរារិt	110						(0)			110	0	
	 Photo copy machine 	unit	350	0	1 (1)	1	350	0	(0)	0	350	350	0	3
	Sub-total of 4)						3.580	0	(0)	Ú	3,580	3,580	0	3.5
5)	Office running cost						_							
	- Office	month	C	0	(68)	12	0	0	(815)	120	129	0	120	I
6	House sental charge		_					1		~	~	3 300	~	
	- House	month	0	300	(0)	24	0	7.200	101	0	0	7.200	0	7.2
7	Overhead (100% of foreign expent)	L S.	100%	100%	1003		0	0	(0)	0	0	0	0	
Tot	at of 2.						3,580	7,200	(2,436)	358	3,938	10,780	358	11,1
Tot	al of (1 2.)						3,580	13,272	(18,674)	2,746	6,326	16,852	2,746	19,5

Note: *1) - Price level, June 1997, US\$ 1.0 = Birt 6 8= J.Yea 114.7

Table 9.2.6	Breakdown of Administration Cost for Structural Measures
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	<u>11810</u>		<u>Unit pr</u>		• • ?	Amount (x 1,000) F.C. L.C. Total					
<u>lo.</u>		<u>Unit</u>	<u>E.C.</u> (USS)	<u>L.С.</u> (Віп)	Q'1y'-	<u>F.C.</u> (US\$)	(Birr)	<u>C.</u> equivalent (US \$)	(USS)		
I. Comm	on expenses								<u></u>		
1) P	ersonnel cost								_		
-	Preparatory stage, 21 staffs x 2 years	M/M	0	(1,000)	504	0	(504)	74	7		
-	Implementation stage, 42 staffs x 2 years	M/M	0	(1,000)	1,008	0	(1,008)	148	14		
	Sub-total of 1)					0	(1,512)	222	22		
2) I	ังกรายเรื่อง										
	Desk and chair, bookshelf,										
	conference table, etc.	unit	0	(500)	50	0	(25)	4			
3) E	equipment cost										
	Procurement of vehicles										
	8 pick-ups (4WD)	unit	0	(250,000)	8	0	(2.000)		21		
	1 sedan	unit	Û	(120,000)	1	0	(120)	18			
-	O&M cost of vehicles for 4 years ⁷³⁴	unit/M	0	(600)	384	0	(230)	34			
	Procurement of computer	นกะเป	0	(30,000)	4	0	(120)	18			
	Photo copy machine	unit	0	(40.000)	l	0	(40)				
	Theodolite	unit	0	(50,000)	1	0	(50)	7			
-	Leveling instrument	unit	0	(15,000)	2	0	(30)	4			
	Sub-total of 3)					0	(2.590)	381	3		
4) (Office running cost										
-	Office for 4 years,										
	including consumables	month	0	(750)		0					
-	- Wage of driver	81/M	0	(900)	384	0	(346)) 51			
	Sub-total of 4)					0	(382	56			
5	Sub-total of 11 - 41					0	(4.509	663	e		
5) (Others	L. S .	10%	10%		0	(451) 66			
Total	of I.					0	(4,960) 729	1		
2. EIA c	ost (international contract basis)										
	- Expert-A (foreign) for 6 months	M/M	10,000	(0)	6	60	0) (0				
	- Expert-B (foreign) for 3 months	M/M	10,000	(0)	1 3	.30) (0) 0			
	- 3 experts (Recal) for 6 months	M/M	0	(1,500)	18	0) (27	-			
	 6 local assistants for 6 months 	M/M	0	(750)		C					
	 International air fare 	round	10,000				•				
	 Allowance for foreign expert 	day	100								
	 Vehicle rental charge 	uniVday	110								
	 Rental charge of photo copy machine 	unit/day	0								
	- Computer	uniVday	9								
	 Report binding (100page x 30 vol.) 	base	0								
	 Overhead (100% of foreign expert) 	L S .	100%	100%		90) (()) (ł		
Tota	of 2.					269) (132	2) 19)		
Tota	1 of (32.)					265	9 (5,09)	2) 749) 1,		

Note:

*1) - Price level; June 1997, US\$ 1.0 = Birr 6.8 = J.Yen 114.7
Unit price includes tax.
*2) - The quantities are estimated for the preparatory and implementation stages of 4 years.
*3) - The quantity for an existing pick-up is included.

