

GOVERNMENT OF MALAYSIA

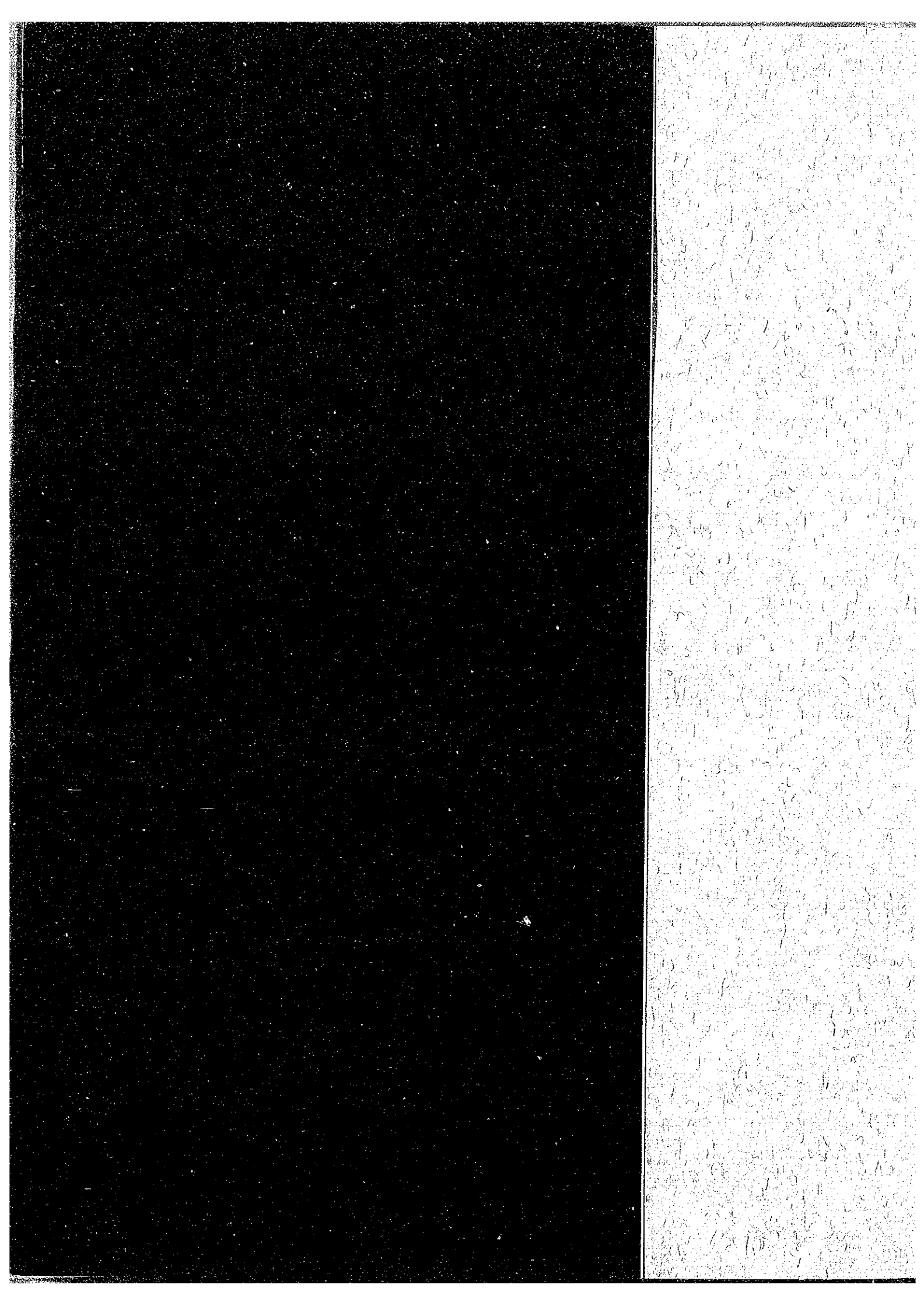
NATIONAL WATER RESOURCES
STUDY, MALAYSIA

