## 社会開発協力部報告書

### COVERNMENT OF MALAYSIA

## NATIONAL WATER BESIDENCES STUDY MALAYSIA . PERICATION PULL PULL

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### **GOVERNMENT OF MALAYSIA**

# NATIONAL WATER RESOURCES STUDY, MALAYSIA PERLIS-KEDAH-PULAU PINANG REGIONAL WATER RESOURCES STUDY PART 1

## VOL. 10 ANNEX

### M. COST ESTIMATE OF PROPOSED DAM PROJECTS

### N. ECONOMIC ANALYSIS OF PROPOSED SOURCE FACILITIES

FEBRUARY 1984

JAPAN INTERNATIONAL COOPERATION AGENCY

#### NATIONAL WATER RESOURCES STUDY, MALAYSIA PERLIS-KEDAH-PULAU PINANG REGIONAL WATER RESOURCES STUDY PART 1

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## ABBREVIATIONS

### (1) Organization/Plan

4MP	:	Fourth Malaysia Plan
DID (JPT)	):	Drainage and Irrigation Department
EPU	:	Economic Planning Unit
FELCRA	:	Federal Land Consolidation and Rehabilitation Authority
FELDA	:	Federal Land Development Authority
GSD	:	Geological Survey Department
JICA	:	Japan International Cooperation Agency
MADA	:	Muda Agricultural Development Authority
NEB (LIN)	:	National Electricity Board
NWRS	:	National Water Resources Study
PWD (JKR)	:	Public Works Department
RISDA	:	Rubber Industry Small-Holders Development Authority
WHO	:	World Health Organization

(2) Others

В	: Benefit
BOD	: Biochemical Oxygen Demand
С.	: Cost
COD	: Chemical Oxygen Demand
D&I	: Domestic and Industrial
dia.	: Diameter
EIRR	: Economic Internal Rate of Return
El.	: Elevation Above Mean Sea Level
Eq.	: Equation
Fig.	: Figure
GDP	: Gross Domestic Product
GNP	: Gross National Product
н	: Height, or Water Head
NHWL	: Normal High Water Level
O&M	: Operation and Maintenance
Q	: Discharge
Ref.	: Reference
SS	: Suspended Solid

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### **ABBREVIATIONS OF MEASUREMENT**

### Length

mm		millimeter
cm	=	centimeter
m	=	meter
km	=	kilometer
ft	=	foot
bv	=	vard

#### Area

cm <sup>2</sup>	=	square o	entimeter
m <sup>2</sup>	=	square m	neter
		hectare	
km <sup>2</sup>	Ŧ	square k	cilometer

#### Volume

cm <sup>3</sup>	-	cubic centimeter
1	=	lit = liter
		kiloliter
_m3	==	cubic meter
gal.	=	gallon

#### Weight

mg	=	millig	cam
g	=	gram	
kg	=	kilogra	am
ton	=	metric	ton
lb	=	pound	

#### Time

S	=	second	
min	=	minute	
$\mathbf{h}^{-1}$	=	hour	
d .	==	day	
v	<b>z</b> .	vear	

#### Electrical Measures

V	= Volt	
Α	= Ampere	
Hz	= Hertz (	(cycle)
Ŵ	= Watt	
kW	= Kilowat	:t
MW	= Megawat	t
GW	= Gigawat	t,
· ·	- ·	

#### Other Measures

00	= percent
PS	= horsepower
0	= degree
1	= minute
<b>u</b>	= second
°C	= degree in centigrade
103	= thousand
10 <sup>6</sup>	= million
10 <sup>9</sup>	= billion (milliard)

#### Derived Measures

		1
m <sup>3</sup> /s	=	cubic meter per second
cusec	=	cubic feet per second
mgđ	=	million gallon per day
kWh	=	kilowatt hour
MWh	==	Megawatt hour
GWh		Gigawatt hour
k₩h/y	=	kilowatt hour per year
kVA -	≕	kilovolt ampere
BTU	=	British thermal unit
psi	=	pound per square inch

#### Money

M\$ = Malaysian ringgit US\$ = US dollar ¥ = Japanese Yen CONVERSION FACTORS

	From Metric System	To Metric System
Length	1  cm = 0.394  inch	1 inch = 2.54 cm
**************************************	1  m = 3.28  ft = 1.094  yd	1  ft = 30.48  cm
	1  km = 0.621  mile	1 yd = 91.44 cm
		1  mile = 1.609  km
Area	$1 \text{ cm}^2 = 0.155 \text{ sq.in}$	$1 \text{ sq.ft} = 0.0929 \text{ m}^2$
	$1 m^2 = 10.76 sq.ft$	$1 \text{ sq.yd} = 0.835 \text{ m}^2$
	1 ha = 2.471 acres	1  acre = 0.4047  ha
	$k \ km^2 = 0.386 \ sq.mile$	$1 \text{ sq.mile} = 2.59 \text{ km}^2$
Volume	$1 \text{ cm}^3 = 0.0610 \text{ cu.in}$	1  cu.ft = 28.32  lit
	1 lit = 0.220 gal.(imp.)	$1 \text{ cu.yd} = 0.765 \text{ m}^3$
	1  kl = 6.29  barrels	l gal.(imp.) = 4.55 lit
	$1 \text{ m}^3$ = 35.3 cu.ft	l gal.(US) = 3.79 lit
	$106 \text{ m}^3 = 811 \text{ acre-ft}$	l acre-ft = 1,233.5 m <sup>3</sup>
Weight	1 g = 0.0353  ounce	1  ounce = 28.35  g
	1  kg = 2.20  lb	$1 \ 1b = 0.4536 \ kg$
	1  ton = 0.984  long ton	$1 \log \tan = 1.016 \tan$
	= 1.102 short ton	1 short ton = $0.907$ ton
Energy	1  kWh = 3,413  BTU	1  BTU = 0.293  Wh
Temperature	$^{\circ}C = (^{\circ}F - 32) \cdot 5/9$	°F = 1.8°C + 32
Temperacure	$C = (r = 32) \cdot 3/9$	r = 1.8 C + 32
Derived	$1 m^3/s = 35.3 cusec$	$1 \text{ cusec} = 0.0283 \text{ m}^3/\text{s}$
Measures	$1 \text{ kg/cm}^2 = 14.2 \text{ psi}$	$1 \text{ psi} = 0.703 \text{ kg/cm}^2$
	1  ton/ha = 891  lb/acre	1  lb/acre = 1.12  kg/ha
	$10^6 \text{ m}^3 = 810.7 \text{ acre-ft}$	$1 \text{ acre-ft} = 1,233.5 \text{ m}^3$
	$1 \text{ m}^3/\text{s} = 19.0 \text{ mgd}$	$1 \text{ mgd} = 0.0526 \text{ m}^3/\text{s}$
	,	
Local	1  lit = 0.220  gantang	l gantang = 4.55 lit
Measures	1  kg = 1.65  kati	1  kati = 0.606  kg
	1  ton = 16.5  pikul	1  pikul = 60.6  kg
and the second		-

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### ANNEX M

## COST ESTIMATE OF PROPOSED DAM PROJECTS

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#### 1. INTRODUCTION

In the Perlis-Kedah-Pulau Pinang regional water resources study, six dams were recommended as source facilities to the demand areas in these three states. They are the Badak-Temin, Sari, Durian, Tawar-Muda and Beris dams in the State of Kedah and the Rui dam in the State of Perak.

For the purpose of optimization of dam scale some cases of alternative dam height (normal H.W.L.) were studied for each dam site as stated in the Volume 5, Annex 0 "Proposed Dam Project".

This report presents a summary of the assumed construction schedule and cost estimate of the six proposed dams. The contents herein are as follows:

- (1) assumed basic work conditions and construction time schedule,
- (2) criteria of cost estimate,
- (3) unit construction costs and priced Bill of Quantities of construction work items, and
- (4) construction cost of the six proposed dams and disbursement schedule.

#### 2. WORK CONDITIONS

#### 2.1 General

The principal features of the representative alternatives on the six proposed dams are summarized in Tables 1 and 2.

The rockfill type was primarily selected for all the dam site, but the concrete gravity type was also studied for the Sari and Beris dam sites taking into account physical conditions. On the otherhand, three alternative dam sites were studied for the Rui dam.

Location of the proposed six dams is shown in Fig. 1.

#### 2.2 Construction Time Schedule

It is assumed that the construction works of any of the proposed dams will be commenced in the middle of 1986 after 2 years of the feasibility study and detailed design period.

The construction works will include the tendering, preparatory works and main works. The construction period was estimated to be 4 years for both rockfill and concrete gravity dams except the Rui dam.

The construction period for the Rui dam was planned to be 5 years due to the works of power house and transfar tunnel.

The procedure is summarized as follows:

1983	Prefeasibility study
1984	Feasibility study
1985 - 1986	Detailed design
1986 - 1987	Tendering and preparatory works
1987 - 1989	Main construction works for the Durian, Sari, Badak-Temin, Beris and Tawar-Muda dams
1987 - 1990	Main construction works for the Rui dam

Figures 2 to 6 show the work sequence of rockfill type dams and concrete gravity dams, respectively.

#### 2.3 Basic Conditions for Construction Works

The yearly workable day for each work item in the project area is estimated to be 190 days for earth works, 260 days for rock and concrete works and 290 days for tunnel works on the basis of meteorological data and actual work conditions of on-going dam projects in Malaysia. Working hour is estimated to be 8 hours a day and 1 shift system is assumed for main construction works except for tunnel works which require a 2-shift system.

#### 3. COST ESTIMATE

#### 3.1 Procedure of Cost Estimate

Figures 7 and 8 show the flow chart of construction cost estimate and constitution of construction cost of a dam project in this study.

The construction cost is composed of the main construction cost, compensation cost, engineering and administration cost and contingency.

The main construction cost consists of costs of preparatory works, main construction works, miscellaneous works and transportation.

The compensation costs include land acquisition cost of flooded area, construction yard and land for access roads, and relocation cost of houses, buildings, public facilities, mines and roads. For further discussions on the compensation cost, refer to Volume 6, Annex 0 "LAND USE IN PROPOSED RESERVOIR AREAS".

The engineering and administration cost covers the costs for detailed design and supervision works.

The contingency includes the physical contingency.

Costs of the main construction works were estimated on the unit price basis, while the other costs were estimated on the lump sum basis.

3.2 Criteria and Assumptions

- (1) Construction cost is estimated at 1982 constant price level.
- (2) The exchange rate of currency is US\$1.0 = M\$2.35 = \$255.
- (3) All items of construction cost were expressed in terms of the Malaysian Ringgit including both foreign and local currency components.

#### 3.3 Unit Construction Cost

The cost of main construction works is estimated on the unit cost basis, principally.

The unit cost of main construction works is divided into the direct and the indirect costs. The direct cost includes labour, material, equipment, miscellaneous and supervision costs while the indirect cost consists of contractor's profit and overhead costs.

(1) Labour cost

All kinds of labours required for the dam construction are available in Malaysia. The daily wage rates of major workers are estimated as shown in Table 3 on the basis of the market investigation.

#### (2) Material cost

It is assumed that all kinds of construction materials are also available in Malaysia. Table 4 shows unit prices of major construction materials required for the dam facilities.

#### (3) Equipment expenses

The costs of construction equipment and spare parts delivered at the port of Butterworth is estimated on the basis of market price in Japan plus inland transportation charge, ocean freight charge, insurance and landing cost at the port of Butterworth.

The equipment expense per unit a hour comprises of depreciation cost, reparing cost and management cost of equipment.

Table 5 shows the hourly equipment expenses of major construction equipment in which the foreign currency portion includes equipment and spare parts costs, transportation cost to the port of Butterworth and the premium of insurance and the local currency portion includes labour and material cost of repairing and landing cost at the port of Butterworth.

(4) Miscellaneous cost

The miscellaneous cost is assumed at 3% of the sum of labour and material costs.

(5) Contractor's supervision cost

The supervision cost is required for contractor's supervision of the construction works. It is assumed at 3% of the sum of labour, material, equipment and miscellaneous costs.

(6) Profit and overhead cost

Profit and overhead cost of contractor is assumed to be 15% of the direct cost referring to the on-going dam projects in Malaysia.

The costs of the main construction works on each proposed dam are shown with priced BQ in Tables 6 to 27.

3.4 Lump Sum Cost

(1) Preparatory works

The cost of preparatory works is assumed at 10% of the main construction works for the dam projects.

#### (2) Miscellaneous works

The cost of miscellaneous works covers those for unallocated minor works and it is assumed at 10% of the sum of costs of preparatory and main construction works. The cost will, however, not be necessary to be counted in the detailed design stage when the estimate is supported by detailed survey and investigation.

#### (3) Transportation cost

Transportation cost is assumed at 2% of the sum of the costs of preparatory, the main construction and miscellaneous works. It covers the inland transportation cost of the construction equipment and plant from Butterworth to the proposed dam sites.

#### (4) Engineering and administration

The cost of engineering and administration covers the detailed design and construction supervision costs. Its rate to the cost of main construction works is assumed at 40% in the Beris and Sari dam, 20% in the Rui dam and 25% in the other dams, respectively.

#### (5) Contingency

The project contingency consists of the physical contingency.

The physical contingency is assumed at 30% of the sum of the main construction, compensation and engineering and administration costs for the study of pre-feasibility stage.

### 4. CONSTRUCTION COST OF PROPOSED DAMS

The construction costs of the proposed dams were calculated by applying the unit costs and the lump sum costs, above mentioned.

Tables 28 to 48 give the total construction costs by major cost items and the disbursement schedule for each alternative of the dams.

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### Table 1 PRINCIPAL FEATURE OF PROPOSED DAMS (1/2)

Name of Dam		Badak Temin	Sari	Durian
1. Main Dam				
Туре		Rockfill & Concrete	Concrete	Rockfill
Crest length	m	1,013	150	697
Crest elevation	EL.m	50	89	79
Maximum height	m	29	41	39
Dam volume	10 <sup>3</sup> m <sup>3</sup>	(R)927 (C)67	50	1,056
2. Subordinate Dam				
Number		4	1	1
Total crest length	m	2,106	190	152
Embankment volume	10 <sup>3</sup> m <sup>3</sup>	462	24	28

 Table 2
 PRINCIPAL FEATURE OF PROPOSED DAMS (1/2)

Name	of Dam		Tawar Muda	Beris	Rui 2	Rui 3
1. 1	Main Dam			-		
	Туре		Rockfill	Concrete	Rockfill	Rockfill
	Crest length	m	337	145	436	283
	Crest_elevation	El.m	82	89	246	244
	Maximum height	m	34	42	73	73
	Dam volume	10 <sup>3</sup> m <sup>3</sup>	281	51	2,387	1,634
2. 5	Subordinate Dam					
	Number		3	1	-	~
	Total crest length	m	1,520	115	-	-
	Embankment volume	10 <sup>3</sup> m <sup>3</sup>	913	70	-	-

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#### Table 3 LABOUR WAGE

	Unit:	M\$/d
Category		Wage
Foreman		55
Operator	•	40
Assistant Operator		30
Driver		35
Mechanic		40
Electrician		40
Concrete Worker		35
Reinforcement Worker		35
Carpenter		40
Powder Operator		43
Driller		35
Boring Worker		35
Grout Worker		30
Common Labour		25
	Foreman Operator Assistant Operator Driver Mechanic Electrician Concrete Worker Reinforcement Worker Carpenter Powder Operator Driller Boring Worker Grout Worker	Category Foreman Operator Assistant Operator Driver Mechanic Electrician Concrete Worker Reinforcement Worker Carpenter Powder Operator Driller Boring Worker Grout Worker

#### Table 4 UNIT PRICE OF CONSTRUCTION MATERIALS

No.	Material	Unit	Price (M\$)
1.	Diesel oil	lit	0.423
2.	Lubricant	lit	2,320
3.	Gasoline	lit	1.027
4.	Grease	kg	4.922
5.	Dynamite	kg	9.15
6.	Cement	kg	0.184
7.	Reterder	kg	1.860
8.	Reinforcement Bar	ton	1,016.00
9.	Timber (Plank Square Log)	m <sup>3</sup>	423.73
10.	H-shaped Steel, H125 x 125	kg	1.22
11.	Boring Rod	Nos.	105.00

### 5 HOURLY EXPENSES OF MAJOR EQUIPMENTS

No.	Equipment	Capacity	F/C (M\$)	L/C (M\$)	Total (M\$)
1.	Bulldozer	15 t	35.96	19.86	55.82
2.	Bulldozer w/ripper	21 t	62.28	34.36	96.64
3.	Bulldozer	32 t	77.23	42.61	119.84
4.	Tractor Shovel	$1.4 m^{3}$	27.71	15.37	43.08
5.	Wheel Loader	2.1 m <sup>3</sup>	36.96	20.32	57.28
6.	Dump Truck	15 t	30.52	15.20	45.72
7.	Dump Truck	11 t	20.58	10.84	31.42
8.	Hydraulic Crane	10 t	31.95	16.61	48.56
9.	Tamping Roller	13.5 t	23.99	11.69	35.68
10.	Vibratory Roller	0.6 t	4.45	1.84	6.29
11.	Vibratory Roller	3 t	11.89	6.38	18.27
12.	Crawler Drill	10 m <sup>3</sup> /min	23.47	9.97	33.44
13.	Leg Hammer	40 kg	8.93	1.93	10,86*
14.	Boring Machine	5.5 kW	31.25	17.07	48.32*
15.	Grout Pump	7.5 kW	25.97	14.03	40.00*
16.	Grout Mixer	600 l x 2	43.39	23.44	66.83*
17.	Rocker Shovel, S-Dump	0.4 m <sup>3</sup>	47.54	21.96	69,50
18.	Battery Locomotive	6 t	28.98	17.13	46.11
19.	Aggregate Plant	50 t/h	113.80	57.75	171.55
20.	Concrete Plant	$1.0 m^3 x 1$	106.36	56.68	163.04
21.	Cable Crane	6 t	221.20	139.09	360.29

Remark; \*; Equipment expense per day

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	DADAI	A LEPI	TIA LYANA	(1/2)				
	Work Item		Unit	Alternat (N.H.W.L.		Unit: 10 <sup>3</sup> M\$ Alternative 2 (N.H.W.L: 40 m)		
			Price	Quantity	Amount	Quantity -	Amount	
ı.	Access Road							
	Rolling	м	223.37	13,000	2,904	13,000	2,904	
	-							
2.	River Div. Works							
	Exca. of Inlet & Outlet	-				÷	· .	
	Common	CU.M	4.97	98,700	491	102,530	510	
	Gate	L.S			905		905	
	Galle	п-э			505			
	Initial Cofferdam						174	
	Conmon	CU.M	6.60	26,300	174	26,300	. 174	
	Gabion	CU.M	49.33	6,120	302	6,120	302	
	Sub-total				1,872		1,891	
3.	Main Dam & Cofferdam							
	Excavation, Dam							
	Common	CU.M	4.97	175,500	872	161,330	802	
	Weathered Rock	CU.M	10.82	32,900	340	30,250	31.2	
	Rock	CU.M	26.25	36,180	950	34,380	902	
	Consolidation Grout							
	Drilling	м	14.66	13,820	203	10,749	158	
	Grouting	TON	514.92	1,106	570	860	443	
	Curtain Grout							
	Drilling	м	52.74	19,267	1,016	17,943	946	
	Grouting	TON	514.92	1,541	793	1,435	739	
	- · ·					-	c 0.20	
	Gallery Concrete	CU.M	247.18	21,110	5,218	20,340	5,028	
	Embankment, Dam							
	Core	CU.M	6.60		1,328	143,240	945	
	Filter	CU.M	37.50	-	4,879	96,640	3,624	
	Rock	CO.W	21.47	-	12,781	366,760	7,874	
	Riprap	CU.M	20.09	2,000	40	2,000	40	
	Sub-total	÷			28,990		21,813	
4.	Spillway							
	* -							
	Excavation	00.14	1 07	69,700	346	59,990	298	
	Common Weathered Rock	CU.M CU.M	4.97 10.32	•	181	15,790	163	
	Rock	CU.M	26.25		84	3,160	83	
		C0.14	20.23	3,200	0.			
	Concrete			<b>60</b> 000	0 100	42 400	6,057	
	Mass Concrete	CU.M	142.86		9,129	42,400	591	
	Reinforced Concrete	CU.M	247.18	2,700	667	2,390		
	Back Fill	CU.M	7.52	4,770	36	4,320	32	
	Curtain Grout							
	Drilling	М	52.74	2,377	125	2,377	125	
	Grouting	TON	514.92	-	98	190	98	
	Sub-total				10,666		7,447	
	JUD-LOLAI				T01000			

Table 6PRICED B.Q. OF MAIN CONSTRUCTION WORKS OF<br/>BADAK TEMIN DAM (1/2)

Work Item	Unit	Unit Price	Alternat (N.H.W.L. Quantity		Unit: Alterna (N.H.W.L. Quantity	tive 2
5. Intake & Outlet Structure						
Shaft						_
Valve	L.S			423		423
Gate or Valve	L.S			126		126
Trash Rack	L.S			- 58		58
Penstock	L.S			70		70
Sub-total				677		677
6. Saddle Dam						
Excavation						
Common	CU.M	4.97	377,600	1,877	244,500	1,215
Weathered Rock	CU.M	10.32	70,800	731	45,840	473
Rock	CU.M	26.25	23,600	620	15,290	401
Embankment						
Core	CU.M	6.60	126,200	833	66,700	440
Filter	CU.M	37.50	80,300	3,011	21,590	810
Rock	CU.M	21.47	255,100	5,477	96,560	2,073
Curtain Grout						
Drilling	м	52.74	39,300	2,073	34,100	1,798
Grouting	TON	514.92	3,144	1,619	2,728	1,405
Sub-total				16,241		8,615
Total 1 to 6				61,350		43,347
Miscellaneous				6,749		4,768
Transportation				1,485		1,049
Grand Total				69,584	<u> </u>	49,164

## Table 7PRICED B.Q. OF MAIN CONSTRUCTION WORKS OF<br/>BADAK TEMIN DAM (2/2)

.

## Table 8 PRICED B.Q. OF MAIN CONSTRUCTION WORKS OF SARI DAM (1/2)

		Unit	Alternat		Alterna		Unit: Alternat	
Work Item	Unit	Price	( Rockfill )		.Grav	-	(Gravity (N.H.W.L.: 80 m	
	-		N.H.W.L.: Quantity	85 m' Amount	<u>W.H.W.L.</u> Quantity	Amount	Quantity	Amount
			<u> </u>	- · · · · ·	_ ^			
1. Access Road						4 014	22.000	4,914
Rolling	м	223.37	22,000	4,914	22,000	4,914	22,000	4,914
2. River Div. Works								
Exca. of Inlet & Outlet							4 400	22
Common	CU.M	4.97	16,300	81	4,400	22 5	4,400 500	5
Weathered Rock	CU.M	10.32	4,500	46 493	500 4,100	1.08	4,100	1.08
Rock	CU.M	26.25	18,800	-123	4)200			
Conc. of Inlet & Outlet Mass Concrete	CU.M	142.86	900	129	1,000	143	1,000	143
Reinforced concrete	CU.M	247.18		346	700	173	700	173
Tunnel Excavation	CU.M	95.62		1,673	7,100	679	7,100	679
Tunnel Concrete	CU.M	263.67		1,714	2,600	686	2,600	686
Plug Concrete	CU.M	138.51	670	93	770	107	770	107
Backfill Grout	CU.M	175.29		107	187	33	187	33
	00111	273105	010					
Consolidation Grout Drilling	м	52.74	4,634	244	1,160	61	1,160	61
Grouting	TON	774.13	371	287	93	72	93	. 72
Curtain Grout								
Drilling	м	52.74	420	22	210	11	210	- 11
Grouting	TON	774.13	25	19	13	10	13	10
Gate	L.S		-	1,316	-	740	-	740
Initial Cofferdam							0.000	50
Common	CU.M	6.60		53 27	8,050 540	53 27	8,050 540	53 27
Gabion	CU.M	49.33	540		040			
Sub-total				6,650		2,930		2,930
3. Main Dam & Cofferdam								
Excavation, Dam							7 700	18
Common	CU.M	4.97		59	3,300	16 136	3,700 11,900	123
Weathered Rock Rock	CU.M CU.M	10.32 26.25		302 567	13,200 14,400	378	14,300	375
	C0.11	20.23	21,000	501				
Consolidation Grout Drilling	м	14.66	1,900	28	2,650	39	2,280	33
Grouting	M TON	514.92		78	212	109	182	94
Curtain Grout								
Drilling	м	52.74	2,000	105	7,788	411	7,130	376
Grouting	TON	514.92	160	82	623	321	570	294
Gallery Concrete	CU.M	247.18	2,500	618		~		~
Embankment, Dam								
Core	CU.M			290		-	-	-
Filter	CU.M			226 4,101	-	-	-	-
Rock	CD'W			4,101	52.500	7,433	45,000	6,372
Concrete Gravity Dam	CU.M	141.59	, –				10,000	7,685
Sub-total				6,456		8,845		1,000

#### Table 9

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## PRICED B.Q. OF MAIN CONSTRUCTION WORKS OF SARI DAM (2/2)

.

- Work Item	Unit	Unit Price			Alternative 2 (Gravity) (N.H.W.L.: 95 m		Unit: 10 <sup>3</sup> M\$ Alternative 3 Grávity (N.H.W.L.: 80 m)	
4. Spillway			Quantity	Amount	Quantity	Amount	Quantity	Amount
Excavation								
Common	CU.M	4.97	9,000	45	1,020	5	1,400	7
Weathered Rock	CU.M	10.32	10,000	103	914	9	1,300	13
Rock	CU.M	26.25	45,000	1,181	1,890	50	1,400	37
Concrete								
Mass Concrete	CU.M	142.86	14.400	2,057	2,590	370	2,340	334
Reinforced Concrete	CU.M	247.18	800	198	2,600	643	2,250	556
Back Fill	CU.M	7.52	2,200	17	1,770	13	1,500	11
Curtain Grout			•					
Drillling	м	52.74	1,000	53	280	15	280	15
Grouting	TON	514.92	80	41	22	11	22	11
Sub-total				3,695		1,116		984
5. Intake & Outlet Structure								
Valve	L.S			353		353		353
Gate or Valve	L.S			96		96		96
Trash Rack	L.S			. 29		29		29
Penstock	L.S			58		58		58
Sub-total				536		536		536
6, Saddle Dam								
Excavation								
Common	CU.M	4.97	12,200	. 61	12,200	61	-	-
Weathered Rock	CU.M	10.32	12,200	126	12,200	126	-	-
Embankment								
Core	CU.M	7.87	8,850	70	8,850	70	-	-
Filter	CU.M	11.22	5,390	60	5,390	60	-	
Rock	CU.M	21.47	9,910	213	9,910	213	-	-
Curtain Grout								
Drilling	м	52.74	6,380	336	6,380	336		-
Grouting	TON	514.92	510	263	510	263		
Sub-total				1,129		1,129	-	~
Total 1 to 6				23,380		19,468		17,049
Miscellaneous				2,572		2,141		1,875
Transportation				566		471		413
Grand Total		,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,		26,518		22,080	·.	19,337

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Table 10

PRICED B.Q. OF MAIN CONSTRUCTION WORKS OF DURIAN DAM (1/2)

						Unit:	10 <sup>3</sup> M\$
Work Item		Unit	Unit	Alternat	ive 1.	Alterna	tive 2
				(N.H.W.L.:		(N.H.W.L.	
101		0	Price	Quantity	Amount	Quantity	Amount
1. Access	s Road						
Roll	ling	м	223.37	16,000	3,574	16,000	3,574
2. River	Div. Works						
Exca	a. of Inlet & Outlet						
	วแพงท	CU.M	4.97	52,720	262	52,720	262
We	eathered Rock	CU.M	10.32	-	254	24,570	254
Ro	ock	CO.M	26.25	30,210	793	30,210	793
	c. of Inlet & Outlet ass Concrete	CU.M	142.86	2,190	313	2,190	313
Tuni	nel Excavation	CU.M	95.62	12,270	1,173	12,270	1,173
Tuni	nel Concrete	CU.M	263.67	4,740	1,250	4,740	1,250
Plue	g Concrete	CU.M	138.51	590	82	590	82
Bacl	kfill Grout	CM.M	175.29	518	91	518	91
Con	solidation Grout						
	rilling	м	52.74	3,787	200	3,787	200
G	routing	TON	774.13	303	235	303	235
Cur	tain Grout						
D	rilling	м	52.74	420	22	420	22
G	routing	TON	774.13	25	19	25	19
Gat	e	L.S			1,316		1,316
	tial Cofferdam			0.070	10	2,270	15
	ommon	CU.M CU.M	6.60 49.33	-	15 27	540	27
	abion	CO.M	49.55	740		510	
Sub-t	otal				6,052		6,052
3. Main	Dam & Cofferdam	÷					
	avation, Dam	011 H	4 07	240.000	1,233	213,300	1,060
	ommon leathered Rock	CU.M CU.M	4.97 10.32		682	60,940	629
	leathered Rock	CU.M	26.25		874	45,670	1,199
	solidation Grout						
	Drilling	м	14.66	13,500	198	8,380	123
	Grouting	TON	514.92		556	670	345
Cur	tain Grout						
	Drilling	м	52.74		886	15,440	814
C	Grouting	TON	514.92	2 1,344	692	1,235	636
Gal	llery Concrete	CU.M	247.18	14,100	3,485	12,710	3,142
	oankment, Dam		_ ~-		1 1 1 1 1	160 330	1 141
	lore	CU.M			1,377	159,730	1,161 3,613
	Filter Pock	CU.M CU.M			4,703 19,567	86,110 571,960	14,831
	Rock	C0.M	4.3.9.	, ,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,	34,253		27,553
Sub-t	total				J <del>1</del> ,2J3		

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## Table 11PRICED B.Q. OF MAIN CONSTRUCTION WORKS OF<br/>DURIAN DAM (2/2)

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DU.	RTAN 1	JAM (Z)	2)			
					Unit:	10 <sup>3</sup> м\$
			Alterna	tive l	Alterna	cive 2
Work Item	Unit	Unit Price	(N.H.W.L.		(N.H.W.L.	: 69 m)
· · · · · · · · · · · · · · · · · · ·			Quantity	Amount	Quantity	Amount
4. Spillway						
Excavation						
Common	CU.M	4.97	123,000	611	140,500	698
Weathered Rock	CU.M	10.32	67,500	697	65,500	676
Rock	CU.M	26.25	71,700	1,882	63,400	1,664
Concrete						
Mass Concrete	CU.M	142.86	35,300	5,043	22,500	3,214 292
Reinforced Concrete	CU.M	247.18	1,860	460	1,180	
Back Fill	CU.M	7.52	5,316	40	4,141	31
Curtain Grout						
Drilling	M TON	52.74 514.92	1,373 110	72 57	1,373 110	72 57
Grouting	I LAN	J14.72	110		110	
Sab-total				8,862		6,704
5. Intake & Outlet Structure						
Excavation, Open						
Rock	CU.M	26.25	300	8	300	8
Concrete, Open						
Mass Concrete	CU.M	142.86	1,100	157	1,100	157
Reinforced Concrete	CU.M	247.18	150	37	150	37
Shaft						251
Excavation Reinforced Concrete	CU.M CU.M	90.46 263.67	1,700 420	154 111	1,700 420	154 111
		203.07	420		420	
Valve	L.S			353		353
Gate or Valve	L.S			788		788
Trash Rack	L.S			77		77
Penstock	L.S			186		186
Sub-total				1,871		1,871
6. Saddle Dam						
Excavation						
Cormon	CU.M	4.97	17,300	86	15,290	76
Weathered Rock	CU.M	10.32	7,800	80	4,370	45
Rock	CU.M	26.25	3,350	88	2,180	57
Embankment					c 1.co	
Core	CU.M	7.27	13,440 2,170	98 91	6,160 1,150	45 48
Filter Rock	CU.M CU.m	41.96 25.93	11,940	310	3,930	102
Curtain Grout						
Drilling	м	52.74	2,820	149	2,580	136
Grouting	TON	514.92	226	116	206	106
Sub-total				1,018		615
Notal 1 to 6			/	55,630		46,369
Aiscellaneous				6,118		5,101
Transportation				1,346		1,122
				-		
Grand Total				63,094		54,592

## PRICED B.Q. OF MAIN CONSTRUCTION WORKS OF TAWAR MUDA DAM (1/3)

							Unit:	10 <sup>3</sup> m\$
			Alterna	tive 1	Alterna	tive 2	Alterna	tive 3
Work Item	Unit	Unit	Alternative 1 (N.H.W.L: 77 m)		(N.H.W.L:	75 m)	(N.H.W.L.	
not a t com		Price	Quantity	Amount	Quantity	Amount	Quantity	Amount
1. Access Road								
Rolling	м	223.37	13.000	2,904	13,000	2,904	13,000	2,904
2. River Div. Works								
Exca. of Inlet & Outlet					.1			.1.5
Common	CU.M	4.97	63,000	313	63,000	313		313 234
Weathered Rock	CU-M	10.32	22,700	234	22,700 20,100	234 528	22,700 20,100	528
Rock	CU.M	26,25	20,100	528	20,100	520	20,100	520
Conc. of Inlet & Outlet		142.00	200	100	700	100	700	100
Mass Concrete	CU.M CU.M	142.86 247.18	700 1,095	100 271	1,095	271		271
Reinforced Concrete						1,753		1,753
Tunnel Excavation	CU.M	95.62	18,330	1,753				1,785
Tunnel Concrete	CU.M	263.67	6,770	1,785		1,785		
Plug Concrete	CU.M	138.51	595	82		82		82
Backfill Grout	CU.M	175.29	547	96	547	96	547	96
Consolidation Grout		•					2 535	196
Drilling	м	52.74		186		186		186 219
Grouting	TON	774.13	283	219	283	219	205	217
Curtain Grout			100		420	22	420	22
Drilling	M	52.74		22 19		.19		19
Grouting	TON	774.13	40			905		905
Gate	L.S			905		905		,65
Initial Cofferdam			1 000	-	1 000	7	1,000	. 7
Common	CU.M	6.60 49.33		7 33	•	33	-	33
Cabion	CU.M	47.33	000			6,553		6,553
Sub-total				6,553		6,000		0,000
3. Main Dam & Cofferdam								
Excavation, Dam	<u></u>	4 07	00 100	489	86,200	428	87,100	433
Common Weathered Rock	CU.M CU.M	4,97 10,32		409		470		449
Rock	CU.M	26,25	-	375		372	14,100	370
Consolidation Grout								
Drilling	м	14.66	3,000	44	2,770	41	2,450	36
Grouting	TON	514.92	240	124	222	114	196	101
Curtain Grout								
Drilling	м	52.74	2,400	127		124		119
Grouting	TON	514.92	! 192	. 99	188	97	181	93
Gallery Concrete	CU.M	247.18	4,500	1,112	4,430	1,095	4,300	1,063
Embankment, Dam							20 000	
Core	CU.M	7.27		389		325		276 130
Filter	CU.M	6.85 21 47		_		147 3,766		2,963
Rock	CU.N	21.47	202,000				-	6,033
Sub-total				7,763	L .	6,979	,	0,035

#### PRICED B.Q. OF MAIN CONSTRUCTION WORKS OF TAWAR MUDA DAM (2/3)

		Unit	Alterna		Alterna		Unit: Alternai	
Work Item	Unit	Price	(N.H.W.L. Quantity		(N.H.W.L. Quantity		(N.H.W.L. Quantity	: 72 m) Amount
. Spillway			<u>Zumiti ()</u>		2		2	
Excavation								
Common	CU.M	4.97	133,000	661	128,300	638	118,800	590
Weathered Rock	CU.M	10.32	46,600	481	45,900	474	45,700	472
Rock	CU.M	26.25	23,900	627	28,700	753	27,400	719
Concrete								
Mass Concrete	CU.M	142.86	58,600	8,372	54,300	7,757	49,600	7,086
Reinforced Concrete	CU.M	247.18	3,100	766	2,900	71.7	2,600	643
Back Fill	си.м	7.52	16,600	125	16,500	124	16,300	123
Curtain Grout								
Drilling	м	52.74	840	44	840	44	840	44
Grouting	TON	514.92	67	34	67	34	67	34
Sub-total				11,110	-	10,541		9,711
. Intake & Outlet Structure	e							
Excavation, Open								
Rock	CU.M	26.25	400	11	400	11	400	11
Concrete, Open								
Mass Concrete	CU.M	142.86	1,100	157	1,100	157	1,100	157
Reinforced Concrete	CU.M	247.18	200	49	200	49	200	49
Shaft								
Excavation	CU.M	90.46	1,400	127	1,400	127	1,400	127
Reinforced Concrete	CU.M	263.67	350	92	350	92	350	92
Valve	L.S			529		529		529
Gate or Valve	L.S			645		645		645
Trash Rack	L.S			77		77		77
Penstock	L.S			698		698		698
Sub-total				2,385		2,385		2,385
. Saddle Dam								
Excavation								
Common	CU.M	4.97	263,000	1,307	238,500	1,185	205,400	1,021
Weathered Rock	CU.M	10.32	117,500	1,213	103,800	1,071	84,800	875
Rock	CU.M	26.25	13,010	342	2,760	72	1,540	40
Embankment								
Core	CU.M	7.27	188,620	1,371	166,050	1,207	129,400	941
Filter	CU.M	6.85	113,400	777	98,700	676	83,600	573
Rock	CU.M	21.47	611,300	13,125	503,000	10,799	356,000	7,643
Curtain Grout							<b>. .</b> ·	
Drilling	M	52.74	15,200	802	13,150	694 542	12,200	643
Grouting	TON	514.92	1,216	626	1,052	542	976	503
Change a l								
Tunnel								
Excavation	CU.M	95.62	2,060	197	2,060	197	2,060	
	CU.M CU.M CU.M	95.62 263.67 138.51	2,060 957 106	197 252 15	2,060 957 106	197 252 15	2,060 957 106	197 252 15

#### PRICED B.Q. OF MAIN CONSTRUCTION WORKS OF TAWAR MUDA DAM (3/3)

								3
			· .				Unit:	10 <sup>3</sup> M\$
		17	Alternat	ive l	Alternat	ive 2	Alternat	ive 3
Work Item	Unit	Unit	(N.H.W.L.:	77 m)	(N.H.W.L.:	75 m)	(N.H.W.L.:	72 m)
		Price	Quantity	Amount	Quantity	Amount	Quantity	Amount
Backfill Grout	CU.M	175.29	103	18	103	18	103	18
Consolidation Grout								
Drilling	м	52.74	1,092	58	1,092	58	1,092	58
Grouting	TON	774.13	87	67	87	67	87	67
Curtain Grout								
Drilling	м	52.74	210	11	210	11	21.0	11
Grouting	TON	774.13	13	10	13	10	13	10
Excavation, App. Channel								
Common	CU.M	4.97	2,620	13	2,620	13	2,620	13
Weathered Rock	CU.M	10.32	7,860	81	7,860	81	7,860	81
Rock	CU.M	26.25	2,620	69	2,620	69	2,620	69
Cofferdam								
Common	CU.M	6.60	6,300	42	6,300	42	6,300	42
Sub-total				21,054		17,737		13,730
Total 1 to 6				51,769		47,099		41,316
Miscellaneous				5,695		5,181		4,545
Transportation				1,253		1,140		1,000
Grand Total			· · · · · · · · · · · · · · · · · · ·	58,717		53,420		46,861