			Unit pr	Unit price"			Amount (x 1,000)				
<u>io.</u>	<u>Item</u>	<u>Unit</u>	<u>F.C.</u>	<u>I.C.</u>	Q'ty ^{*2}	<u>F.C.</u>		<u>. C.</u>	<u>Total</u>		
			(US\$)	(Birr)		(US\$)	(8irr)	equivalent (US\$)	(U\$\$)		
I. C	'ommon expenses										
	1) Personnel cost										
	 Preparatory stage, 4 staffs x 2 years 	M/M	0	(1,000)	96	0	(96)	14	1		
	- Implementation stage, 8 staffs for 1 year	M/M	0	(1,000)	96	0	(96)	14	1		
	Sub-total of 1)					0	(192)	28	:		
	2) Furniture										
	 Desk and chair, bookshelf, 										
	conference table, etc.	unit	0	(500)	10	0	(5)	I.			
	3) Equipment cost										
	- O&M cost of vehicles for 3 years	unit/M	0	(600)	72	0	(43)	6			
	 Procurement of overhead projecter 	unit	2,500	(0)	ł	3	(0)	0			
	Sub-total of 3)					3	(43)	6			
	4) Office running cost										
	 Wage of driver³³ 	M/M	0	(900)	72	0	(65)	10			
	Sub-total of () - 4)					3	(305)	45			
	5) Others	L.S.	10%	10%		0	(31)	4			
1	Total of 1.					3	(336)	49			

Table 9.2.7 Breakdown of Administration Cost for Non-structural Measures

Note: *1) - Price level: June 1997, USS 1.0 = Birr 6.8 = J.Yen 114.7 - Unit price includes tax.

*2) - The quantities are estimated for the preparatory and implementation stages of 3 years.