SECTORAL REPORT

VOL. 17

PHYSIOLOGICAL AND BENEFICIAL
AND ADVERSE EFFECTS

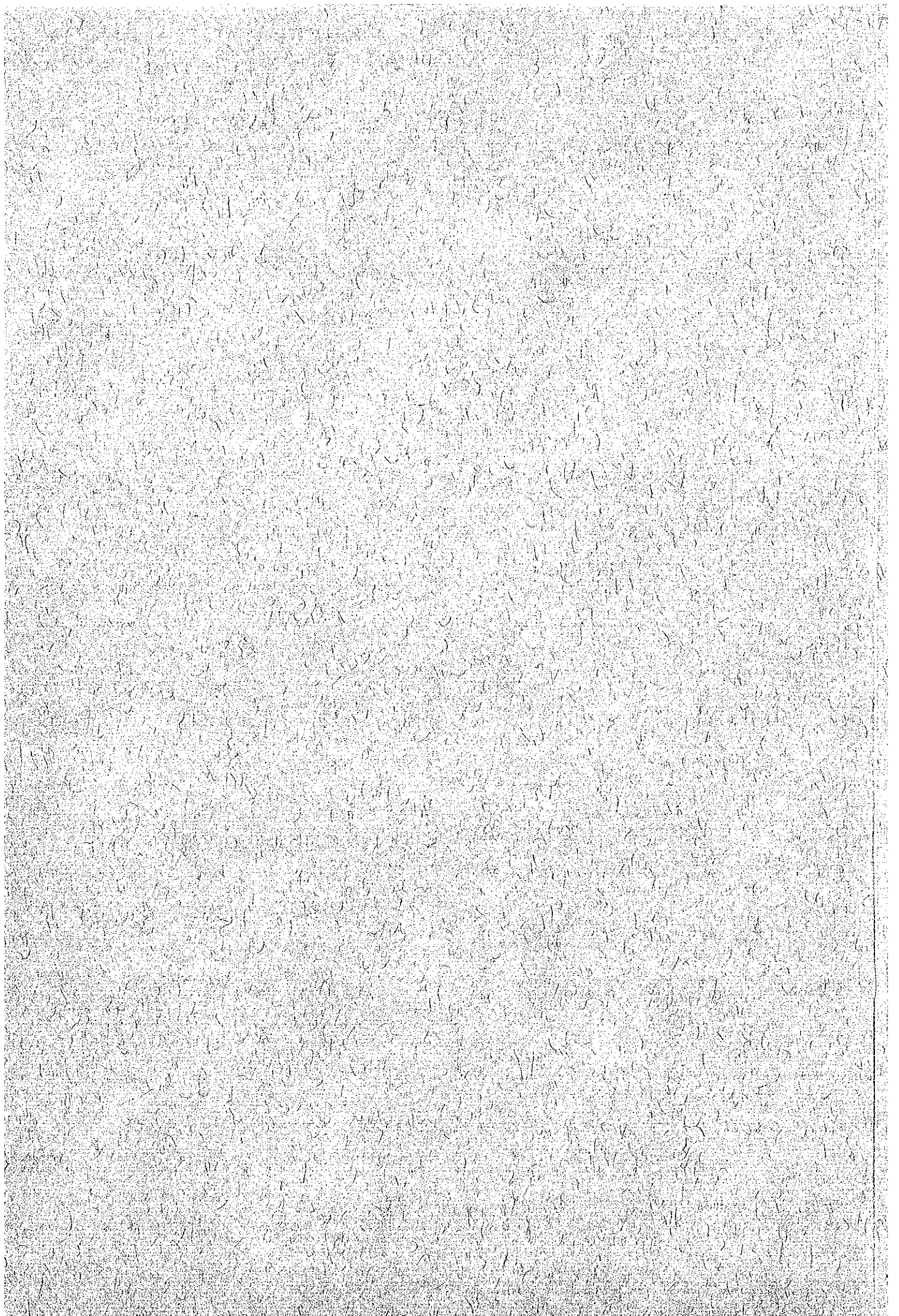




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GOVERNMENT OF MALAYSIA

**NATIONAL WATER RESOURCES
STUDY, MALAYSIA**

SECTORAL REPORT

VOL. 17

**PUBLIC EXPENDITURE AND BENEFICIAL
AND ADVERSE EFFECTS**

OCTOBER 1982

JAPAN INTERNATIONAL COOPERATION AGENCY

LIST OF REPORTS

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- Vol. 2. WATER RESOURCES DEVELOPMENT AND USE PLAN