# Table 15PRICED B.Q. OF MAIN CONSTRUCTION WORKS OF<br/>BERIS NO.2 DAM (GRAVITY) (1/2)Jnit: 103 MS

	,			·				Jnit:	10 <sup>3</sup> M\$
			The state	Alternat	ive l	Alterna	tive 2	Alterna	tive 3
	Work Item	Unit	Unit Price	(N.H.W.L.:	85 m)	(N.H.W.L.	: 82 m)	(N.H.W.L.	: 77 m)
	· · · · · · · · · · · · · · · · · · ·			Quantity	Amount	Quantity	Amount	Quantity	Amount
1.	Access Road								
	Rolling	м	223.37	11,000	2,457	11,000	2,457	11,000	2,457
2.	River Div. Works								
	Exca. of Inlet & Outlet								
	Common	CU.M	4.97	5,000	25	5,000	25	5,000	25
	Weathered Rock	CU.M	10.32	3,400	35	3,400	35	3,400	35
	Rock	CU.M	26.25	7,000	184	7,000	184	7,000	184
	Conc. of Inlet & Outlet Reinforced Concrete	CU.M	247.18	900	222	900	222	900	222
	Tunnel Excavation	CU.M	95.62	7,700	736	7,580	725	7,400	708
	Tunnel Concrete	CU.M	263.67	2,900	765	2,860	754	2,800	738
	Plug Concrete	CU.M	138.51	520	72	490	68	440	61
	Backfill Grout	CU.M	175.29	210	37	210	37	210	37
	Consolidation Grout								
	Drilling	м	52.74	1,358	72	1,358	72	1,358	72
	Grouting	TON	774.13	109	84	109	84	109	84
	Curtain Grout								
	Drilling	м	52.74	210	11	210	11	210	11
	Grouting	TON	774.13	13	10	13	10	13	10
	Gate	L.S		740			740		740
	Initial Cofferdam								
	Common	CU.M	6.60	1,600	11	1,600	11	1,600	11
	Gabion	CU.M	49.33	720	36	720	36	720	36
	Sub-total				3,040		3,014		2,974
3.	Main Dam & Cofferdam								
	Excavation, Dam								
	Common	CU.M	4.97	9,310	46	-	43	7,870	. 39
	Weathered Rock	CU.M	10.32	4,160	43	4,150	43	4,160	43
·	Rock	CU.M	26.25	15,300	402	15,240	400	15,280	401
	Consolidation Grout								
	Drilling	м	14.66	1,900	28	1,600	23	1,200	18
	Grouting	TON	514.92	152	78	128	66	96	49
	Curtain Grout								
	Drilling	M	52.74	2,800	148	2,500	132	2,300	121
	Grouting	TON	514.92	224	115	200	103	184	95
	Concrete Gravity Dam	CU.M	141.59	57,560	8,150	49,900	7,065	38,860	5,502
	Sub-total				9,010		7,875		6,268

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#### PRICED B.Q. OF MAIN CONSTRUCTION WORKS OF BERIS NO.2 DAM (GRAVITY) (2/2)

	BERIS	NO.2	DAM (GRAV	/ITY) (	(2/2)		Unit:	10 <sup>3</sup> M\$
Work Item	Unit	Unit Price	Alternat (N.H.W.L.:	85 m)	Alternat (N.H.W.L.:	82 m)	Alternat	: 77 m)
·			Quantity	Amount	Quantity	Amount	Quantity	Amount
4. Spillway								
Excavation								~ <b>~</b>
Common	CU.M	4.97	8,430	42		40	7,450	37 24
Weathered Rock	CU.M	10.32	2,730	28		26	2,300 9,180	24 241
Rock	CU-W	26.25	10,920	287	10,180	207	9,100	Ç 1.
Concrete				700	4 400	640	3,920	560
Mass Concrete	CU.M	142.86 247.18		700 771	4,480 2,720	672	2,140	529
Reingorced Concrete	CU.M				640	5		4
Back Fill	CU.M	7.52	700	5	640	-	500	-
Sub-total			• •	1,833		1,650		1,395
5. Intake & Outlet Structure	9							
Valve	L.S			529		529		529
Gate or Valve	L.S			170		170		170
Trash Rack	L.S			87		87		87
Penstock	L.S			101		101		101
Sub-total				887		887		887
6. Saddle Dam								
Excavation								
Common	CU.M	4.97	12,500	62		51		31
Weathered Rock	CU.M	10.32	25,000	258	20,400	211	12,670	131
Embankment						1 - 2	8,360	66
Core	CU.M	7.87		179 619		132 450		236
Filter Rock	CU.M CU.M	37.50 21.47		1,396	-	887	-	346
	C0.M	21.47	03,000	1,550				.*
Curtain Grout	м	52.74	3,990	210	3,500	185	2,620	138
Drilling Grouting	M TON	514.92	-	164	•	144		108
Sub-total				2,888	:	2,060		1,056
Total 1 to 6				20,115	i	17,943		15,037
Miscellaneous				2,212	!	1,974		1,653
Transportation				487	,	434		364
Grand Total			<u> </u>	22,814	· · · · · · · · · · · · · · · · · · ·	20,351	^	17,054

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			Unit:	10 <sup>3</sup> m\$
Work Item	Unit	Unit Price	Alternal (N.H.W.L. Quantity	: 82 m)
1. Access Road				
Rolling	м	223.37	11,000	2,457
2. River Div. Works				
Exca. of Inlet & Outlet Common Weathered:Rock Rock	CU.M CU.M CU.M	4.97 10.32 26.25	600 1,200 4,200	3 12 110
Conc. of Inlet & Outlet Reinforced Concrete	CU.M	247.18	2,200	544
Tunnel Excavation	CU.M	95.62	12,700	1,214
Tunnel Concrete	CU.M	263.67	4,900	1,292
Plug Concrete	CU.M	138.51	960	133
Backfill Grout	CU.M	175.29	470	82
Consolidation Grout Drilling Grouting	M TON	52.74 774.13	3,700 300	195 232
Curtain Grout Drilling Grouting	M TON	52.74 774.13	420 25	22 19
Gate	L.S			1,316
Initial Cofferdam Common Gabion	CU.M CU.M	6.60 49.33	1,800 720	12 36
Sub-total				5,222
3. Main Dam & Cofferdam				
Excavation, Dam Common Weathered Rock Rock	CU.M CU.M CU.M	4.97 10.32 26.25	19,700 4,900 12,200	98 51 320
Consolidation Grout				
Curtain Grout Drilling Grouting	M TON	52.74 514.92	6,300 504	332 260
Gallery Concrete	CU.M	247.18	3,200	791
Embankment, Dam Core Filter Rock	CU.M CU.M CU.M	7.87 37.50 21.47	35,800 15,200 161,100	282 570 3,459
Sub-total				6,163

### Table 17PRICED B.Q. OF MAIN CONSTRUCTION WORKS OF<br/>BERIS NO.2 DAM (ROCKFILL) (1/2)

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	<b>,</b>		Unit:	10 <sup>3</sup> M\$
			Alternat	
Work Item	Unit	Unit	(N.H.W.L.:	
WOLK I Cent	01110	Price	Quantity	Amount
······	· · · · · · · · · · · · · · · · · · ·			
4. Spillway				
Excavation				
Common	CU.M	4.97	12,500	62
Weathered Rock	CU.M	10.32	25,100	259
Rock	CU.M	26.25	87,700	2,302
Concrete				
Mass Concrete	CU.M	142.86	32,100	4,586
Reinforced Concrete	CU.M	247.18	3,600	890
Back Fill	CU.M	7.52	5,400	41
	00.14		37100	
Curtain Grout	М	52.74	1,400	74
Drilling Grouting	TON	514.92	112	58
-	100			
Sub-total				8,272
5. Intake & Outlet Structure				
Shaft	L.S			-
Valve	L.S			529
Gate or Valve	L.S			170
Trash Rack	L.S			87
Penstock	L.S			101
Sub-total				887
6. Saddle Dam				
Excavation				
Common	CU.M	4.97	70,300	349
Weathered Rock	CU.M	10.32	20,400	211
Embankment				
Core	CU.M	7.87	16,300	132
Filter	CU.M	37.50		450
Rock	CU.M	21.47	41,300	887
Curtain Grout				
Drilling	м	52.74	3,500	185
Grouting	TON	514.92	280	144
Sub-total				2,358
Total 1 to 6				25,359
Miscellaneous				2,789
Transportation				614
Grand Total				28,762
Grand LOORL				-

## Table 18PRICED B.Q. OF MAIN CONSTRUCTION WORKS OF<br/>BERIS NO.2 DAM (ROCKFILL) (2/2)

#### PRICED B.Q. OF MAIN CONSTRUCTION WORKS OF RUI NO.2 DAM (1/6)

Unit: 10<sup>3</sup> MS Alternative 3 Alternative 1 Alternative 2 Unit (N.H.W.L.: 241 m) (N.H.W.L.: 236 m) (N.H.W.L.: 231 m) Work Item Unit Amount Quantity Quantity Amount Quantity Amount 1. Access Road 24,000 5,361 Rolling 223.37 24,000 5,361 24,000 5,361 м 2. River Div. Works Exca. of Inlet & Outlet сп м 4.97 168.000 168,000 835 168.000 835 835 Common 372 Weathered Rock CU.M 10.32 36,000 372 36,000 372 36,000 Rock CU.M 26.25 23,000 604 23,000 604 23,000 604 Conc. of Inlet & Outlet 1,900 271 271 142.86 271 1,900 Mass Concrete CIL-M 1,900 321 Reinforced Concrete CU.M 247.18 1,300 321 1,300 321 1,300 5,355 Tunnel Excavation CU.M. 95.62 56,000 5,355 56,000 5,355 56,000 Tunnel Concrete 5,273 20,000 5,273 CU.M 263,67 20,000 5,273 20,000 2,400 332 Plug Concrete CU.M 138.51 2,400 2,400 332 332 239 CU.M 175.29 239 Backfill Grout 1,362 239 1,362 1,362 Consolidation Grout 386 Drilling м 52.74 7,320 386 7,320 386 7,320 454 454 586 TON 774.13 586 Grouting 586 454 Curtain Grout 22 22 Drilling М 52.74 420 22 420 420 Grouting TON 774.13 25 19 25 19 25 19 2,303 2,303 2,303 Gate L.S Initial Cofferdam 20 Common CU.M 6.60 3,000 20 3,000 20 3,000 67 Gabion 67 1,350 CU.M 49.33 . 1,350 67 1,350 16,873 16,873 16,873 Sub-total 3. Main Dam & Cofferdam Excavation, Dam 1,243 224,000 1,113 250,000 Common CU.M 4.97 276,000 1,372 1,847 Weathered Rock CU.M 10.32 220,000 2,270 201,000 2,074 179,000 1,628 45,000 1,181 Rock CU.M 26.25 1,790 62,000 68,200 Consolidation Grout 201 15,200 223 13,700 14.66 246 Drilling м 16,800 564 Grouting TON 514.92 692 1,216 626 1,096 1,344 Curtain Grout Drilling 52,74 27,600 1,456 25,100 1,324 22,600 1,192 М 2,008 1,034 1,808 931 Grouting TON 514.92 2,208 1,137 CU.M 247.18 9,700 2,398 8,700 2,150 Gallery Concrete 11,000 2,719 Embankment, Dam 366,500 2,419 Core CU.M 6,60 444,800 2,936 395,500 2,610 Filter CU.M 14.25 138,100 1,968 122,000 1,739 104,400 1,488 1,490,000 35,015 1,219,400 28,656 Rock CU.M 1,804,100 42,396 23.50 49.914 Sub-total 58,982 41.742

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#### PRICED B.Q. OF MAIN CONSTRUCTION WORKS OF RUI NO.2 DAM (2/6)

Unit: 10<sup>3</sup> M\$

							OILC.	10 110
		Unit	Alternat		Alternat		Alternat	
Work Item	Unit	Price			(N.H.W.L.:		(N.H.W.L.: Ouantity	231 m) Amount
· · · · · · · · · · · · · · · · · · ·			Quantity	Amount	Quantity	Amoune	Quantity	Anoune
4. Spillway								
Excavation								
Common	CU.M	4.97	103,700	515	108,600		113,400	564
Weathered Rock	CU.M CU.M	10.32 26.25	155,600 122,700	1,606 3,221	162,900 134,100		170,100 145,500	1,755 3,819
Rock	CU - M	20.25	122,700	3,221	1347100	5,520	110,000	5,015
Concrete Mass Concrete	CU.M	142.86	64,700	9,243	62,200	8,886	59,700	8,529
Reinforced Concrete	CU.M	247.18	3,400	840	3,300		3,200	791
Back Fill	CU.M	7:52	38,200	287	38,200	287	38,200	287
Curtain Grout			•					
Drilling	М	52.74	9,100	480	9,100			
Grouting	TON	514.92	428	220	428	220	428	220
Sub-total				16,412		16,430		16,445
5. Intake & Outlet Structure								
Exavation, Open								
Rock	CU.M	26.25	300	8	300	8	300	8
Concrete, Open								
Mass Concrete	CU.M	142.86	2,800	400	2,800 150		2,800 150	
Reinforced Concrete	CU.M	247.18	150	37	100	51	100	5.
Shaft Excavation	CU.M	90.46	4,500	407	4,500	407	4,500	407
Reinforced Concrete	CU.M	263.67	1,050		1,050		1,050	277
Valve	L.S			423		423		423
Gate or Valve	L.S			2,294		2,924		2,294
Trash Rack	L.S			135		135		135
Penstock	L.S			1,070		1,070		1,070
Sub-total				5,051		5,051		5,051
6. Transfar Tunnel (L=9KM)								
Excavation, Adit	CU.M	132.07	31,500	4,160	31,500	4,160	31,500	4,160
Concrete, Adit	CU.M	198.62						2,066
Tunnel Excavation	CU.M	137.02			-		163,300	22,375
Tunnel Concrete	CU.M			17,804		17,804		17,804
Backfill Grout		175.29		1,238		1,238		1,238
Consolidation Grout	00111	1,0,12,	,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,	2,000				
Drilling	м	52.74	63,000	3,323	63,000	3,323	63,000	3,323
Grouting	TON	774.13	•	-				3,902
Curtain Grout								
Drilling	м	52.74						
Grouting	TON	774.13	25					19
Sub-total				54,909		54,909		54,909

#### PRICED B.Q. OF MAIN CONSTRUCTION WORKS OF RUI NO.2 DAM (3/6)

				Unit: 10 <sup>3</sup> M\$
Work Item	Unit	Unit Alternative 1 Price $\frac{(N.H.W.L.: 241 m)}{Quantity}$ Amount		Alternative 3 (N.H.W.L.: 231 m) Quantity Amount
7. Power Station				
Excavation	L.S	306	306	306
Concrete				
Sub-structure	L.S	1,964	1,964	1,964
Super-structure	L.S	4,090	4,090	4,090
Metal Works	L.S	5,109	4,406	3,626
Sub-total		11,469	10,766	9,986
8. Generating Equipment	L.S	16,246	14,210	12,347
9. Micro Hydropower	L.S	1,200	1,200	1,200
10. Transmission Line	L.S	4,465	4,465	4,465
Total 1 to 10		190,968	179,179	168,379
Miscellaneous		21,005	19,709	18,520
Transportation		4,621	4,336	4,075
Grand Total		216,594	203,224	190,974

RUI NO.2 DAM (4/	6)				
			Unit: 1	.0 <sup>3</sup> M\$	
Work Item	Unit	Unit Price -	Alternative 4 (Up-stream)		
		Q	uantity 7	mount	
1. Access Road					
Rolling	м	223.37	24,000	5,361	
2. River Div. Works					
Exca. of Inlet & Outlet			100 000	407	
Common	CU.M	4.97 10.32	100,000 54,000	497 557	
Weathered Rock Rock	CU.M CU.M	26.25	46,000	1,208	
Conc. of Inlet & Outlet					
Mass Concrete	CU.M	142.86	1,900	271	
Reinforced Concrete	CU.M	247.18	1,300	321	
Tunnel Excavation	CU.M	95.62	43,000	4,112	
Tunnel Concrete	CU.M	263.67	15,100	3,981	
Plug Concrete	CU.M	138.51	2,400	332	
Backfill Grout	CU.M	175.29	1,056	185	
Consolidation Grout		÷			
Drilling	M	52.74	5,670 454	299 351	
Grouting	TON	774.13	404	3.71	
Curtain Grout		52.74	420	22	
Drilling Grouting	M TON	774.13	25	19	
Gate	L.S			2,303	
Initial Cofferdam					
Common	CU.M	6.60	3,000	20	
Gabion	CU.M	49.33	1,350	67	
Sub-total				14,545	
3. Main Dam Cofferdam					
Excavation, Dam		4 07	-	1,041	
Common	CU.M CU.M	4.97 10.32	209,500		
Weathered Rock Rock	CU.M	26.25	42,000		
Consolidation Grout					
Drilling	м	14.66	9,890	145	
Grouting	TON	514.92	791	407	
Curtain Grout			14 000	701	
Drilling	M TON	52.74 514.92	14,800 1,184	781 610	
Grouting			5,800	1,434	
Gallery Concrete	CU.M	247.18		1,454	
Embankment, Dam Core	CU.M	6.60	224,200	1,480	
Filter	CU.M		87,100	ì,241	
Rock	CU.M	23.50	1,007,300	23,672	
Sub-total				33,648	

### Table 22PRICED B.Q. OF MAIN CONSTRUCTION WORKS OF<br/>RUI NO.2 DAM (4/6)

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#### PRICED B.Q. OF MAIN CONSTRUCTION WORKS OF RUI NO.2 DAM (5/6)

				Unit:	10 <sup>3</sup> M\$
			finit	Alternat	ive 4
	Work Item	Unit	Unit Price	(Up-str	eam)
			Price	Quantity	Amount
4.	Spillway				
	Excavation				
	Common	CU.M		111,600	
	Weathered Rock Rock	CU.M	10.32	167,500	
		CU.M	26.25	142,700	3,746
	Concrete		340.04		
	Mass Concrete Reingorced Concrete	CU.M CU.M	142.86 247.18	65,600	
				3,500	
	Back Fill	CU.M	7.52	23,900	180
	Curtain Grout				
	Drilling Grouting	M TON	52.74	8,500	
		TON	514.92	680	350
	Sub-total				17,245
5.	Intake & Outlet Structure				
	Excavation, Open				
	<sup>®</sup> Rock	CU.M	26.25	300	. 8
	Concrete, Open				
	Mass Concrete	CU.M	142.86	2,800	400
	Reinforced Concrete	CU.M	247.18	150	37
	Shaft				
	Excavation Reinforced Concrete	CU.M CU.M	90.46 263.67	4,500	407
	Valve	L.S	203.07	1,050	277 423
	Gate or Valve	L.S			2,294
	Trash Rack	L.S			135
	Penstock	L.S			1,070
	Sub-total				5,051
6.	Transfar Tunnel (L=9KM)				
	Excavation, Adit	CU.M	132.07	31,500	4,160
	Concrete, Adit	CU.M	198.62	10,400	2,066
	Tunnel Excavation	CU.M	137.02	163,300	23,375
	Tunnel Concrete	CU.M	261.06	68,200	17,804
	Backfill Grout	CU.M	175.29	7,065	1,238
	Consolidation Grout			1	
	Drilling	М	52.74	63,000	3,323
	Grouting	TON	774.13	5,040	3,902
	Curtain Grout				
	Drilling	М	52.74	420	22
	Grouting	TON	774.13	25	19
	Sub-total				54,909

Table	24	

#### PRICED B.Q. OF MAIN CONSTRUCTION WORKS OF RUI NO.2 DAM (6/6)

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RUL NO.2 DEM	(0/0/			
			Unit:	10 <sup>3</sup> m\$
Work Item	Unit	Unit Price	Alternat (Up-str	
· · · · · · · · · · · · · · · · · · ·			Quantity	Amount
7. Power Station				
Excavation	L.S			306
Concrete				
Sub-structure	L.S			1,964
Super-structure	L.S			4,090
Metal Works	L.S			5,109
Sub-total				11,469
8. Generating Equipment	L.S			16,246
9. Micro Hydropower	L.S			1,200
10. Transmission Line	L.S			4,465
Total 1 to 10				164,139
Miscellaneous				18,055
Transportation				3,972
Grand Total				186,166

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#### PRICED B.Q. OF MAIN CONSTRUCTION WORKS OF RUI NO.3 DAM (1/3)

					,		Unit:	10 <sup>3</sup> м\$
	Unit	Unit	Alternat		Alternat (N.H.W.L.:		Alternat (N.H.W.L.:	
Work Item	OULC	Price	(N.H.W.L.: Quantity		Quantity		Quantity	Amount
1. Access Road								
kolling	м	223.37	24,000	5,361	24,000	5,361	24,000	5,361
ROLLING		223137	247000	5,501	24,000	0,001	21,000	
2. River Div. Works								
Exca. of Inlet & C		4 07	26 600	100	26,000	103	26 600	182
Common Weathered Rock	CU.M CU.M	4.97 10.32	36,600 24,400	182 252	36,600 24,400	182 252	36,600 24,400	252
Rock	CU.M	26.25	42,600	1,118	42,600	1,118	42,600	1,118
Conc. of Inlet & C			,		•			
Mass Concrete	CU.M	142.86	4,970	71.0	4,970	710	5,000	714
Reinforced Concr		247.18	104	26	104	26	100	25
Tunnel Excavation	CU.M	95.62	43,700	4,179	43,700	4,179	43,700	4,179
Tunnel Concrete	CU.M	263.67	15,600	4,113	15,600	4,113	15,600	4,113
Plug Concrete	CU.M	138.51	2,580	357	2,580	357	2,580	357
Backfill Grout	CU.M	175.29	1,010	177	1,010	177	1,010	1.77
Consolidation Grou	ıt							
Drilling	М	52.74	5,362	283		283	•	283
Grouting	. TON	774.13	429	332	429	332	429	332
Curtain Grout	·							
Drilling	М	52.74	420	22	420	22	· 420 25	22 19
Grouting	TON	774.13	25	19	25	-	25	
Gate	L.S			2,303		2,303		2,303
Initial Cofferdam						1 7 3	26, 200	172
Common	CU.M	6.60	26,200	173 67	26,200 1,350	173 67	26,200 1,350	173 67
Gabion	CU.M	49.33	1,350		1,550		1,000	
Sub-total				14,313		14,313		14,316
3. Main Dam & Cofferdam	n.							
Excavation, Dam								
Common	CU.M	4.97	204,680	1,017	273,700	1,360	231,000 66,000	1,148 681
Weathered Rock	CU.M	10.32	78,480	810 1,030	78,200 39,100	807 1,026	33,000	866
Rock	CU.M	26.25	39,240	1,050	39,100	1,020	33,000	000
Consolidation Grou		14 66	15,900	233	13,200	194	11,900	174
Drilling Grouting	M TON	14.66 514.92	1,272	655	1,056	544	952	490
		<b>9</b> 2 11 9 4	2,210					
Curtain Grout Drilling	м	52.74	14,900	786	12,400	654	14,800	781
Grouting	TON	514.92	1,192	614		511	1,184	610
Gallery Concrete	CU.M	247.18	6,700	1,656	6,100	1,508	5,500	1,359
Embankment, Dam								
Core	CU.M	6.60	234,780	1,550	195,400	1,290	173,600	1,146
Filter	CU.M	14.25	99,530	1,418	87,000	1,240	74,000	1,055
Rock	CU.M	23.50	1,300,080	30,552	1,091,000	25,639	921,500	21,655
Sub-total				40,321		34,773		29,965

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#### PRICED B.Q. OF MAIN CONSTRUCTION WORKS OF RUI NO.3 DAM (2/3)

. ł	KUT NO	S DAM	(2/3)					
				-			Unit:	10 <sup>3</sup> м\$
· · · ·			Alternat	ive 1	Alternat	ive 2	Alternat	ive 3
· Work Item	Unit	Unit Price	(N.H.W.L.:	238 m)	(N.H.W.L.:			
		PLICE	Quantity	Amount	Quantity	Amount	Quantity	Amount
4. Spillway								
Excavation								
Common	CU.M	4.97	269,300	1,338	268,200	1,333	267,000	1,327
Weathered Rock	CU.M	10.32	115,400	1,191	115,000	1,187	114,500 177,400	1,182 4,657
Rock	CO.W	26.25	156,900	4,119	167,200	4,389	177,400	4,057
Concrete		140 00	05 000	12 742	93,300	13,329	90,400	12,915
Mass Concrete Reinforced Concrete	CU.M CU.M	142.86 247.18	96,200 5,000	13,743 1,236		1,211	4,800	1,186
Back Fill	CU.M	7.52	46,300	348	42,200	317	38,000	286
	COM	1.52	40,000					
Curtain Grout Drilling	м	52.74	4,000	211	4,000	211	4,000	211
Grouting	TON	514.92	320	165		165	320	165
Sub-total				22,351		22,142		21,929
5. Intake & Outlet Structure							· · ·	
Excavation, Open					-			
Rock	CU.M	26.25	300	8	300	8	300	8
Concrete, Open								
Mass Concrete	CU.M	142.86	2,800	400	2,800	400		400
Reinforced Concrete	CU.M	247.18	150	37	150	37	150	37
Shaft				407	4 500	407	4,500	407
Excavation Reinforced Concrete	CU.M CU.M	90.46 263.67		407 277		277	1,050	277
	L.S	203107	1,000	423		423	-	423
Valve	L.S			2,294		2,294		2,294
Gate or Valve				135		135		135
Trash Rack	L.S					1,070		1,070
Penstock	L.S			1,070				-
Sub-total				5,051		5,051		5,051
6. Transfar Tunnel (L=9KM)								
Excavation, Adit	CU.M	132.07	31,500	4,160	31,500	4,160	31,500	4,160
Concrete, Adit	CU.M	198.62	10,400	2,066	10,400	2,066	10,400	2,066
Tunnel Excavation	CU.M	137.02	163,300	22,375	163,300	22,375	163,300	22,375
Tunnel Concrete	CU.M	261,06	68,200	17,804	68,200	17,804	68,200	17,804
Backfill Grout	CU.M	175,29	7,065	1,238	7,065	1,238	7,056	1,238
Consolidation Grout							~~ ~~~	3 300
Drilling	м	52.74		3,323		3,323		3,323 3,902
Grouting	TON	774.13	5,040	3,902	5,040	3,902	5,040	5,502
Curtain Grout		<u> </u>	400	~~	420	22	420	22
Drilling Grouting	M TON	52.74 774.13		22 19		19		19
-	101	112123	2.5			54,909		54,909
Sub-total				54,909		24,909		34, 505

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#### PRICED B.Q. OF MAIN CONSTRUCTION WORKS OF RUI NO.3 DAM (3/3)

	RUL NO.	J DAM	4 (3/3)						
						Unit: 10 <sup>3</sup> M\$			
Work Item	Unit	Unit Price	Alterna (N.H.W.L.	. –	Alternative 2 (N.H.W.L.: 233 m)	Alternative 3 (N.H.W.L.: 228 m)			
		PLICE	Quantity	Amount	Quantity Amount	Quantity Amount			
7. Power Station									
Excavation	L S			306	306	306			
Concrete Sub-structure Super-structure	L.S L.S			1,964 4,090	1,964 4,090	•			
Metal Works	L.S			5,109	4,406	3,626			
Sub-total				11,469	10,766	9,986			
8. Generating Equipment	L.S			16,246	14,210	12,347			
9. Micro Hydropower	L.S			1,200	1,200	1,200			
10. Transmission Line	L.S			4,465	4,465	4,465			
Total to 1 to 10				175,686	167,190	159,529			
Miscellaneous				19,325	18,388	17,548			
Transportation				4,252	4,046	3,861			
Grand Total	<u></u>			199,263	189,624	180,938			

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#### Table 28 ANNUAL DISBURSEMENT SCHEDULE (1/21)

Naņ	e of Dam: Badak-Temin	Dam T	ype: 1	Rockfill	Scheme:	Max.	N.H.W.L.: Unit:	45 m M\$10 <sup>6</sup>
	Item	Amount	1985	1986	1987	1988	1989	1990
1.	Preparatory Works	б.13			6.13			-
2.	Main Construction Works	69,58	. =	2,09	7.04	32.86	25.50	2.09
3.	Engineering & Administration	18.93	6.63	3.79	1,89	2.84	2.84	0.94
4.	Compensation	20.10		8.04	6.03	6.03	<u> </u>	-
5.	Physical Contingency	34.42	1,99	4.18	6.33	12.51	8.50	0.91
	Total	149.16	8.62	18.10	27.42	54.24	36.84	3.94

Table 29 ANNUAL DISBURSEMENT SCHEDULE (2/21)

Nam	e of Dam: Badak-Temin	Dam Ty	ype: R	ockfill	Scheme:	Min.	N.H.W.L.: Unit:	40 m M\$10 <sup>6</sup>
	Item	Amount	1985	1986	1987	1988	1989	1990
1.	Preparatory Works	4.34	-	100 1	4.34	-	-	
2.	Main Construction Works	49.16	—	1.47	6.26	24.60	15.36	1.47
3.	Engineering & Administration	13.37	4.69	2.67	1.34	2.00	2.00	0.67
4.	Compensation	14.50		5.80	4.35	4.35	-	-
5.	Physical Contingency	24.41	1,40	2.99	4.88	9.28	5.22	0.64
	Total	105.78	6.09	12.93	21.17	40.23	22.58	2.78

м-34

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Nan	ne of Dam: Sari	Dam Type:	Rockfi	11 S	cheme:	N	.H.W.L.: Unit:	85 m M\$10 <sup>6</sup>
	Item	Amount	1985	1986	1987	1988	1989	1990
1.	Preparatory Works	2.34			2.34			-
2.	Main Construction Works	26.52	-	0.80	10.90	8.77	5.25	0.80
3.	Engineering & Administration	11.54	4.04	2.31	1.16	1.73	1.73	0.57
4.	Compensation	15.20	••	6.08	4.56	4.56	-	-
5.	Physical Contingend	y <u>16.68</u>	1.21	2.75	5.69	4.52	2.10	0.41
	Total	72.28	5.25	11.94	24.65	19.58	9.08	1.78

### Table 30 ANNUAL DISBURSEMENT SCHEDULE (3/21)

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Table 31 ANNUAL DISBURSEMENT SCHEDULE (4/21)

Nan	ne of Dam: Sari	Dam Type:	Gravity	S	cheme:	Max.	NH.W.L.:	85 m
							Unit:	M\$10 <sup>6</sup>
	Item	Amount	1985	1986	1987	1988	1989	1990
1.	Preparatory Works	1.94	<u>-</u> .	-	1.94			_
2.	Main Construction Works	22.08	**	0.67	7.78	6.96	6.00	0.67
3.	Engineering & Administration	9.61	3.36	1.93	0.96	1.44	1.44	0,48
4.	Compensation	15.20		6.08	4.56	4.56	-	-
5.	Physical Contingend	y 14.65	1.01	2.59	4.59	3.89	2.23	0.34
	Total	63.48	4.37	11.27	19.83	16.85	9.67	1.49

Table 32	ANNUAL	DISBURSEMENT	SCHEDULE	(5/21)

Nan	e of Dam: Sari	Dam Type:	Gravity	Ş	Scheme: Mi	.n.	N.H.W.L.:	80 m
							Unit:	M\$10 <sup>6</sup>
	Item	Amount	1985	1986	1987	1988	1989	1990
1.	Preparatory Works	1.70	-	-	1.70	•*	••••	t sa
2.	Main Construction Works	19.34	-	0.58	7.67	5,49	5.02	0.58
3,	Engineering & Administration	8.41	2.95	1.68	0.84	1.26	1.26	0.42
4.	Compensation	14.80	-	5.92	4.44	4.44	· · -	-
5.	Physical Contingend	Y 13.28	0.89	2.45	4.40	3.36	1.88	0.30
	Total	57.53	3.84	10.63	19.05	14.55	8.16	1.30

Table 33 ANNUAL DISBURSEMENT SCHEDULE (6/21)

Nam	e of Dam: Durian	Dam Type:	Rockfi	ill s	cheme:	Max. N	H.W.L.:	74 m
							Unit:	м\$10 <sup>6</sup>
	Item	Amount	1985	1986	1987	1988	1989	1990
1.	Preparatory Works	5.56	-	-	5,56	-	-	. <del>,</del>
2.	Main Construction Works	63.09	-	1.90	11.50	26.39	21.40	1.90
3.	Engineering & Administration	17.16	6.02	3.43	1.71	2.57	2.57	0.86
4.	Compensation	1.35		0.53	0.41	0.41	-	
5.	Physical Contingency	26.15	1,80	1.76	5.76	8.81	7.19	0.83
	Total	113.31	7.82	7.62	24.94	38.18	31.16	3.59

#### Table 34 ANNUAL DISBURSEMENT SCHEDULE (7/21)

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Nan	ne of Dam: Durian	Dam Type:	Rockfi	.11	Scheme: Mi	.n. N	.H.W.L.:	69 m
							Unit:	м\$10 <sup>6</sup>
·	Item	Amount	1985	1986	1987	1988	1989	1990
1.	Preparatory Works	4.64		•••	4.64		-	-
2.	Main Construction Works	52.59		1.58	11.26	22.19	15.98	1.58
3.	Engineering & Administration	14.30	5.02	2.86	1.43	2.14	2.14	0.71
4.	Compensation	1.16	_	0.46	0.35	0.35		-
5.	Physical Contingency	y 21.81	1.50	1.47	5.30	7.41	5.44	0.69
	Total	94.50	6.52	6.37	22.98	32.09	23.56	2.98

Table 35 ANNUAL DISBURSEMENT SCHEDULE (8/21)

Nam	e of Dam: Tawar-Muda	Dam Typ	pe: Roo	kfill	Scheme:	Max. N	.H.W.L.:	77 m
							Unit:	M\$10 <sup>6</sup>
	Item	Amount	1985	1986	1987	1988	1989	1990
l.	Preparatory Works	5,18	-	-	5.18	-	-	
2.	Main Construction Works	58.72	<b>~</b>	1.76	12,05	22.70	20,45	1.76
3.	Engineering & Administration	15.97	5.57	3.20	1.60	2.40	2.40	0.80
4.	Compensation	8.30	-	3.32	2.49	2.49	-	
5.	Physical Contingency	26.45	1.67	2.48	6.39	8.29	6.85	0.77
	Total	114,62	7.24	10,76	27.71	35,88	29.70	3.33

#### Table 36 ANNUAL DISBURSEMENT SCHEDULE (9/21)

Nam	e of Dam: Tawar-Muda	Dam Typ	pe: Roo	ckfill	Scheme:	Med. N	H.W.L.:	75 m
							Unit:	M\$10 <sup>6</sup>
	Item	Amount	1985	1986	1987	1988	1989	1990
1.	Preparatory Works	4.71	-	-	4.71	-	-	-
2	Main Construction Works	53,42	-	1.61	11.80	20.47	17.93	1.61
3.	Engineering & Administration	14.53	5.08	2.90	1.46	2.18	2.18	0.73
4.	Compensation	7.60	-	3.04	2.28	2.28		-
5.	Physical Contingency	24.08	1.53	2.27	6.08	7.46	6.04	0_70
	Total	104.34	6.61	9.82	26.33	32.39	26.15	3.04

Table 37 ANNUAL DISBURSEMENT SCHEDULE (10/21)

Nam	e of Dam: Tawar-Muda	Dam Typ	pe: R	ockfill	Scheme:	Min.	N.H.W.L.:	72 m
							Unit:	M\$10 <sup>6</sup>
	Item	Amount	1.985	1986	1987	1988	1989	1990
1.	Preparatory Works	4.14	-	643	4.14	·	-	-
2.	Main Construction Works	46.86		1.40	11.52	17.89	14.65	1.40
3.	Engineering & Administration	12.74	4.47	2.54	1.27	1.91	1.91	0.64
4.	Compensation	6,30		2,52	1.89	1.89	-	-
5.	Physical Contingency	21.01	1.34	. 1.94	5,65	6.50	4,97	0.61
	Total	91.05	5.81	8.40	24.47	28.19	21.53	2.65

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#### Table 38ANNUAL DISBURSEMENT SCHEDULE (11/21)

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Nan	ne of Dam: Beris No.2	Dam Typ	pe: Gr	avity	Scheme:	Max.	N.H.W.L.:	85 m
							Unit:	M\$106
	Item	Amount	1985	1986	1987	1988	1989	1990
1.	Preparatory Works	2.01		-	2.01			~
2.	Main Construction Works	22.81	· _	0.69	5.64	7.91	7.88	0.69
3.	Engineering & Administration	9.93	3.46	1.99	1.00	1.49	1.49	0.50
4.	Compensation	22.30	-	8,92	6.69	6,69	) ~	-
5.	Physical Contingency	17.12	1.04	3.48	4.60	4,82	2.82	0.36
	Total	74.17	4.50	15.08	19.94	20,91	12.19	1.55

Table 39 ANNUAL DISBURSEMENT SCHEDULE (12/21)

.