		1998			1999			2000			2001			Total	
Ben	F.C.	L.C.	Total	E.C.	LC.	Total	F.C.	LC	Total	F.C.	L.C.	Total	E.C.	<u>i.c.</u>	Tecal
tructural measures															
1. Construction cost															
1) Kechene weir	0	0	0	0	0	0	543	1,275	1,818	181	425	606	724	1,700	2,424
2) Kostre regulating pond	ō	ó	Ó	0	0	0	405	397	802	0	0	0	405	397	803
3) Bantyiketu regulating pood	0	0	0	0	0	0	484	354	837	484	354	837	967	707	1,674
4) Bantyiketu river channel improve	- hocor														
- I Flood wall	0	0	0	0	Ō	0	8	137	145	25	411	436	33	548	58
- 2 Stope protection	Ó	ò	0	0	0	0	159	124	283	476	373	848	635	495	1.13
- 3 River channel excavation	Ó	Ó	Ð	0	0	0	56	32	88	168	96	264	224	128	35
- 1 Associated works	0	0	Ð	0	0	0	0	26	26	0	77	77	0	103	10
Sub-total of 4)	0	0	0	0	0	0	223	319	542	669	956	1,625	892	1,274	2.16
	_	-													
5) Urban development works	0	0	0	0	0	0	335	80	415	1,004	241	1,244	1,338	321	1,65
Sub-total of 1.	0	0	0	0	0	0	1.989	2,424	4,413	2,337	1,975	4,312	4,326	1,339	8,72
2 Engineering services cost	0	0	0	890	31	921	445	15	460	445	15	460	1,780	61	1,84
3. Resettlement cost	Ó	0	0	0	.30	.30	0	0	0	0	0	0	0	.30	1
4 Administration cost	27	15	102	81	225	305	8	225	305	81	225	305	269	749	1.01
Sub-total of (1 4.)	27	75	102	971	285	1,256	2 515	2,664	5.179	2.863	2.215	5,017	6.375	5,239	11.6
	_/-														
5. Physical contingency	3	7	10	97	29	126	249	269	518	286	221	508	635	526	1.16
Sub-tota) of (1 5.)	<u>30</u>	82	112	1.068	314	1,381	<u>2.764</u>	2933	<u>5,697</u>	<u>3,149</u>	2,436	5,585	<u>7.010</u>	5,765	12.7
Price contingency	1	5			39	104	256	560		395	639	1.035	718	1.243	1.90
Sub-total of (1 6.)	.30	81	118	1,133	352	1,485	3,020	3,493	6,513	3,544	3,076	6,620	7.728	7.608	14,73
Non-structural measures															
E Installation cost															
1) River zone	0) 0	0	0	0	0	189	189	0	0	0	0	189	1
2) Flood waring system	õ						64	92		0	Ő	0	64	92	1
3) Flood fighting system	o	(0) 0	0	0	3	79	82	0	Ó	0	3	79	
4) Social education	0	. ()))	0	0	0	o	5	5	0	0	0	0	5	
Sub-total of 1.	C	• •) (0	0	Ű	67	365	432	0	0	0	6 7	365	4
2. Administration cost	1	10) 10) 1	15	16	2	25	26	0	0	0	3	49	
Sub-total of (1 2.)	1	. 10	<u>0 10</u>	<u>)</u>	. 15	16	<u>69</u>	<u>390</u>	458	0	Q	0	<u>70</u>	<u>414</u>	1
	_		-												
3. Physical contingency	0	1	I I	. 0	+ 1	2	7	39	45	Û	0	0	7	43	
Sub-timal of (1 3.)	<u> </u>	<u>1</u>	L <u>11</u>	<u>1</u>	16	<u>17</u>	<u>75</u>	423	504	Q	Q	<u>0</u>	<u>71</u>	455	5
 Price contingency 	C														
Sub-total of (1 4.)	1	J	1 12	2 1	18	19	82	510	593	0	0	6	84	540	6
Fotal of structural and non-structu	iral me	asures													
Project cost	31		9 130) 1,134	371	1,505	3,103	1,003	7,106	3,544	3.076	6,620	7,812	7,548	15,3

Table 9.2.8 Annual Disbursement Schedule

 Note
 Price level, June 1997, USS 1.0 = 8irr 6.8 = J.Yen 114.7

 Tax is included in the cost.

			<u>Unit pr</u>	ice ⁴⁰		Amount (x 1,000)				
<u>No.</u>	<u>ltem</u>	Unit	<u>F.C.</u> (US\$)	<u>1.C.</u> (Birr)	<u>Q'ty*2</u>	<u>F.C.</u> (US\$)	1 (Bin)	C. equivalent (US\$)	<u>Total</u> (US\$)	
I. Comm	on expenses							(001/		
	ersonnel cost									
	3 staffs x 12 months	M/M	0	(1,000)	36	0	(36)	5		
21 V	ehicle ranning cost									
	O&M cost for 1 vehicle	unit/M	0	(600)	12	0	(7)	L L		
•	Wage of driver	M/M	0	(900)	12	0	(II)	2		
	Sub-total of 2)					0	(18)	3		
s	ob-total of 11 - 2)					0	(54)	8		
3) C	Dibers	L. S .	10%	10%		0	(5)	ŧ		
Total c	of 1.					0	(59)	9		
2. Mainte	mance cost of structures									
-	Excavation, reservoir & pond	m3	4.7	(53.3)	1.000	5	(53)	8		
-	Exeavation, river	m3	4.7	(53.3)	120	1	(6)	L		
	Wet masonry	m3	0	(417.2)	160	0	(67)	10		
	Other works	L.S.				1	(13)	2		
Total o	of 2.					7	(139)	20		
3. Авриа	diseserve for replacement of gate									
-	Annual reserve, reptae, cycle = 29 years (1 gate = USS 21,000 + Birr 17,000)	no.	1.050	(850)	3	3	(3)	0		
Total	of (13.)					19	(201)	30		

Table 9.2.9 Breakdown of O&M Cost for Structural Measures

())

Unit price includes tax.
*2) The quantities are estimated on annual basis.