STATE REPORT

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- Vol. 15. WATER RESOURCES ENGINEERING
- Vol. 16. WATER SOURCE AND HYDROPOWER DEVELOPMENT PLANNING
- Vol. 17. PUBLIC EXPENDITURE AND BENEFICIAL AND ADVERSE EFFECTS
- Vol. 18. WATER RESOURCES MANAGEMENT
- Vol. 19. WATER LAWS AND INSTITUTIONS

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COMPOSITION OF THIS VOLUME

This Volume consists of two parts: Part 1 deals with the subject matters of Peninsular Malaysia and Part 2 is devoted to the States of Sabah and Sarawak.

ABBREVIATIONS

(1) Plan

FMP	:	First Malaysia Plan
SMP	:	Second Malaysia Plan
TMP	:	Third Malaysia Plan
4MP	:	Fourth Malaysia Plan
5MP	:	Fifth Malaysia Plan
6MP	:	Sixth Malaysia Plan
7MP	:	Seventh Malaysia Plan
NEP	:	New Economic Policy
OPP	:	Outline Perspective Plan
RESP	:	Rural Environmental Sanitation Program

(2) Domestic Organization

DID (JPT)	:	Drainage and Irrigation Department
DOA	:	Department of Agriculture
DOE	:	Division of Environment
DOF	:	Department of Forestry
DOFS	:	Department of Fishery
DOM	:	Department of Mines
DOS	:	Department of Statistics
EPU	:	Economic Planning Unit
FAMA	:	Federal Agricultural Marketing Authority
FELCRA	:	Federal Land Consolidation and Rehabilitation Authority
FELDA	:	Federal Land Development Authority
ICU	:	Implementation and Coordination Unit
MARDI	:	Malaysian Agricultural Research and Development Institute
MIDA	:	Malaysian Industrial Development Authority
MLRD	:	Ministry of Land and Regional Development
MMS	:	Malaysian Meteorological Service
MOA	:	Ministry of Agriculture
MOF	:	Ministry of Finance

MOH : Ministry of Health
 MOPI : Ministry of Primary Industries
 MRRDB : Malaysia Rubber Research and Development Board
 NDPC : National Development Planning Committee
 NEB (LLN) : National Electricity Board
 PORIM : Palm Oil Research Institute of Malaysia
 PWD (JKR) : Public Works Department
 RDA : Regional Development Authority
 RISDA : Rubber Industry Small-holders Development Authority
 RRIM : Rubber Research Institute of Malaysia
 SEB : Sabah Electricity Board
 SEBC : State Economic Development Corporation
 S(E)PU : State (Economic) Planning Unit
 SESCO : Sarawak Electricity Supply Corporation
 UDA : Urban Development Authority

(3) International or Foreign Organization

ADAA : Australian Development Assistance Agency
 ADB : Asian Development Bank
 ASCE : American Society of Civil Engineers
 FAO : Food and Agriculture Organization of the United Nations
 IBRD : International Bank for Reconstruction and Development
 ILO : International Labour Organization
 IMF : International Monetary Fund
 IRRI : International Rice Research Institute
 JICA : Japan International Cooperation Agency
 JSCE : Japan Society of Civil Engineers
 MOC : Ministry of Construction, Japan
 OECD : Organization for Economic Cooperation and Development
 OECF : Overseas Economic Cooperation Fund, Japan
 UK : United Kingdom
 UNDP : United Nations Development Program

UNSF : United Nations Special Fund
US or USA: United States of America
US/AID : United States Agency for International
Development
USBR : United States Bureau of Reclamation
WHO : World Health Organization
WMO : World Meteorological Organization

(4) Others

B : Benefit
BOD : Biochemical Oxygen Demand
C : Cost
CIF : Cost, Insurance and Freight
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
FOB : Free on Board
FSL : Full Supply Level
GDP : Gross Domestic Product
GNP : Gross National Product
H : Height, or Water Head
HWL : Reservoir High Water Level
LWL : Reservoir Low Water Level
O&M : Operation and Maintenance
Q : Discharge
Ref. : Reference
SITC : Standard International Trade Classification
SS : Suspended Solid
V : Volume
W : Width