Nan	ne of Dam: Beris No.2	Dam Ty	pe: Gra	avity	Scheme:	Med.	N.H.W.L.:	82 m -
							Unit:	м\$10 <sup>6</sup>
	Item	Amount	1985	1986	1987	1988	1989	1990
1.	Preparatory Works	1.79	***	_	1.79	•••	-	57
2.	Main Construction Works	20.35	-	0.61	5.56	6.93	6.64	0.61
3.	Engineering & Administration	8,86	3.10	1.77	0.89	1.33	1.33	0.44
4.	Compensation	18.70	-	7.48	5.61	5,61	-	-
5.	Physical Contingency	14.91	0.93	2.95	4,16	4.16	2.39	0.32
	Total	64.61	4.03	12,81	18.01	18.03	10.36	1.37

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Nan	e of Dam: Beris No.	2 Dam T	ype: G	ravity	Scheme:	Min.N	.H.W.L.:	77 m
							Unit:	м\$10 <sup>6</sup>
	Item	Amount	1985	1986	1987	1988	1989	1990
1.	Preparatory Works	1.51		·	1.51	-	-	-
2.	Main Construction Works	17.05	-	0.52	5.43	5.60	4.98	0.52
3.	Engineering & Administration	7.43	2.61	1.49	0.74	1.11	1.11	0.37
4.	Compensation	12,60	-	5.04	3.78	3.78		
5.	Physical Contingency	11.58	0.78	2.11	3.44	3.15	1.83	0.27
	Total	50.17	3.39	9.16	14.90	13.64	. 7.92	1.16

#### Table 40 ANNUAL DISBURSEMENT SCHEDULE (13/21)

Table 41 ANNUAL DISBURSEMENT SCHEDULE (14/21)

Nam	ne of Dam: Beris No. 2	2 Dam T	ype: R	ockfill	Scheme	N	H.W.L.:	77 m
							Unit:	м\$10 <sup>6</sup>
	Item	Amount	1985	1986	1987	1988	1989	1990
1.	Preparatory Works	2.54	-	-	2.54	-	-	-
2.	Main Civil Works	28.76		0.86	7.92	10.95	8.17	0.86
3.	Engineering & Administration	12.52	4.39	2.50	1.26	1.87	1.87	0.63
4.	Compensation	12.60	-	5.04	3.78	3.78	-	-
5.	Physical Contingency	16,93	1.31	2.53	4.64	4.99	3.01	0.45
	Total	73.35	5.70	10.93	20.14	21,59	13.05	1.94

#### Table 42 ANNUAL DISBURSEMENT SCHEDULE (15/21)

.

Nan	ne of Dam: Rui No. 2	Dam T	ype: Ro	ckfil1	Scheme	: Max.	N.H.W.L.:	241 m
							Unit:	M\$106
	Item	Amount	1985	1986	1987	1988	1989	1990
1.	Preparatory Works	19.09	-2		19.09	-	-	-
2.	Main Civil Works	216.59	-	6.51	54.36	79.59	49.49	26.64
з.	Engineering & C Administration	47.14	16.50	9.43	4.71	7.07	7.07	2.36
4.	Compensation	0.30		0.12	0.09	0.09	-	-
5.	Physical Contingency	84,94	4,94	4.81	23.48	26.04	16.97	8.70
	Total	368.06	21,44	20.87	101.73	112.79	73.53	37.70

Table 43 ANNUAL DISBURSEMENT SCHEDULE (16/21)

Name of Dam: Rui No. 2		Dam	Туре:	Rockfill	Scheme	Med.	N.H.W.L.;	236 m
							Unit:	м\$10 <sup>6</sup>
	Item	Amount	1985	1986	1987	1988	1989	1990
1.	Preparatory Works	17.92	·	-	17.92	-	—	~
2.	Main Civil Works	203.22	-	6.11	53.40	73.91	45.28	24.52
3.	Engineering & Administration	44.23	15.49	8.84	4.43	6.63	6.63	2.21
4.	Compensation	0.20	-	0.08	0.06	0.06	-	-
5.	Physical Contingency	79.67	4.64	4.51	22.74	24.19	15.57	8.02
	Total	345.24	20.13	19,54	98.55	104.79	67.48	34.75

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#### Table 44 ANNUAL DISBURSEMENT SCHEDULE (17/21)

Nam	e of Dam: Rui No. 2	Dam T	уре: І	Rockfill	Scheme:	Min.	N.H.W.L.: Unit:	231 m M\$10 <sup>6</sup>
	Item	Amount	1985	1986	1987	1988	1989	1990
1.	Preparatory Works	16.84	-	7 Fed	16.84	-20	•••	
2.	Main Civil Works	190.97	-	5,74	52.38	68.32	41.87	22.66
3.	Engineering & Administration	41.56	14.56	8.31	4.16	6.23	6,23	2.07
4.	Compensation	0.20		0.08	0.06	0.06	<b>-</b> .	-
5.	Physical Contingency	74.87	4.36	4.24	22.03	22.39	14.43	7.42
	Total	324.44	18.92	18.37	95.47	97.00	62.53	32.15

Table 45 ANNUAL DISBURSEMENT SCHEDULE (18/21)

Upstream Name of Dam: Rui No. 2		Dam Typ	e: Rocl	fill Scheme: N.H.W.L.: 241 m				
							Unit:	м\$10б
	Item	Amount	1985	1986	1987	1988	1989	1990
1.	Preparatory Works	16.41	-		16.41	-	: . ===	-
2.	Main Civil Works	186.17	••••	5.60	52.34	66.49	40.30	21.44
3.	Engineering & Administration	40.51	14.18	8.10	4.06	6.07	6.07	2.03
4.	Compensation	0.20		0.08	0.06	0.06	-	
5.	Physical Contingency	72.99	4.26	4.14	21.86	21.78	13.91	7.04
	Total	316.28	18.44	17.92	94.73	94.40	60.28	30.51

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#### Table 46ANNUAL DISBURSEMENT SCHEDULE (19/21)

.

Name of Dam: Rui No. 3		Dam Type: Rock		ckfill	kfill Scheme:		N.H.W.L.: Unit:	238 m M\$10 <sup>6</sup>	
	Item	Amount	1985	1986	1987	1988	1989	1990	
1.	Preparatory Works	17.57	<del>64</del>		17.57			-	
2.	Main Civil Works	199.26		5.99	52.01	71.00	46.80	23.46	
3.	Engineering and Administration	43.37	15.19	8.67	4.34	6.50	6.50	2.17	
4.	Compensation	5.20		2.08	1.56	1.56	. –	-	
5.	Physical Contingency	79.62	4.56	5.03	22.63	23.71	16.00	7.69	
	Total	345.02	19.75	21.77	98.11	102.77	69.30	33.32	

Table 47 ANNUAL DISBURSEMENT SCHEDULE (20/21)

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Nam	e of Dam: Rui No. 3	Dam Ty	pe: Ro	ckfill	Scheme:	Med. N	.H.W.L.:	233 m
							Unit:	м\$10 <sup>6</sup>
	Item	Amount	1985	1986	1987	1988	1989	1990
1.	Preparatory Works	16.71	-	-	16,71	-	-	-
2.	Main Civil Works	189.62	-	5.70	5.31	66.79	43.90	21.92
3.	Engineering and Administration	41.27	14.44	8.26	4.13	6.19	6.19	2.06
4.	Compensation	5,20	~	2.08	1.56	1.56	-	-
5.	Physical Contingency	75.85	4.33	4.81	22,13	22.36	15.02	7.20
	Total	328.65	18.77	20.85	95.84	96.90	65.11	31.18

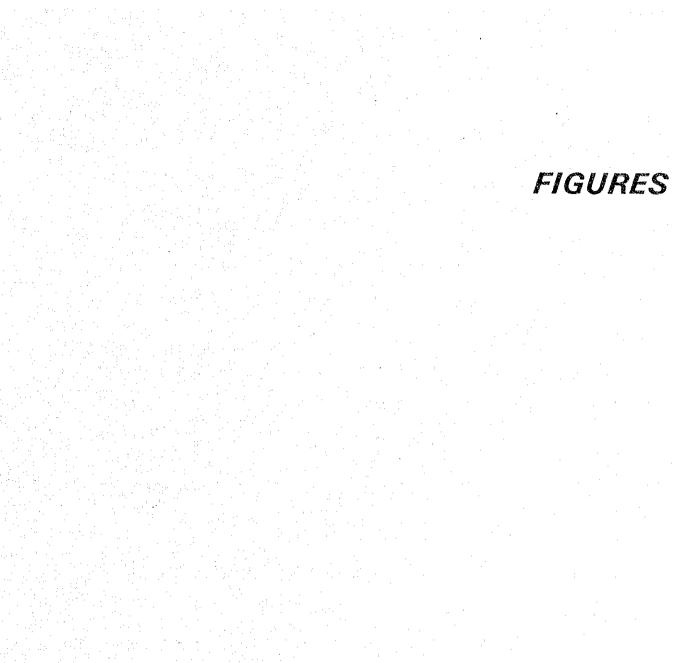
Table 48	ANNUAL	DISBURSEMENT	SCHEDULE	(21/21)
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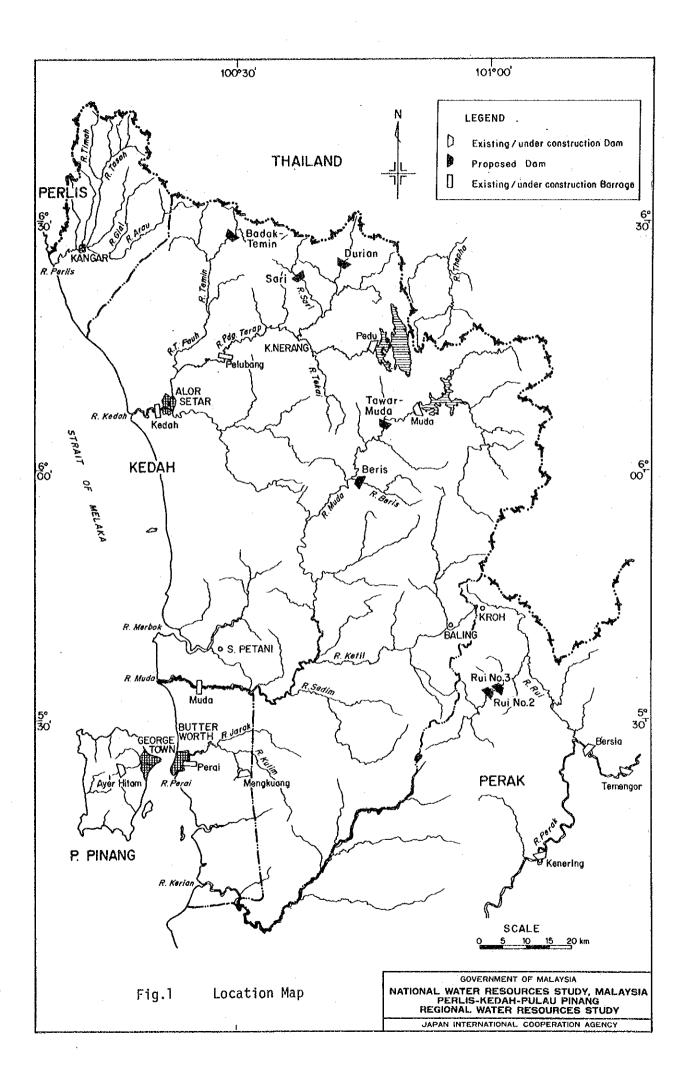
Name of Dam: Rui No. 3	B Dam Ty	pe: Ro	ckfill	Scheme:	Min.	N.H.W.L.:	228 m
						Unit:	M\$10 <sup>6</sup>
Item	Amount	1985	1986	1987	1988	1989	1990
1. Preparatory Works	15,95	-	<del></del>	15.95	-	-	-
2. Main Civil Works	180.94	-	5.44	50.42	63.21	41.24	20.63
3. Engineering and Administration	39.37	13.79	7.87	3.94	5.90	5.90	1.97
4. Compensation	5.20	-	2.08	1.56	1.56	-	~
5. Physical Contingend	y 72.44	4.13	4.62	21.56	21.20	14.15	6.78
Total	313.90	17.92	20.01	93.43	91.87	61.29	29.38

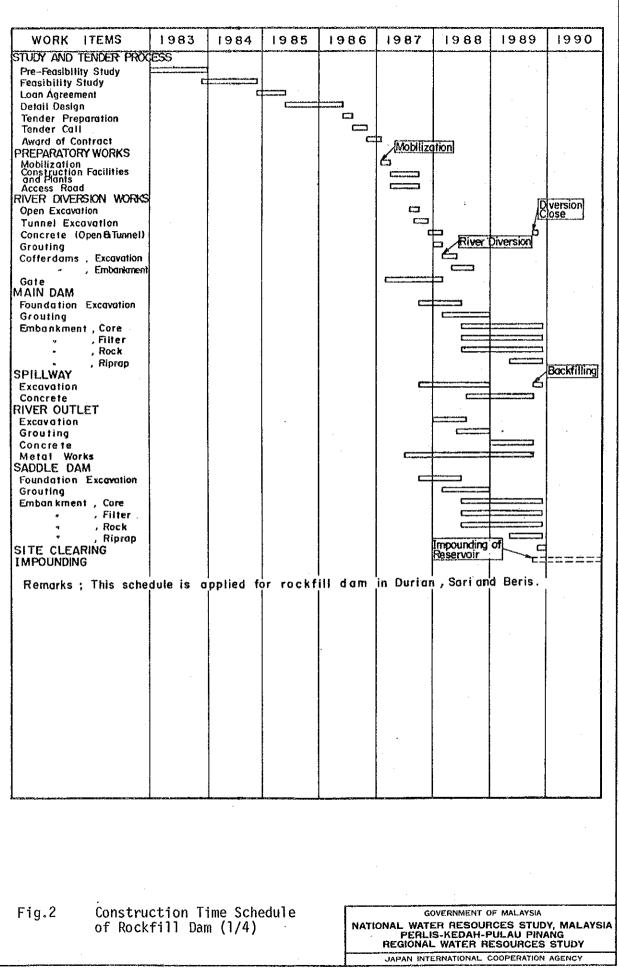
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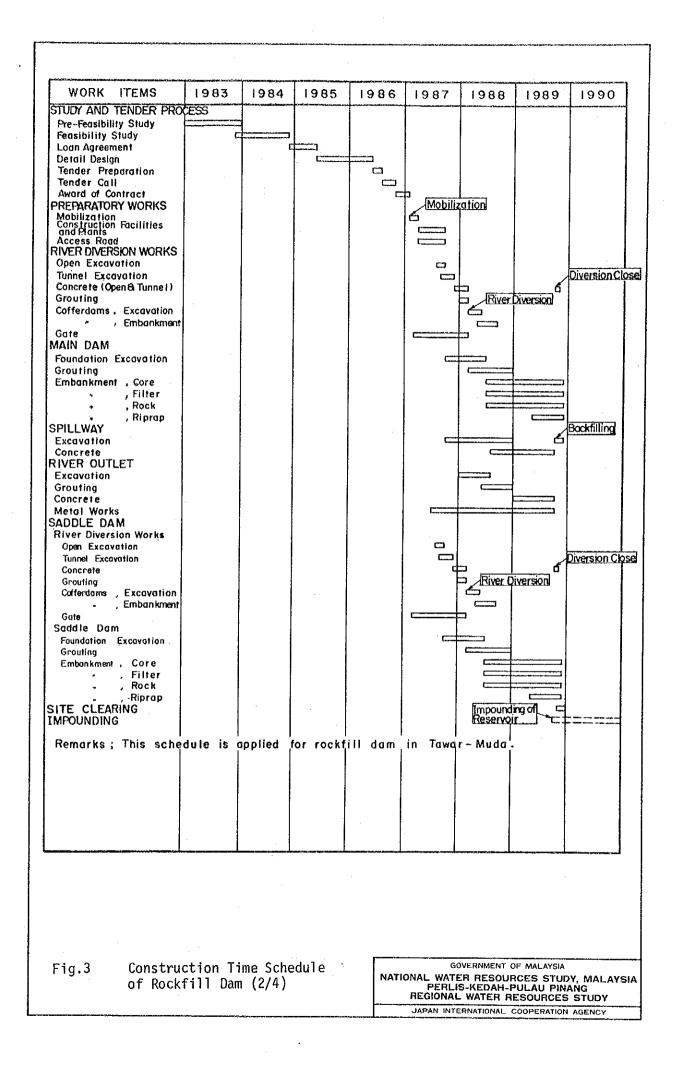
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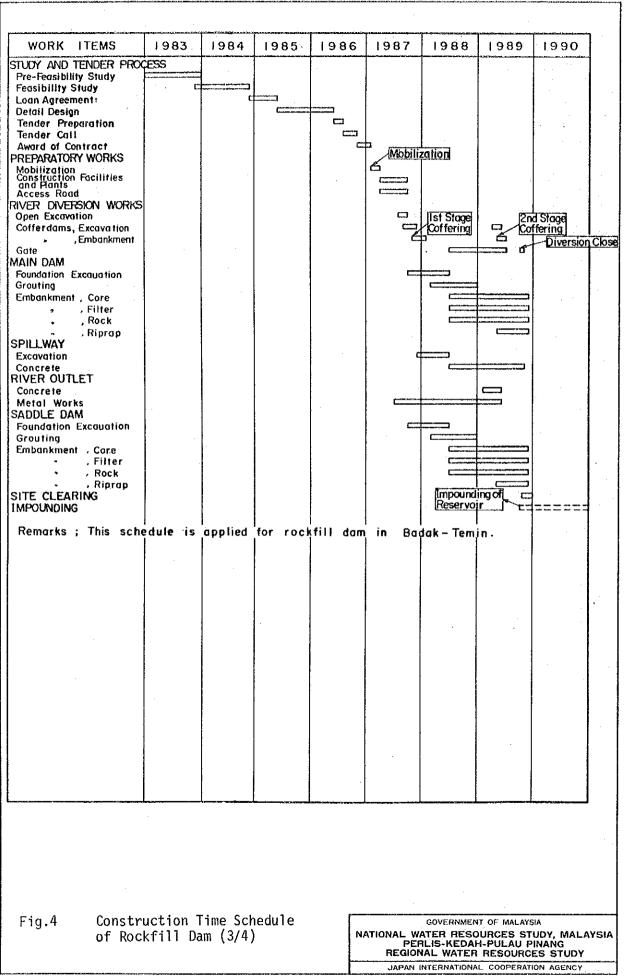
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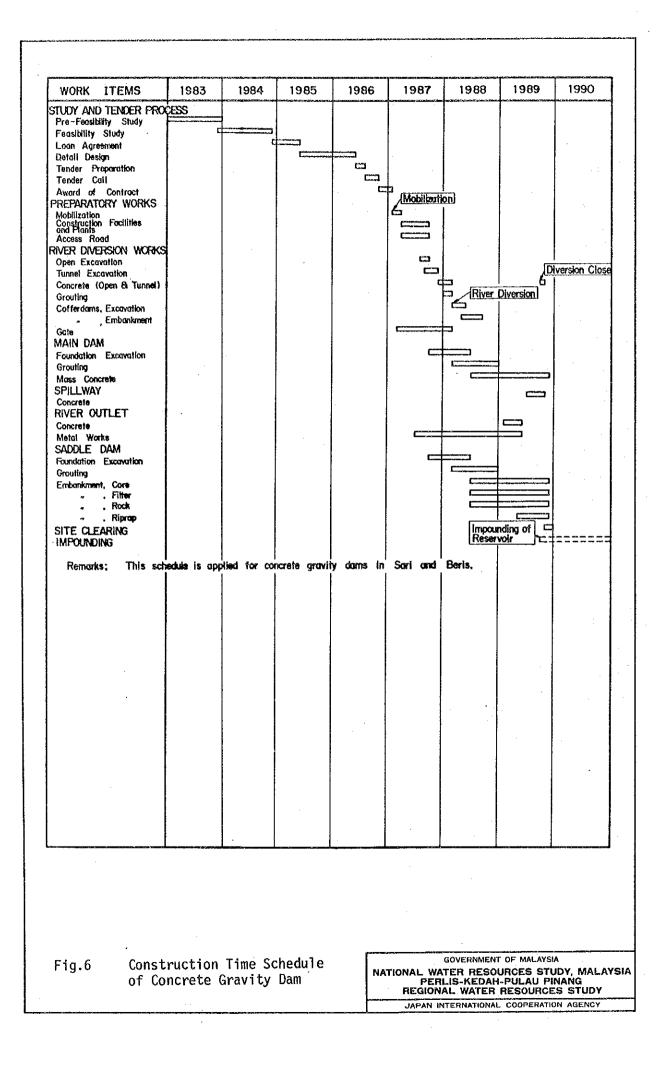


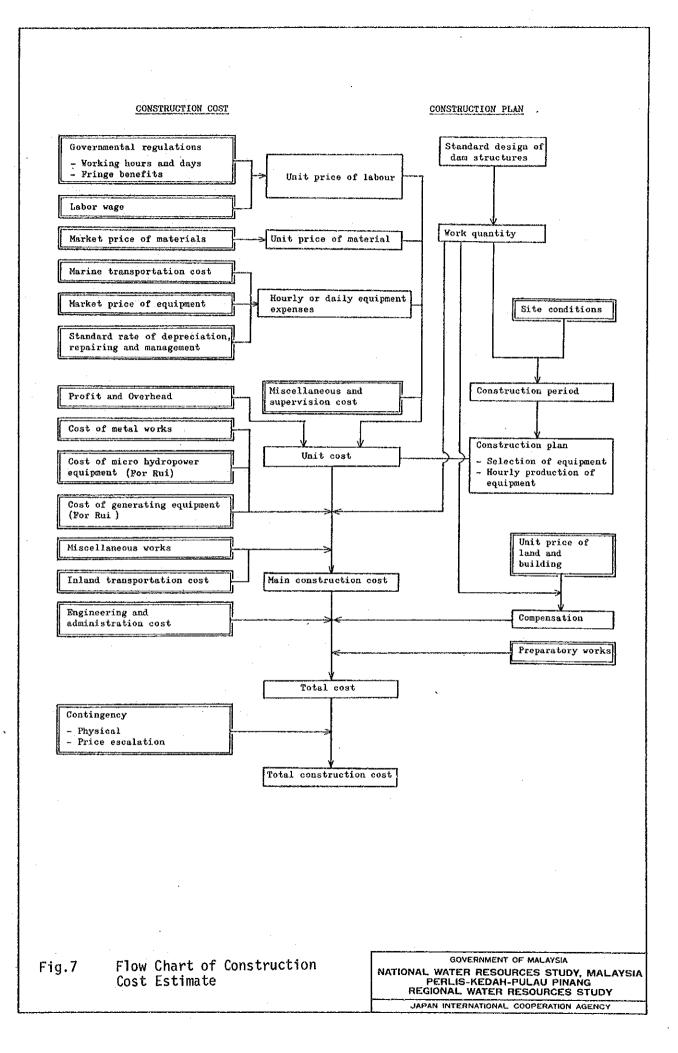


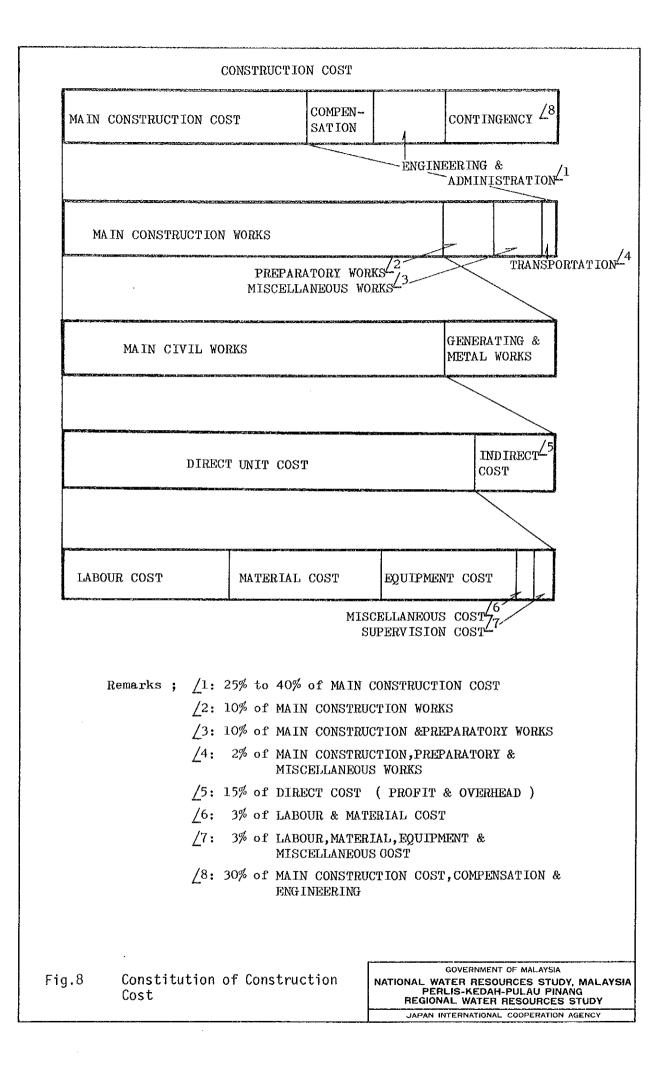
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Switchyard Transmission Line									
SITE CLEARING								Impounding (	जी त
IMPOUNDING								Reservoir	_ <u></u>
Remarks; This sche	dule is	 applied	for r	ockfill da	m. In Rui.				

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Fig.5 Construction Time Schedule of Rockfill Dam (4/4) GOVERNMENT OF MALAYSIA NATIONAL WATER RESOURCES STUDY, MALAYSIA PERLIS-KEDAH-PULAU PINANG REGIONAL WATER RESOURCES STUDY JAPAN INTERNATIONAL COOPERATION AGENCY







# ANNEX N

# ECONOMIC ANALYSIS OF PROPOSED SOURCE FACILITIES

.

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#### 1. INTRODUCTION

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This ANNEX N presents the details of assumptions and calculations which are made in relation to the economic and financial analysis of water demand and supply balance Plan.

#### 2. WATER DEMAND AND WATER DEFICIT

Water demand and water deficit are summarized herein, to the extent relevant to the economic analysis in the subsequent Chapters. The details of water demand are described in ANNEXes B and D and those of water deficit are compiled in ANNEXI.

Herein the following definitions are introduced:

- (1) MADA or MADA main; the major irrigation scheme in the MADA area,
- (2) MADA minor; minor irrigation schemes depending on off-take of the MADA canal or main stream of the Kedah river. MADA minor is main minor,
- (3) Main minor; minor irrigation schemes in the main stream,
- (4) Tributary minor or tributary; minor irrigation scheme depending on a tributary,
- (5) D&I; domestic and industrial water supply,
- (6) Main stream; a river stretch upstream of which a source project is assumed, and
- (7) Tributary; a river stretch upstream of which no source project is assumed.

The annual water demand in the main stream of the Kedah and Muda rivers is summarized for 1982, 1990 and 2000 as shown in Table 1, based on Tables 10, 12, 15, 28 and 29 of ANNEX I. The Pinang Tungal irrigation scheme and public water supply system in the State of Pinang conjunctively utilize water in the Muda and Perai rivers. Their water demand is counted for only the portion which is supplied from the Muda river in estimating water demand in the main stream of the Muda-Perai river system.

The rate of river maintenance flow in Table 2 is a reproduction of Table 21 of ANNEX I.

Average annual water deficit by cause by affected area in Tables 3 and 4 are reproducted from Tables 60 and 62 of ANNEX I. The water deficit shown are that occuring in the main stream of the Kedah and Muda rivers on an average between 1961 and 1980.

Tables 5 to 7 are the reproduction of Tables 63 to 65 of ANNEX I, showing the net water output of the Jeniang system, Beris dam and Tawar-Muda dam broken down into the causes of water deficit. The net water output shown are an average annual volume between 1961 and 1980. The distribution of water output to causes is estimated for 3 different operation rules of the Jeniang system: In Alternative 1, the Jeniang system can take water from the Muda river only if it does not cause water deficit in the Muda-Perai river system, in Alternative 2, the Jeniang system takes water so that the proportion of water deficit to water demand is even between the Kedah river system and Muda-Perai river system, and in Alternative 3, the Jeniang system can take water unless it does not interfere 1982 water demand in the Muda-Perai river system.

For all the Alternatives, the following roles of the source facilities are assumed:

The Jeniang system is constructed to supply water deficit within its net water output in MADA, minor irrigation projects in the main stream and domestic and industrial water supply which are existing and to be developed in the Kedah river system up to 2000. The Beris dam is constructed to supply most water deficit caused by increase in domestic and industrial water supply demand in the Muda-Perai river system, all water deficit caused by minor irrigation development in tributaries in both the Kedah and Muda-Perai river system, and a part of remaining water deficit in MADA, minor irrigation projects and domestic and industrial water supply in the Kedah river system. The Tawar-Muda dam is constructed to supply all remaining water deficit caused by increase in domestic and industrial water demand in the Muda-Perai river system and a part of water deficit in the MADA area, minor irrigation projects in the Kedah river system.

#### 3. ECONOMIC BENEFITS AND COSTS

- 3.1 Economic Benefit
- (1) Irrigation benefit
  - (a) Crop yield

According to the paddy statistics, the paddy yield in 1981/82 was 4.0 ton/ha for the main season cropping and 4.2 ton/ha for the dry season cropping in the MADA area, 2.1 ton/ha for the rainfed cropping, 3.4 ton/ha for the main season cropping and 3.5 ton/ha for the dry season cropping in other paddy cultivation areas in the Region. Under with-project condition, crop yield is assumed to be increased as the tertiary canal system and farm road network are improved and a reasonable cropping pattern is adopted which enables the optimum application of water and fertilizer, together with the adoption of suitable rice varieties to the regional climate. It is also assumed that 4 years will be required to achieve the full crop yield.

It is assumed that the paddy yield in the MADA area will be 4.2 ton/ha for the main season cropping, 5.0 ton/ha for the off season cropping on the transplanting fields and 4.8 ton/ha for the off season cropping on the direct-seeding fields under the condition that sufficient water is available and tertiary development is provided. For the minor irrigation projects which would be developed after 1982, paddy yield is assumed to be 4.2 ton/ha for the main season cropping and 4.8 ton/ha for the off season cropping under the condition that sufficient water is available and tertiary canal density is 45 m/ha.

Where the tertiary development is not provided yet in the MADA area, the crop yield is assumed to be identical with that under without-project condition but increased cropping intensity is assumed. The existing minor irrigation projects, whose canal density is generally low, is assumed that no structural improvement will be conducted and water demand will not be increased beyond the present level. Consequently, crop yield will remain at the present level.

#### (b) Cropping intensity

The schedule of double cropping a year in the MADA area is always staggered and the period of every two crops exceeds one year. This has resulted the cancel of one off season cropping every 6 years. The off season cropping area is limited within 94% of total area. These facts are caused by insufficient water availability. The average cropping intensity of 178% at present is assumed for the MADA area under without-project condition. The cropping intensity in the existing minor irrigation projects has a wide range of 100% to 200% depending on water availability in each project. It is 108% in the Kedah river basin and 176% in the Muda river basin on an average. It is assumed that the present cropping intensity will remain the same to the future, water being used within the present water right.

Under with-project condition, cropping intensity in the whole MADA area is assumed to be 197%. For the minor irrigation projects to be developed after 1982, cropping intensity is assumed to be 150% if the projects get water from a tributary upstream of which there is neither existing nor assumed source project, and 200% if there were an existing or assumed source project upstream.

## (c) Net incremental production value

The economic farm gate price of paddy is estimated to be M\$459/ton in 1982 and M\$609/ton in 1995 at 1982 constant price level, based on the actual price in 1982 and projected price for 1995 by IBRD for the standard 15% broken Thai grade, assuming an average milling ratio of 65%. It is assumed that the farm gate price of paddy will linearly increase between the above-mentioned prices from 1982 to 1995 and it will be constant thereafter (See Table 29 of ANNEX C).

The net production value of paddy is estimated from the economic point of view, as the balance between the gross production value and production cost including family labor cost and fertilizer cost, which was estimated based on international market price (See Table 32 of ANNEX C). The net production value in 1995 onward at 1982 price level with insufficient water at present is estimated as shown in Table 8. In the same table, the paddy yield and net production value with sufficient water are also shown.

In estimating rice yield in case that water deficit is not fully avoided, it is normally assumed that the crop area is reduced in proportion to water available, as the relationship between water applied and rice yield has not been quantified. In this Study, therefore, it is assumed that the net production value in an area will be reduced in proportion to the water deficit/water demand.

The net incremental production value which is the balance between the net production values with- and without-project conditions in 2003 onward is shown in Table 9. Net production value streams with- and without-project condition were prepared for the Kedah river basin as shown in Table 10 and for the Muda-Perai river basin as shown in Table 11, based on data in ANNEX C.

## (2) Domestic and industrial water supply benefit

The benefit which accrues from supplying the deficit in domestic and industrial water use is estimated based on the least-costly alternative method.

It is assumed that the water stored in the proposed dam and its alternative is released into the river course and abstracted at the same water supply intake located downstream. It is also assumed that the associated water supply systems comprising water mains, treatment plants and distribution systems are identical for the proposed dam and its alternative. Accordingly, the benefit attributable to the water at the outlet of the proposed dam is measured as that of the least-costly alternative dam.

The least-costly alternative dam is assumed to be such a proposed dam that it is ranked next to the proposed dam.

The unit domestic and industrial water supply benefit is measured in this Study as the unit value of water to be developed by its leastcostly alternative dam to supply water deficit in domestic and industrial supply, assuming a discount rate of 8% as shown in Table 12.

(3) Hydropower benefit

The benefit of hydropower generation of the Rui dam project is counted as a sum of capacity benefit and energy benefit. The capacity value and energy value are estimated to be M\$208/kW and M\$0.145/kWh as discussed in ANNEX O.

#### (4) Adverse effect of tributary irrigation

Water use for minor irrigation schemes in a tributary causes some water deficit in irrigation and water supply in the main stream. The loss in irrigation benefit and water supply benefit due to this water deficit are the adverse effect of tributary irrigation.

The adverse effect of tributary irrigation is calculated as shown in Tables 13 and 14. The calculation procedure is herein explained according to column number in Table 13.

- (a) Net production value in MADA with-project in Table 10,
- (b) Net production value in main minor with-project in Table 10,
- (c) Percentage of water deficit caused by tributary minor and affecting on MADA and main minor in Table 3 to water demand of MADA and main minor in the Kedah river system in Table 1,
- (d) (c) x ((a) + (b))/100,

- (e) Water deficit caused by tributary minor and affecting on D&I in the Kedah river system in Table 3 multiplied by unit D&I water supply benefit for the Kedah river system based on the cost of the Beris dam in Table 12,
- (f) Net production value in main minor with-project in Table 11,
- (g) Percentage of water deficit caused by tributary minor and affecting on main minor in the Muda-Perai river system in Table 3 to water demand of main minor in the Muda-Perai river system in Table 1,
- (h) (f) x (g) / 100,
- Water deficit caused by tributary minor and affecting on D&I in the Muda-Perai river system in Table 3 multiplied by unit D&I water supply benefit for the Muda-Perai river system based on the cost of the Beris dam in Table 12,
- (j) (d) + (e) + (h) + (i).
- (5) River maintenance flow

No economic benefit is assumed for the river maintenance flow.

(6) Recreation benefit

The concept of willingness-to-pay is used for estimating the economic benefit accrued from reservoir recreation. The out-of-pocket expenses on travelling to the reservoirs is used for measuring the willingness-to-pay of each visitor to the reservoir, where only the domestic visitors living within one hour drive distance is considered as potential visitors.

The reservoir recreation benefit is estimated for the Jeniang system, Beris dam and Tawar-Muda dam, assuming the fuel cost of M0.11/km. The estimated net present value of benefit in 1982 at the discount rate of 8% is M $9.3 \times 10^6$  for the Jeniang system, M $13.9 \times 10^6$  for the Beris dam and M $13.2 \times 10^6$  for the Tawar-Muda dam.

The reservoir recreation benefit may be included in the benefit of the recommended source projects. It is, however, treated as supplementary benefit and not counted in this Study.

#### 3.2 Economic Cost

Economic investment cost of the irrigation projects, domestic and industrial water supply projects and the source development projects is assumed to be 80% of the corresponding financial investment cost, assuming that the remaining 20% was the transfer payment including tax, local contractors' profit, land rent, etc., referring to the national economic conversion factors prepared by EPU as shown in Table 15. The economic investment cost of the irrigation direct facilities is estimated at M\$7,200/ha for the tertiary development for the MADA area, M\$9,200/ha for pump/gravity schemes and M\$7,200/ha for control head offtake schemes. A cost stream of irrigation direct facilities is shown in Table 16 (for more detail, see ANNEX C).

Economic investment cost, annual cost and production foregone of the Jeniang system and the proposed and potential dams are shown in Table 17 (for more detail, see ANNEXes L, M and O). Assuming the year of commission to be 1990 for the Jeniang system, 1991 for the proposed and potential dams, cost streams of these source facilities are prepared as shown in Tables 18 and 19.

#### 4. ECONOMIC ANALYSIS OF OVERALL SOURCE DEVELOPMENT PLAN

It is assumed that water demand will grow as projected and direct facilities for irrigation and domestic and industrial water supply will be, accordingly, constructed.

If a source project is implemented the overall cost will increase by the cost of the source project and the overall benefit will also increase by the benefit corresponding to the water deficit which is reduced by the source project. The implementation of the source project is economically justified, if the incremental benefit is greater than the incremental cost, or incremental net benefit is positive. Additional source project is also justified if its incremental net benefit is positive. In this way, the overall source development plan is economically optimized by including all the source projects which show positive incremental net benefit.

In the optimization process, the priority of the proposed dams is assumed in the reverse order of investment cost/net water output as shown in Table 20.

A detailed breakdown of present values of benefit and cost assuming variable discount rate in High and Low Growth Case with the operation of Jeniang system of Alternatives 1, 2 and 3 is shown in Tables 21 to 26 for the plans involving the following source projects;

> Jeniang, Jeniang + Beris, Jeniang + Beris + Tawar-Muda, and Jeniang + Beris + Tawar-Muda + Sari.

The backgrounds of the above-mentioned tables are compiled in Tables 27 to 44. The calculation procedure is described for Tables 27 to 29:

- (a) Total supply with Jeniang is total demand in Table 1 deducted by caused deficit in Table 3 and added by net water output of Jeniang in Table 5. Regarding MADA and main minor in the Kedah river system, percentage of total supply with Jeniang to water demand in Table 1 is calculated.
- (b) Percentage of Beris net water output for MADA + Main Minor + Tributary minor in the Kedah river system in Table 5 less D&I deficit caused by tributary minor in the Kedah river system in Table 3 to MADA + main minor water demand in the Kedah river system in Table 1.
- (c) Percentage of Tawar-Muda output for MADA + main minor in the Kedah river system in Table 5 to MADA + main minor water demand in the Kedah river system in Table 1.