Table 9.2.10 Breakdown of O&M Cost for Non-structural Measures

			Unit pr	ce ''	Amount (x 1,000)					
<u>io.</u>	lien	Unit	<u>F.C.</u> (US\$)	<u>L.С.</u> (Віп)	<u>Q'ty'25</u>	<u>F.C.</u> (US\$)	[(Birc)	.C. equivalent (USS)	<u>Total</u> (US\$)	
I. Com	mon expenses			· · · · · · · · · · · · · · · · · · ·				(03.7		
	Personnel cost									
	- 9 staffs x 12 months	M/M	0	(1,000)	108	0	(108)	16	1	
2)	Vehicle running cost									
	- O&M cost for 1 vehicle	unit/M	0	(600)	12	0	(7)	L		
	- Wage of driver	M/M	0	(900)	12	0	(11)	2		
	Sub-total of 2)					0	(18)	3		
	Sub-total of 1) - 2)					0	(126)	19		
3)	Others	L.S.	10%	10%		0	(13)	2		
Тоіз	tof).					0	(139)	20		
2. 0&1	M of non-structural measures									
	- Maintenance of stakes, @10m, both sides	m	0	(30)	388	0	(12)	2		
	 Maintenance of flood warning system 	L.S.	900	(9400)	1	3	(9)	l		
	 Maintenance of flood fighting system 	L.S.	5	(2500)	1	0	(3)	0		
	 Publicity of bylaw 	no.	0	(10)	2,000	0	4 = = 7	-		
	 Poster of River Festival 	£0.	0	(100)	50	0	•••			
	- Others	ts.				0	(5)	1		
Tota) of 2.					I	(53)	8		
Tota	1) of (12.)					ı	(192)	28		

Unit price includes tax.
*2) - The quantities are estimated on annual basis.

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Control of

THE STUDY ON ADDIS ABABA FLOOD CONTROL PROJECT

CHAPTER 10

SOCIAL AND ENVIRONMENTAL IMPACT ASSESSMENT

THE STUDY

ON

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ADDIS ABABA FLOOD CONTROL PROJECT

IN

THE FEDERAL DEMOCRATIC REPUBLIC OF ETHIOPIA

CHAPTER 10 SOCIAL AND ENVIRONMENTAL IMPACT ASSESSMENT

Contents

10.	SOCIA	L AND ENVIRONMENTAL IMPACT ASSESSMENT	10-1
10.1	Genera		10-1
10.2	Legal S	Situation on Environmental Impact Assessment	10-1
10.3	The Ou	atline of the Guideline for Environmental Impact Assessment	10-2
1	0.3.1	Procedural Guideline	10-2
1	0.3.2	Environmental Impact Statement	10-3
1	0.3.3	Sectoral Guideline	10-3
10.4	Social	and Environmental Impact Assessment	10-4
1	10.4.1	Positive Impacts	10-4
1	10.4.2	Negative Impacts	10-4

10. SOCIAL AND ENVIRONMENTAL IMPACT ASSESSMENT

10.1 General

Environmental impact assessment of the priority projects is prepared on the basis of the draft Environmental Impact Assessment Guideline prepared by the Environmental Protection Authority of the Federal Democratic Republic of Ethiopia and in consideration of the JICA guideline for the environmental impact consideration for development projects. The details on the said Environmental Impact Assessment Guideline are presented in the subsequent sections.

10.2 Legal Situation on Environmental Impact Assessment

The Environmental Policy of Ethiopia (EPE) was issued in April 2, 1997 by Secretariat for the Conservation Strategy of Ethiopia, Environmental Protection Authority in collaboration with the Ministry of Economic Development and Cooperation.