ABBREVIATIONS OF MEASUREMENT

Length

mm = millimeter
cm = centimeter
m = meter
km = kilometer
ft = foot
yd = yard

Area

cm² = square centimeter
m² = square meter
ha = hectare
km² = square kilometer

Volume

cm³ = cubic centimeter
l = lit = liter
kl = kiloliter
m³ = cubic meter
gal. = gallon

Weight

mg = milligram
g = gram
kg = kilogram
ton = metric ton
lb = pound

Time

s = second
min = minute
h = hour
d = day
y = year

Electrical Measures

V = Volt
A = Ampere
Hz = Hertz (cycle)
W = Watt
kW = Kilowatt
MW = Megawatt
GW = Gigawatt

Other Measures

% = percent
PS = horsepower
° = degree
' = minute
" = second
°C = degree in centigrade
10³ = thousand
10⁶ = million
10⁹ = billion (milliard)

Derived Measures

m³/s = cubic meter per second
cusec = cubic feet per second
mgd = million gallon per day
kWh = kilowatt hour
MWh = Megawatt hour
GWh = Gigawatt hour
kWh/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
<u>Length</u>	1 cm = 0.394 inch 1 m = 3.28 ft = 1.094 yd 1 km = 0.621 mile	1 inch = 2.54 cm 1 ft = 30.48 cm 1 yd = 91.44 cm 1 mile = 1.609 km
<u>Area</u>	1 cm ² = 0.155 sq.in 1 m ² = 10.76 sq.ft 1 ha = 2.471 acres 1 km ² = 0.386 sq.mile	1 sq.ft = 0.0929 m ² 1 sq.yd = 0.835 m ² 1 acre = 0.4047 ha 1 sq.mile = 2.59 km ²
<u>Volume</u>	1 cm ³ = 0.0610 cu.in 1 lit = 0.220 gal.(imp.) 1 kl = 6.29 barrels 1 m ³ = 35.3 cu.ft 10 ⁶ m ³ = 811 acre-ft	1 cu.ft = 28.32 lit 1 cu.yd = 0.765 m ³ 1 gal.(imp.) = 4.55 lit 1 gal.(US) = 3.79 lit 1 acre-ft = 1,233.5 m ³
<u>Weight</u>	1 g = 0.0353 ounce 1 kg = 2.20 lb 1 ton = 0.984 long ton = 1.102 short ton	1 ounce = 28.35 g 1 lb = 0.4536 kg 1 long ton = 1.016 ton 1 short ton = 0.907 ton
<u>Energy</u>	1 kWh = 3,413 BTU	1 BTU = 0.293 Wh
<u>Temperature</u>	°C = (°F - 32) · 5/9	°F = 1.8°C + 32
<u>Derived Measures</u>	1 m ³ /s = 35.3 cusec 1 kg/cm ² = 14.2 psi 1 ton/ha = 891 lb/acre 10 ⁶ m ³ = 810.7 acre-ft 1 m ³ /s = 19.0 mgd	1 cusec = 0.0283 m ³ /s 1 psi = 0.703 kg/cm ² 1 lb/acre = 1.12 kg/ha 1 acre-ft = 1,233.5 m ³ 1 mgd = 0.0526 m ³ /s
<u>Local Measures</u>	1 lit = 0.220 gantang 1 kg = 1.65 kati 1 ton = 16.5 pikul	1 gantang = 4.55 lit 1 kati = 0.606 kg 1 pikul = 60.6 kg

Exchange Rate
(as average between July and December 1980)

\$1 = M\$2.22
¥100 = M\$1.03

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PENINSULAR
MALAYSIA

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SPECIAL ABBREVIATIONS

O&M : Operation and Maintenance

EIRR : Economic Internal Rate of Return

1. INTRODUCTION

The Water Resources Development and Use Plan has been prepared to give a general direction of water resources development in Malaysia, identifying future problems and needs and availability of water and other resources, based on analysis and interpretation of readily available data and information, rather than dealing with specific projects.