- (d) Percentage of Sari output for MADA + minor to MADA + main minor water demand in the Kedah river system in Table 1.
- (e) Increase in incremental net production value by Jeniang; Net production value in MADA with-project in Table 10 multiplied by (a) less the same value for 1983.
- (f) (1) Similar to (e)
- (m) Percentage of Beris output for main minor and tributary minor in the Muda-Perai river system in Table 5 less D&I deficit caused by Tributary minor in the Muda-Perai river system in Table 3 to main minor water demand in the Muda-Perai river system in Table 1.
- (n) Percentage of Tawar-Muda output for main minor in the Muda-Perai river system in Table 5 to main minor water demand in the Muda-Perai river system in Table 1.
- Net production value in main minor in Table 11 multiplied by (m).
- (p) Net production value in main minor in Table 11 multiplied by (n).
- (q) Jeniang output for D&I in the Kedah river system in Table 5 multiplied by unit water cost of Beris water for Kedah system in Table 12.
- (r) Beris output for D&I in the Kedah system in Table 5 multiplied by unit water cost of Tawar-Muda for Kedah system in Table 12 plus D&I deficit caused by tributary minor in the Kedah river system multiplied by unit water value of Beris for Kedah system in Table 12.
- (s) Tawar-Muda output for D&I in Table 5 multiplied by unit water cost of Sari for the Kedah system in Table 12.
- (t) Sari output for D&I multiplied by unit water cost of Badak-Temin for the Kedah system.
- (u) Beris output for D&I in the Muda-Perai river system in Table 5 multiplied by unit water cost of Tawar-Muda for the Muda-Perai system in Table 12 plus D&I water deficit caused by tributary minor in the Muda-Perai river system in Table 3 multiplied by unit water cost of Beris for the Muda-Perai river system.
- (v) Tawar-Muda output for D&I in the Muda-Perai system in Table 5 multiplied by unit water cost of Sari for the Muda-Perai system in Table 12.

The same calculation assuming that the Reman dam and Merbok storage can be implemented among the potential dams is shown in Tables 45 to 52.

#### 5. ECONOMIC ANALYSIS OF INDIVIDUAL SOURCE PROJECTS

Estimated values of EIRR of the Jeniang system, proposed source projects and potential ones are summarized in Table 53. The supporting figures are compiled in Table 54 to 76.

Table 54, compiled from Tables 10, 11 and 16, shows the net irrigation benefit as the net production value less irrigation direct facilities cost.

The calculation procedure for Table 55 is described hereunder:

- (a), (b) from Table 5
- (c) Percentage of (a) to total Kedah river deficit caused by MADA in Table 3.
- (d) Percentage of (b) to total Kedah river deficit caused by main minor.
- (e) MADA main net irrigation benefit in Table 54 multiplied by (c).
- (f) MADA minor net irrigation benefit multiplied by (d).
- (g) D&I deficit in the Kedah system in Table 5 multiplied by unit water cost of the Beris dam for the Kedah system in Table 12.
- (h) (e) + (f) + (g)
- (i) from Table 18.

The calculation procedure for Table 57 is as follows:

- (a), (b) from Table 5
- (C) Percentage of (a) to total Kedah river deficit caused by MADA in Table 3.
- (d) Percentage of (b) to total Kedah river deficit caused by main minor.
- (e) MADA main net irrigation benefit in Table 54 multiplied by (c).
- (f) MADA minor net irrigation benefit multiplied by (d)
- (g) Tributary minor net irrigation benefit in the Kedah system in Table 54.
- (h) D&I deficit in the Kedah system in Table 5 multiplied by unit water cost of the Tawar-Muda dam for the Kedah system in Table 12.

- Water deficit in main minor in the Muda-Perai system in Table 5 plus main minor deficit caused by tributary minor in the Muda-Perai system in Table 3.
- (j) Percentage of (i) to water demand for main minor in the Muda-Perai system in Table 1.
- (k) Net production value of main minor with project in Table 11 multiplied by (j).
- D&I deficit in the Muda-Perai system in Table 5 multiplied by unit water cost of the Tawar-Muda dam for the Muda-Perai system in Table 12 plus D&I deficit caused by tributary minor in the Muda-Perai system in Table 3.
- (m) (e) + (f) + (g) + (h) + (k) + (1)
- (n) from Table 18.

Source development in the main stream for the purpose of tributary irrigation is to eliminate water deficit caused by the tributary irrigation and adversely affects on the water uses in the main stream. The benefit of above-mentioned source development may be either the net irrigation benefit in tributary minor in Table 54 or the adverse effect in Tables 13 and 14. Herein the small between the 2 is regarded as the benefit; the net irrigation benefit in Table 54 for the Kedah river system and adverse effect in Table 13 or 14 for the Muda river system.

#### 6. FINANCIAL ANALYSIS

#### 6.1 Fund Requirement and Cost Allocation

Financial investment cost disbursements are estimated for the recommended demand and supply balance plans in High Growth Case and Low Growth Case as shown in Table 77. The Financial analysis of development plans is carried out for the recommended plan including the Jeniang, Beris and Tawar-Muda dams as new source facilities. It is assumed that the distribution of remaining deficit follows Alternative 1, the Muda priority case. A schedule of O&M cost is shown in Table 78. The direct facilities costs including the public investment costs for the abovementioned source facilities, on-going tertiary development in the MADA area, minor irrigation schemes development, rehabilitation of existing minor irrigation schemes, PWD/PWA and RESP public water supply system development, and private investment costs for water supply system by private enterprises and the recommended source projects costs are the cost components. It is noted that the costs of the committed projects except the Jeniang system are not incorporated in Tables 77 and 78. The estimated investment cost for the plan totals M\$6.1 x  $10^9$  in High Growth Case and M\$3.4 x 10<sup>9</sup> in Low Growth Case in terms of 1982 constant price. The investment cost of the recommended source development projects is estimated at M\$73.9 x  $10^6$  for the Jeniang system, M\$72.6 x  $10^6$  for the Beris dam and M\$111.3 x 10<sup>6</sup> for the Tawar-Muda dam.

The costs of the source projects are allocated to the water users based on the deficit to be met by the net water outputs of the projects caused by the water users. The separable costs-remaining benefits method based on the present value of the investment and O&M costs in 1982 at the discount rate of 8% is adopted as a cost allocation rule in order to indicate the share of each purpose in the total cost. The allocations of the joint cost of the Beris and Tawar-Muda dams are shown in Tables 79 and 80 for High Growth Case and Tables 81 and 82 for Low Growth Case. For the Jeniang system, unit of use method which allocates the cost according to the use of net water output is used because separable cost of the Jeniang system is not realistic. The allocation of the joint cost of the Jeniang system is shown in Table 83 for High Growth Case and Table 84 for Low Growth Case. The estimated cost allocation of the investment and O&M costs of the source projects by State/MADA by purpose by MP is shown in Tables 85 and 86 for High Growth Case and Tables 87 and 88 for Low Growth Case. The total fund requirement of public and private investment and O&M costs for the water demand and supply balance plan by State/MADA by purpose by MP including the allocated source development costs is shown in Tables 89 to 92 for High Growth Case and Tables 93 to 96 for Low Growth Case, in which the construction costs of on-going projects are also included.

The separable costs-remaining benefits method is adopted as allocation rule in this Study because it complies with the following principles which should be met whichever allocation method be adopted:

- (1) The allocated cost should not exceed the total net benefit of the purpose.
- (2) The allocated cost should at least cover the sum of the exclusive cost and separable cost of the purpose, where separable cost is defined as the expenditure that could be avoided if the purpose was excluded from the project.

It is noted, however, the adopted method is by no means a perfect resolution for cost allocation and used only as a tentative allocation vehicle. The cost allocation rule should finally be set up so that all the conflicting interests among the parties concerned should successfully be resolved.

For the States of Perlis and Kedah, the total public development expenditure is estimated at M\$1,313 x  $10^6$  comprising M\$223 x  $10^6$  for irrigation, M\$1,084 x  $10^6$  for public water supply and M\$6 x  $10^6$  for river maintenance flow in High Growth Case. The allocated investment cost of the Jeniang system, Beris dam and Tawar-Muda dam is M\$90 x  $10^6$ , or 7% of the total public development expenditure. The private expenditure for water supply system is estimated at M\$1,316 x  $10^6$ . For Low Growth Case, the public development expenditure is estimated at M\$713 x  $10^6$  including M\$226 x  $10^6$  for irrigation and M\$551 x  $10^6$  for public water supply. The allocated cost of the 3 source projects is M\$66 x  $10^6$  or 5% of total expenditure. Private investment cost is estimated at M\$264 x  $10^6$ .

For the State of Pulau Pinang, the public development expenditure in High Growth Case is estimated at  $M\$1,571 \times 10^6$  including  $M\$1 \times 10^6$ for irrigation and  $M\$1,570 \times 10^6$  for public water supply. The allocated cost of the Beris and Tawar-Muda dams is  $M\$58 \times 10^6$  or 4% of the total expenditure. The private expenditure is estimated at  $M\$1,182 \times 10^6$ . For Low Growth Case, the total public development expenditure is estimated at  $M\$934 \times 10^6$  consisting of  $M\$1 \times 10^6$  for irrigation and  $M\$933 \times 10^6$  for public water supply. The allocated cost of the two dams is  $M\$12 \times 10^6$  or 7% of the total expenditure. The private expenditure is estimated at  $M\$642 \times 10^6$ .

The public development expenditure for MADA is estimated at  $M\$952 \times 10^6$ , consisting of  $M\$838 \times 10^6$  of tertiary development cost and  $M\$115 \times 10^6$ , or 12% of allocated cost of the Jeniang system, Beris dam and Tawar-Muda dam in High Growth Case and it is  $M\$1,022 \times 10^6$  in Low Growth Case. The tertiary development cost is equal to that in the High Growth Case but the allocated cost of the 3 source projects was  $M\$185 \times 10^6$ , or 15% of the total expenditure.

The percentage distribution of allocated cost of the Beris dam is 22.7% for MADA, 39.7% for minor irrigation, 2.1% for domestic and industrial water supply in the Kedah river system, 15.8% for minor irrigation and 19.0% for domestic and industrial water supply in the Muda-Perai river system and 0.7% for the river maintenance flow in the Kedah river system in High Growth Case. It is 41.1% for MADA, 43.5% for minor irrigation, 0.0% for domestic and industrial water supply in the Kedah river system and 11.3% for minor irrigation and 4.1% for domestic and industrial water supply in the Muda-Perai river system in Low Growth Case.

The same ratio of the Tawar-Muda dam is 38.7% for MADA, 4.6% for minor irrigation, 4.8% for domestic and industrial water supply in the Kedah river system, 1.8% for minor irrigation and 48.9% for domestic and industrial water supply in the Muda-Perai river system and 1.2% for the river maintenance flow in the Kedah river system in High Growth Case, and 80.4% for MADA, 8.3% for minor irrigation, 0.4% for domestic and industrial water supply in the Kedah river system and 1.4% for minor irrigation, 9.5% for domestic and industrial water supply in the Muda-Perai river system.

Major portion of the cost of the Jeniang system is allocated to MADA, accounting for 72.6% in High Growth Case and 83.8% in Low Growth Case. The rest are allocated to the water users in the States of Perlis and Kedah in both cases. None is allocated to the State of Pulau Pinang.

#### 6.2 Unit Water Cost

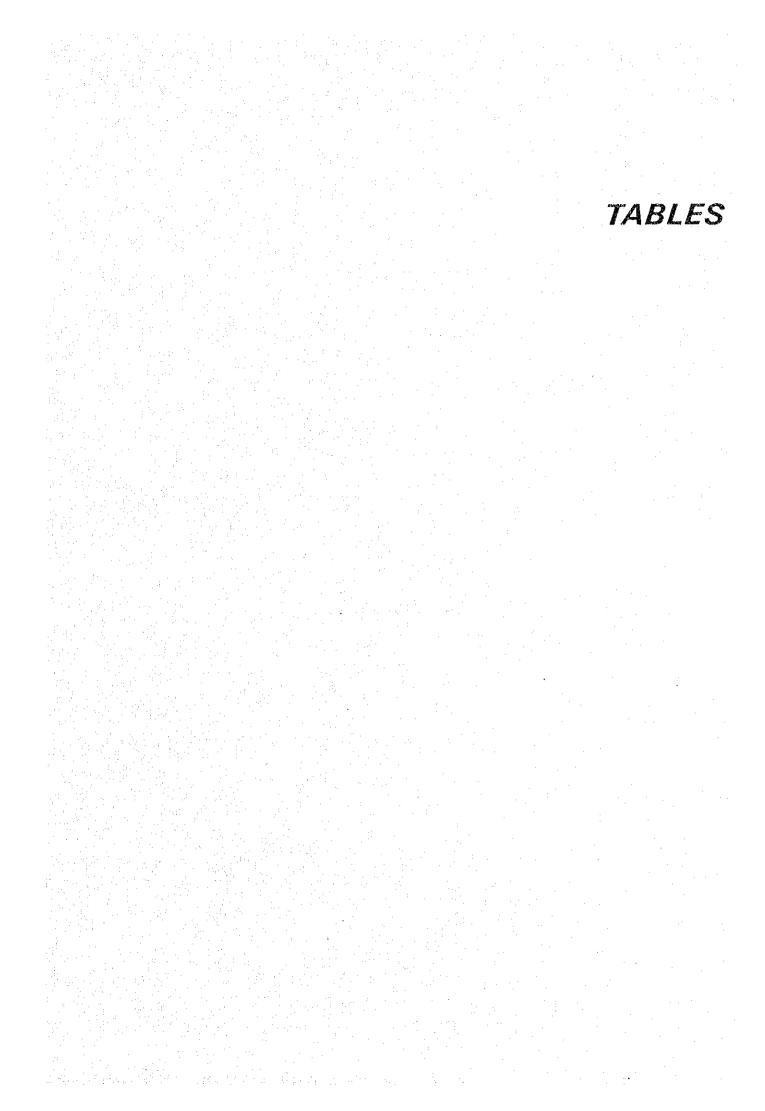
Assuming that the appropriate portion of the source development projects should be borne by the private sector as described in the previous section, the unit cost of water including the costs of direct facilities and source facilities to be borne by the consumers is estimated at M $0.58/m^3$  or 0.70% of household expenditure (0.35% of per capita GRP) for domestic use and M $1.16/m^3$  or 0.9% of gross output value of manufacturing industries for industrial use on the condition that commercial water rate is set twice as high as household water rate. It seems within the limit of the capacity to pay of the consumers.

The water rate applied by PWA was revised in 1981 and 1983 in recent years. It is  $M\$0.30/m^3$  for domestic use and  $M\$0.40/m^3$  for commercial use, according to the tariff applicable in 1983. These rates may be considered as indicative of the present cost of water, because the account of PWA usually shows a reasonable surplus. With new facilities increasingly coming in, the cost of water will increase and will reach the above-mentioned cost in the future. It seems possible for PWA to continue its sound account toward future. The rate of public water supply of  $M\$0.22/m^3$  for domestic use and  $M\$0.44/m^3$  for commercial use has remained unchanged for years in the States of Perlis and Kedah. The water supply account is in deficit in these States. The management and development of water supply system to meet increasing demand cannot be undertaken, unless a sound account is established. It is recommended to include provisions for accounting and auditing procedure in the Water Supply Fund Enactment of these States.

The cost of source facilities for domestic and industrial water supply owned by private enterprise was estimated to be  $M$0.05 - 0.08/m^3$ . The rate of raw water supply for private water supply system which should be borne by private sector should be established to cover this cost.

The investment cost of irrigation development is at present totally made up by federal grant with little exceptions. O&M cost of the proposed irrigation facilities is estimated to be M\$218/ha for the MADA area and M\$170/ha for minor irrigation projects but the present irrigation rate remains in the range of M\$20 - 25/ha in the MADA area and M\$7 - 15/ha in minor irrigation projects.

Although it may not be realistic to make farmers bear the investment cost, it is considered practicable and recommended that the irrigation water rate should gradually be raised so that it should meet the O&M cost of irrigation facilities, taking into account the increase in farmers' income owing to the implementation of the projects.



# Table 1ANNUAL WATER DEMAND IN THE<br/>MAIN STREAM

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		Unit: 106 m <sup>3</sup>
	Low Growth Case	High Growth Case
1982		
Kedah System		
MADA	1,621.1	1,621.1
Main minor	6.1	. 6.1
D&I	28.8	28.8
Total	1,656.0	1,656.0
Muda-Perai System		
Main minor	265.4	265.4
<u>D&amp;I</u>	38.1	38.1
Total	303.5	303.5
1990		
Kedah System		
MADA	1,543.0	1,543.0
Main minor	61.4	61.4
D&I	47.4	62.1
Total	1,651.8	1,666.5
Muda-Perai System		
Main minor	280.9	280.9
D&I	53.7	90.5
Total	334.6	371.4
2000		
Kedah System		
MADA	1,484.7	1,484.7
Main minor	84.9	84.9
D&I	69.3	158.1
Total	1,638.9	1,627.7
Muda-Perai System		
Main minor	282.9	282,9
D&I	142.2	297.5
Total	425.1	580.4

Source; Tables 10, 12, 15, 28 and 29 of ANNEX I

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# Table 2

RIVER MAINTENANCE FLOW

			U	nit: m <sup>3</sup> /s
	19	90	200	0
River System	High Growth	Low Growth	High Growth	Low Growth
Perlis	0.5		1.5	-
Kedah	2.2	2.0	6.1	2.3
Muda	0	0	0	0
Merbok	0	0	• 0	0
Perai	0	0	0	0
Juru	0	0	0	0

#### Table 3

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## AVERAGE ANNUAL WATER DEFICIT BY CAUSE BY AFFECTED AREA IN HIGH GROWTH CASE

Unit:  $10^6 \text{ m}^3$ 

· · ·		Af	fected	Area by	Water De	eficit	
	Кес	lah Rive					er System
Cause of		Main			Main		
Water Deficit	MADA	Minor	D&I	Total	Minor	D&I	Total
1982			-				
Kedah System							
MADA	271			271			
Main minor		1		1			
Tributary minor	5.9		0.1	6			
D&I			5	5			
Total	276.9	1	5.1	283			
luda-Perai System	•						
Main minor					3		3
Tributary minor					0.8	0.2	1
D&I						1	1
Total				•	3.8	1.2	5
990							
edah System							
MADA	280.0	11.0	11.0	302			
Main minor	31.5	1.2	1.3	34			
Tributary minor	10.2	0.4	0.4	11			
D&I				0			
Total ,	321.7	12.6	12.7	347		¢.	
luda-Perai System				: 1			
Main minor		۰.		. ,	2.3	0.7	3
Tributary minor				4	4.5	0.5	5
D&I						0	0
Total				•	6.8	1.2	8
000							
edah System							
MADA	231.8	13.3	24.9	270			
Main minor	43.8	2.5	4.7	51			
Tributary minor	30.0	1.8	3.2	35			
D&I	26.6	1.5	2.9	31		't 	
Total	332.2	19.1	35.7	387			
uda-Perai System							
Main minor					1.5	1.5	3
Tributary minor					5.0	5.0	10
D&I					13.0	0	13
Total					19.5	6.5	26

Remarks; Supply by Ahning and Mengkuang dams is counted in D&I deficit in 1990 and 2000.

# Table 4AVERAGE ANNUAL WATER DEFICIT BY CAUSEBY AFFECTED AREA IN LOW GROWTH CASE

$\begin{array}{c c c c c c c c c c c c c c c c c c c $			-				Unit	: 10 <sup>6</sup> m <sup>3</sup>
Kedah River System         Muda-Perai River System           Water Deficit         MADA         Minor         D&I         Total         Muin         Main           1982         Kedah System         MADA         271         271         Minor         D&I         Total         Total           MADA         271         271         1         1         Total         Total         7041           MADA         270         5         5         5         5         5         5         5         5         5         5         5         5         5         7         7041         276.9         1         5.1         283         8         0.2         1			Af	fected	l Area b	y Water De	ficit	
Water Deficit         MADA         Minor         D&I         Total         Minor         D&I         Total           1982         Kedah System         271         271         1         1           MADA         271         271         1         1         1           Main minor         1         1         1         1         1           Total         276.9         1         5.1         283		Kee						er System
1982         Kedah System       271       271         MADA       271       1         Tributary minor       5.9       0.1       6         D&I       5       5         Total       276.9       1       5.1       283         Muda-Perai System       3       3       3         Main minor       3       3       3         Tributary minor       0.8       0.2       1         DeI       1       1       1         Total       276.9       1       5.1       283         Muda-Perai System       3       3       3       3         MADA       282.0       11.2       8.8       302       30         MADA       282.0       11.2       8.8       302       30         MADA       282.0       11.2       8.8       302       30         Main minor       25.2       1.0       0.8       27       7         Tributary minor       10.3       0.4       0.3       11       0         DeI       0       0.8       3.0       0       3         Total       317.5       12.6       9.9	Cause of		Main			Main		
Kedah System         271         271           MADA         271         1           Main minor         1         1           Tributary minor         5.9         0.1         6           D&I         5         5	Water Deficit	MADA	Minor	D&I	Total	Minor	D&I	Total
MADA       271       271         Main minor       1       1         Tributary minor       5.9       0.1       6         D&I       276.9       1       5.1       283         Muda-Perai System       3       3       3         Main minor       3       3       3         Total       276.9       1       5.1       283         Muda-Perai System       3       3       3         Main minor       3       3       3         Tributary minor       0.8       0.2       1         D&I       1       1       1         Total       3.8       1.2       5         1990       Kedah System       3.8       1.2       5         MADA       282.0       11.2       8.8       302       1         Main minor       25.2       1.0       0.8       27       1         Tributary minor       10.3       0.4       0.3       11       1         D&I       0       3.0       0       3       3       3         Tributary minor       3.0       0       3       3.0       0       3         D	1982							
MADA       271       271         Main minor       1       1         Tributary minor       5.9       0.1       6         D&I       276.9       1       5.1       283         Muda-Perai System       3       3       3         Main minor       3       3       3         Tributary minor       0.8       0.2       1         D&I       1       1       1         Total       276.9       1       5.1       283         Muda-Perai System       3       3       3         MADA       282.0       11.2       8.8       302         Main minor       25.2       1.0       0.8       27         Tributary minor       10.3       0.4       0.3       11         D&I       0       -       -       -         Total       317.5       12.6       9.9       340         Muda-Perai System       3.0       0       3       3         Main minor       3.0       0       3       0         Total       317.5       12.6       9.9       340         Muda-Perai System       MADA       244.3       14.0 <td>Kedah System</td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td>	Kedah System							
Tributary minor       5.9       0.1       6         DSI       5       5         Total       276.9       1       5.1       283         Muda-Perai System       3       3       3         Main minor       3       3       3         Tributary minor       0.8       0.2       1         D&I       1       1       1         Total       3.8       1.2       5         1990       Kedah System       302       3       1         MADA       282.0       11.2       8.8       302       3         Main minor       25.2       1.0       0.8       27       7         Tributary minor       10.3       0.4       0.3       11       5         DSI       0       0.8       27       7       7         Total       317.5       12.6       9.9       340       7         Muda-Perai System       3.0       0       3       3         Main minor       3.0       0       3       0         Total       6.0       0       6       2000         Kedah System       MADA       244.3       14.0       <	_	271			271			
$\begin{array}{c c c c c c c c c c c c c c c c c c c $	Main minor		1		1			
$\begin{array}{c ccccccccccccccccccccccccccccccccccc$	Tributary minor	5.9		0.1	6			
Muda-Perai System       3       3         Main minor       3       3         Tributary minor       0.8       0.2       1         D&I       1       1         Total       3.8       1.2       5         1990       3.8       1.2       5         Kedah System       MADA       282.0       11.2       8.8       302         Main minor       25.2       1.0       0.8       27       7         Tributary minor       10.3       0.4       0.3       11       1         DEI       0       0       6       0       6         Muda-Perai System       317.5       12.6       9.9       340       33         Muda-Perai System       317.5       12.6       9.9       340       30       3         Muda-Perai System       3.0       0       3       3       3       3         Total       317.5       12.6       9.9       340       3.0       0       3         Main minor       6.0       0       6       0       6       2000       6.0       0       6         Kedah System       MADA       244.3       14.0       <	-			5	· 5			
Main minor       3       3         Tributary minor       0.8       0.2       1         D&I       1       1       1         Total       3.8       1.2       5         1990       Kedah System       3       3         MADA       282.0       11.2       8.8       302         Main minor       25.2       1.0       0.8       27         Tributary minor       10.3       0.4       0.3       11         D&I       0       0       0       1         Total       317.5       12.6       9.9       340         Muda-Perai System       3       3       3         Main minor       3.0       0       3       3         Total       317.5       12.6       9.9       340         Muda-Perai System       3.0       0       3       3         Total       317.7       12.6       9.9       340         MADA       244.3       14.0       11.7       270         Main minor       46.2       2.6       2.2       51         Tributary minor       31.7       1.8       1.5       35         D&I	Total	276.9	1	5.1	283			
Main minor       3       3         Tributary minor       0.8       0.2       1         D&I       1       1       1         Total       3.8       1.2       5         1990       Kedah System       3       3         MADA       282.0       11.2       8.8       302         Main minor       25.2       1.0       0.8       27         Tributary minor       10.3       0.4       0.3       11         D&I       0       0       3       3         Total       317.5       12.6       9.9       340         Muda-Perai System       3       3       3         Main minor       3       3       3         Total       317.5       12.6       9.9       340         Muda-Perai System       0       0       6         Z000       Kedah System       0       6.0       0         MADA       244.3       14.0       11.7       270         Main minor       46.2       2.6       2.2       51         Tributary minor       31.7       1.8       1.5       35         D&I       0.8       0.1	Muda-Perai System							
$\begin{array}{c c c c c c c c c c c c c c c c c c c $						3		3
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$\begin{array}{c ccccccccccccccccccccccccccccccccccc$	_						1	1
Kedah System         MADA       282.0       11.2       8.8       302         Main minor       25.2       1.0       0.8       27         Tributary minor       10.3       0:4       0.3       11         D&I       0       0       3       11         D&I       0       3       11       0         Total       317.5       12.6       9.9       340         Muda-Perai System       3       3       3         Main minor       3       3       3         Tributary minor       3.0       0       3         D&I       0       0       6.0       0       6         2000       Kedah System       6.0       0       6       2000         Kedah System       0       11.7       270       46.0       0       6         2000       Kedah System       13.7       1.8       1.5       35       26I       0.1       0.1       1         Total       323.0       18.5       15.5       357       20       1.0       3         Muda-Perai System       2.0       1.0       3       3       3       3	Total ·					3.8	1.2	5
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$\begin{array}{c ccccccccccccccccccccccccccccccccccc$	Kedah System							
Main minor       25.2       1.0       0.8       27         Tributary minor       10.3       0.4       0.3       11         D&I       0       0       3       11         Total       317.5       12.6       9.9       340         Muda-Perai System       3       3       3         Main minor       3       3       0       3         Tributary minor       3.0       0       3       3         DEI       0       6.0       0       6         Z000       Kedah System       6.0       0       6         MADA       244.3       14.0       11.7       270         Main minor       46.2       2.6       2.2       51         Tributary minor       31.7       1.8       1.5       35         D&I       0.8       0.1       0.1       1         Total       323.0       18.5       15.5       357         Muda-Perai System       2.0       1.0       3       3         Main minor       2.0       1.0       3       3         Tributary minor       2.0       0.0       2         D&I       2.0		282 0	11.2	8.8	302			
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Total       317.5       12.6       9.9       340         Muda-Perai System       3       3       3         Main minor       3       3       3         Tributary minor       3.0       0       3         D&I       0       0       6         Total       6.0       0       6         2000       Kedah System       6.0       0         MADA       244.3       14.0       11.7       270         Main minor       46.2       2.6       2.2       51         Tributary minor       31.7       1.8       1.5       35         D&I       0.8       0.1       0.1       1         Total       323.0       18.5       15.5       357         Muda-Perai System       2.0       1.0       3         Main minor       2.0       1.0       3         Tributary minor       4.6       2.4       7         D&I       2.0       0       2		10.00	•••	•••				
Main minor       3       3         Tributary minor $3.0$ $0$ D&I $0$ Total $6.0$ $0$ MADA $244.3$ $14.0$ $11.7$ $270$ Main minor $46.2$ $2.6$ $2.2$ $51$ Tributary minor $31.7$ $1.8$ $1.5$ $35$ D&I $0.8$ $0.1$ $0.1$ $1$ Total $323.0$ $18.5$ $15.5$ $357$ Muda-Perai       System $2.0$ $1.0$ $3$ Main minor $2.0$ $1.0$ $3$ Tributary minor $4.6$ $2.4$ $7$ D&I $0.0$ $2.0$ $0.0$ $2$		317.5	12.6	.9.9	340			
Main minor       3       3         Tributary minor $3.0$ $0$ D&I $0$ Total $6.0$ $0$ MADA $244.3$ $14.0$ $11.7$ $270$ Main minor $46.2$ $2.6$ $2.2$ $51$ Tributary minor $31.7$ $1.8$ $1.5$ $35$ D&I $0.8$ $0.1$ $0.1$ $1$ Total $323.0$ $18.5$ $15.5$ $357$ Muda-Perai       System $2.0$ $1.0$ $3$ Main minor $2.0$ $1.0$ $3$ Tributary minor $4.6$ $2.4$ $7$ D&I $0.0$ $2.0$ $0.0$ $2$	Muda-Perai System							
Tributary minor $3.0$ $0$ $3$ D&I $0$ $0$ Total $6.0$ $0$ $6$ 2000       Kedah System $6.0$ $0$ $6$ MADA       244.3 $14.0$ $11.7$ $270$ $70$ Main minor $46.2$ $2.6$ $2.2$ $51$ $71$ Tributary minor $31.7$ $1.8$ $1.5$ $35$ $55$ D&I $0.8$ $0.1$ $0.1$ $1$ $7$ Total $323.0$ $18.5$ $15.5$ $357$ Muda-Perai System $2.0$ $1.0$ $3$ Main minor $2.0$ $1.0$ $3$ Tributary minor $4.6$ $2.4$ $7$ D&I $2.0$ $0$ $2$	_					3		з
$\begin{array}{c ccccccccccccccccccccccccccccccccccc$							0	
Total $6.0$ $0$ $6$ 2000Kedah SystemMADA $244.3$ $14.0$ $11.7$ $270$ Main minor $46.2$ $2.6$ $2.2$ $51$ Tributary minor $31.7$ $1.8$ $1.5$ $35$ $D&I$ $0.8$ $0.1$ $0.1$ $1$ Total $323.0$ $18.5$ $15.5$ $357$ Muda-Perai System $2.0$ $1.0$ $3$ Main minor $2.0$ $1.0$ $3$ Tributary minor $4.6$ $2.4$ $7$ $D&I$ $2.0$ $0$ $2$	—					5.0		5
Kedah System         MADA       244.3       14.0       11.7       270         Main minor       46.2       2.6       2.2       51         Tributary minor       31.7       1.8       1.5       35         D&I       0.8       0.1       0.1       1         Total       323.0       18.5       15.5       357         Muda-Perai       System       2.0       1.0       3         Main minor       2.0       1.0       3         Tributary minor       4.6       2.4       7         D&I       2.0       0       2	· · · · · · · · · · · · · · · · · · ·					6.0	0	6
MADA       244.3       14.0       11.7       270         Main minor       46.2       2.6       2.2       51         Tributary minor       31.7       1.8       1.5       35         D&I       0.8       0.1       0.1       1         Total       323.0       18.5       15.5       357         Muda-Perai System       2.0       1.0       3         Tributary minor       4.6       2.4       7         D&I       2.0       0       2	2000							
MADA       244.3       14.0       11.7       270         Main minor       46.2       2.6       2.2       51         Tributary minor       31.7       1.8       1.5       35         D&I       0.8       0.1       0.1       1         Total       323.0       18.5       15.5       357         Muda-Perai System       2.0       1.0       3         Tributary minor       4.6       2.4       7         D&I       2.0       0       2	Kedah System							
Main minor       46.2       2.6       2.2       51         Tributary minor $31.7$ $1.8$ $1.5$ $35$ D&I       0.8       0.1       0.1       1         Total $323.0$ $18.5$ $15.5$ $357$ Muda-Perai System       2.0 $1.0$ $3$ Tributary minor $4.6$ $2.4$ $7$ D&I $2.0$ $0$ $2$		244.3	14.0	11.7	270			
Tributary minor $31.7$ $1.8$ $1.5$ $35$ D&I $0.8$ $0.1$ $0.1$ $1$ Total $323.0$ $18.5$ $15.5$ $357$ Muda-Perai System $2.0$ $1.0$ $3$ Main minor $2.0$ $1.0$ $3$ Tributary minor $4.6$ $2.4$ $7$ D&I $2.0$ $0$ $2$								
D&I         0.8         0.1         0.1         1           Total         323.0         18.5         15.5         357           Muda-Perai System         2.0         1.0         3           Main minor         2.0         1.0         3           Tributary minor         4.6         2.4         7           D&I         2.0         0         2								
Total     323.0     18.5     15.5     357       Muda-Perai System     2.0     1.0     3       Main minor     2.0     1.0     3       Tributary minor     4.6     2.4     7       D&I     2.0     0     2								
Muda-Perai System       2.0       1.0       3         Main minor       2.0       1.0       3         Tributary minor       4.6       2.4       7         D&I       2.0       0       2						- <del>1</del>		<u> </u>
Main minor       2.0       1.0       3         Tributary minor       4.6       2.4       7         D&I       2.0       0       2								
Tributary minor       4.6       2.4       7         D&I       2.0       0       2						2.0	1.0	3
D&I 2.0 0 2								
	-							
				**************************************			3.4	

Remarks;

Supply by Ahning and Mengkuang dams is counted in D&I deficit in 1990 and 2000.

# Table 5NET WATER OUTPUT OF SOURCE FACILITIESBY CAUSE OF WATER DEFICIT<br/>(ALTERNATIVE 1, MUDA PRIORITY) (1/3)

					Unit:	10 <sup>6</sup> m <sup>3</sup>
	Low Growth Case			High Growth Case		
	Jeniang		Tawar-	Jeniang		Tawar-
	& Naok	Beris	Muda	& Naok	Beris	Muda
1990						
Kedah System						
MADA	197.4	40.4	28,5	193.2	38,6	27.0
Main minor	17.6	3.6	2.5	21.8	4.4	3.0
Tributary minor	0	11.0	0	0	11.0	0
D&I	0	0	0	0	0	0
Sub-total	215.0	55.0	31.0	215.0	54.0	30.0
Muda-Perai System						
Main minor		1.0	2.0		0	3.0
Tributary minor		3.0	0		5.0	0
D&I		0	0		0	0
Sub-total		4.0	2.0		5.0	3.0
Total	215.0	59.0	33.0	215.0	59.0	33.0
2000						
Kedah System						
MADA	180.2	12.6	25.1	156.0	6.5	16.0
Main minor	34.1	2.4	4.8	29.5	1.2	3.0
Tributary minor	0	35.0	0	0	35.0	0
D&I	0.7	0.0	0.1	17.9	0.8	1.8
Maintenance flow	0	0	0	11.6	0.5	1.2
Sub-total	215.0	50.0	30.0	215.0	44.0	22.0
Muda-Perai System						
Main minor		0	3.0		0.9	2.1
Tributary minor		9.0	0		10.0	0
D&I		0	0		4.1	8.9
Sub-total		9.0	3.0		15.0	11.0
Total	215.0	59.0	33.0	215.0	59.0	33.0

# Table 6NET WATER OUTPUT OF SOURCE FACILITIESBY CAUSE OF WATER DEFICIT(ALTERNATIVE 2, EVEN DISTRIBUTION) (2/3)

10<sup>6</sup> m<sup>3</sup> Unit: High Growth Case Low Growth Case Tawar-Jeniang Jeniang Tawar-Muda & Naok Muda & Naok Beris Beris 1990 Kedah System 38.6 28.5 29.4 193.2 MADA 197.4 40.4 2.5 4.4 21.8 Main minor 17.6 3.6 2,6 11.0 0 0 11.0 0 0 Tributary minor 0 0 0 0 0 D&I 0 215.0 54.0 31.0 215.0 55.0 32.0 Sub-total Muda-Perai System 0 2.0 1.0 1.0 Main minor 0 5.0 0 Tributary minor 3.0 0 0 0.0 0 D&I 2.0 4.0 1.0 5.0 Sub-total 59.0 33.0 215.0 59.0 33.0 Total 215.0 2000 Kedah System 9.4 17.4 MADA 180.3 14.2 26.0 156.0 1.8 Main minor 34.1 2.7 4.9 29.5 3.3. 0 35.0 0 0 35.0 0 Tributary minor 0.7 0.1 17.9 1.1 2.0 0.1 D&I Ò 0.7 1.3 Maintenance flow 0 0 11.6 Sub-total 215.1 52.0 31.0 215.0 48.0 24.0 Muda-Perai System 2.0 0.2 1.7 Main minor 0 7.0 0 10.0 0 Tributary minor D&I 0 0 0.8 7.3 11.0 9.0 Sub-total 7.0 2.0 Total 215.1 59.0 33.0 215.0 59.0 33.0

#### NET WATER OUTPUT OF SOURCE FACILITIES BY CAUSE OF WATER DEFICIT (ALTERNATIVE 3, KEDAH PRIORITY) (3/3)

Unit:  $10^6 \text{ m}^3$ High Growth Case Low Growth Case Jeniang Tawar-Jeniang Tawar-& Naok Muda Beris & Naok Beris Muda 1990 Kedah System 42.2 MADA 197.4 43.1 30.3 193.2 29.7 17.6 3.9 2.7 Main minor 21.8 4.8 3.3 Tributary minor 0 11.0 0 0 11.0 0 0 D&I 0 0 0 0 0 Sub-total 215.0 58.0 33.0 215.0 58.0 33.0 Muda-Perai System 0 Main minor 0 Tributary minor 1.0 1.0 0 D&I 0 Sub-total 1.0 1.0 Total 215.0 59.0 33.0 215.0 59.0 33.0 2000 Kedah System MADA 180.3 19.3 27.7 156.0 16.7 24.0 34.1 3.6 5.2 29.5 Main minor 3.2 4.5 · 0 35.0 35.0 0 Tributary minor 0 0 0.7 2.7 17.9 D&I 0.1 0.1 1.9 Maintenance flow 0 0 0 11.6 1.2 1.8 Sub-total 215.1 58.0 33.0 215.0 58.0 33.0 Muda-Perai System Main minor 0 0 Tributary minor 1.0 1.0 D&I 0 0 1.0 Sub-total 1.0 Total 215.1 59.0 33.0 215.0 59.0 33.0

## ESTIMATED PADDY YIELD AND NET PRODUCTION VALUE

			Main	Season	Of	f Season
			N	et Production	handra dan bir sanara da bada	Net Production
			Yield	Value	Yield	Value
-			(Ton/ha)	(M\$/ha)	(ton/ha)	(M\$/ha)
1.	With	Insufficient Water				
	1.1	MADA				. *
		- Without tertiary				
	÷	development	4.0	1,220	4.2	1,230
	1.2	Rainfed	2.1	440	-	-
	1.3	Existing minor irrigation	3.4	600	3.5	610
2.	With	Sufficient Water				
	1.1	MADA				
		- Transplanting area	4.7	1,900	5.0	1,980
		- Direct-seeding area	4.7	1,900	4.8	1,960
		- Without tertiary development	4.0	1,220	4.2	1,230
	1.2	Minor irrigation				
		- New projects	4.2	1,590	4.8	1,880
		- Existing since 1982	3.4	600	3.5	610

Remarks; Net production value is projected to 1995 onward in 1982 constant price.