Following the approval of the said policy, preparation for the legislation of related regulations has been conducted by the Environmental Protection Authority, Federal Democratic Republic of Ethiopia.

As of December, 1997, the draft Environmental Impact Assessment Guideline has been prepared. This consists of the Volume I : Procedural Guideline, Volume II : EIA Guideline for Industrial Sector Development Projects, Volume III : EIA Guideline for Agricultural Sector Development Projects, Volume IV : EIA Guideline for Transport Sector Development Projects.

Volume V : EIA guideline for Mining is now under preparation. EIA guideline for flood control sector development projects is not prepared but EIA guideline for Dams and Reservoirs are now under preparation.

The coming procedures for the legislation of the environmental impact assessment are:

- to pass through workshop(s) by concerned agencies,
- to pass through the Environmental Council,
- to pass through the Council of Ministers.

It is expected that the legislation of some of the above-mentioned guidelines be achieved within one year if everything goes smoothly. Accordingly the priority projects will have to go through this environmental impact assessment on its implementation stage.

10.3 The Outline of the Guideline for Environmental Impact Assessment

10.3.1 Procedural Guideline

The general flow of procedure specified in the said draft procedural guideline is as follows:

- (1) Initial screening should be conducted by the proposed project proponent and the Initial Environmental Impact Statements (IEIS) should be submitted to the Competent Agency for review.
- (2) The Competent Agency shall make its decision regarding revision, exemption, or conducting detailed study.
- (3) When detailed study on environmental impact assessment is requested by the Competent Agency, the project proponent shall prepare TOR for the study and the TOR should be submitted to the Competent Agency for approval.
- (4) Based on the approved TOR, the project proponent should conduct the Environmental Impact Study on its own cost and the result report "Environmental Impact Statement (EIS)" should be submitted to the Competent Agency.
- (5) The Competent Agency shall review the EIS in consultation with other concerned and interested bodies. The consulted bodies shall submit their comments to the Competent Agency.
- (6) The Competent Agency shall provide the project proponent with a clear statement of rejection or conditions attached with granting of Environmental Clearance Certificate.

10.3.2 Environmental Impact Statement

The said Environmental Impact Statement should include the following:

- 1) Potential impacts of the proposed projects
- 2) Significance of the impacts
- 3) Alternatives for mitigating the likely adverse impacts and the costs
- 4) Management plan to mitigate negative impacts
- 5) Economic evaluation of environmental costs and benefits
- 6) Detailed plan to monitor the implementation of mitigative measures

10.3.3 Sectoral Guideline

According to the said Sectoral Guidelines, the following are the common checklists for screening projects:

- 1) Will it cause pollution on water, air, or soil ?
- 2) Will it cause erosion and sedimentation ?
- 3) Will it cause waste problems ?
- 4) Will it affect areas with conservation-worthy objects or landscape ?
- 5) Will it affect areas with conservation-worthy fauna or flora or other especially vulnerable cosystems ?
- 6) Will it affect cultural and/or historical monuments or relics ?
- 7) Will it change the people way of life ?
- 8) Will it lead to increased risk of infections and diseases and/or medication?
- 9) Will it cause hydrological impacts?
- 10) Will it cause adverse socio-economic impacts ?
- 11) Will it contain a risk for accidents with serious consequences for the population and nature ?
- 12) Will it cause conflicts based on access to land ?
- 13) Will it prevent or cause changes to the local population's use of other natural resources and areas than those directly affected by the project ?

The present conditions of the priority projects area are described in chapter 2 from the social and environmental view points. Based on that present social and environmental conditions of the project area and the major features of the priority projects and the construction plan, and based on the above-mentioned guideline for environmental impact assessment, the following assessment is conducted:

10.4.1 Positive Impacts

(1) Overall

The project is evaluated to have only positive impacts to the society during the operation stage since the project mitigates the habitual inundation conditions in the objective area reducing the inundation damage and accordingly reducing the possibility of infection to diseases and contributing to the cleanness of the city.