#### TOTAL NET PRODUCTION VALUE IN 2003 ONWARD UNDER WITH AND WITHOUT PROJECT CONDITIONS

			Unit: M\$10 <sup>6</sup>
	Without Project	With Project	Increment
Kedah River System			
MADA	209.9	359.0	149.1
Main minor	1.5	11.7	10.2
Tributary minor	5.6	10.9	5,3
Muda River System			
Main minor	19.7	26.6	6.9
Tributary minor	5.4	17.5	12.1

Remarks; In 1982 constant price.

#### Table 10 FLOWS OF NET PRODUCTION VALUE WITH AND WITHOUT PROJECT CONDITION FOR THE KEDAH RIVER BASIN

Unit: M\$10<sup>6</sup>

		MADA			Main Min	or	Tri	butary M	inor
Year	W/O	W/P	1/B	W/O	W/P	I/B	W/0	W/P	I/B
1983	209.9	209,9	0	1.49	1.49	0	5,56	5.56	0.00
1984	209.9	211.9	2.0	1.49	1,49	0	5.56	6,37	0,81
1985	209.9	214.6	4.7	1.49	2.05	0.56	5.56	6.58	1.02
1986	209.9	218.7	8.8	1.49	2,96	1.47	5.56	6.80	1.24
1987	209.9	221.0	11.1	1.49	4.20	2.71	5.56	6.96	1.40
1988	209.9	223,2	13.3	1.49	4.82	3.33	5.56	7.00	1.44
1989	209.9	225.5	15.6	1.49	5.26	3.77	5.56	7.05	1.49
1990	209.9	253.6	43.7	1.49	5.56	4.07	5.56	7.10	1.54
1991	209.9	264.8	54.9	1.49	10.23	8.74	5.56	7.78	2.22
1992	209.9	277.6	67.7	1.49	10.62	9.13	5.56	8.22	2,66
1993	209.9	291.5	81.6	1.49	11.09	9.60	5.56	8.72	3,16
1994	209.9	299.2	89.3	1.49	11.40	9.91	5.56	9.22	3.66
1995	209.9	306.7	96.8	1.49	11.44	9.95	5.56	9.60	4.04
1996	209.9	314.5	104.6	1.49	11.61	10.12	5.56	9.89	4,33
1997	209.9	322.7	112,8	1.49	11.65	10.16	5.56	10.24	4,68
1998	209.9	331.1	121.2	1.49	11.70	10,21	5.56	10.36	4.80
1999	209.9	340.0	130.1	1.49	11.73	10.24	5.56	10.57	5,01
2000	209.9	349.6	139.7	1,49	11.73	10.24	5.56	10.79	5.23
2001	209.9	355.3	145.4	1.49	11.73	10.24	5,56	10.87	5.31
2002	209.9	357.6	147.7	1.49	11.73	10.24	5.56	10.92	5,36
2003	209,9	359.0	149.1	1,49	11.73	10.24	5.56	10.94	5.38

Remarks;

(1): W/O: Without project W/P: With project

I/B: Incremental net production value

(2): In 1982 constant price.

#### FLOWS OF NET PRODUCTION VALUE WITH AND WITHOUT PROJECT CONDITION FOR THE MUDA RIVER BASIN

#### Unit: M\$10<sup>6</sup>

		Main Minor			Tributary M	inor
Year	W/O	W/P	I/B	W/0	W/P	I/B
1983	20.28	20.48	0.20	5.94	6.16	0.22
1984	20.28	20.70	0.42	5.83	6.38	0.55
1985	20.28	20.88	0.60	5,68	6.99	1,31
1986	20.26	21.18	0.92	5.45	7,55	2.10
1987	20.24	21.34	1.10	5.43	8.44	3.01
1988	19.88	21.16	1.28	5.43	9.27	3.84
1989	19.68	21.58	1.90	5.43	10.05	4.62
1990	19,68	22.40	2.72	5.43	10.71	5.28
1991	19.68	24.93	5.25	5.43	11.55	6.12
1992	19,68	25,59	5.91	5,43	12.20	6.77
1993	19.68	26.21	6.53	5.43	12.72	7.29
1994	19,68	26.54	6.86	5.43	13.26	7.83
1995	19,68	26.55	6.87	5.43	13.72	8.29
1996	19.68	26.55	6.87	5,43	14.25	8.82
1997	19,68	26,55	6.87	5.43	14.76	9.33
1998	19,68	26.55	6.87	5.43	15.43	10.00
1999	19,68	26,55	6.87	5.43	16.04	10.61
2000	19.68	26.55	6.87	5.43	16.71	11.28
2001	19,68	26.55	6.87	5.43	17.07	11,64
2002	19.68	26.55	6.87	5.43	17.34	11.89
2003	19.68	26.55	6.87	5.43	17.54	12.11

Remarks; (1): W/O: Without project W/P; With project

I/B: Incremental net production value

(2): In 1982 constant price.

	Annual Equivalent	For Kedal Net Water	n System	For Muda-P Net Water	erai System
Alternative Facilities	of Cost (M\$10 <sup>3</sup> )	Output (106 m3)	Benefit (M\$/m <sup>3</sup> )	Output (106 m <sup>3</sup> )	Benefit (M\$/m <sup>3</sup> )
Beris	7.1	59.3	0.12	25.0	0.28
Tawar-Muda	12.4	33.4	0.37	14.0	0.89
Sari	8.6	16.7	0.51	8.0	1.08
Badak-Temin	15.5	21.5	0.72	10.1	1.54
Durian	12.4	14.6	0.85	7.8	1.59

## Table 12DOMESTIC AND INDUSTRIAL WATER SUPPLY BENEFITBASED ON ALTERNATIVE FACILITIES COST

Remarks: (1): Benefit is not unit value of raw water but unit value of water deficit met for the purpose of domestic and industrial water supply.

(2): Based on alternative facilities cost of the source projects.

(3): In 1982 constant price.

## Table 13CASH FLOW AND PRESENT WORTH OF ADVERSE EFFECT DUETO TRIBUTARY IRRIGATION, HIGH GROWTH CASE

		KRDAH				HUDA				TOTAL LOSS
YEAR	GROSS		PROPORTION OF ADVERSE		D& I Loss	G.PRO- DUCT HATN	PROPORTION OF ADVERSE EVFECT		da i Loss	
		(M\$10 <sup>6</sup> ) (b)	(X) (c)	(M\$10 <sup>6</sup> ) (d)	(M\$10 <sup>6</sup> ) (e)	(M\$10 <sup>6</sup> (f)		(M\$10 <sup>6</sup> ) (h)	(M\$10 <sup>6</sup> ) (i)	(мş10 <sup>6</sup> ) (j)
1983	209.90	1.49	0.40	0.84	0.02	20,48	3 0.45	0.09	0.07	1.01
1984	211.90	1.49		0.93	0.02	20.70		0.13	0.08	1.15
1985	214.60	2.05		1.02	0.03	20.88		0.16	0.09	1.30
1986	218.70	2.96	0.51	1.13	0.03	21.18		0.20	0.10	1.46
1987	221.00	4.20	0.55	1.23	0.03	21.34		0.24	0.11	1.61
1988	223.20	4.82		1.33	0.04	21.16		0.27	0.12	1.76
1989	225.50	5.26		1,44	0.04	21.58		0.31	0.13	1.92
1990	253.60	5.56		1.71	0.05	22.40		0.36	0.14	2,26
1991	264.80	10.23	0.80	2.19	0.08	24.93		0.40	0.27	2.94
1992	277.60	10.62	0.93	2.69	0.12	25.59		0.42	0,39	3.62
1993	291.50	11.09	1.07	3.24	0,15	26.21		0.43	0.52	4.34
1994	299,20	11.40	1.21	3.75	0.18	26.54		0.44	0.64	5.02
1995	306.70	11.44	1.35	4.28	0.22	26.55		0.45	0.77	5.71
1996	314.50	11.61	1.48	4.83	0.25	26.55		0.45	0.90	6.43
1997	322.70	11.65		5.41	0.28	26.55		0.46	1.02	7.17
1998	331.10	11.70	1.76	6.02	0.32	26.55		0.46	1.15	7.95
1999	340.00	11.73		6.66	0.35	26.55		0.47	1.27	8.75
2000	349.60	11.73		7.33	0.38	26.55		0.47	1.40	9.59
2001	355+30	11.73	2.03	7.45	0.38	26.55		0.47	1,40	9.70
2002	357.60	11.73	2.03	7.50	0.38	26.55		0.47	1.40	9.75
2003	359.00	11.73	2.03	7.53	0.38	26.55		0.47	1.40	9,78
2010	359.00	11.73	• 2.03	7.53	0.38	26.55	1.77	0.47	1.40	9.78
2011	359.00	11.73	2.03	7.53	0.38	26.55	1.77	0.47	1.40	9.78
2031	359.00	11.73	2.03	· 7.53	0.38	26.55	1.77	0.47	1.40	9.78
2032	359.00	11.73	2.03	7.53	0.38	26.55		0.47	1.40	9.78
NPV( 6%)	4551.96	130,12		64.55	3.09	383.25		5.65	11,10	84.38
NPV( 8%)	3395.42	92.67		43.71	2.04	292.23		4.11	7.31	57.17
NPV(10Z)	2656,03	68.96		31.06	1.41	233.01		3.13	5.03	40.63
NPV(12%)	2157.14	53.17		23.00	1.01	192.35		2.47	3.60	30.08
NPV(14%)	1804.47	42.20		17.64	0.75	163.10		2.01	2.66	23.06
NPV(16%)	1545.09	34.30		13.94	0.57	141.23		1.67	2.02	18.21
NPV(18%)	1347.88	28.43		11.31	0.45	124.35		1.42	1.58	14.75

#### CASH FLOW AND PRESENT WORTH OF ADVERSE EFFECT DUE TO TRIBUTARY IRRIGATION, LOW GROWTH CASE

Table 14

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		KEI	AH					NUDA		TOTAL
YEAR			PROPORTION OF ADVERSE	TION	De I Loss	G.PRO- DUCT	PROPORTION OF ADVERSE	TION	D& I LOSS	Loss
	. MAIN	RINUR	EFFECT	LOSS		HAIN	EFFECT	10\$S		
hair an air an dra	(M\$10 <sup>6</sup> )	(M\$10 <sup>6</sup> )	(X)	(M\$10 <sup>6</sup> )	(M\$10 <sup>6</sup> )	(M\$10 <sup>6</sup>	(%)	(M\$10 <sup>6</sup> )	(M\$10 <sup>6</sup> )	(M\$10
1983	209.90	1.49	0.40	0.84	0.02	20.48	0.38	0.08	0.05	0.9
1984	211.90	1.49	0.44	0.93	0.02	20.70	0.48	0.10	0,04	1.0
1985	214.60	2.05	0.48	1.03	0.02	20.88	0.57	0,12	0.04	1.2
1986	218.70	2.96	0.52	1.14	0.02	21.16	0.67	0.14	0.03	1.3
1987	221.00	4.20	0.55	1.25	0.03	21.34	0.77	0.16	0.02	1.4
1988	223.20	4.82	0.59	1.35	0.03	21.16	0.87	0.18	0.01	1.5
1989	225.50	5.26	0.63	1.46	0.03	21.58	0.96	0.21	0.01	.1.3
1990	253.60	5.56	0.67	1.74	0.04	22.40	1.06	0.24	0.00	2.0
1991	264.80	10.23	0.82	2.24	0.05	24.93	1.12	0.28	0.07	2.0
1992	277.60	10.62	0.96	2.77	0.06	25.59	1.17	0.30	0.13	3.:
1993	291.50	11.09	1.11	3.35	0.08	26.21	1.23	0.32	0.20	3.5
1994	299.20	11.40	1.25	3.89	0.09	26.54	1.29	0.34	0.27	· 4.
1995	306.70	11.44	1.40	4.45	0,11	26.55	1.35	0.36	0.34	5.3
1996	314.50	11.61	1.55	5.04	0.12	26.55	1.40	0.37	0.40	5.9
1997	322.70	11.65	1.69	5.66	0.14	26.55	1.46	0.39	0.47	6.
1998	331.10	11.70	1.84	6.30	0,15	26.55	1.52	0.40	0.54	7.
1999	340.00	11.73	1.98	6.98	0.17	26.55	1.57	0.42	0.60	8.
2000	349.60	11.73	2.13	7.70	0.18	26.55	1.63	0.43	0.67	8.9
2001	355.30	11.73	2.13	7.82	0.18	26.55	1.63	0.43	0.67	9.3
2002	357.60	11.73	2.13	7.87	0.18	26.55	1.63	0.43	0.67	9.
2003	359.00	11.73	2.13	7.90	0.18	26.55	1.63	0.43	0.67	9.3
2010	359.00	11.73	2.13	7.90	0.18	26.55	1.63	0.43	0.67	9.3
2011	359.00	11.73	2,13	7.90	0.18	26.55	1.63	0.43	0.67	9.1
2031	359.00	11.73	2.13	7.90	0.15	26.55	1.63	0.43	0.67	9.1
2032	359.00	11.73	2.13	7.90	0.18	26.55	1.63	0.43	0.67	9.1
( 67)	4551.96	130.12		67.29	1.54	383.25		4.68	5.04	78.5
( 8%)	3395.42	92.67		45.48	1.04	292.23		3,34	3.27	53.1
(10%)	2656.03	68.96		32.24	0.73	233.01	•	2.50	2.21	37.6
(12%)	2157.14	53.17		23.82						
(14%)	1804.47	42.20		18.23	0.41	163.10		1.56	1.13	21.3
(16%)	1545.09	34.30		14.38	0.32	141.23		1.28	0.85	16.8
(18%)	1347.88	28.43		11.64	0.26	124.35		1.08	0.65	13.6

N-30

#### Table 15 NATIONAL ECONOMIC CONVERSION FACTORS

Category	Factor
General conversion factor	0.89
Port handling	0.72
Transport services	0.66
Construction services	0.77
Construction materials	0.88
Transport equipment	0.76
Power and fuel	0.97
Public services	0.89

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Source; National Parameters for Project Appraisal in Malaysia Vol. I to Vol. V; The Opportunity Cost of Labour (in Peninsular Malaysia) Vol. III; Conversion Factors for Tradeable and Non-tradeable Goods and Services, Economic Planning Unit, Prime Minister's Department.

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#### Table 16 COST STREAM AND PRESENT WORTH OF IRRIGATION DIRECT FACILITY

	1	CEDAH		HUDA
YEAR	HADA MAIN	HADA MINOR	TRIBU- TARY MINOR	TRIBU- TARY MINOR
1983	35.10	1.43	1.83	1,20
1984	33.70	3.88	1.32	1.94
1985	31.50	6.67	0.37	2.64
1986	29.90	5.46	0.43	2.95
1987	30.50	2.84	0.59	2.73
1988	31.00	0.45	0.80	2.38
1989	35.10	2.31	1.51	1,94
1990	40.60	2.98	2.05	1.95
1991	45.20	2.47	2.09	2.06
1992	46.30	0.62	1.36	2.05
1993	47.30	0.41	1.00	1,93
1994	49.50	0.67	1.09	2.01
1995	52.70	0.77	1.16	2.08
1996	55.30	0.68	0,92	2.42
1997	56.40	0.42	0.56	2.79
1998	57.30	0.42	0+47	3,05
1999	44.40	0.42	0.36	2.25
2000	26.80	0.42	0.28	1.29
2001	13.00	0.42	0.23	0.54
2002	13.00	0.42	0.23	0.54
2003	13.00	0.42	0.23	0.54
2010	13.00	0.42	0.23	0+54
2011	13.00	0.42	0,23	0.54
2031	13.00	0.42	0.23	0.5
2032	13.00	0.42	0.23	0.5
NEV( 6%)	494.10	26.31	12.65	26.3
NPV( 87)		23.29	10.75	22.0
NPV(10%)		20.96	9.31	18.7
NPV(12%)	289.13	19.08	8.20	16.3
NPV(14%)		17.51	7.30	14.3
NPV(16%)		16.18	6.57	12.7
NPV(18%)			5.97	11.4

N-32

ECONOMIC INVESTMENT COST, ANNUAL COST AND PRODUCTION FORGONE OF JENIANG SYSTEM, PROPOSED DAMS AND POTENTIAL DAMS

	Investment Cost (M\$10 <sup>6</sup> )	Annual Cost + Production Forgone (M\$10 <sup>3</sup> /y)
Jeniang system	60.13	0.66
Beris dam	43.55	1.00
Tawar-Muda dam	84.31	1.05
Sari dam	51.11	1.10
Durian dam	89.25	1.11
Badak-Temin dam	98.43	1,90
Rui No. 2 dam (High)	261.12	2.60
(Low)	244.10	2.40
Ma dam	64.00	1.30
Khlong Thepha dam	72.00	1.40
Reman dam	65.10	4.75
Merbok scheme (High)	99.77	1.40
(Low)	79.82	1.12

Remarks; (1): Values at the optimum scale

(2): In 1982 constant price

### 2 18 COST STREAM AND PRESENT WORTH OF SOURCE FACILITY (1/2)

Table 18

Unit: M\$10<sup>6</sup>

				01	1241	
YEAR	JENIANG	BERIS	T-HUDA	SARI	DURIAN	
	System	DAM	DAM	DAM	DAM	DAH
1983	0.00	0.00	0.00	0.00	0.00	0.00
1984	0.00	0.00	0.00	0.00	0.00	0.00
1985	0.00	3.62	0.00	0.00	0.00	0.00
1986	1.73	5.85	5.82	3.97	6.25	6.89
1987	22.88	11.98	5.47	7.74	6.25	9.45
1988	20.42	11.98	21.14	16.92	20.53	18.66
1989	15.10	10.12	26.95	13.35	30.34	39.32
1990	0.67	1.00	24.93	9.13	25.88	30.53
1991	0.64	1.00	1.05	1.10	1.11	1.90
1992	0.64	1.00	1.05	1.10	1.11	1.9
1993	0.64	1.00	1.05	1.10	1.11	1.9
1994	0.66	1.00	1.05	1.10	1.11	1.9
1995	0.65	1.00	1.05	1.10	1.11	1.9
1996	0.65	1.00	1.05	1.10	1.11	1.9
1997	0.65	1.00	1.05	1.10	1.11	1.9
1998	0.69	1.00	1.05	1.10	1.11	1.9
1999	0.67	1.00	1.05	1.10	1.11	1.9
2000	0.66	1.00	1.05	1.10	1.11	1.9
2001	0.66	1.00	1.05	1.10	1.11	1.9
2002	0.66	1.00	1.05	1.10	1.11	1.9
2003	0.66	1.00	1.05	1.10	1.11	1.9
2010	0.66	1.84	2.46	1.64	2.51	2.5
2011	0.66	1.00	1.05	1.10	1.11	1.9
2031	0.65	1.00	1.05	1.10	1.11	1.9
2032	0.66	1.00	1.05	1.10	1.11	1.9
NPV( 6%)	49.60	42.14	67.47	46.08	71.39	89.2
NPV( 8%)		35.91	57.49	38.77	60.83	75.0
NPV(10%)		31.21	49.67	33.25	52.56	64.3
NPV(12%)		27.52	43.34	28.91	45.86	55.0
NFV(14%)		24.50	38.08	25.37	40.30	48.
NPV(16%)		21.97	33.66	22.43	35,62	42.1
NPV(18%)		19.82	29.88	19.95	31.62	37.8

# Table 19COST STREAM AND PRESENT WORTH<br/>OF SOURCE FACILITY (2/2)

Unit: M\$10<sup>6</sup>

	MERBOK	REMAN	Khlong	MA	DAM	RUÍ 2	YEAR
RVOIR	RESE	DAM	тнерна	DAH			-
(L0	(HIGH)		DAM		(LOW)	(HIGH)	
0.	0.00	0.00	0.00	0.00	0.00	0.00	1983
0.	0.00	0.00	0.00	0.00	0.00	0.00	1984
0.	0.00	0.00	0.00	0.00	14.64	15.66	1985
0.	0.00	2.31	3,60	3.20	14.68	15.70	1986
11.	14.97	1.54	7.20	6.40	68.35	73.11	1987
23.	29.93	12.98	21.60	19.20	73.23	78.33	1988
23.	29.93	26.68	21.60	19.20	48.80	52.22	1989
19.	24.94	21.59	18.00	16.00	24.40	26,10	1990
1.	1.40	4.75	1.40	1.30	2.40	2.60	1991
1.	1.40	4.75	1.40	1.30	2.40	2.60	1992
1.	1.40	4.75	1.40	1.30	2.40	2.60	1993
1.	1.40	4.75	1.40	1.30	2.40	2.60	1994
1.	1.40	4.75	1.40	1.30	2.40	2,60	1995
1.	1.40	4.75	1.40	1.30	2.40	2.60	1996
1.	1.40	4.75	1.40	1.30	2.40	2.60	1997
1.	1.40	4.75	1.40	1.30	2.40	2.60	1998
1.	1.40	4.75	1.40	1,30	2.40	2.60	1999
1.	1.40	4.75	1.40	1.30	2.40	2.60	2000
1,	1.40	4.75	1.40	1.30	2.40	2.60	2001
1.	1,40	4.75	1.40	1.30	2.40	2.60	2002
1.	1.40	4.75	1.40	1.30	2.40	2,60	2003
1,	2.21	4.75	1.40	1.30	2.40	2,60	2010
1.	1.40	4.75	1,40	1.30	2.40	2.60	2011
1.	1,40	4.75	1.40	1.30	2.40	2.60	2031
1,	1.40	4.75	1.40	1.30	2.40	2.60	2032
65.	81.37	88.79	62,49	56.08	197.31	211.38	RPV( 6%)
55.	69.16	68.97	52.57	47.09	172.30	184.53	NPV( 8%)
47.	59.65	55.38	45.02	40.27	152.22	162.98	NPV(10%)
41.	51.98	45.56	39.03	34.88		145,13	PV(12%)
36.	45.63	38.16	34.15	30.49		130.03	NPV(14%)
32.	40.29	32.40	30.08	26.84		117.05	XPV(16%)
28.	35.74	27.81	26.64	23.76		105.78	NPV(18%)

N~35

Priority Order	Dam	(1) Investment Cost (M\$10 <sup>6</sup> )	(2) Net Water Output (106 m <sup>3</sup> )	(3) (1)/(2) (M\$/m <sup>3</sup> )
1	Beris	74.2	92.3	0.804
2	Tawar-Muda	114.6	40.4	2.84
3	Sari	72.5	22.8	3,18
4	Badak-Temin	149.2	30.3	4.92
5	Durian	113.3	20.5	5.53

PRIORITY ORDER OF PROPOSED DAMS

Remarks; Net water output is estimated assuming 2,000 water demand in the Kedah river basin under the hydrological condition in 1977. Investment cost and net water output are of the optimum scale.

#### PRESENT VALUE OF B-C OF OVERALL SOURCE DEVELOPMENT PLAN IN HIGH GROWTH CASE ASSUMING JENIANG OPERATION OF ALTERNATIVE 1

			OPERA	TION C	OF ALTEP	NATIVE	1		
							-	Unit:	M\$10 <sup>6</sup>
* JENTANG				NET.		WITH VARIABLE	DISCOUNT	RATE	
" JENTANG BENEP:			62	81	101	122	142	161	181
pont.	TRIBUTARY IRRIGATIO	NH (KW014)	60.33	11.00					
	ADVERSE LOSS HADA	'(KEDAH)	50.72 -64.35	35.00 -43.71	25.30 -31.06	19.01	14.75	11.76	9.59
	ADVERSE LOSS D & 1		-3.09	-2.04	-1.41	-13.00 -1.01	-17.64 -0.75	~13.94 -0.57	-11.31 -0.45
	TREBUTARY IRRIGATIO		131.80	94.65	71.19	55.60	44.76	36.92	31.08
	ADVERSE LOSS M.HIN		-3.65	-4,11	-3.13	-2.47	-2.01	-1.67	-1.42
	ADVERSE LOSS D & 1	(NUDA )	-11.10	-7.31	-5.03	-3.60	-2.66	-2.02	-1.58
	NADA HAIN	(KEDAH)	\$64.37	639.46	442.84	318.18	235.85	179.49	139.72
	MADA MINOR	(KEDAH)	97.17	68.03	49.66	37.51	29.12	23.11	18.69
	D 4 I	(XEDAR)	15.59	9.95	6.60	4.52	3,18	2.29	1,68
	TOTAL BENEFIT		1175.26	789.92	554.96	404.74	304.60	235.37	186.00
COST									
	HADA HAIN (TERTIAR)	)	494.10	403.70	338.29	289.13	251.10	220.99	196.69
	KADA HINOR		26.31	23.29	20.96	19.08	17.51	16.18	15.02
	JENIANG SYSTEM		49.61	43.14	37.98	33.71	30,11	27.02	24.34
	TRIBUTARY IRRIGATIO		12.65	10.75	9.31	8,20	7.30	6.57	5.97
	TRIBUTARY IRRIGATIO	H (KUDA )	26.39	22.02	18.79	16.31	14.35	12,77	11.47
4	TOTAL COST		609.06	502.90	425.33	366.43	320.37	283.53	253.49
TOTAL	B→C		566.20	287.02	129.63	38.31	-15.77	-48.16	-67.49
TOTAL	COST		609.05	502.90	425.33	366.43	320.37	283.53	253.49
	+ BERIS **								
BENEF <u>i</u>									
	BENEFIT OF JENIANG		1175.26	789.92	554.94	404.74	304.60	235.37	186,00
	BERIS MADA MAIN	(KEDAH)	85.63	58.00	40.94	29.79	22.24	16.95	13.14
	BERIS MADA MINOR	(KEDAH)	2.97	2.04	1.45	1-06	0.80	0.61	0.48
	BERIS MAIN MINOR	(HUDA )	4.97	3.33	2.32	1.67	1.24	0.93	0.72
	BERIS D & L	(KEDAH)	5.05	3.24	2.16	1.49	1.06	0,77	0.57
-	SERIS D & 1	(HUDA )	36.95	23.53	15.70	10.78	7.61	5.50	4.05
COST	TOTAL BENEFIT		1310.83	680.22	617-53	449.53	337.55	260.13	204.96
	COST FOR JENZANG								
	COST FOR JENIANG		609.06	502.90	425.33	366.43	320.37	283.53	253.49
	COST FOR BERIS DAM TOTAL COST		42.14	35.91	31.21	27.52	24.50	21.97	19.82
*	TOTAL COST		651.20	538.81	456.54	393,95	344.87	305.50	273.31
TAL	8-C		··· ··	<b></b> ·					
OTAL	COST		659.63	341.41	160.99	55.58	-7.32	-45.37	-86.33
			651.20	538.81	436.54	393.95	344.87	305.50	273.31
ENIANG DENEFI	+ BERIS + TAWAR-MUDA *	•							
	BENEFIT OF JENIANG (	REDIS	1310.83	820 53	614				A
	T-KUDA HADA HAIN	(REDAR)	42.89	830.22 29.31	617.53 20.82	449.53	337.55	260.13	204.96
	T-NUDA MADA MINOR	(KEDAN)	42.89	1,03	20.82	15.25	\$1.46 0.41	8.78	6.84
	T-HUDA MAIN MINOR	(NUDA )	2.05	1.62	0.74	0.55	0.41 0.57	0.32	0.25
	T-HUDA D & I	(KEDAH)	6.67	4.26	2.82	1.93	1.36	0.98	0.72
	T-HUDA D 4 I	(HUDA )	69.70	44.47	29.48	20.19	14.21	10.24	7.52
±1	TOTAL BENEFIT		1433.65	960.71	672.41	488.20	365.56	280,89	220.63
COST								200,03	110.03
	COST FOR JENIARC & S	LIRIS	651,20	538.81	455.54	393.95	344.87	303.50	273.31
	COST FOR T-NUDA DAM		67.47	57.49	49.67	43.34	38.08	33.66	29,88
47	TOTAL COST		718.67	596,30	506.21	437.29	382,95	339.16	303.19
							-		
DTAL	8-C		714.98	364.41	166.20	50.91	-17.39	-58.27	-82.55
DTAL.	COST		718.67	596.30	506.21	437.23	382.95	339.16	303.19
	BERTS + TAVAR-KUDA +	SARI **					-*		••••••
8882917									
	BENEFIT OF JENIANG		1433.65	960.71	672.41	468.20	365.56	280.89	220.63
	SARI MADA HAIN	(KEDAH)	30,70	20.66	14.46	10.45	7.75	5.88	4.53
	SARI MADA MINOR	(KEDAH)	1.06	0.72	0.51	0,37	0.28	0.21	0.16
<i></i>	SARI D & I	(KEDAH)	7.33	4.67	3.10	2.12	1.49	1.05	0.79
COST -	OTAL BENEFIT		1472.74	985,76	690.45	501.14	375.08	288.06	226.11
0031	COST FOR JENIANG . B		***		·				
		DALA A CARAK-KUDA	718.67	596.30	506.21	437.29	382.95	339.16	303,19
**	COST FOR BARI DAM GTAL COST		46.08	38.77	33.25	28.91	25.37	22.43	19.95
~1	STAL WOL		764.75	635.07	539.46	466.20	408.32	361.59	323.14
	B-C		363 64						
1746			707,99	351.69	151.02	34,94	-33,24	-73.53	~97.03
OTAL	COST		764,75	635.07	539.46	466.20	408.32	361,59	323.14

#### PRESENT VALUE OF B-C OF OVERALL SOURCE DEVELOPMENT PLAN IN HIGH GROWTH CASE ASSUMING JENIANG OPERATION OF ALTERNATIVE 2

			OI MIUL				-		
								Unit:	M\$10
	•				PRESENT VALUE				
JENIANG	40		61	81	107	123	14%	161	18
BENEFIT	t								
	TRIBUTARY IRRIGATION	(KEDAH)	50.72	35.00	25.30	19.01	14.25	11.76	9.5
	ADVERSE LOSS HADA	(KEDAR)	-64.55	-43.71	-31.05	-23.00	-17.64	-13.94	-11.3
	ADVERSE LOSS D & I		-3.09	-2.04	-1.41	-1.01	-0.75	-0.57	-0.4
	TRIBUTARY IRRIGATION	(HUDA )	131.80	94,65	71.19	55.60	44.76	36.92	31.0
	ADVERSE LOSS N. HINOR	(HUDA )	~5.65	-4.11	-3.13	-2.47	-2.01	-1-67	-1.4
	ADVERSE LOSS D & I	(MUDA )	-11.10	-7.31	-5.03	-3.60	-2.66	-2.02	-1.5
	NADA MAIN	(KEDAH)	964.37	639.46	442.84	315.18	235.85	179.49	139.7
	HADA NINOR	(REDAB)	97.17	68.03	49.66	37.51	29.12	23,11	18.6
	D & 1 '	(KEDAR)	15.59	9.95	5.60	4.52	3.18	2.29	1.6
<b>#</b> 1	TOTAL BENEFIT		1175.25	789.92	554.96	404.74	304.60	235,37	186.0
COST									
	HADA NAIN (TERTIARY)		494.10	403.70	338.29	289.13	251.10	220.99	195.0
	MADA HINOR		26.31	23.29	20.96	19.08	17.51	16,18	12.0
	JENIANG SYSTEM		49.61	43,14	37.98	33.71	30-11	27.02	24.
	TRIBUTARY IRRIGATION	(KEDAH)	12.65	10.75	9.31	8.10	7.30	6.57	5.5
	TRIBUTARY IRRIGATION	(NUDA )	26.39	22.02	18.79	16.31	14.35	12.77	11.0
*	TOTAL COST		609.06	502,90	425.33	365.43	320.37	283.53	253.4
*TOTAL	8-C		565.20	287.02	129.63	38.31	-15.77	-48.16	-67.4
TOTAL	COST		609.05	502.90	425.33	365.43	320,37	283.53	253.4
JENTANG	+ BERIS **								
SENEFI:			•						
	BENEFIT OF JENIANG		1175.26	769.92	554.96	404.74	304.60	235.37	185.
	BERIS MADA MAIN	(KEDAB)	91.15	61.54	43.24	31.35	23.33	17.73	13.
	BERIS NADA MINOR	(KEDAH)	3.16	2.15	1.53	1.12	0.54	0.64	٥.
	DERIS MAIN MINOR	(KUDA )	4.49	3.03	2.12	1.54	1.14	0,85	0.
	AZRIS D 6 1	(KEDAH)	5.85	3.75	2.50	1.72	1.22	0.88	0.
	SZRIS D & I	(HUDA )	15.63	10.02	6.69	4.61	3.26	2.36	1.
	TOTAL SEREFIT		1295.54	870.44	611.04 -	445.08	334.39	257.84	203.
COST									
	COST FOR JENIANC		609.06	502.90	425.33	366.43	320.37	283.53	253.0
	COST FOR BERIS DAN		42.14	35.91	31.21	27,52	26.50	21.97	19.1
	TOTAL COST		651.20	538,81	456.54	393.95	344.87	305.50	273.3
	10120 0001		0,1110	220101	450154	3754775			
+ TOTAL	3-C		644.34	331.63	154.50	51.13	-10.48	-67.66	-70.0
TOTAL	0037		651.20	538,81	636.54	393.95	344.87	305.50	273.
.INNTANG	+ BERIS + TAWAR-MUDA *								
BENEFI									
	BEREVIT OF JERIANG	L BZRIS	1293.54	870.44	611.04	445.05	334.39	237.84	203.2
	T-HUDA HADA HAIN	(KEDAR)	46.05	31.39	22.23	16.25	12.18	9.31	7.5
	T-NUDA HADA MINOR	(KEDAN)	1.60	1.10	0.79	0.58	0.44	0.34	0,
	T-HUDA HAIN NINCE	(KUDA )	1.58	1.08	0.77	0.56	0.42	0.32	0.
	T-RUDA D & L	(KEDAR)	7.40	4.72	3.13	2.14	1.51	1.09	0.
							11.65	8.39	U. 6.
	T-MUSA D & J	. (MUDA )	57.16	35.47	24.18	34,56 491,17	360.59	277,29	р. 218.
	. INIAL BERLYIT		1409.34	\$45.20	662.14	481.17	300.33	211.29	1184
COST			<i>((i</i> )			102 27			273.
	COST FOR JENIANG 6		651.20	338,81	456.54	393.95	344.87	305.50	
	COST TOR T-HUBA DAM		67.47	57.49	49-67	43.34	39.08	33.66	29.
•	TOTAL COST		718-67	598.30	506.21	437.29	302.95	339.16	303.
				_					
*TOTAL	B-C		\$90.67	348.90	155.93	43.68	-22.36	-61.87	-85.
TOTAL	COST		718,67	\$95.30	506.21	437.29	382.93	339.16	303.
. 1947.497	- 35010 - 71044-10044	C107 44							
	+ BERIS + TAWAR-HUDA +	JARI -							
BENEFI		RDD10 4 Ballin Mores	1100 51	a		101 17	160 60		
		BERIS & TANAR-HUDA	1409.34	945.20	667.14	481.17	360.59	277.29	218.
	SARI KADA KAIN	(KEQAH)	30.70	20.66	14.45	10.45	7.75	5.88	4.
	SALL MADA MINOR	(KEDAH)	1.06	0.72	0.51	0.37	0.24	0.21	0.
	SARL D & I	(RAGEX)	7,33	4.67	3.10	2.12	1.49	1.08	0.
	TOTAL BENEFIT		1448.43	971.25	680.21	494.11	370,11	284.46	223.
COST					_		No		
	COST FOR JENIANG ,	BERIS & TAVAR-NUDA	718.67	596,30	506.21	437.29	392,93	339.16	303.
	COST FOR SARI DAM		66.08	36,77	33.25	28.91	25.37	22.43	19.
			764.75	635.07	539.46	436.20	408.32	361.59	323.
•	TOTAL COST								
• TOTAL	TOTAL COST B-C		683.68	336,18	140.75	27.91	-38.21	-77.13	-99.