(2) Creation of Job Opportunity

Positive impact is also expected during the construction stage of the project. The project implementation will create job opportunity to local people. According to the construction plan, approximately 60,000 man-day labors including machine operators will be needed for the construction during the construction period of about 2 years..

10.4.2 Negative Impacts

Conceivable negative impacts are expected only during the construction stage. The following are the conceivable negative impacts of the project and the mitigative measures :

(1) Resettlement

One of the conceivable important negative impact by the priority projects is resettlement mainly for the construction of the Kechene weir. Approximately 4 houses will be needed to move to other place since those houses area will be submerged during the design flood for retention function of the weir.



The compensation method is already established for resettlement. The land and houses should be prepared by the responsible agency. The responsible agency for the resettlement for this project is Addis Ababa Flood Control and Prevention Project Office. Since the number of resettlement is very limited, it is expected that the resettlement will be smoothly conducted in time.

(2) Air Pollution

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One of the negative impacts is air pollution by the passage of dump trucks to transport the excavated soil to disposal area. It was observed that the passage of dump trucks for the construction of the Sheraton Hotel raised a cloud of dust. The excavation work was only for laying the drainage ditch and pipes for the length of about 300 m. The mitigation measure to this is watering on the road. The countermeasure should be adopted for implementation of the priority projects. The necessary length of the road to be watered is estimated at about 500 m from the loading site.

(3) Traffic Disturbance

Other negative impact by the priority projects during the constructions stage will be the disturbance of the traffic. The passage of heavy vehicles between the construction site and disposal area, between the construction site and mixed concrete plant may create the heavy traffic volume along the road. The traffic volume for dumping soil is estimated at about 4,500 car-days. The traffic volume for transporting ready-mixed concrete by mixer car for the construction of Kechene weir is estimated at about 3,100 cars.

In addition, the construction of the drainage ditch across main streets is also planned in the projects. The planned streets for the said structures are the Churchil Avenue, the Menili II Avenue, the Ras Danitew Street, the Yohanis Street, Ras Mekonin Avenue, and they have usually heavy volume of traffic. But those streets have more than 4 lanes and it is possible to avoid one way traffic during the construction of the facilities. Traffic control during the construction stage should be conducted with the cooperation of the traffic police.

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During the construction stage of the Kechene weir, the foundation works may cause some increase of sedement in the Kechene river. But since the basic river-bed material is rock, the volume of sediment to be increased by the construction works is estimated to be limited.

10.4.3 Others

The consideration to the other features is made as follows:

(1) Impact to Conservation-worthy Objects or Landscape

Presently there exist no conservation-worthy objects or landscape along the objective reaches of the river. No impact is expected.

(2) Impact to Conservation-worthy Flora or fauna

Presently there exist no conservation-worthy flora or fauna along the objective reaches of the river. No impact is expected.

(3) Impact to Ecosytem

Presently there exist no conservation-worthy ecosystem along the objective reaches of the river. No impact is expected.

(4) Impact to Cultural and/or Historical Monuments or Relics

Presently there exist no cultural and/or historical monuments or relics along the objective reaches of the river. No impact is expected.

(5) Impact to Increase of Infections and Diseases and/or Medication

As mentioned in the section of overall, the project may contribute to decrease of the infections and diseases since the inundation conditions will be decreased by the project.

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(6) Impact to the People Way of Life

After the construction, the river water can be used again for washing clothes at the Kechene weir site. The water storing at the site during a flood continues only for several hours. The project is estimated that it will not change the people way of life.

(7) Hydrological Impacts

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It is generally said that mitigation of flood at some place may cause increase of flood at downstream sites. This project aims at mitigation of flood peak before entering into the urban area of Addis Ababa. Accordingly the project will not cause any increase of flood at downstream reaches.

(8) Impact to Others

The project is evaluated that it will not cause any adverse effect to the features other than those mentioned in the above.