#### PRESENT VALUE OF B-C OF OVERALL SOURCE DEVELOPMENT PLAN IN HIGH GROWTH CASE ASSUMING JENIANG OPERATION OF ALTERNATIVE 3

									M\$10
				NET				Unit:	WŞTÜ
. JENTANG			61	81		WITH VARIABLE	141		18
BENEF				64	101	124	194	161	10
95451	TRIBUTARY IRRIGATION	(******	30.72	35.00	25,30	19.01	14.75	11.76	9.3
	ADVERSE LOSS KADA	(KEDAH)	-64.55	-43.71	-31.06	-23.00	-17.64	-13.94	-11.3
	ADVERSE LOSS D & 1		-3.09	-2.04	-1.41	-1.01	-0.75	~0.57	-0.4
	TELBUTARY IRRIGATION		131.80	94,65	71.19	55.60	44.76	36.92	31.0
				-4,11	-3.13			-1.67	
	ADVERSE LOSS M.NENOR		-5.65			-2.47	-2.01	-1.02	-1.4
	ADVERSE LOSS D & 1		-11.10	-7.31	-5.03	-3.60	-2.56		-1.5
	KADA KAIN	(KRDAH)	964.37	639.46	442.84	318.18	235.85	179.49	139.7
	HADA KINOR	(KEDAH)	97.17	68.03	49.66	37.51	29.12	23.11	18.6
	Děl	(XEDAH)	15.59	9.95	6.60	4.52	3.18	2,29	1.6
	TOTAL BENEFIT		1175.26	789.92	554.96	404.74	304.60	235.37	186.0
OOST									
	HADA HAIN (TERTIARY)		494.10	403.70	338,29	289.13	251.10	220.99	196.1
	HADA MINOR		26.31	23.29	20.96	19.08	17.51	16.18	15.0
	JENIANC SYSTEM		49.61	43.14	37.98	33.71	30.11	27.02	24 . S
	TRIBUTARY IRRIGATION		12.65	10.75	9.31	8.20	7,30	6.37	5.9
	TRIBUTARY IRRIGATION	(NUDA )	26.39	22.02	18.79	16.31	14.35	12.37	11.4
	TUTAL COST		609.06	502.90	425.33	366.43	320.37	283.53	253.4
			:						
*TOTAL	B-C		566.20	287.02	129.63	38.31	-15.77	-48.15	-67.4
TOTAL.	CUST		609.06	502.90	425.33	366.43	320.37	283.53	253.4
	+ BERIS **								
BENEFI				304 44	E7	101 31	101 - 10		
	BENEFIT OF JENIANC		1175.26	769.92	554.96	404.74	304.60	235.37	186.0
	BERTS MADA HAIN	(KEDAH)	105.64	71-65	50.08	35.15	26.78	20.28	15.0
	BERIS MADA HINOR	(KEDAR)	3.69	2,50	1.77	1.29	0.96	0.73	0.5
	EERIS MAIN HINOR	(NUDA )	0.45	0.31	0.22	0.16	0.12	0.09	0.0
	BERTS D & I	(KEDAB)	8.02	5,14	3.42	2.35	1.65	1.20	0.8
	BERIS D & I	(KUDA )	1.34	0.91	0.64	0.47	0.35	0.27	0.1
	TOTAL BENEFIT		1295.40	870.43	611.09	445.16	334.47	257.94	203,3
COST									
	COST FOR JENIANG		609.05	502.90	425,33	366.43	320.37	283.53	253.4
	COST FOR BERIS DAM		42.14	35.91	31.21	27.52	24.50	21,97	19.6
1	TOTAL COST		651.20	538.81	456.54	393.95	344.87	305.30	273.3
A TOTAL	8-C		644.20	331.62	154.55	51.21	-10.40	-47.56	-59.9
*TOTAL	COST		651.20	538.81	455.54	393.95	344.87	305.50	273.3
* JENTANG BENEFI	+ BERIS + TAWAR-MUDA **								
	AENEFIT OF JENIARG &	TYPIC	1295.40	870.43	611.09	445,16	334.47	257.94	203.3
	T-HUDA KADA MALN	(KEDAH)	59.49	40.04	28.03	20.26	15.03	11.40	203.3 ę.7
	T-HUDA HADA NINOR	(KEDAN)	2.05	1.40	0.99	0.72	0.54	0.41	0.3
				0.00	0.00	0.00	0.00	0.00	0.0
	T-RUDA RAIN MINOR	(HUDA )	0.00						
	t-HUSA D & L	(KEDAH)	10.01	6.39	4.23	2.90	2.04	1.47	1.0
	T-KUDA D & I	(HUDA )	0.00	0,00	0.00	0.00	0.00	0.00	0.0
	TOTAL BENEFIT		1366.96	918.26	. 644.34	459.04	352.05	271.22	213.5
COST									
	COST FOR JENIANG & B	2#15	651.20	538,81	456.54	393.95	344.87	305.50	273.3
	COST FOR T-HUDA DAN		67.47	57.49	49.67	43.34	38.08	33.66	29.8
1	TOTAL COST		718.67	596.30	506.21	437.29	382.95	339.16	303.1
			<i></i>				-10 -1	-67.94	
*TOTAL *TOTAL	B-C COST		648.29 718.57	321.96 595.30	138.13 506.21	31.75 437.29	-30.87 382.95	-67.94 339.16	-89.6 303.1
	+ BERIS + TAMAR-KUDA +	5 <u>481</u> 88							
BENEPI									
	BINEPIT OF JENIANG		1366.96	918.26	644.34	469.04	352.08	271.22	213.9
	SARI HADA MAIN	(KEDAR)	39.70	20,66	14.46	10.45	7.75	5.68	<b>4.</b> 5
	SARI MADA MINOR	(KEDAH)	1.06	0.72	0.51	0.37	0.28	0.21	0.1
	SARI D & L	(KEDAH)	7.33	4.67	3.10	2.12	1.49	1.08	0.7
	TOTAL BENEFIT		1406.05	944.31	552.41	481.98	361.60	278.39	219.0
C0\$1	•								
	COST FOR JERIANG , B	ERIS & TAWAR-HUDA	718.67	596.30	506.21	437,29	382.95	339.16	303.1
	COST FOR SARE DAN		45.08	38.77	33.25	26.91	25.37	22,43	19.9
	TOTAL COST		764.75	635.07	539.46	465.20	408.32	361.59	323.1
•									
•									
•TOTAL	8-0		641.30	309.24	122.95	15.78	-46.72	-63.20	-104.1

#### TABLE 24

#### PRESENT VALUE OF B-C OF OVERALL SOURCE DEVELOPMENT PLAN IN LOW GROWTH CASE ASSUMING JENIANG OPERATION OF ALTERNATIVE 1

									-
								Unit:	M\$10
				ŅŖT	· · ·	HITH VARIABLE			
. JENTANG			63	83	102	121	142	162	-16
B2NXF1	TRIBUTARY IRRIGATION	(VEDIG)	50.72	35.00	74.30	19.01	14.75	11.76	9.5
	ADVIESE LOSS KARA	(KLDAR)	-67.29	-45.48	25.30	-23.82	~18.23	-14.38	-ti.6
	ADVERSE LOSS B & I	(KEDAN)	-1.54	-1.04	-0.73	-0.54	-0.41	-0.32	-0.3
	TRIBUTARY IRRIGATION		131.80	94.65	71.19	55.60	44.76	36.92	31.0
	ABVERSE LOSS N. MINOR	(HUDA )	-4.68	-3.34	-2.50	~1.94	-1.55	-1.28	-1.0
	ADVERSE LOSS & 6 1	(HUDA )	-5.04	-3.27	-2.21	-1.55	-1.13	-0.65	-0.0
	KADA MALN	(KEDAN)	1013.90	671.43	464.35	333.14	246.55	187.34	145.5
	MADA NIHOR	(KEDAH)	98,85	69.12	50,40	38.02	29,49	23.39	18.E
	Del	(KEOAH)	0.58	0.37	0.25	0.17	0.12	0.09	0.0
•	TOTAL MENEFIT		1217.30	817.45	573.01	418.09	314.34	242.67	.91.5
COST						•			
	NADA MAIN (TERTIARY)		494.10	403.70	338.29	289.13	251.10	220.99	196.6
	MADA HENOR		26.31	23.29	20.96	19.08	17.51	16.18	15.0
	JENIANG BYSTEM		49.61	43.14	37.98	33.71	30.11	27.02	24.3
	TRIBUTARY IRRIGATION		12.65	10.75	9.31	6.20	7.30	6.57	5.5
	TRIBUTANT INDICATION	(MUDA )	26.39	22.02	18.79	16.31	14.35	12.77	11.4
•	TOTAL COST		609.06	502.90	425.33	366.43	320.37	283.53	253,4
	3-0		(				/		
TOTAL	BC COST		609.24	314.36	148.48	51.66	-6.03	-40.86	-81.9
- 10146			609.06	502.90	425,33	366.43	320.37	283.53	253.4
JEHIANG	+ 32815 **								
BEHEFI									
Destruct 1	HEREFIT OF JERIANG		1217.30	617.46	573.81	418.07	314,34	242.67	191.5
	BERIS MADA MAEN	(KEDAH)	100.41	67.50	47.20	34.09	25.27	19.14	14.7
	BERIS HADA MINOR	(KEDAN)	3.47	2.35	1.67	1.21	0.91	0.69	0.5
	BERIS HAIN NINOR	(KUDA )	4.80	3.21	2.23	1.60	1.18	0.69	0.6
	BERIS D & I	(KEDAH)	1.40	0.91	0.61	0.43	0.31	0.23	0,1
	82815 <b>3</b> 6 I	(HUDA )	10.01	6.39	4.23	2.90	2.04	1.47	1.0
	TOTAL BEREFIT		1337.39	897.83	629.75	458.32	344.05	265.09	208,8
COST						450774	511105	10,107	
	COST FOR JENIARG		609.06	502.90	425.33	355.43	320.37	283.53	253,4
	COST FOR MERIS DAM		42.14	35.91	31.21	27.52	24.50	21.97	19.8
6	TOTAL COST		631.20	538.81	456.54	393.95	344.87	305.50	273.3
ATOTAL	∎-C		685.19	359.02	173.21	64.37	-0.82	-40.41	-64.5
TOTAL	COST		651.20	538.81	456.54	393.95	344.87	305.50	273.3
							*******		
	+ BZRIS + TAYAR-MUBA **								
SENEFI									
•	BENEFIT OF JENIARG &		1337.39	897.83	629.75	458.32	344.05	265.09	208.8
	T-BUBA MADA MAIN	(XEDAR)	60.63	40.61	28.29	20.36	15.05	11.37	8.7
	T-HUBA MADA MISOR	(KEDAH)	2.09	1.42	1.00	0.72	0.54	0.41	0.3
	T-HUDA NAIN MINOR	(MUDA )	1.65	1.13	0.60	0.58	0.44	0.33	0,2
	T-MOM D & I	(REDAH)	0.36	0.23	0.15	0.11	0.07	0.05	0,0
	T-HUBA B & I	(MUDA )	9.43	6.02	3.99	2,73	1.92	1.38	1,0
C05T	TOTAL BENEFIT		1411.55	847.24	663.98	482.82	362.07	278.63	219.1
cusi	COST FOR JENIANC & BI							101 10	
	COST FOR T-MUDA RAN	EK13	651.20	538,01	456.54	393.95	344.87	305.50	273,3
	TOTAL COST		67.47 718.67	57,49	49.67	43.34	38.04 382.95	33.66 339.16	29.8
	TOTAL OFFI		/10.4/	596.30	506.21	437.29	202193	337.10	303.1
TOTAL	B-C		692.85	350.94	157.77	45.53	-20.88	-60.53	-64.0
TOTAL	cost		718.67	596.30	506.21	437.29	382.95	339.16	303.1
									*****
PALINE +	+ BERIS + TANAR-HUBA + :	5ART **							
DENIFI									
	BENEFIT OF JEBIANG ,	BERES & TAWAR-HUDA	1411.55	947.24	663.98	452.02	362.07	278.63	219.1
	SALI MADA MAIN	(KEDAH)	34.21	22.88	15.92	11.44	8.45	6.37	5.A
	SARI MADA MINOR	(KEDAH)	1.1a	0,80	0.56	0.41	0.30	0.23	0.14
	SARI B & 1	(KEDAH)	0.51	0.32	0.21	0.15	0.10	0.07	0,0
	TWTAL DENEPIT		1447.45	971.24	680.67	494.82	370,92	285.30	224.3
COST									
	COST FOR JENIANG , BI	ERIS & TAWAR-MUDA	718.67	596.30	506.21	437,29	382.95	339.16	303,19
	COST FOR SARI DAM		46.08	38,77	33,25	28.91	25,37	22.43	19,9
•	TOTAL COST		764.73	635.07	539.46	456.20	408.32	361.39	323.14
				394 13		28.62	- 37 60	-76.29	
**TOTAL **TOTAL	8-C COST		682.70 764,75	336.17 635.07	141.21	466.20	-37.40 408.32	361.59	-98.84

#### PRESENT VALUE OF B-C OF OVERALL SOURCE DEVELOPMENT PLAN IN LOW GROWTH CASE ASSUMING JENIANG OPERATION OF ALTERNATIVE 2

							Unit:	MŞl
			HET	PRESENT VALUE	WITH VALIABLE	DISCOUNT		***
· JENEANG	: **	6X	81 S	10%	128	165	163	J.
BENEF								
	TRIBUTARY IRRIGATION (KEDAH)	50.72	35.00	25.30	19.01	14.75	11.76	9.:
	ADVERSE LOSS MADA (KEDAH) Adverse Loss D 6 I (Kedah)	-67.29	-45.48	-32.24	-23.82	-18.23	-14.38	-11.1
		~1.54	-1.04	-0.73	-0.54	-0.41	-0.32	-0.3
	TREBUTARY TRREGATION (HUDA ) ADVERSE LOSS N., HINGR (HUDA )	131.80 -4.68	94.65 -3.34	71.19	\$5.60	44.76	36.92	31.0
	ADVERSE LOSS D & I (HUDA )	-5.04	-3.34	-2.50 -2.2)	~1.94	-1.58	-1.28	-1.0
	MADA HAIN (KEDAH)	1013.90	671.45	464.35	-1.55 333.14	-1.13 246.55	-0.85 187.34	-0.6
	HADA HINOR (KEDAH)	98.65	69.12	50.40	38.02	210.23	23.39	145.5
	D & 1 (KEDAH)	0.58	0,37	0.25	0.17	0,12	0.09	18.0
	TOTAL BENEFIT	1217.30	817.45	573.81	418.09	314.34	242.67	191.3
COST						211121		
	HADA HAIN (TERTIARY)	494.10	403.70	338.29	289.13	251.10	220.99	196.6
	HADA HINCR	26.31	23.29	20.96	19.09	17.51	16.18	15.0
	JENIANG SYSTEM	49.61	43.14	37.98	33.71	30.11	27,02	24.3
	TRIBUTARY IRRIGATION (XEDAR)	12.65	10.75	9.31	8.20	7.30	6.57	5.9
	TRIBUTARY IRRIGATION (MUDA )	26.39	22.02	18.79	16.31	14.35	12.77	11.4
	TOTAL COST	609.06	502.90	425.33	366.43	320,37	283.53	253.4
	• •							
TOTAL	Ь-С MAR	608.24	314.55	148.48	51.66	-6.03	-40.85	-61.9
4 TOTAL	COST	609.06	502.90	425.33	365.43	320.37	283.53	253.4
A JENIANC	+ bERIS **			******			*************	
BENEFI								
	BEHEFIT OF JENIANG	1217.30	817.46	573,81	418.09	314.34	242.67	101 4
	BERIS KADA HAIN (KEDAH)	103.43	69.41	48.45	34.94	25.86	242.67	191.5
	BERTS HADA HINOR (KEDAH)	3.58	2.42	1.71	1.24	0.93	0.71	0.5
	BERIS MAIN NINOR (HUDA )	4,46	2.99	2.05	1.50	1.11	0,84	0.6
	BERIS D & I (KEDAH)	1.69	1.09	0.74	0.51	0.37	0.27	0.2
	BERIS D & I (MUDA )	1.45	0.93	0.61	0.42	0.30	0.21	0.1
	TOTAL BENEFIT	1331.91	\$94.30	637.40	456.70	342.91	264.26	208.1
COST								
	COST FOR JENIARC	609.06	502,90	425,33	366.43	320.37	283.53	253.4
	COST FOR BERIS DAM	42.14	35.91	31.21	27.52	24.50	21.97	19.8
•	TOTAL COST	\$51.20	\$38.61	456.54	393.95	344.87	305.50	273.3
TOTAL	8-C	650.71	355.49	170.85	62.75	-1.96	-41.24	-65.1
*TOTAL	COST	651.20	538.81	456.54	393.95	344.87	305.30	273.3
- JENLANG	+ BERIS + TAVAR-HUDA **				*			
BENEFI		,						
	BENEFIT OF JENIANG & BERIS	1331.91	894.30	627.40	456,70	342.91	264.26	268.1
	T-HUDA HADA HAIN (REDAN)	62.85	42.10	29.33	21.11	15.60	11.78	9.0
	T-HUDA MADA MINOR (REDAH)	2.17	1.47	1.03	0.75	0.55	0.42	0.3
	T-NUDA HAIN MINOR (MUDA )	1.58	1.04	0.72	0.51	0.37	0.28	0.2
	T-HUDA D 6 1 (KEDAR)	0.36	0.23	0.15	0.11	0.07	0.05	0.0
	T-HUDA D & I (HUDA )	0,00	0.00	0.00	0.00	0,00	0.00	0.0
*	TOTAL BESEVIT	1398.87	939.14	658.63	479.18	359.51	276,79	217.8
C05T								
	COST FOR JENIANG & BERIS	651.20	538.81	456.54	393.95	344.67	305.50	273.3
	COST FOR T-HUDA DAM	67.47	57.49	49.67	43.34	38.05	33.66	29.8
•	TOTAL COST	218.67	596.30	506.21	437.29	382,95	339.16	303.15
-								
TOTAL	1-C	680.20	342.84	152.42	41.89	-23,44	-62.37	-85.3(
TOTAL	CUST	718,67	\$98.30	506.21	437.29	382.95	339.16	303.19
	+ BERIS + TAWAR-HUDA + SARI **							
RENEFI								
	BENEFIT OF JENIANG , BERIS & TAWAR-MUDA	1398.67	939,14	658.63	479.18	359.51	276.79	217.8
	SARI MADA MAIN (REDAB)	34,21	22.88	15.92	11.44	8.45	6.37	4.8
	SARI HADA HINOR (KEDAN)	1.18	0.80	0.56	0.41	0.30	0.23	•••• 0,10
	SARIDEI (KEDAH)	0.51	0.32	0.21	0.15	0.10	0.07	0.0
*	TOTAL BEHEFIT	1434.77	963.14	675.32	491.18	368.35	283.45	222.95
COST					····-			
	COST FOR JENIARG , BERIS & TAMAR-HUDA	718.67	595.30	\$06.21	437.29	382,95	339.16	303.14
	COST FOR SARI DAM	46.08	38.27	33.25	28.91	25.37	22.43	19.95
	TOTAL COST	764.75	633,07	539.46	466.20	408.32	361.59	323.14
*								
TOTAL	8-C COST	670.02 764.75	328,07	135.85	24.9B	~39.96	-78.13	-100.19

REMARKS; IN 1982 CONSTANT PRICE.

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#### PRESENT VALUE OF B-C OF OVERALL SOURCE DEVELOPMENT PLAN IN LOW GROWTH CASE ASSUMING JENIANG OPERATION OF ALTERNATIVE 3

			OPERAT	TON O	e ALTER	WALLAR 2	,		
								Unit:	M\$10
	4			NET	PRESENT VALUE	WITH VARIABLE	DISCOUNT	····	ΜQTO
* JENIANG	**		61	81	103	122	141	161	182
<b>BENEFI</b>	it .								
	TRIBUTARY IRRIGATION	(KEDAH)	\$0.72	35.00	23.30	19.01	14.75	11-76	9,39
	ADVERSE LOSS MADA	(KEDAH)	~67.29	-45,48	-32.24	-23.82	-18.23	-14.38	-11.64
	ABYERSE LOSS D & 1	(KEDAH)	-1.54	-1.04	-0.73	-0.54	-0.41	-0.32	-0.26
	TREBUTARY IRREGATION (		131.40	94.65	71.19	55.60	44.76	36.92	31.08
	ADVERSE LOSS M.HINCE		-4.65	-3.34	-2.50	-1.74	-1.56	-1.28	-1.08
	ABVEESE LOSS D & I		-5.04	-3.27	-2.21	-1.35	-1.13	-0.85	~0.65
		(KEDAH)	1013.90	671.45	464.35	333.14	246.55	187.34	145.59
		(KEDAH)	98.85	49.12	50.40	38.02	29.49	23.39	18.89
	DAI ( TOTAL BENZFIT	(XEDAH)	0.58	0.37	0.25	0.17	0.12	0.09	0.06
cost -	IVIAL BEREFIT		1217.30	817.45	573.41	418.09	314.34	242.67	191.58
-051	KADA KAIN (TERTIARY)		494.10	403.70	338.29	249.13	251.10	220.99	196.69
	NABA HINOL		26.31	23.29	20.96	19.08	17.51	15.18	15.02
	JENIANG SYSTEM		49.61	43.14	37.98	33.71	30,11	27.02	24.34
	TRIBUTARY IRRIGATION (	(REDAH)	12.65	10.75	9.31	8.20	7.30	6.57	5.97
	TREBUTARY INDICATION (	(KUDA )	26.39	22.02	18.79	16.31	14.35	12.77	11.47
1	TOTAL COST		609.06	502.50	425.33	366.43	320.37	283.53	253.49
*Tetal.	B-C		608.24	314.56	148.48	51.65	-6.03	-40.66	-61.91
*TOTAL	C05T		609.05	502.90	425.33	366.43	320.37	283.53	253.49
		*******							******
NZYEFI	+ BERIS **								
-626/1	BENEFIT OF JENIARG		1217.30	817.46	573.81	418.09	314.34	242.67	191.58
		(KEDAH)	114.24	76.47	53.26	38.31	28.30	21.35	16.42
		(KEDAR)	3,94	2.67	1.80	1.36	1.01	0.77	0.60
		(HUDA )	0.55	0.39	0.24	0.21	0.16	0.13	0.10
		(REDAH)	1.69	1.09	0.74	0.51	0.37	0.27	0.20
		(NUDA )	1,02	0.65	0.43	0.29	0.21	0.15	0.11
	TOTAL SENEFIT		1338.74	\$98.73	630.40	458.77	344.39	265.35	209.01
005T									
	COST FOR JENIANG		609.06	502.90	425.33	356.43	320.37	283.53	253.49
	COST FOR MERIS DAM		42.14	35.91	31.21	27.52	24.50	21.97	19.62
•	TOTAL COST		651,20	538.81	456.54	393,95	344.87	305-50	273,31
*TOTAL	S-C Cest		617.54	359.92	173.86	44.92	-0.45	-40.15 305.50	-64.30 273.31
			651.20	538.41	456.54	393.95	344.97		
JENIANG	+ BERIS + TAVAR-HUDA **								
ACKEPT	if								
	BENEFIT OF JENIANG &	BERIS	1338.74	858.73	630.40	458,77	344.39	265.35	209.01
	T-MUDA HADA MAIK	(KEDAB)	66.52	44.49	30.95	22,23	16.42	12.39	9.51
	T-HUBA HADA HINOR	(KEDAH)	2.30	1.55	1.09	0.79	4.59	0.45	0,34
	T-HUBA MAIN MINOR	(BUDA )	0.90	9.80	ê.e0	0.04	0.00	0.05	0.00
	T-HUBA \$ 4 I	(KEOAH)	0.36	0.23	0.15	0.11	0.07	- 0.05	0.04
	T-HURA D & I	(HUDA )	0.00	0.00	0.00	0.00	0,00	8.00	0.00
	TOTAL BENEFIT		1407,92	945.00	662-39	481.92	361.47	278.24	218.90
0057									
	COST FOR JENIANS & BEI	R18	651.20	538.01	436.54	393.95	344.87	305,50	273.31
	COBT FOR T-HUBA RAN		47,47	57.49	49.67	43.34	38.08	33.46	29.68
•	TOTAL COST		714.67	596.30	506.21	437.25	382.95	339.16	303.19
			689.23	348.70	156.38	44.63	-21.48	-40.92	-84.29
			469.23	142.10			382.95	339.16	
	3-C C817		218.47	596.30		417.38			
	9-C C85T		718.67	596.30	506.21	437.29			303,19
ATOTAL		ARI #*	718.67	596.30	505.21	437.29			303,19
ATOTAL	COST + BIRIS + TAMAR-HUDA + S.	ART ++	718.67	596.30	508.21	437.29			303,19
ATOTAL JENTANG	COST + BIRIS + TAMAR-HUDA + S.		718.67	596.30 945.00	662.59	437.29 	361.47	278.24	303,19
ATOTAL JENTANG	COST + BIRIS + TAMAR-HUDA + 9, IT BIHEFIT 67 JENIANG , 1		*** * *** #** * * * * * * * * * *						
ATOTAL JENTANG	COST + BERIS + TAMAR-HUDA + 9, IT BERFIT 67 JENIANG , 1 SARI MARA MAIN	BERIS & TAWAR-HUDA	1407.92	945.00	662.59	431.92	361.47	278.24	218.90
ATOTAL JENTANG	CBST + BERIS + TAMAR-HUDA + 8, IT BEHEFIT 67 JEMIANG , 1 BARI MADA MINOR BARI MADA MINOR	BERIS & TAVAR-HUDA (KEDAH)	1407 <b>.9</b> 2 34.21	945.00 22.88	652.59 15. <del>9</del> 2	481.92 11.44	361.47 8.45	278.24 6.37	218.90 4.89
ATOTAL A JENIANG BENRFI	CBST + BERIS + TAMAR-HUDA + 8, IT BEHEFIT 67 JEMIANG , 1 BARI MADA MINOR BARI MADA MINOR	BERIS & TAWAR-HUDA (KEDAH) (KEDAH)	1407 <b>.9</b> 2 34.21 1.16	945.00 22.88 0.80	652.59 15.92 9.56	481.92 11.44 0.41	361.47 8.45 0.30	278.24 6.37 6.23	218.90 4.89 0.12
ATOTAL JENIANG BENEFI	CBST + BERIS + TAMAR-HUDA + S. IT SEHEFIT 67 JENIANG , 1 SARI MADA MAIN SARI MADA NINER SARI D & L *TATAL BERKEIT	BERIS & TAWAR-MUDA (KEDAH) (KEDAH) (KEDAH)	1407.92 34.21 1.18 6.51 1443.82	945.00 22.88 0.80 0.32 969.00	652,59 15-92 0.56 0.21 679.28	481.92 11.44 0.41 9.15 493.92	361.47 8.45 0.30 0.10 370.32	278.24 6.37 9.23 8.07 284.91	218.90 4.89 0.18 0.03 224,02
ATOTAL A JENIANG BENEFI	CBST + BIRIS + TAMAR-HUDA + S. IT SIREFIT 67 JENIANG , S SARI MADA MAIN SARI MADA NINER SARI D & L SARI D & L COST FOR JENIANG , BEI	BERIS & TAWAR-MUDA (KEDAH) (KEDAH) (KEDAH)	1407.92 34.21 1.18 0.51 1443.02 718.67	945.00 22.88 0.80 0.32 969.00 596.30	652,59 15.92 0.56 0.21 679.28 306.21	431.92 11.44 0.41 9.15 493.92 437.29	361.47 8.45 0.30 0.10 370.32 362.95	278.24 6.37 0.23 8.07 266.91	218.90 4.89 0.18 0.03 224.02 303.19
ATOTAL A JENIANG BERRFI COST	COST + BIRIS + TAMAR-HUDA + SH IT BIRFFIT 67 JENIANG , : SARI MARA MINOR SARI MARA MINOR SARI B 4 1 -TOTAL BERKFIT COST FOR JARI BAN	BERIS & TAWAR-MUDA (KEDAH) (KEDAH) (KEDAH)	1407.92 34.21 1.18 0.51 1443.82 718.47 45.08	945.00 22.88 0.80 0.32 969.00 596.30 38,72	662.55 15.52 0.56 0.21 679.28 306.21 33.25	431.92 11.44 0.41 9.15 493.92 437.29 28.91	361.47 8.45 0.30 0.10 370.32 362.95 25.37	278-24 6.37 0.23 8.07 284.91	218.90 4.89 0.12 0.03 224.02 303.19 19.95
ATOTAL A JENIANG BERRFI COST	CBST + BIRIS + TAMAR-HUDA + S. IT SIREFIT 67 JENIANG , S SARI MADA MAIN SARI MADA NINER SARI D & L SARI D & L COST FOR JENIANG , BEI	BERIS & TAWAR-MUDA (KEDAH) (KEDAH) (KEDAH)	1407.92 34.21 1.18 0.51 1443.02 718.67	945.00 22.88 0.80 0.32 969.00 596.30	652,59 15.92 0.56 0.21 679.28 306.21	431.92 11.44 0.41 9.15 493.92 437.29	361.47 8.45 0.30 0.10 370.32 362.95	278.24 6.37 0.23 8.07 266.91	218.50 4.65 0.12 0.03 224,02 303,19
* JENIANG * JENIANG \$288791 COST	CBST + BERIS + TAMAR-HUDA + S. IT SEMERIT 67 JENIANG , S SARI MADA MMIN SARI MADA NIMER SARI D 4 1 *TOTAL BERKFIT COST FOR SARI BAN *TOTAL COST	BERIS & TAWAR-MUDA (KEDAH) (KEDAH) (KEDAH)	1407.92 34.21 1.18 0.51 1443.82 718.47 45.08 784.75	945.00 22.88 0.80 0.32 969.00 595.30 38,77 635.07	652,59 15.92 0.56 0.21 679.28 306.21 33.25 539.46	481.92 11.44 0.41 9.15 493.92 437.29 28.91 466.20	361.47 8.45 0.30 0.10 370.32 342.95 25.57 408.32	278-24 6-37 6-23 8.07 284.91 339.16 22.43 361.39	218.90 4.69 0.18 0.03 224,02 303.19 19,95 323.14
SZKEFI COST	COST + BIRIS + TAMAR-HUDA + SH IT BIRFFIT 67 JENIANG , : SARI MARA MINOR SARI MARA MINOR SARI B 4 1 -TOTAL BERKFIT COST FOR JARI BAN	BERIS & TAWAR-MUDA (KEDAH) (KEDAH) (KEDAH)	1407.92 34.21 1.18 0.51 1443.82 718.47 45.08	945.00 22.88 0.80 0.32 969.00 596.30 38,72	662.55 15.52 0.56 0.21 679.28 306.21 33.25	431.92 11.44 0.41 9.15 493.92 437.29 28.91	361.47 8.45 0.30 0.10 370.32 362.95 25.37	278-24 6.37 0.23 8.07 284.91	218.50 4.69 0.11 0.03 224,02 303,19 19,95

BARRING; IN 1962 CONSTANT PRICE.

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#### BENEFIT CASH FLOW AND PRESENT WORTH OF IRRIGATION IN KEDAH RIVER FOR OVERALL PLAN, ALTERNATIVE 1 HIGH GROWTH CASE

	10 18E TO	TAL DENA		PUT		HADA	MAIN		MADA MINOR			
YEAR	JENLANG BYBTBM (3) (a)		Т- HUDA Dah (7) (с)	BARI DAN (3)	BYSTEN (MS 106)	велів пан (M\$10 <sup>6</sup> ) ( <u>f</u> )	т-нира DAM (11\$10 <sup>6</sup> )( (g)	8ARI DAN M\$10 <sup>6</sup> X 	JENIANG BYBTEN M\$10 <sup>6</sup> )( (i)	BERIS DAN (N\$10 <sup>6</sup> )( (j)	<b>t-huda</b> dan m\$10 <sup>6</sup> ) (k)	8AR DA (M\$10 <sup>6</sup> 
1983	100.00	0.00	0.00	0.00	0.00	0.00	0.00	0.09	0.00	0.00	0.00	0.0
1984	100.00	0.00	0.00	0.00	2.00	Č 0,00	0.00	0.00	0.00	0.00	0.00	0.0
1965	100.00	0.00	0.00	0.00	4.70	0.00	0,00	0.00	0.55	0.00	0.00	0.0
1986	100.00	0.60	0.00	0.00	8.80	0.00	0.00	0.00	1.47	0.00	0.00	0.0
1987	100.00	0.00	0.00	0.00	11.10	0.00	0,00	0.00	2.71	0.00	0.00	0.0
1988	100.00	0,00	0.00	0.00	13.30	0.00	0,00	0.00	3.33	0.00	0.00	0.0
1989	100.00	0.00	0.00	0,00	15.60	0.00	0.09	0.00	3.77	0.00	0.00	0.0
1990	92.45	0.00	0.00	0.00	24.58	0.00	0,00	0.00	3.65	0.00	0.00	0.0
1991	92.35	3.26	1.80	1.05		8.63	4.78	2.78	7.96	0,33	0.18	0.1
1992	92.24	3.18	1.74	1.04	46.16	8.82	4.82	2,88	8.31	0.34	0.18	0.1
1993	92.13	3.09	1.67	1.02	58.67	9.02	4.87	2.98	6.73	0.34	0.19	0.
1994	92.02	3.01	1.61	1.01	65.44	9.01	4,81	3.03	9.00	0.34	0.18	0.1
1995	91.92	2.93	1.54	1.00	72.00	8.99	4.72	3.07	9.03	0.34	0.18	0.1
1996	91.81	2.85	1.47	0.99	78.83	8,96	4.64	3.11	9.17	0.33	0.17	0.1
1997	91.70	2.77	1.41	0.98	86.01	8.93	4.54	3.15	9.19	0.32	0,16	0,1
199B	91.59	2.68	1.34	D.95	93.35	8.89	4.44	3.19	9.23	0.31	0.16	0.1
1999	91.48	2,60	1.28	0.95	101.13	8.85	4.34	3.24	9.24	0.31	0.15	0.1
2000	91.37	2.52	1.21	0.94	109.53	8,81	4.23	3.29	9.23	0.30	0.14	0.1
2001	91.37	2.52	1.21	0.94	114.74	8,95	4.30	3,34	9.23	0.30	0.14	0.1
2002	91.37	2.52	1.21	0.94	116.84	9.01	4.33	3.36	9.23	0.30	0.14	0.1
2003	91.37	2.52	1.21	0.94	118.12	9.05	4.34	3.37	9.23	0.30	0.14	0.1
2010	91.37	2.52	1.21	0.94	118.12	9.05	4.34	3.37	9.23	0,30	0.14	0.1
2011	91.37	2.52	1.21	0.94	118.12	9.05	4,34	3.37	9.23	0.30	0.14	0.1
2031	91.37	2.52	1.21	0.94	118.12	9.05	4.34	3.37	9.23	0.30	0.14	0.1
2032	91.37	2.52	1.21	0.94	118.12	9.03	4.34	3.37	9,23	0.30	0.14	0.1
			ł	IPV( 6X)	964.37	85.63	42.89	30.70	97.17	-2.97	1.50	1.(
			E E	IPV( 83)	639.46	58.06	29.31	20.65	68.03	2.04	1.03	0.7
			ŀ	IPV(10X)	442.84	40.94	20.82	14.46	49.66	1.45	0.74	0.5
			H	IPV(12X)	318.18	29.79	15.25	10.45	37.51	1.06	0.55	0.3
			ł	PY(147)	235.85	22.24	11.46	7.75	29.12	0.80	0.41	0.2
			B	PV(16X)	179.49	- 16.95	8.78	5.88	23.11	0.61	0.32	0.3
			ħ	FV(183)	139.72	13.14	6.84	4,53	18.69	0.48	0.25	· 0.1

BENEFIT CASH FLOW AND PRESENT WORTH OF IRRIGATION IN MUDA RIVER FOR OVERALL PLAN, ALTERNATIVE 1 HIGH GROWTH CASE

		********		
	PROPORTIO	N OF	MAIN	MINOR
	N.W.O. TO	DEMAND		
YEAR			-	
•	BERIS	T-HUDA	BERIS	T-MUDA
	DAM	DAH	' DAM	DAN
	(7)	(%)	(M\$10 <sup>6</sup> )	(M\$10 <sup>6</sup> )
	<u>(m)</u>	<u>(ŋ)</u>	<u>(o)</u>	<u>(p)</u>
1983	0.00	0.00	0.00	0.00
1984	0.00	0,00	0.00	0.00
1985	0.00	0.00	0.00	0.00
1986	0.00	0.00	0.00	0.00
1987	0.00	0.00	0,00	0.00
1988	0.00	0.00	0.00	0.00
1989	0.00	0.00	0.00	0.00
1990	0.00	0.00	0.00	0.00
1991	1.65	1.03	0.41	D.26
1992	1.70	1.00	0.43	0.25
1993	1.75	0.96	0.46	0.25
1994	1.80	0.93	0.48	0.25
1995	1.85	0.90	0.49	0.24
1996	1.89	0.87	0.50	0.23
1997	1.94	0.84	0.52	0.22
1998	1.99	0.80	0.53	0.21
1999	2.04	0.77	0.54	0,20
2000	2.09	0.74	0.55	0.20
2001	2.09	0.74	0.55	0.20
2002	2.09	0.74	0.55	0.20
2003	2.09	0.74	0.55	0.20
2010	2.09	0.74	0.55	0.20
2011	2.09	0.74	0.55	0.20
			0133	0120
2031	2.09	0.74	0.55	0.20
2032	2.09	0.74	0,55	0.20
NPV( 6%)			4.97	2.06
NPV( 8%)			3.33	1.42
NPV(10Z)			2.32	1.02
NPV(12%)			1.67	0.75
NPV(14%)			1.24	0.57
NPV(16%)			0.93	0.44
NPV(18%)			0.72	0.34

#### BENEFIT CASH FLOW AND PRESENT WORTH OF D&I WATER SUPPLY FOR OVERALL PLAN, ALTERNATIVE 1 HIGH GROWTH CASE

Unit: M\$10<sup>6</sup>

		KEDAH	l		MUDA		
YEAR	JENIANG	BERIS	T-MUDA	SARI	BERIS	T-HUDA	
	System (q)	DAM (r)	DAM (5)	DAM (t)	DAM (u)	DAH (v)	
1983	0.00	0,00	0.00	0.00	0.00	0.00	
1984	0.00	0.00	0.00	0.00	0.00	0.00	
1985	0.00	0.00	0.00	0.00	0.00	0.00	
1986	0.00	0,00	0.00	0.00	0.00	0.00	
1987	0.00	0.00	0.00	0.00	0.00	0.00	
1988	0.00	0.00	0.00	0.00	0.00	0.00	
1989	0.00	0.00	0.00	0.00	0.00	0.00	
1990	0.00	0.00	0.00	0.00	0.00	0.00	
1991	0.22	0.11	0.09	0.10	0.63	0.96	
1992	0.43	0.18	0.18	0.20	1.12	1.92	
1993	0,65	0.24	0.28	0.30	1.61	2.88	
1994	0.86	0.30	0.37	0,40	2.10	3.84	
1995	1.08	0.37	0.46	0.51	2.60	4.81	
1996	1.29	0,43	0.55	0.61	3.09	5.77	
1997	1.51	0.49	0.64	0.71	3.58	6.73	
1998	1.72	0.55	0.74	0.81	4.07	7.69	
1999	1.94	0.62	0.83	0.91	4.56	8.65	
2000	2.15	0.68	0.92	1.01	5.05	9.61	
2001	2.15	0.68	0.92	1.01	5.05	9.61	
2002	2.15	0.68	0.92	1.01	5.05	9.61	
2003	2.15	0.68	0.92	1.01	5.05	9.61	
2010	2.15	0.68	0.92	1.01	5.05	9.61	
2011	2.15	0.68	0.92	1.01	5.05	9.61	
2031	2.15	0.68	0.92	1.01	5.05	9,61	
2032	2.15	0.68	0.92	1.01	5.05	9.61	
ev( 6%)	15.59	5.05	6.67	7.33	36.95	69.70	
V( 8%)	9.95	3.24	4.26	4.67	23.63	44.47	
V(10Z)	6.60	2.16	2.82	3.10	15.70	29.48	
V(12%)	4.52	1.49	1,93	2.12	10,78	20.19	
V(14%)	3.18	1.06	1.36	1.49	7.61	14.21	
PV(16%)	2,29	0.77	0.98	1.08	5.50	10.24	
					4.05	7,52	

#### BENEFIT CASH FLOW AND PRESENT WORTH OF IRRIGATION IN KEDAH RIVER FOR OVERALL PLAN, ALTERNATIVE 2, EVEN DISTRIBUTION, HIGH GROWTH CASE

	to the to		NATER OUT	PUT		нала і	AIN .		HADA MINOR			
YEAR	JENIARG SYSTEM (2)	BERIS DAN (%)	T- HUDA Dan (1)	SARI DAK (I)	JENIANG SYSTEM	BERIS DAN MS10 <sup>6</sup> M	T-HUDA DAN MSTO <sup>6</sup> )(1	DAH	JENIANG SYSTER (MS10 <sup>6</sup> )()	BERIS DAM MS10 <sup>6</sup> )(	т-нира Дан M\$10 <sup>6</sup> )(1	вар . d/ .13 (\$ 10
						0.00	0.00	0.00	0.00	0.00	0.00	0.0
1983	100.00	0.00	0.00	0.00	0.00 2.00	0.00	0.00	0,00	0,00	0.00	0.00	0.0
1984 1985	100.00	0.00	0.00	0,00	4.70	0.00	0.00	0.00	0.56	0.00	0.00	0.
		0.00	0.00	0.00		0.00	0.00	0.00	1.47	0.00	0.00	0.
1986	100.00	0.00	0.00	0.00	8.80 11.10	0.00	0.00	0.00	2.71	0.00	0.00	0.
1987	100.00	0.00	0.00	0.00	13.30	0.00	0.00	0,00	3.33	0.00	0.00	0.
1985 1989	100.00	0.00	0.00	0.00	15.60	0.00	0.00	0.00	3.77	0.00	0.00	0.
	92.45			0.00	24.58	0.00	0.00	0.00	3.65	0.00	0.00	o.
1990 1991	92.35	0.00 3.28	0.00	1.05	34.65	8.69	4.95	2.78	7.96	0.34	0.19	0,
	92.24	3.22		1.03	46.16	8.94	5.02	2.88	8.31	0.34	0.19	0.
1992 1993	92.13	.3.19	1.01	1.04	36.67	9.21	5.02	2.98	8.73	0.35	0.19	0.
	92.02	3.10	1.69	1.01	65.44	9.28	5.04	3.03	9.00	0.35	0.19	0.
1994				1.00	72.00	9.32	4.98	3.03	9.03	0.35	0.19	0.
1995	91.92	3.04	1.63				4.90		9.17	0.35	0.18	0.
1996	91.81	2.98	1.56	0.93	78.83	9.37	4.85	3.11 3.15	9.19	0,34	0.18	0.
1997	91.70	2.92	1.50	0.98	86.01	9.42						
1998	91.59	2.86	1.44	0.96	93.35	9.47	4.77	3.19	9.23	0.33	0.17	0.
1999	91.48	2.80	1.38	0.95	101.13	9.52	4.70	3.24	9.24 9.23	0.33	0.16	0. 0.
2000	91.37	2.74	1.32	0.94	109.53	9.58	4.61 1. cò	3.29		0.32	0.15	
2001	91.37	2.74	1.32	0.94	114.74	9.74	4.69	3.34	9.23	0.32	0.15	0.
2002	91.37	2,74	1.32	0.94	116.84	9.80	4.72	3.38	9.23	0.32	0,15	0,
2003	91.37	2.74	1.32	0.94	118.12	9.84	4.74	3.37	9.23	0,32	0.15	0.
2010	91.37	2.74	1.32	0.94	118.12	9.84	4.74	3.37	9.23	0.32	0.15	0.
2011	91.37	2,74	1.32	0.94	118.12	9.84	4.74	3,37	9.23	0.32	0.15	. O.
2031	91.37	2.74	1.32	0.94	118.12	9.84	4.74	3.37	9.23	0.32	0.15	Q.
2032	91.37	2.74	1.32	0.94	118.12	9.84	4.74	3,37	9.23	0.32	0.15	0.
				(PY( 6X)	964.37	\$1.15	46.06	30.70	97.17	3.16	1.60	
			1	PV( ƏX)	639.46	61.56	31.39	20.65	68.03	2.16	1.10	0.
			1	PY(10%)	442.84	43.24	22.23	14.46	49.65	1.53	0,79	0.
			1	FPV(12X)	318.18	31,35	16.25	10.45	37.51	1.12	0.58	0.
			I	(14%)	235.85	23.33	12,18	7.75	29.12	0.84	0.44	0.
			. 5	IFY(16%)	179.49	17.73	9.31	9.68	23.11	0.64	0.34	0.
				NPV(18%)	139.72	13.71	7.24	4.53	18.69	0.50	0.25	0.

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BENEFIT CASH FLOW AND PRESENT WORTH OF IRRIGATION IN MUDA RIVER FOR OVERALL PLAN, ALTERNATIVE 2, EVEN DISTRIBUTION, HIGH GROWTH CASE

	PROPORTIO		HAIN	MINOR
99940 99340	N.W.O. TI	DEMAND		
YEAR LOSS	BERIS	T-MUDA	BERIS	T-HUDA
2005	DAN	DAM	DAH	DA
	(%)	(%)		
			(M\$10 <sup>6</sup> )	(M\$10 <sup>6</sup> )
1983	0.00	0.00	0.00	0.00
1984	0.00	0,00	0.00	0.00
1985	0.00	0.00	0.00	0.00
1986	0.00	0.00	0.00	0.00
1987	0.00	0.00	0.00	0.00
1988	0.00	0.00	0.00	0.0
1989	0.00	0.00	0.00	0.0
1990	0.00	0.00	0.00	0.0
1991	1,62	0.70	0.40	0.1
992	1.65	0.69	0.42	0.1
1993	1.67	0.68	0.44	0.1
1994	1.70	0.67	0.45	0.1
95	1,72	0.66	0.46	0,1
1996	1.74	0.64	0.46	0.1
997	1.77	0,63	0.47	0.1
998	1.79	0.62	0.48	0.1
1999	1.82	0.61	0.48	0.1
000	1.84	0.60	0.49	0.1
2001	1.84	0,60	0.49	0.1
2002	1.84	0.60	0.49	0.1
2003	1.84	0.60	0.49	0.1
2010	1.84	0.60	0.49	0.1
2011	1.84	0.60	0.49	0.1
2031	1.84	0.60	0.49	0.1
032	1.84	0.60	0.49	0.1
				*******
( 6%)	17.02		4,49	1.5
8%)	11.49		3.03	1.0
10%)	8.06		2.12	0.7
(12%)	5.84		1.54	0.5
(14%)	4.34		1.14	0.4
16%)	3.30		0.86	0.3
(18%)	2.55		0.67	0.2

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#### BENEFIT CASH FLOW AND PRESENT WORTH OF D&I WATER SUPPLY FOR OVERALL PLAN ALTERNATIVE 2, EVEN DISTRIBUTION, HIGH GROWTH CASE

## Unit: M\$10<sup>6</sup>

		квран	HUDA				
YEAR -	JENIANG	BERIS	T-MUDA	SARI	BERIS	T-MUDA	
	SYSTEM	DAM	DAH	DAM	DAM	DAM	
1983	0.00	0.00	0.00	0.00	0.00	0.00	
1984	0.00	0.00	0.00	0.00	0.00	0.00	
1985	0.00	0.00	0.00	0.00	0.00	0.00	
1986	0.00	0.00	0.00	0.00	0.00	0.00	
1987	0.00	0.00	0.00	0.00	0.00	0.00	
1988	0.00	0.00	0.00	0.00	0.00	0.00	
1989	0.00	0.00	0.00	0.00	0.00	0.00	
1990	0.00	0.00	0.00	0.00	0.00	0,00	
1991	0.22	0.12	0.10	0.10	0.34	0.79	
1992	0.43	0.20	0,20	0.20	0.53	1.58	
1993	0.65	0.27	0.31	0.30	0.73	2.36	
1994	0.86	0.35	0.41	0.40	0.93	3.15	
1995	1.08	0.42	0.51	0.51	1.13	3.94	
1996	1.29	0.49	0.61	0.61	1.32	4.73	
1997	1.51	0.57	0.71	0.71	1.52	5.52	
1998	1.72	0.64	0.82	0.81	1.72	6.30	
1999	1.94	0.72	0.92	0.91	1.91	7.09	
2000	2.15	0.79	1.02	1.01	2.11	7.88	
2001	2.15	0.79	1.02	1.01	2.11	7.8	
2002	2.15	0.79	1.02	1.01	2.11	7.8	
2003		0.79	1.02	1.01	2.11	7.8	
2010	2.15	0.79	1.02	1.01	2.11	7.8	
2011	2.15	0.79	1.02	1.01	2.11	7.8	
2031	2.15	0.79	1.02	1.01	2.11	7.8	
2032	2.15	0.79	1.02	1.01	2.11	7.8	
RPV( 6%)	) 15.59	5.85	7.40	7.33	15.63	57.1	
NPV( 8%)	·	3.75	4.72	4.67	10.02	36.4	
NPV(10%)		2.50	3.13	3.10	6.69	24.1	
NPV(12%)		1.72		2,12	4.61	16.9	
		1.22		1.49	3.26	11.0	
NPV(14%		0.88		1.08	2.36	8.	
NPV(16%	) 1.68	0.65		0.79	1.75	6.	

#### BENEFIT CASH FLOW AND PRESENT WORTH OF IRRIGATION IN KEDAH RIVER FOR OVERALL PLAN, ALTERNATIVE 3, KEDAH PRIORITY, HIGH GROWTH CASE

YEAR	YO THE TO		NATER OU	וויסר		HADA	KAIN			NADA I	NIHOR	
+644	JENIANG System (X)	BERIS DAM (2)	T- NUDA DAH (X)	SARI DAM (I)	JENLANG SYSTEM ( <u>M\$10<sup>6</sup>)</u> (	BERIS DAM M\$10 <sup>6</sup> )(	т-ната ван MS10 <sup>6</sup> )(1	SARI DAN MS 10 <sup>6</sup> )(	JENIANG STSTEN MS10 <sup>6</sup> )(A	BERIS DAN 4\$10 <sup>6</sup> )(1	T-HUDA DAH 4\$10 <sup>6</sup> )(1	5AR) DAN M\$ 10 <sup>6</sup>
1983	100.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
1984	100.00	0.00	0.00	0.00	2.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
1985	100.00	0.00	0.00	0.00	4.70	0.00	0.00	0.00	0.56	0.00	0.00	0.00
1986	100.00	0.00	0.00	0.00	8.80	0.00	0.00	0.00	1.47	0.00	0.00	0.00
1987	100.00	0.00	0.00	0.00	11.10	0.00	0.00	0.00	2.71	0.00	0.00	0.00
1958	100.00	0.00	0.00	0.00	13.30	0.00	0.00	0.00	3.33	0.00	0.00	0.00
1989	100.00	0.00	0.00	0.00	15.60	0.00	0.00	0.00	3.77	0.00	0.00	0.00
1990	92.46	0.00	0.00	0.00	24.58	0.00	0.00	0.00	3.65	0.00	0.00	0.00
1991	92.35	3.56	2.04	1.05	34.65	9.43	5.39	2.78	7.96	0.36	0.21	0.11
1992	92.24	3.53	2.01	1.04	46.16	9.80	5.59	2.88	8.31	0.37	0.21	0.11
1993	92.13	3.50	1.99	1.02	58.67	10.20	5.80	2.98	8.73	0,39	0.22	0.11
1994	92.02	3.47	1.96	1.01	65.44	10.38	5.88	3.03	9.00	0.40	0.22	0.12
1995	91.92	3.44	1.94	1.00	72.00	10.55	5.95	3.07	9.03	0.39	0.22	0.11
1996	91.81	3.41	1.92	0.99	78.83	10.72	6.03	3.11	9.17	0.40	0.22	0.11
1997	91.70	3.38	1.89	0.98	86.01	10.91	6.11	3.15	9.19	0.39	0.22	0.11
1998	91.59	3.35	1.87	0.96	93.35	11.09	5.18	3.19	9.23	0.39	0.22	0.11
1999	91.48	3.32	1.84	0.95	101.13	11.29	6.27	3.24	9.24	0.39	0.22	0.11
2000	91.37	3.29	1.82	0.94	109.53	11.50	6.36	3.29	9.23	0.39	0.21	0.11
2001	91.37	3.29	1.82	0.94	114.74	11.69	6.47	3.34	9.23	0.39	0.21	0.11
2002	91.37	3.29	1.82	0.94	116.84	11.77	6.51	3.36	9.23	0.39	0.21	0.11
2003	91.37	3.29	1.82	0.94	118.12	11.81	6.53	3.37	9.23	0.39	0.21	0.11
2010	91.37	3.29	1.82	0.94	118.12	11.8]	6.53	3.37	9.23	0.39	0.21	0.11
2011	91.37	3.29	1.82	0.94	118.12	11.91	6.53	3.37	9.23	0.39	0.21	0.11
2031	91.37	3.29	1.52	0.94	118.12	11.81	6.53	3.37	9.23	0.39	0.21	0.11
2032	91.37	3.29	1.82	0.94	118.12	11.81	6.53	3.37	9.23	0.39	0.21	0.11
<b>-</b> •			N	2V( 6 <b>1</b> )	964.37	105.64	59.49	30.70	97.17	3.69	2,06	1.06
			H.	PV( 8%)	639.46	71.65	40.04	20.65	68.03	2.50	1.40	0.72
			N	PV(10X)	442.84	50.08	28.03	14.46	49.66	1.77	0.99	0.51
			N	PV(12%)	318.18	36.15	20.26	10.45	37.51	1.29	0.72	0.37
			N	PV(14Z)	235.85	26.78	15.03	7.75	29.12	0.96	0,54	0.28
			<b>H</b>	PV(16X)	179.49	20.28	11.40	5.88	23,11	0.73	0.41	0.21
			N	PV(181)	139.72	15.63	8.79	4.53	15.69	0.57	0.32	0,16

BENEFIT CASH FLOW AND PRESENT WORTH OF IRRIGATION IN MUDA RIVER FOR OVERALL PLAN, ALTERNATIVE 3, KEDAH PRIORITY, HIGH GROWTH CASE

			**************************************	
	PROPORTION		HAIN I	IINOK
	N.W.O. TO	DEMAND		
YEAR •	BERIS	T-MUDA	BERIS	T-NUDA
	DAN	DAM	DAM	DAH
	(%)	(%)	6.	
			(M\$10 <sup>6</sup> )	(M\$10°)
1983	0.00	0.00	0,00	0.00
1984	0.00	0.00	0.00	0,00
1985	0.00	0.00	0.00	0.00
1986	0.00	0.00	0.00	0.00
1987	0.00	0.00	0.00	0,00
1988	0,00	0.00	0.00	0.00
1989	0.00	0.00	0.00	0.00
1990	0.00	0.00	0.00	0.00
1991	0.18	0.00	0.04	0.00
1992	0.18	0.00	0.05	0.00
1993	0.18	0.00	0.05	0.00
1994	0,18	0.00	0.05	0.00
1995	0.18	0.00	0.05	0.00
1996	0.18	0.00	0.05	0.00
1997	0.18	0.00	0.05	0.00
1998	0.18	0,00	0.05	0.00
1999	0.18	0.00	0.05	0.00
2000	0.18	0.00	0.05	0.00
2001	0.18	0.00	0.05	0,00
2002	0.18	0.00	0.05	0.00
2003	0.18	0.00	0.05	0.00
2010	0.18	0.00	0.05	0.00
2011	0.18	0.00	0.05	0.00
2031	0.18	0.00	0.05	0.00
2032	0,18	0.00	0.05	0.00
NPV( 6%)			0.45	0.0
NPV( 8%)			0.31	
NPV(107)			0.22	
NPV(12%)			0.16	
NPV(14%)		•	0.12	
NPV(162)	-		0.09	
NPV(18X)			0.07	

BENEFIT CASH FLOW AND PRESENT WORTH OF D&I WATER SUPPLY FOR OVERALL PLAN ALTERNATIVE 3, KEDAH PRIORITY, HIGH GROWTH CASE

Unit: M\$10<sup>6</sup>

YEAR		KEDA	H .		MUD.	Α
IBAR	JENIANG	BERIS	T-HUDA	SARI	BBRIS	T-HUDA
	SYSTEM	DAH	DAM	DAM	DAM	DAM
1983	0.00	0.00	0.00	0.00	0.00	0.00
1984	0.00	0.00	0.00	0.00	0.00	0.00
1985	0.00	0.00	0.00	0.00	0.00	0.00
198 <del>6</del>	0.00	0.00	0.00	0.00	0.00	0,00
1987	0.00	0.00	0.00	0.00	0.00	0.00
1988	0.00	0.00	0.00	0.00	0.00	0.00
1989	0.00	0.00	0.00	0.00	0.00	0.00
1990	0.00	0.00	0.00	0.00	0.00	0.00
1991	0.22	0.15	0.14	0.10	0.14	0.00
1992	0.43	0.26	0.28	0.20	0.14	0,00
1993	0.65	0.36	0.41	0.30	0.14	0.00
1994	0.86	0.47	0.55	0.40	0.14	0.00
1995	1.08	0.57	0.69	0.51	0.14	0.00
1996	1.29	0.67	0.83	0.61	0.14	0.00
1997	1.51	0.78	0.97	0.71	0.14	0.00
1998	1.72	0.88	1.10	0.81	0.14	0.00
1999	1.94	0.99	1.24	0.91	0.14	0.00
2000	2.15	1.09	1,38	1.01	0.14	0.00
2001	2,15	1.09	1,38	1.01	0.14	0.00
2002	2.15	1.09	1.38	1.01	0.14	0.00
2003	2.15	1.09	1.38	1.01	0.14	0.00
2010	2.15	1.09	1.38	1.01	0.14	0.00
2011	2.15	1.09	1.38	1.01	0.14	0.00
2031	2.15	1.09	1.38	1.01	0.14	0.00
2032	2.15	1.09	1.38	1.01	0.14	0.00
/( 6%)	15.59	8,02	10.01	7.33	1.34	0.00
7(8%)	9.95	5.14	6.39	4.67	0.91	0.00
(10X)	6.60	3.42	4.23	3.10	0.64	0.00
(12%)	4.52	2.35	2.90	2.12	0.47	0.00
V(14%)	3.18	1.66	2.04	1.49	0.35	0.00
/(16%)	2.29	1,20	1.47	1.08	0.27	0.00
(18%)	1.68	0.89	1.08	0.79	0.21	0.00

#### BENEFIT CASH FLOW AND PRESENT WORTH OF IRRIGATION IN KEDAH RIVER FOR OVERALL PLAN, ALTERNATIVE 1, LOW GROWTH CASE

	PROPORTIO TO THE TO			JTPUT		HADA	MAIR			MADA I	HINOR	
TEAR	JENIANG System (2)	AZRIS DAM (X)	T- MUDA DAM (X)	SARI DAM (1)	JENIANG STSTEN (M\$10 <sup>6</sup> )(	beris Dan <u>M\$10<sup>6</sup>)</u> (	T-NUTA DAN MS 10 <sup>6</sup> )(	SARI DAM <u>M\$10<sup>6</sup>)</u> (	JENLANG SYSTEN <u>MŞ10<sup>6</sup>)(1</u>	BERIS DAM 1\$10 <sup>6</sup> )	<b>т-нира</b> Dan <u>M\$10<sup>6</sup>) (</u>	SAR DA M\$10
1983	100.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.0
1984	100.00	0.00	0.00	0.00	2.00	0.00	0.00	0.00	0.00	0,00	0.00	0.0
1985	100.00	0.00	0.00	0.00	4.70	0.00	0.00	0.00	0.56	0.00	0.00	0.0
1986	100.00	0.00	0.00	0.00	8.80	0.00	0.00	0.00	1,47	0.00	0.00	· 0.0
1987	100.00	0.00	0.00	0.00	11,10	0.00	0.00	0.00	2.71	0.00	0.00	0.0
1988	100.00	0.00	0.00	0.00	13.30	0.00	0.00	0.00	3.33	0.00	0.00	0.0
1989	100.00	0.00	0.00	0.00	15.60	0.00	0.00	0.00	3.77	0.00	0.00	0.0
1990	92.69	0.00	0.00	0.00	25.67	0.00	0.00	0.00	3,67	0.00	0.00	0.0
1991	92.92	3.38	1.93	1.06	36.15	8.94	5.10	2.61	5.02	0.35	0.20	0.1
1992	92.95	3.35	1.92	1.06	48.13	9.29	5.34	2.95	8.38	0.36	0.20	0.
1993	92.98	3.31	1.92	1.07	61.15	9.66	5.60	3.11	8.82	0.37	0.21	0.
1994	93.01	3.28	1.92	1.07	68.40	9.82	5.74	3.20	9.11	0.37	0.22	0.0
1995	93.05	3.25	1.92	1.07	75.47	9.97	5.67	3.28	9.15	0.37	0.22	0.1
1996	93.08	3.22	1.91	1.07	82.82	10.12	5.01	3.37	9.32	0.37	0.22	0.
1997	93.31	3.19	1.91	1.07	90.56	10.28	6.16	3.47	9.36	0.37	0.22	0.
1998	93.14	3.15	1.91	1.08	98.48	10.44	6.31	3.56	9.41	0.37	0.22	0.1
1999	93.17	3.12	1.90	1.08	106.87	10.61	6.47	3.67	9.44	0.37	0.22	٥.
2000	93.20	3.09	1.90	1.08	115.93	10.60	6.64	3.78	9.44	0.36	0.22	0.
2001	93.20	3.09	1.90	1.08	121,24	10.98	6.75	3.84	9.44	0.36	0.22	0.
2002	93.20	3.09	1.90	1.08	123.38	11.05	6.79	3.86	9.44	0.36	0.22	0.
2003	93.20	3.09	1.90	1.08	124.69	11.09	6.82	3.88	9.44	0.36	0,22	0.
2010	93.20	3.09	1.90	1.08	124.69	11.09	6.82	3.88	9.44	0.36	0.22	0.
2011	93.20	3.09	1.90	1.08	124.69	11.09	6.82	3.88	9.44	0.36	0,22	0.
2031	93.20	3.09	1.90	1.08	124.69	11.03	6.82	3.68	9.44	0.36	0.22	0.1
2032	93.20	3.09	1.90	1.08	124.69	11.09	6.82	3.88	9.44	0.36	0.22	0.
				NPV( 6%)	1013.90	100.41	60.63	34.21	98.83	3.47	2.09	1.
				FFV( 81)	671.45	67.50	40.61	22.88	69.12	2.36	1.42	0.
				NPV(10%)	464.35	47.20	28.29	15.92	50.40	1.67	1.00	0.
				NFV(12%)	333.14	34.09	20.36	11.44	38.02	1.21	0.72	0.
				NPV(14%)	246.55	25.27	15.05	8,45	29.49	0.91	0.54	0.
				NPV(16%)	187.34	29.14	11.37	6.37	23.39	0.69	0.41	0.
				NPV(18%)	145.59	14.75	8.74	4.89	18.89	0.54	0.32	Q.

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#### BENEFIT CASH FLOW AND PRESENT WORTH OF IRRIGATION IN MUDA RIVER FOR OVERALL PLAN ALTERNATIVE 1, LOW GROWTH CASE

	PROPORTI	on of	MAIN	MINOR
YEAR	N.H.O. T	O DEMAND		
10.00	BERIS	T-MUDA	BERIS	T-MUD/
	DAM	DAM	DAM	DA
	(%)	(%)	(M\$10 <sup>6</sup> )	(X\$10 <sup>6</sup>
1983	0.00	0.00	0.00	0.0
1984	0.00	0.00	0.00	0.0
1985	0.00	0.00	0.00	0.0
1986	0.00	0.00	0.00	0.0
1987	0.00	0.00	0.00	0.00
1988	0.00	0.00	0.00	0.0
1989	0.00	0.00	0.00	0.0
1990	0.00	0.00	0.00	0.0
1991	1.48	0.75	0.37	0.1
1992	1.55	0.78	0.40	0.2
1993	1.61	0.82	0.42	0.2
1994	1.68	0.85	0.44	0.2
1995	1.74	0.89	0.46	0.2
1996	1.80	0.92	0.48	0.2
1997	1.87	0.96	0,50	0.2
1998	1.93	0,99	0.51	0,2
1999	2,00	1.03	0.53	0.27
2000	2.06	1.06	0,55	0.2
2001	2,06	1.06	0.55	0,21
2002	2.06	1.06	0.55	0.2
2003	2.06	1.06	0,55	0.2
2010	2.06	1.06	0.55	0.21
2011	2.06	1.06	0,55	0.28
2031	2.06	1.06	0.55	0.28
2032	2.06	1.06	0.55	0.28
PV( 6%)			4.81	2.46
(PV( 8%)			3.21	1.64
RV(10X)			2.23	1.14
PV(12%)			1.60	0.82
PV(14%)			1.18	0.60
PV(16%)			0.89	0.4
FV(18%)			0.68	0.35

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#### BENEFIT CASH FLOW AND PRESENT WORTH OF D&I WATER SUPPLY FOR OVERALL PLAN, ALTERNATIVE 1, LOW GROWTH CASE

## Unit: M\$10<sup>6</sup>

		KEDAH	L		MUDA	7
YEAR	JENIANG SYSTEM	BERIS DAM	T-MUDA DAH	SARI DAM	BERIS DAM	T-MUD/ DAN
1983	 0.00	0.00	0.00	0.00	0.00	0.00
1984	0.00	0.00	0.00	0.00	0.00	0.0
1985	0.00	0.00	0.00	0.00	0.00	0.0
1986	0.00	0.00	0.00	0.00	0.00	0.0
1987	0.00	0.00	0.00	0.00	0.00	0.0
1988	0.00	0.00	0.00	0.00	0.00	0.0
1989	0.00	0.00	0.00	0.00	0.00	0.0
1990	0.00	0.00	0.00	0.00	0.00	0.0
1991	0.01	0.05	0.01	0.01	0.14	0.1
1992	0.02	0.07	0.01	0.01	0.28	0.2
1993	0.02	0.08	0.02	0.02	0,41	0.3
1994	0.03	0.10	0.02	0.03	0.55	0.5
1995	0.04	0.11	0.03	0.04	0.69	0.6
1996	0.05	0.12	0.03	0.04	0.63	0.7
1997	0.06	0.14	0.04	0.05	0.97	0.9
1998	0.06	0.15	0.04	0.06	1.10	1.0
1999	0.07	0.17	0.05	0.06	1.24	1.1
2000	0.08	0.18	0.05	0.07	1.38	1.3
2001	0.08	0.18	0.05	0.07	1.38	1.3
2002	0.08	0.18	0.05	0.07	1.38	1.3
2003	0.08	0,18	0.05	0.07	1.38	1.3
2010	0,08	0.18	0.05	0.07	1.38	1.3
2011	Q.08	0.18	• 0.05	0.07	1.38	1.3
2031	0.08	0.18	0.05	0.07	1.38	1.3
2032	0.08	0.18	0.05	0.07	1.38	1.3
NPV( 6%)	0.58	1.40	0.36	0.51	10.01	9.4
NPV( 8%)	0.37	0.91	0.23	0.32	6.39	6.0
NPV(10Z)	0.25	0.61	0.15	0.21	4.23	3.9
NPV(12%)	0.17	0.43	0.11	0.15	2.90	2.7
NPV(14%)	0.12	0,31	0.07	0.10	2.04	1.9
NPV(167)	0.09	0.23	0.05	0.07	1.47	1.3
NPV(18%)	0.06	0.17	0.04	0.05	1.08	1.0

#### BENEFIT CASH FLOW AND PRESENT WORTH OF IRRIGATION IN KEDAH RIVER FOR OVERALL PLAN ALTERNATIVE 2, EVEN DISTRIBUTION, LOW GROWTH CASE

	PROPORTIO TO THE YO		WATER OU	tput		NADA	MA1N			KADA I	MINOR	
¥ EAR	JENIANG BYSTEM (X)	BERIS DAN (2)	T- HUDA Dan (7)	DAH (T)	SYSTEM	BERIS DAN	т-нира Dan NS1061	SARI DAN (NSLOG)	JENIANG SYSTEM (M\$ 10 <sup>6</sup> ) (	BERIS DAN	T-HUDA DAH	SAR DAI
										<u>wş100</u> )(	MSIO	15100
1983	100,00	0.00	0.00	0.00	0.00	0.00	0,00	0.00	0.00	0.00	0.00	0.0
1984	100.00	0.00	0,00	0.00	2.00	0.00	0.00	0.00	0.00	0.00	0.00	0.0
1985	100.00	0.00	0.00	0.00	4.70	0.00	0.00	0.00	0.56	0.00	0.00	0.0
1986	100.00	0.00	0.00	0.00	8.60	0.00	0.00	0.00	1.47	0.00	0.00	0.0
1987	100.00	0.00	0.00	0.00	11.10	0.00	0,00	0.00	2.71	0.00	0.00	0.0
1988	100.00	0.00	0.00	0,00	13.30	0.00	0,00	0.00	3,33	0.00	0.00	0.0
1989	100.00	0.00	0.00	0.00	15.60	0.00	0.00	0.00	3.77	0.00	0.00	0.0
1990	92.89	0.00	0,00	0.00	25.67	0.00	0,00	0.00	3.67	0.00	0.00	0.0
1991	92.92	3.39	2.00	1.06	36.15	8.98	5.29	2.81	8.02	0.35	0.20	0.1
1992	92,95	3.37	1.99	1.06	48.13	9.36	5.54	2.95	8.38	0.36	0,21	0.1
1993	92.98	3.35	1.99	1.07	61.15	9.77	5,80	3.11	6.82	0.37	0.22	0.1
1994	93.01	3,33	1.99	1.07	68,40	9.96	5.95	3.20	9.11	0.38	0.23	0.1
1995	93.03	3.31	1.99	1.07	75.47	10.15	6.09	3.28	9.15	0.38	0.23	0.1
1996	93.08	3.29	1.98	1.07	82.82	10.35	6.23	3.37	9.32	0,38	0.23	0.1
1997	93.11	3.27	1.98	1.07	90,56	10.55	6.39	3.47	9.36	0.38	0.23	0.1
1998	93.14	3.25	1.98	1.08	98.48	10.76	6.54	3.56	9.41	0.38	0.23	0.1
1999	93.17	3.23	1.97	1.08	106.87	10.98	6.71	3.67	9.44	0,38	0.23	0.13
2000	93.20	3.21	1,97	1.08	115.93	11.22	6.89	3.78	9.44	0,38	0.23	0.13
2001	93.20	3.21	1.97	1.08	121,24	11.41	7.00	3.84	9.44	0.38	0.23	0.1
2002	93.20	3.21	1.97	1.08	123,38	11.48	7.04	3.86	9.44	0.38	0.23	0,13
2003	93.20	3.21	1.97	1.08	124.69	11.52	7.07	3.68	9.44	0.38	0.23	0.13
2010	93.20	3.21	1.97	1.03	124.69	11.52	7.07	3.88	9.44	0.38	0.23	0.13
2011	93.20	3.21	1.97	1.08	124.69	11.52	7.07	3,88	9.44	0.38	0.23	0.13
2031	93.20	3.21	1,97	1.08	124.69	11.52	7.07	3.88	9.44	0.38	0.23	0.1
2032	93,20	3.21	1.97	1.08	124.69	11.52	7.07	3.88	9.44	0.38	0.23	0.1
		· · · · · · · ·		IPV( 67)	1013,90	103.43	62.85	34.21	98.85	3.58	2.17	1.1
			1	(8%)V9	671.45	69.41	42.10	22.88	69.12	2.42	1,47	0.8
			ł	ISA( TOX)	464.35	48.45	29.33	15.92	50.40	1.71	1.03	0.50
			8	24(12%)	333.14	34.94	21.11	11.44	38.02	1.24	0.75	0.4
			E	PV(14%)	246.55	25.86	15.60	8,45	29.49	0,93	0.36	0.30
		•	N	PV(16%)	187.34	19.56	11.78	6.37	23,39	0.71	0.42	0.23
			H	PV(181)	143.59	13.06	9.06	4.89	18.89	0.55	0,33	0,16

BENEFIT CASH FLOW AND PRESENT WORTH OF IRRIGATION IN MUDA RIVER FOR OVERALL PLAN, ALTERNATIVE 2, EVEN DISTRIBUTION, LOW GROWTH CASE

			***	
	PROPORTIO	ON OF	MAIN	MINOR
	N.W.O. TO	demand		
YEAR	•		******	
	BERIS	T-MUDA	BERIS	T-HUDA
	DAM	DAH	DAN	DAH
	(%)	(%)	wareh	1.000.06
			<u>(M\$10°)</u>	<u>(M\$10<sup>6</sup>)</u>
1983	0.00	0.00	0.00	0.00
1984	0.00	0.00	0.00	0.00
1985	0.00	0.00	0.00	0.00
1986	0.00	0.00	0.00	0.00
1987	0.00	0,00	0.00	0.00
1988	0.00	0.00	0.00	0.00
1989	0.00	0.00	0.00	0.00
1990	0.00	0.00	0.00	0.00
1991	1.47	0.39	0.37	0.10
1992	1.51	0.43	0.39	0.11
1993	1.56	0.46	0.41	0.12
1994	1.60	0.50	0.43	0.13
1995	1.65	0.53	0.44	0,14
1996	1.70	0.57	0.45	0.15
1997	1.74	0.60	0.46	0.16
1998	1.79	0.64	0.47	0.17
1999	1.83	0.67	0.49	0.18
2000	1.88	0.71	0.50	0.19
2001	1.88	0.71	0.50	0.19
2002	1.88	0.71	0.50	0.19
2003	1.88	0.71	0.50	0.19
2010	1 00	0.71	A 60	0.10
2010	1.88	0.71	0,50	0,19
2011	1.88	0.71	0.50	0.19
2031	1.88	0.71	0.50	0.19
2032	1.88	0.71	0.50	0.19
NPV( 6%)			4.46	1.58
NPV( 8%)			2.99	1.04
NPV(10X)			2.08	0.72
NPV(12%)			1.50	0.51
NPV(14%)			1.11	0.37
NPV(16Z)			0.84	0.28
NPV(18%)			0.64	0.21

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#### BENEFIT CASH FLOW AND PRESENT WORTH OF D&I WATER SUPPLY FOR OVERALL PLAN, ALTERNATIVE 2, EVEN DISTRIBUTION, LOW GROWTH CASE

Unit: M\$106

100.00		KEDAI	સ		MUD	Α
YEAR	JENIANG	BERIS	T-HUDA	SARI	BERIS	T-HUD
	SYSTEM	DAH	DAM	DAM	DAM	DAI
1983	0,00	0.00	0.00	0.00	0.00	0.0
1984	0.00	0.00	0.00	0.00	0.00	0.0
1985	0,00	0.00	0.00	0.00	0.00	0.0
1986	0.00	0.00	0.00	0.00	0.00	0.0
1987	0.00	0.00	0.00	0.00	0.00	0.0
1988	0.00	0,00	0.00	0.00	0.00	0.0
1989	0.00	0.00	0.00	0.00	0.00	0.0
1990	0.00	0.00	0.00	0.00	0.00	0.0
1991	0.01	0.06	0.01	0.01	0.05	0.0
1992	0.02	0.08	0.01	0.01	0.10	0.0
1993	0.02	0.09	0.02	0,02	0.14	0.0
1994	0.03	0.11	0.02	0.03	0.19	0.0
1995	0.04	0,13	0.03	0,04	0.24	0.0
1996	0.05	0.15	0.03	0.04	0.29	0.0
1997	0.06	0.17	0.04	0.05	0.34	0.0
1998	0.06	0.18	0.04	0.06	0.38	0.0
1999	0.07	0.20	0.05	0.06	0.43	0.0
2000	0,08	0.22	0.05	0.07	0.48	0.0
2001	0.08	0.22	0.05	0,07	0.48	0.0
2002	0.08	0.22	0.05	0.07	0.48	0.0
2003	0.08	0.22	0.05	0.07	0.48	0.0
2010	0.08	0.22	0.05	0.07	0.48	0.0
2011	0.08	0.22	0.05	0.07	0.48	0.0
2031	0.08	0.22	0.05	0.07	0.48	0.0
2032	0.08	0.22	0.05	0.07	0.48	0.0
V( 6%)	0.58	1.69	0.36	0.51	3.48	0.0
V( 8X)	0.37	1.09	0.23	0.32	2.22	0.0
V(10X)	0.25	0.74	0.15	0.21	1.47	0.0
V(12%)	0.17	0.51	0.11	0.15	1.01	0.0
V(14%)	0.12	0.37	0.07	0.10	0.71	0.0
V(16%)	0.09	0.27	0.05	0.07	0.51	0.0
V(18%)	0.06	0.20	0.04	0.05	0.38	0.0

# Table 42BENEFIT CASH FLOW AND PRESENT WORTH OF<br/>IRRIGATION IN KEDAH RIVER FOR OVERALL<br/>PLAN ALTERNATIVE 3, KEDAH PRIORITY,<br/>LOW GROWTH CASE

	PROPORTION TO THE TO			IPUT		MADA	HAIH	•	RADA MINOR				
YKAR	JENIANG System (2)	BERIS DAN (%)	T- HUDA DAK (X)	8ARI DAN (%)	JENIANG SYSTEN (M\$10 <sup>6</sup> )	BBRIS DAM (M\$10 <sup>6</sup> )	<b>1-нида</b> дам (M\$10 <sup>6</sup> )(	SARI DAM M\$10 <sup>6</sup> )	JBHIANG SISTEM (M\$10 <sup>6</sup> )(	BERIS DAM M\$10 <sup>6</sup> ){	<b>т-кира</b> Дам M\$10 <sup>6</sup> )(}	5AR DAI 4\$10 <sup>6</sup>	
1983	100.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.0	
1984	100.00	0.00	0.00	0.00	2.00	0.00	0.00	0,00	0.00	0.00	0.00	0.0	
1985	100.00	0.00	0.00	0.00	4.70	0.00	0.00	0.00	0.56	0.00	0.00	0.0	
1986	100.00	0.00	0.00	0.00	8.80	0.00	0.00	0.00	1.47	0.00	0.00	0.0	
1987	100.00	0.00	0.00	0.00	11.10	0.00	0.00	0.00	2.71	0,00	0.00	0.0	
1988	100.00	0.00	0.00	0.00	13.30	0,00	0.00	0.00	3.33	0.00	0.00	0.0	
1989	100.00	0.00	0.00	0.00	15.60	0.00	0.00	0.00	3.77	0.00	0.00	0.0	
1990	92.89	0,00	0.00	0.00	25.67	0.00	0.00	0,00	3.67	0.00	0.00	0.0	
1991	92.92	3.60	2.06	1.06	36,15	9.53	5.47	2.81	8.02	0.37	0.21	0.1	
1992	92.95	3.60	2.07	1,06		9.99	5.74	2.95	8.38	0,38	0,22	0.1	
1993	92.98	3.60	2.07	1.07		10.49	6.04	3.11	8.82	0.40	0.23	0.1	
1994	93.01	3.60	2.08	1.07		10.76	6.21	3.20	9.11	0.41	0.24	0.1	
1995	93.03	3.60	2.08	1.07		11.03	6.38	3.28	9,15	0.41	0,24	0.1	
1996	93.08	3.59	2.08	1.07		11.30	6.55	3.37	9.32	0,42	0.24	0.1	
1997	93.11	3.59	2.09	1.07		11.59		3.47	9.36	0.42	0,24	0.1	
1998	93.14	3.59	2.09	1.08		11.89	6.93	3.56	9.41	0.42	0.24	0.1	
1999	93.17	3.59	2.10	i.08		12.21	7.13	3,67	9.44	0.42	0.25	0.1	
2000	93.20	3.59	2.10	1,08		12.55		3.78	9.44	0.42	0.25	0.1	
2001	93,20	3.59	2.10	1.08		12.76		3.84	9.44	0,42	0.25	0.1	
2002		3,59	2.10	1.08				3.86	9.44	0.42	0.23	0.1	
2003		3.59		1.08				3.88	9,44		0.25	0.	
2010	93.20	3.59	2.10	1.08	124.69	12.89	7.54	3.88	9.44	0.42	0.25	0,	
2011	93.20	3.59	2.10	1.08	124.69	12-89	7.54	3.88	9.44	0.42	0.25	0.	
2031	93.20	3.59	2.10	1.08	124.69	12.89	7.54	3.88	9.44	0.42	0.23	Q.,	
2032	93.20	3.59	2.10	1.08	124.69	12.89	7.34	3.66	9.44	0.42	0.25	0.	
				NPV( 6%)	1013.90	114.24	66.52	34.21	\$8.65	3.94	2.30	1.	
				NPV( 8%)	671.45	76.47	44.49	22.58	69.12	2.67	1.55	0.	
				NPV(10%)	464.35	\$3.26	30.95	15.92	50.40	1.86	1.09	0.5	
				NPV(12X)	333.14	38.31	22.25	11.44	38,02	1.36	0.79	0.	
				NFV(14%)	246.55	28.30	16.42	8.45	29.49	1.01	0.59	0.	
				HPV(16%)	187.34	21.36	12.39	6.37	23.39	0.77	0.45	0.	
		•		NPV(18X)	145.59	16.42	9+51	· 4,89	18.69	0.60	0.34	0.	

BENEFIT CASH FLOW AND PRESENT WORTH OF IRRIGATION IN MUDA RIVER FOR OVERALL PLAN, ALTERNATIVE 3, KEDAH PRIORITY, LOW GROWTH CASE

	PROPORTION. TO		HAIN	MINOR
YEAR	BERIS	T-MUDA	BERIS	T-MUDA
	DAM	DAH		
	(%)	(%)	(M\$10 <sup>6</sup> )	
1983	0.00	0.00	0,00	0.00
1984	0.00	0.00	0.00	0.00
1985	0.00	0.00	0.00	0.00
1986	0.00	0.00	0.00	0.00
1987	0,00	0.00	0.00	0.00
1988	0.00	0.00	0.00	0.00
1989	0.00	0.00	0.00	0.00
1990	0.00	0.00	0,00	0.00
1991	0.33	0.00	.0.08	0.00
1992	0.32	0.00	0.08	0.00
1993	0.30	. 0.00	0.08	0.00
1994	0.28	0.00	0.07	0.00
1995	0.27	0.00	0.07	0.00
1996	0.25	0.00	0.07	0.00
1997	0.23	0.00	0.06	0.00
1998	0.21	0.00	0.06	0.00
1999	0.20	0,00	0.05	0.00
2000	0.18	0.00	0.05	0,00
2001	0,18	0.00	0.05	0.00
2002	0.18	0.00	0.05	0.00
2003	0,18	0.00	0.05	0.00
2010	0.18	0.00	0.05	0.00
2011	0.18	0.00	0.05	0,00
2031	0.18	0.00	0.05	0.00
2032	0.18	0.00	0.05	0,00
	0724 <b>8</b> 448 4		······	*******
NPV( 6%)			0.55	0.00
NPV( 8%)			0.39	0.00
NPV(10%)			0,28	0.00
RPV(122)			0.21	0.00
YPV(14%)			0.16	0.00
IPV(16%)			0.13	0.00
NPV(18%)			0.10	0.00

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BENEFIT CASH FLOW AND PRESENT WORTH OF D&I WATER SUPPLY FOR OVERALL PLAN, ALTERNATIVE 3, KEDAH PRIORITY, LOW GROWTH CASE

Unit: M\$10<sup>6</sup>

•		KEDAR		HUDA		
YEAR	JENIANG	BERIS	T-MUDA	SARI	BERIS	T-HUD!
	SYSTEM	DAM	DAM	DAN	DAM	DAL
1983	0.00	0.00	0.00	0.00	0.00	0.0
1984	0.00	0.00	0.00	0.00	0.00	0.0
1985	0.00	0.00	0.00	0.00	0.00	0.0
1986	0.00	0.00	0.00	0.00	0.00	0.0
1987	0.00	0.00	0.00	0.00	0.00	0.0
1988	0.00	0.00	0.00	0.00	0.00	0.0
1989	0.00	0.00	0.00	0.00	0,00	0.0
1990	0.00	0.00	0.00	0.00	0,00	0.0
1991	0.01	0.06	0.01	0.01	0.01	0,0
1992	0.02	0.08	0.01	0.01	0.03	0.0
1993	0.02	0.09	0.02	0.02	0.04	0.0
1994	0.03	0.11	0.02	0.03	0.06	0.0
1995	0,04	0,13	0.03	0.04	0.07	0.0
1996	0.05	0.15	0.03	0.04	0.08	0.0
1997	0.06	0.17	0.04	0.05	0.10	0.0
1998	0.06	0.18	0.04	0.06	0,11	0.0
1999	0.07	0.20	0.05	0.06	0.13	0.0
2000	0.08	0.22	0.05	0.07	0.14	0.0
2001	0.08	0.22	0.05	0.07	0.14	0.0
2002	0.08	0,22	0.05	0.07	0.14	0.0
2003	0.08	0.22	0.05	0.07	0.14	0.(
2010	0.08	0.22	0.05	0.07	0.14	0.0
2011	0.08	0.22	0.05	0.07	0,14	0.(
2031	0,08	0.22	0.05	0.07	0.14	0.0
2032	0.08	0.22	0.05	0.07	0.14	0.4
PV( 6%)	0.58	1.69	0.36	0.51	1.02	0.
PV( 8%)	0.37	1.09	0.23	0.32	0.65	0.
PV(10%)	0.25	0.74	0.15	0.21	0.43	0.
PV(12%)	0.17	0.51	0.11	0.15	0.29	0.
PV(14%)	0.12	0.37	0.07	0.10	0.21	0,
PV(16%)	0.09	0.27	0.05	0.07	0.15	0.
IPV(18X)		0.20	0.04	0.05	0.11	0.

#### PRESENT VALUE OF B-C OF OVERALL PLAN FOR HIGH GROWTH CASE IF THE REMAN DAM AND MERBOK STORAGE CAN BE IMPLEMENTED

							Unit:	M\$10
			NET		WITH VAREABLE			
AN JENIANG BENEF		61	26	10%	121	143	161	18
	TRIBUTARY IRRIGATION (KRDAH)	50.72	35.00	15 10	10.01			
	ADVERSE LOSS MADA (KEDAH)	-64.55	-43,71	25.30 -31.06	19.01 +23.00	14,75	11.76	9.55
	ADVERSE LOSS D + 1 (RECAH)	-3.09	-2.04	-1,41	-1.01	-0.75	-13.94 -0.57	-11.3
	TRIBUTARY IRRIGATION (MUDA )	131,80	94.65	71.19	33.60	44.76	36.92	31.02
	ADVERSE LOSS N.NINOR (HUDA )	-5.65	-4.11	-3.13	-2.47	-2,01	-1.67	-1.42
	ADVERSE LOSS D 6 I (HUDA )	-11.10	-7.31	-5.03	-1.60	-2,68	-2.02	-1.56
	NADA NAIN (KEDAH)	964.37	639.46	442.84	318.18	235.65	179.49	139.72
	MADA HINOR (KEDAN)	97.17	68.03	49.65	37.51	29.12	23.11	18.69
	D & I (KECAH)	15.59	9.93	6.60	4.52	3.18	2.29	1.60
	*TOTAL BENEFIT	1175.26	789.92	\$\$4.96	404.74	304.60	235.37	186.00
OOST								
	HADA HAIR (TERTIARY)	494.10	403.70	338.29	289,13	251.10	220.99	195.65
	NADA MINUR	26.31	23.29	20.96	19.03	17.51	16.18	15.02
	JENIANG SYSTEM	49.61	43.14	37.98	33.71	30.11	27,02	24.34
	TRIBUTARY IRRIGATION (KEDAR)	12.65	10.75	9.31	8.20	7.30	6.57	5.97
	TRISUTARY IRRIGATION (HUDA )	26.39	22.02	18.79	16.31	14.35	12.77	11.47
	TOTAL COST	609.05	592,90	425.33	366.43	320.37	283.53	253.49
			•					
TOTAL	B-C	566.20	287.02	129.63	38.31	-15.77	-48.16	-67.49
TUTAL	COST	609.06	502.90	425.33	366.43	320.37	283.53	253.49
	A \$7810 \$5					*********	********	
IN JENEANG BENEFI	+ BERIS **							
BENEFI	BENEFIT OF JENIANG	1175.26	128.6-					
	BEREFIT OF SERTARG BEREF HADA HAIN (KEDAN)		789.92	554.96	404.74	304.60	235.37	185.00
	BERIS HADA HIHOR (REDAH)	105.64	71.65	50.08	36.15	26.78	20.28	15.63
	BERIS KAIN MINOR (NUDA )		2.50	1.77	1.29	0.95	0.73	0.57
	BERIS D & I (KEDAN)	0.45	0.31	0.22	0.16	0.12	0.09	0.07
	BERIS D & I (NUDA )	1.34	5.14 0.91	3.42	2.35	1.66	1.20	0.89
	TOTAL BENEFIT	1295.40	870.43	0.64	0.47	0.35	0.27	0.21
COST		11/2010	010145	611.09	445,16	334.47	237.94	203.37
	COST FOR JENIANG	609.06	502.90	425.33	366.43	320.37	283.53	253.49
	COST FOR BERIS DAM	42,14	35.91	31.21	27.52	24.50	203.33	
•	TOTAL COST	651.20	538.81	456.54	393.95	344.87	305.50	19.62 273.31
						30010	337730	113,31
TOTAL	B≁C	644.20	331.62	154.55	51.21	-10.40	-47.56	-69,94
TOTAL	COST	651.20	538.81	456.54	393.95	344.87	305.50	273.31
	+ BERIS + BEMAN ++							
BENEFI	11							
	BENEFIT OF JENIANG & BERIS	1295.40	870.43	611.09	445.16	334.47	257.94	203.37
	REMAN HADA WAIN (KEDAH)	215.69	141.64	97.07	68.67	49,93	37.14	28.16
	RENAN MADA MINOR (KEDAH)	7.39	4.90	3.39	2.42	1.77	1.33	1.01
	REMAN D & I (KEDAM)	41.42	28.42	17.52	12.00	8.44	6.08	4.47
	TOTAL BENEFIT	1559.90	1043.59	729.07	528.25	394.61	302.49	237.01
C05T								
	COST FOR JENIANG & BERIS	651.20	538.81	455.54	393.95	344.87	305.50	273.31
				55,38		38.16	32,40	27.81
	COST FOR REMAN DAM	88.79	68.97		45.56			
	COST FOR REMAN DAM TOTAL COST	88.79 739.99	68.97 607.78	511.92	439.51	383.03	337.90	301.12
	TOTAL COST	739.99	607.78	511.92	439.51			
ATOTAL	TOTAL COST B-C	739.99 819.91	607.78 435.81	511.92 217.15	439.51 88.74	11.58	~35.41	-54-11
ATOTAL	TOTAL COST	739.99	607.78	511.92	439.51			
*TOTAL *TOTAL	B-C COST	739.99 819.91	607.78 435.81	511.92 217.15	439.51 88.74	11.58	~35.41	-54.11
4TOTAL 4TOTAL	DOTAL COST B-C COST + BERIS + REMAN + MERBOR **	739.99 819.91	607.78 435.81	511.92 217.15	439.51 88.74	11.58	~35.41	-54.11
4TOTAL TOTAL JENIANG	DOTAL COST B-C COST + BERIS + REMAN + MERBOR **	739.99 819.91	607.78 435.81 607.78	511.92 217.15 511.92	439.51 88.74 439.51	11,58 383.03	~35.41 337.90	-64.11 301.12
4TOTAL TOTAL JENIANG	TOTAL COST B-C COST + BERIS + REMAN + HERBOR ** T	739.99 819.91 739,99	607.78 435.81	511.92 217.15 511.92 729.07	439.51 88.74 439.51 528.25	11,58 383.03 394.61	~35.41 337.90 302.49	-64.11 301.12 237.01
4TOTAL TOTAL JENIANG	TOTAL COST B-C COST + BERIS + REJAN + HERBOX ** T BEREPIT OF JENIANG , BERIS,6 REJAN	739.99 819.91 739.99 1559.90	607.78 435.81 607.78 	511.92 217.15 511.92	439.51 88.74 439.51 528.25 3.04	11.58 383.03 394.61 2.26	~35.41 337.90 302.49 i.71	-64.11 301.12 237.01 1.32
4TOTAL *TOTAL * JENIANG BENEPI	TOTAL COST B-C COST + BERIS + REJUN + HERBOK ** T BENEFIT OF JEHTANG , BERIS,6 BEJUN HERBOK HAIH MINOR (HUDA )	739.99 619.91 739.59 1559.90 8.97	607.78 435.81 607.78 1043.39 6.03	511.92 217.15 511.92 729.07 4.22	439.51 88.74 439.51 528.25	11,58 383.03 394.61	-35,41 337,90 302,49 1,71 19,75	-64.11 301.12 237.01 1.32 14.51
4TOTAL *TOTAL * JENIANG BENEPI	TOTAL COST B-C COST + BERIS + REMAN + MERBOK ** T BENEPIT OF JEMIANC , BERIS, E REMAN HERBOK NAIN NINOR (MUDA ) HERBOR D & I (MUDA )	739.99 819.91 739.99 1559.90 8.97 134.48	607.78 435.81 607.78 1043.39 6.03 85.80	511.92 217.15 511.92 729.07 4.22 36.88	439.51 88.74 439.51 528.25 3.04 38.95	11.58 383.03 394.61 2.26 27.42	~35.41 337.90 302.49 i.71	-64.11 301.12 237.01 1.32
ATOTAL ATOTAL A JENIANG BENEFI	TOTAL COST B-C COST + BERIS + REMAN + MERBOK ** T BENEPIT OF JEMIANC , BERIS, E REMAN HERBOK NAIN NINOR (MUDA ) HERBOR D & I (MUDA )	739.99 819.91 739.99 1559.90 8.97 134.48	607.78 435.81 607.78 1043.39 6.03 85.80	511.92 217.15 511.92 729.07 4.22 36.88	439.51 88.74 439.51 528.25 3.04 38.95	11.58 383.03 394.61 2.26 27.42	-35,41 337,90 302,49 1,71 19,75	-64.11 301.12 237.01 1.32 14.51
ATOTAL ATOTAL A JENIANG BENEFI	TOTAL COST B-C COST + BERIS + REMAN + MERBOK ** T BSKEPIT OF JENTANG , BERIS,6 BEMAN MERBOK MAIN NILOZ (MUDA ) MERBOK D & I (MUDA ) TOTAL BENEFIT	739.99 619.91 739.99 1559.90 8.97 134.48 1703.35	607.78 435.81 607.78 1043.39 6.03 85.80 1135.42	511.92 217.15 511.92 729.07 4.22 56.88 790.17	439.51 88.74 439.51 528.25 3.04 38.95 570.24	11.58 383.03 394.61 2.26 27.42 424.29	-35.41 337.90 302.49 1.71 19.73 323.95	-64.11 301.12 237.01 1.32 14.51 252.84
*TOTAL *TOTAL * JENIANG BENEFI COST	TOTAL COST B-C COST + BERIS + REJUN + HERBOK ** T BENEFIT OF JENTANC , BERIS, 6 BEMAN HERBOK D.4 I (NUDA ) HORADK D.4 I (NUDA ) TOTAL BENEFIT COST FOR JENTANC , BERIS, 6 BEMAN	739.99 819.91 739.99 1559.90 8.97 134.48 1703.35 739.99	607.78 433.81 607.78 1043.39 6.03 85.80 1135.42 607.78	511.92 217.15 511.92 729.07 4.22 56.88 790.17 511.92	439.51 88.74 439.51 528.25 3.04 38.95 570.24 439.51	11.58 383.03 394.61 2.26 27.42 424.29 383.03	-35,41 337,90 302,49 1,71 19,75 323,95 337,50	-64.11 301.12 237.01 1.32 14.51 252.84 301.12 35.74
4TOTAL 4TOTAL * JENIANG BENEFI COST	TOTAL COST B-C COST + BERIS + REMAN + MERBOK 4* T BENEPIT OF JENIANG , BERIS, 6 REMAN HERBOK D.4 I (MUDA ) HERBOK D.6 I (MUDA ) TOTAL BEREFIT COST FOR JENIANG , BERIS, 6 BEMAN COST FOR HERBOK	739.99 819.91 739.99 1559.90 8.97 134.48 1703.35 739.99 81.37	607.78 433.81 607.78 1043.39 6.03 85.80 1135.42 607.78 69.16	511.92 217.15 511.92 729.07 4.22 56.88 790.17 511.92 59.65	439.51 88.74 439.51 528.25 3.06 38.95 570.24 439.51 51.98	11.58 383.03 394.61 2.26 27.42 424.29 383.03 45.63	-35,41 337,90 302,49 1,71 13,73 323,95 337,90 40,29	-64.11 301.12 237.01 1.32 14.51 252.84 301.12
ATOTAL INTOTAL INTOTAL BENEFT GOST	TOTAL COST B-C COST + BERIS + REMAN + MERBOK 4* T BENEPIT OF JENIANG , BERIS, 6 REMAN HERBOK D.4 I (MUDA ) HERBOK D.6 I (MUDA ) TOTAL BEREFIT COST FOR JENIANG , BERIS, 6 BEMAN COST FOR HERBOK	739.99 819.91 739.99 1559.90 8.97 134.48 1703.35 739.99 81.37	607.78 433.81 607.78 1043.39 6.03 85.80 1135.42 607.78 69.16	511.92 217.15 511.92 729.07 4.22 56.88 790.17 511.92 59.65	439.51 88.74 439.51 528.25 3.06 38.95 570.24 439.51 51.98	11.58 383.03 394.61 2.26 27.42 424.29 383.03 45.63	-35,41 337,90 302,49 1,71 13,73 323,95 337,90 40,29	-64.11 301.12 237.01 1.32 14.51 252.84 301.12 35.74

REMARKS; IN 1982 CONSTANT PRICE.

#### PRESENT VALUE OF B-C OF OVERALL PLAN FOR LOW GROWTH CASE IF THE REMAN DAM CAN BE IMPLEMENTED

Unit: M\$10<sup>6</sup>

•				BET	PRESENT VALUE	WITH VARIABLE	DISCOUNT	RATE	
44 JENTANG	**		6X	81	101	123	143	161	182
BENEFI	τ								
	TRIBUTARY IRRICATION	(KEDAS)	50,72	35,00	25.30	19.01	14.75	11.76	9.59
	ADVERSE LOSS MADA	(KEDAB)	-67.29	-45.48	-32.24	-23.82	-18.23	-14.38	-11.54
	ADVERSE LOSS D & I	(KEDAR)	-1.54	-1.04	-0,73	-0.54	-0.41	-0.32	-0,26
	TRIBUTARY IRRIGATION	(MUDA )	131.80	94.65	21.19	55.60	44.76	36.92	31.08
	ADVERSE LOSS M.HINOR	(HUDA )	-4.68	-3.34	-2.50	-1.94	-1.56	-1.28	-1.08
	ADVERSE LOSS D & 1	(HUDA )	-5.04	-3.27	-2.21	-1.55	-1.13	-0.85	-0,65
	KADA MATR	(KEDAH)	1013.90	671.45	464.35	333.14	246.55	187.34	145.59
	MADA HINOR	(KEDAH)	98.85	69.12	59.40	38.02	29.49	23.39	18.89
	D 4 1	(KEDAH)	0.58	0.37	0.25	0.17	0.12	0.09	0.05
	TOTAL BENEFIT		1217.30	617.46	\$73.81	418.09	314.34	242.67	191.58
COST									
	MADA MAIN (TERTIARY)		494.10	403.70	338.29	289.13	251.10	220.99	196.69
	NADA MINOR	4	26.31	23.29	20.96	19.08	17.51	16.18	15.02
	JENIANG SYSTER		49.61	43.14	37.98	33.71	30.11	27.02	24.34
	TRIBUTARY IDRICATION		12.65	10.75	9.31	8.20	7,30	6.57	5.97
	TRIBUTARY IRRIGATION	(RUDA )	26.39	22.02	18.79	16.31	[4.35	12.77	11.47
4	TOTAL COST		609.06	502.90	425.33	366.43	320.37	283.53	253.49
PRYOTAL	8-C		608.24	314.56	148.48	51.65	-6.03	-40.86	-61.91
** TOTAL	ODST		609.06	502.90	425.33	365.43	320.37	283.53	253.49
AA JENIANG BENEFI				· · ·	****				
	BENEFIT OF JENIANG		1217.30	817.46	573.61	418.09	314.34	242.67	191,58
	SESIS KADA KAIN	(REDAH)	97.16	65.32	45.67	32.98	24.43	18.52	14.28
	SERIS MADA MINOR	(REDER)	3.36	2.28	1.61	1.17	0.85	0.67	0.52
	BERIS NAIN MINOR	(HUDA )	7.05	4.85	3.44	2.52	1.39	1.45	1.13
	BERIS D & I	(KEDAH)	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	NERIS D & 1	(HUDA )	20.53	13.10	8.65	5.95	4.18	3.01	2.21
•	TOTAL BENEFIT		1345.44	10.000	633.21	460.71	345.74	265.32	209.72
COST									
	COST FOR JENIANG		609.06	502-90	425.33	366.43	320.37	283.53	253.49
	COST FOR BERIS DAM		42.14	35.91	31.21	27.52	24.50	21.97	19.82
•	TOTAL COST		651.20	538.81	456.54	393.95	344.87	305,50	273.31
**TOTAL	8-C		694.24	364.20	176.67	66.75	0.67	-39.18	-63.59
**TUTAL	COST		651.20	538.81	436.54	393.95	344.67	305.50	273.31
·· JENIANC	+ BERIS + BEMAN **								
BENZFI	IT				•				
	BENLFIT OF JENIANG &	BERIS	1345.44	\$03.01	633.21	450.71	345.74	256.32	209.72
	RZNAN KADA HAIN	(KZDAH)	181.48	120.05	62.65	58.80	42.99	32,14	24.49
	RENAM HADA MINOR	(REDAH)	6.23	4.16	2.89	2.08	1.53	1.15	65.0
	REMAN D & I	(KEDAN)	1.09	0.59	0.46	0.32	0,22	0.16	0.12
005T	TOTAL BENEFIT		1534.24	1027.91	719.21	521.91	390.48	299,77	235.21
ODST	COST FOR JENIANG & B		661 20	538.81		393.95	344.87	305,50	
	COST FOR BENAN	SELP	651.20 88.79	538.81 68.97	456+54 55+38	45.56	38.16	305,50	273.31 27.81
	TOTAL COST		739.99	607.78	511.92	439.51	383.03	32.40	301.12
ATOTAL	8C		794.25	420.13	207.29	62.40	7.45	-38,13	-65.91
ANTOTAL.	COST		739.99	607.78	511.92	439.51	383.03	337.90	301.12

#### BENEFIT CASH FLOW AND PRESENT WORTH OF IRRIGATION IN KEDAH RIVER FOR HIGH GROWTH CASE IF THE REMAN DAM AND MERBOK STORAGE CAN BE IMPLEMENTED

	PROPORTION OF N.W.O. TO THE TOTAL DEMAND				HADA		HADA MINOR		
YEAR	10 1RE 10	TAL DEHAN	) 	980-010 at 1970 at 10			******		
	JENIANG	BERIS	REMAN		BERIS	REMAN	JENIANG	BERIS	REMA
	SYSTEM	DAN	DAH	System	DAH	DAM	System	DAN	DA
	(X)	(X) 	(%)	(M\$10 <sup>6</sup> )	(M\$10 <sup>6</sup>				
1983	100.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.0
1984	100.00	0.00	0.00	2.00	0.00	0.00	0.00	0.00	0.0
1985	100.00	0.00	0.00	4.70	0+00	0.00	0.56	0.00	0.0
1986	100.00	0.00	0.00	8,80	0.00	0.00	1.47	0.00	0.0
1987	100.00	0.00	0.00	11.10	0.00	0.00	2.71	0.00	0,0
1988	100.00	0.00	0:00	13.30	0.00	0.00	3.33	0.00	0.0
1989	100.00	0.00	0.00	15.60	0,00	0.00	3.77	0.00	0.0
1990	92.46	0.00	0.00	24.58	0,00	0.00	3.65	0.00	0.0
1991	92.35	. 3.56	4.89	34.65	9.43	12.94	7.96	0.36	0.5
1992	92.24	3.53	5.16	46.16	9.80	14.32	8.31	0.37	0.5
1993	92.13	3.50	5.44	58.67	10.20	15.84	8.73	0.39	0.6
1994	92.02	3.47	5.71	65.44	10.38	17.08	9.00	0.40	0.6
1995	91.92	3.44	5.99	72.00	10.55	18.36	9.03	0.39	0.6
1996	91.81	3.41	6.26	78.83	10.72	19.69	9.17	0.40	0.7
1997	91.70	3.38	6.54	86.01	10.91	21.09	9.19	0.39	0.7
1998	91.59	3.35	6.81	93.35	11.09	22.55	9.23	0.39	0.8
1999	91.48	3.32	7.09	101.13	11.29	24.09	9.24	0.39	0.8
2000	91.37	3.29	7.36	109.53	11.50	25.73	9.23	0.39	0.8
2001	91.37	3.29	7.36	114.74	11.69	26.15	9.23	0.39	0.8
2002	91.37	3.29	7.36	116.84	11.77	26.32	9.23	0.39	0.80
2003	91.37	3.29	7.36	118.12	11.81	26.42	9.23	0+39	0.86
2010	91.37	3.29	7.36	118.12	11.81	26.42	9.23	0.39	0.8
2011	91.37	3.29	7.36	118.12	11.81	26.42	9.23	0.39	0.86
2031	91.37	3.29	7.36	118.12	11.81	26.42	9.23	0.39	0.86
2032	91.37	3.29	7.36	118.12	11.81	26.42	9.23	0.39	0,86
	-	NPV	( 6%)	964.37	106.64	215.69	. 97.17	3.69	7.39
		NPV	( 8%)	639.46	71.65	141.84	68.03	2.50	4.90
		NPV	(10%)	442.84	50.08	97.07	49.66	1.77	3.39
		NPV	(12%)	318.18	36.15	68.67	37.51	1.29	2.42
		HPV	(14%)	235.85	26.78	49.93	29.12	0.96	1.77
		NPV	(16%)	179.49	20.28	37.14	23.11	0.73	1.33
		NPV	(18%)	139.72	15.63	28.16	18.69	0.57	1.01

BENEFIT CASH FLOW AND PRESENT WORTH OF IRRIGATION IN MUDA RIVER FOR HIGH GROWTH CASE IF THE REMAN DAM AND MERBOK STORAGE CAN BE IMPLEMENTED

	PROPORTI N.W.O. T		HAIN MINOR		
YEAR	BERIS DAM	MERBOK DAM	BERIS	MERBOX	
	(%)	(%)	(MS 10 <sup>6</sup> )	(M\$10 <sup>6</sup> )	
1983	0.00	0.00	0.00	0.00	
1984	0.00	0.00	0.00	0.00	
1985	0.00	0.00	0.00	0.00	
1986	0.00	0.00	0.00	0.00	
1987	0.00	0.00	0.00	0.00	
1988	0,00	0.00	0.00	0.00	
1989	0.00	0.00	0.00	0.00	
1990	0.00	0.00	0.00	0.00	
1991	0.18	3.12	0.04	0.78	
1992	0.18	3.18	0.05	0.81	
1993	0.18	3.25	0.05	0.85	
1994	0.18	3.32	0.05	0.88	
1995	0.18	3.39	0.05	0.90	
1996	0.18	3.45	0.05	0.92	
1997	0.18	3.52	0.05	0.93	
1998	0.18	3.59	0.05	0.95	
1999	0.18	3.65	0.05	0.97	
2000	0,18	3.72	0.05	0.99	
2001	0.18	3.72	0.05	0.99	
2002	0.18	3.72	0.05	0.99	
2003	0.18	3.72	0.05	0.99	
2010	0.18	3.72	0.05	0.99	
2011	0.18	3.72	0.05	0.99	
2031	0.18	3.72	0,05	0.99	
2032	0.18	3.72	0.05	0.99	
NPV( 6%)			0.45	8.97	
NPV( 8%)			0.31	6.03	
NPV(10X)			0.22	4.22	
NPV(12%)			0.16	3.04	
NPV(14%)			0.12	2.26	
NPV(16%)			0.12	1,71	
NPV(18%)			0.03	1.32	

BENEFIT CASH FLOW AND PRESENT WORTH OF D&I WATER SUPPLY FOR HIGH GROWTH CASE IF THE REMAN DAM AND MERBOK STORAGE CAN BE IMPLEMENTED

		KED	NH	MUDA		
YEAR	JENIANG	BERIS	REHAN	BERIS	MERBOX	
	SYSTEN	DAM	DAM	DAM	DAH	
	(M\$10 <sup>6</sup> )	(M\$10 <sup>6</sup> )	(M\$10 <sup>6</sup> )	(M\$10 <sup>6</sup> )	<u>(м\$10<sup>6</sup>)</u>	
1983	0.00	0.00	0.00	0.00	0.00	
1984	0.00	0.00	0.00	0.00	0.00	
1985	0.00	0.00	0.00	0.00	0.00	
1986	0,00	0.00	0.00	0.00	0.00	
1987	0.00	0.00	0.00	0.00	0.00	
1988	0.00	0.00	0.00	0.00	0.00	
1989	0.00	0.00	0.00	0.00	0.00	
1990	0.00	.0.00	0.00	0.00	0.00	
1991	0.22	0.15	0.57	0.14	1.85	
1992	0.43	0.26	1.14	0.14	3.71	
1993	0.65	0.36	1.71	0.14	5.56	
1994	0.86	0.47	2.28	0.14	7.42	
1995	1.08	L 0,57	2.86	0.14	9.27	
1996	1.29	0,67	3.43	0.14	11.12	
1997	1.51	0.78	4.00	0.14	12.98	
1998	1.72	0.88	4.57	0.14	14.83	
1999	1.94	0.99	5.14	0.14	16.69	
2000	2.15	1.09	5.71	0.14	18.54	
2001	2.15	1.09	5.71	0.14	18.54	
2002	2.15	1.09	5.71	0,14	18.54	
2003	2.15	1.09	5.71	0.14	18.54	
2010	2.15	1.09	5.71	0.14	18.54	
2011	2.15	1.09	5.71	0.14	18.54	
2031	2.15	1.09	5.71	0.14	18.54	
2032	2.15	1.09	5.71	0.14	18.54	
NPV( 6%)	15.59	8.02	41.42	1.34	134.48	
NPV( 8%)	9.95	5.14	26.42	0.91	85.80	
NPV( 0%)	5.50	3.42	17.52	0.64	56.88	
NPV(10%)	4.52	2.35		0.47	38.95	
		1.66	8.44	0.35	27.42	
NPV(14%)	3.18			0.35	19.75	
NPV(16%)	2.29	1.20		0.21	14.51	
NPV(18%)	1.68	0.89	4.4/	0.21	14+31	

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# Table 50BENEFIT CASH FLOW AND PRESENT WORTH OF<br/>IRRIGATION IN KEDAH RIVER FOR LOW GROWTH<br/>CASE IF THE REMAN DAM CAN BE IMPLEMENTED

	PROPORTION TO THE TO				MADA 1	4AIN		MADA 1	1INOR
YEAR	JENIANG SYSTEM (%)	BERIS DAM (%)	REMAN DAM (2)	JENIANG SYSTEM (M\$10 <sup>6</sup> )	BERIS DAM (M\$10 <sup>6</sup> )	REMAN DAM (M\$10 <sup>6</sup> )	JENIANG SYSTEM (M\$10 <sup>6</sup> )	BERIS DAM (MS10 <sup>6</sup> )	REMAN DAM (M\$10 <sup>6</sup>
1983	100.00	0.00	0.00	• •••••••••	0.00	0.00	0.00	0.00	0.00
1984	100.00	0.00	0.00	2.00	0.00	0.00	0.00	0.00	0.00
1985	100.00	0.00	0.00		0.00	0.00	0.56	0.00	0.00
	100.00	0.00	0.00	8.80	0.00	0.00	1.47	0.00	0.00
1986		0.00	0.00	11.10	0.00	0.00	2.71	0.00	0.00
1987	100.00	0.00	0.00	13.30	0.00	0.00	3.33	0.00	0.00
1988	100.00	0.00	0.00	15.60	0.00	0.00	3.77	0.00	0.00
1989	100.00		0.00	25.67	0.00	0.00	3.67	0.00	0.00
1990	92.89	0.00	4.64	36.15	8.66	12.30	8.02	0.33	0.48
1991	92.92	3.27		48.13	8.99	13.32	8.38	0.34	0.51
1992	92.95	3.24	4.80		9.35	14.44	8.82	0.36	0.55
1993	92.98	3.21		61.15	9.50	15.28	9.11	0.36	0.58
1994	93.01	3.18	5.11	68.40				0.36	0.60
1995	93.05	3.15	5.26	75.47	9.65	16.13	9.15		0.63
1996	93.08	3-11	5.41	82.82	9.79	17.03	9.32	0.36	
1997	93.11	3.08	<b>∢5.57</b>	90.56	9.95	17.97	9.36	0.36	0.6
1998	93.14	3.05	5.72	98.48	10.11	18.95	9.41	0.36	0.6
1999	93.17	3.02	5.88	106.87	10.27	19.98	9.44	0.35	0.6
2000	93.20	2.99	6.03	115.93	10.45	21.08	9.44	0.35	0.7
2001	93,20	2.99	6.03	121.24	10.62	21.42	9.44	0.35	0.7
2002	93.20	2.99	6.03	123.38	10.69	21.56	9.44	0.35	0.7
2003	93.20	2.99	6.03	124.69	10.73	21.65	9.44	0.35	0.73
2010	93.20	2.99	6.03	124.69	10.73	21.65	9.44	0.35	0.7
2011	93.20	2.99	6.03	124.69	10,73	21.65	9.44	0.35	0.7
2031	93.20	2.99	6.03	124.69	10.73	21.65	9.44	0.35	0.7
2032		2.99	6.03	124.69	10.73	21.65	9.44	0.35	0.7
	<u>.</u>								6.2
			NPV( 6%)	1013.90	97.16	181.48	98.85 69.12	3.36 2.28	4.1
			NFV( 8%)	671.45	65.32	120.05	69.12		
			NPV(10%)	464.35	45.67	82.65	50.40	1.61	2.8
			NP%(12%)	333.14	32.98	58.80	38.02	1.17	2.0
			NPV(14%)		24.45	42.99		0.58	
			NPV(16%)		18.52	32.14		r.67	1.1
			NPV(18%)	145.59	14.28	24.49	.18+89	0.52	0.8

BENEFIT CASH FLOW AND PRESENT WORTH OF IRRIGATION IN MUDA RIVER FOR LOW GROWTH CASE IF THE REMAN DAM CAN BE IMPLEMENTED

	PROPORTION OF	MAIN
VEAR	N.W.O. TO DEMAND	HINOR
1240	BERIS	BERIS
	DAN	DAH
	(%)	(M\$10 <sup>6</sup> )
1983	0.00	0.00
1984	0.00	0.00
1985	0.00	0.00
1986	0.00	0.00
1987	0.00	0.00
1988	0.00	0.00
1989	0.00	0.00
1990	0.00	0.00
1991	3.14	0.78
1992	3.09	0.79
1993	3.04	0.80
1994	2.99	0.79
1995	2.95	0.78
1996	2.90	0.77
1997	2.85	0.76
1998	2.80	0.74
1999	2.75	0.73
2000	2.70	0.72
2001	2.70	0.72
2002	2.70	0.72
2003	2.70	0.72
2010	2.70	0.72
2011	2.70	0.72
2031	2.70	0.72
2032	2.70	0.72
PV( 6%)		7.09
PV( 8%)		4.85
PV(10%)		3.44
PV(12%)		2.52
PV(14%)		1.89
PV(16%)		1.45

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BENEFIT CASH FLOW AND PRESENT WORTH OF D&I WATER SUPPLY FOR LOW GROWTH CASE IF THE REMAN DAM CAN BE IMPLEMENTED

	·····	KEDAH		HUDA
YEAR	JENIANG	BERIS	REMAN	BERIS
	SYSTEM (MS106)	<b>ДАН</b> (M\$10 <sup>6</sup> )	DAM (MS10 <sup>6</sup> )	DAM (N\$10 <sup>6</sup> )
1983	0.00	0.00	0.00	0.00
1984	0.00	0.00	0.00	0.00
1985	0.00	0.00	0.00	0,00
1986	0.00	0.00	0.00	0.00
1987	0.00	0.00	0.00	0.00
1988	0.00	0.00	0.00	0.00
1989	0.00	0.00	0.00	0.00
1990	0.00	0.00	0.00	0.00
1991	0,01	0.00	0.02	0.28
1992	0.02	0.00	0.03	0.57
1993	0.02	0.00	0.05	0.85
1994	0.03	0.00	0.06	1.13
1995	0.04	0.00	0.08	1.42
1996	0.05	0.00	0.09	1.70
1997	0.06	0.00	0.11	1.98
1998	0.06	0.00	0.12	2.26
1999	0.07	0.00	0.14	2.55
2000	0.08	0.00	0.15	2.83
2001	0.08	0.00	0.15	2.83
2002	0.08	0.00	0.15	2.83
2003	0.08	0.00	0.15	2.83
2010	0.08	0.00	0.15	2.83
2011	0.08	0.00	0.15	2.83
2031	0.08	0.00	0.15	2.83
2032	0.08	0,00	0.15	2.83
NPV( 6%)	0.58	0,00		20.53
NPV( 8%)	0.37	0.00	0.69	13.10
NPV(10%)	0.25	0.00	0.46	8.68
NPV(12%)	0.17	0.00	0.32	5.95
NPV(14%)	0.12	0.00	0.22	4.18
NPV(16%)	0.09	0.00	0.16	3.01
NPV(18%)	0,06	0.00	0.12	2.21
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