The main objective of this Report, Public Expenditure and Beneficial and Adverse Effects, is to describe the frameworks for estimating effects, both beneficial and adverse, to be derived from the proposed projects and estimating public expenditure comprising development (investment) and recurrent (O&M), and manpower requirement and to illustrate the estimated effects and requirements with fuller details. The estimates were given not only for the recommended plans but for the alternative plans in order to give the decision makers the idea of relative magnitude of effects and requirements, resulting from various choices. The methodologies for deriving effects and requirements are explained in more detail in the respective Sectoral Reports.

The effects and requirements are also given for the Water Resources Development and Use Plan under the condition of lower economic growth; another possibility for the future water resources development.

The estimated figures in this Report were given only to show the order of magnitude. The effects and requirements should be estimated in more detail with additional data and information before judging the viability of specific projects.

In this Report, private development costs were also given for reference.

2. INVESTMENT AND O&M COSTS

2.1 Basic Assumptions

The investment costs comprise i) direct investment cost, ii) engineering and administration cost, iii) land acquisition cost, and iv) physical contingency. It is noted that the costs at this stage are only notional just to indicate the order of magnitude.

Costs of equipment, materials and labor locally available were estimated at 1980 end price level based on the actual costs (contract amount) and previous estimates for similar projects in Malaysia. For updating the costs, the following escalation rates were assumed:

1976 through 1978	0% p.a.
1979 through 1980	27% p.a.

The prices of internationally traded goods and services were estimated based on the international market price at 1980 end or the IBRD projection up to 1990 where applicable. The exchange rates of US\$1 = M\$2.22 and US\$1 = ¥216, which were the average from January through December, 1980, were assumed for currency conversion.

The approximate foreign-local currency proportion by type of projects is given in Table 1 for reference.

Major unit investment costs assumed are listed in Tables 2 to 3. They are given with fuller detail in the relevant Sectoral Reports. The engineering and administration cost was assumed at 10% of the direct investment cost uniformly regardless the type of the works. Physical contingency was assumed at 30% of the sum of direct investment cost, engineering and administration cost and land acquisition cost. The investment cost was assumed to be disbursed in five years antecedent to the year of commission of the proposed facilities except that the investment costs for rural untreated water supply and inland fishery were assumed to be disbursed in one year.

The construction costs were estimated for all the facilities proposed by the Study and those of which construction was started after 1980, except that the existing budget for water supply in 4MP was assumed to be capable of constructing public water supply systems and irrigation facilities to the extent required up to 1985 and was not included in the expenditure for 4MP.

It was assumed that investment and O&M costs for irrigation, source development, hydropower development and flood mitigation works should sole be borne by the public sector.

Public water supply systems administered by State PWDs, Waterworks Departments and Water Authorities and these under RESP will be rapidly expanded to cover the entire population in 2000. It was assumed that

all the investment and O&M costs for these systems should be borne by public agencies. Under RESP, O&M should be conducted by rural communities at their own expenses.

Considering the current practice, it was assumed for public sewerage projects that house connection expenses should be borne by private sector in the existing town area and branch sewers and house connections expenses in the new town area.

O&M costs (recurrent expenditure) were assumed as the percentage of investment cost as shown in Table 4.

2.2 Estimated Costs

Estimated public investment costs by MP for the recommended plans and alternatives and for those under the condition of lower economic growth are given in the following tables with fuller detail:

(1) Dams, barrages and diversion facilities:	<u>Lower Economic Growth</u>
Tables 5 to 17	Tables 73 to 74
(2) Public water supply in urban area:	<u>Lower Economic Growth</u>
Tables 18 to 20	Tables 75 to 77
(3) Treated water supply in rural area:	<u>Lower Economic Growth</u>
Table 21	Table 78
(4) Untreated water supply in rural area:	<u>Lower Economic Growth</u>
Table 22	Table 79
(5) Pre-treatment facilities:	<u>Lower Economic Growth</u>
Tables 23 to 26	Tables 80 to 81
(6) Irrigation:	
Tables 27 to 28	
(7) Constructed pond:	
Table 29	
(8) Inland fishery in reservoirs:	<u>Lower Economic Growth</u>
Tables 30 to 33	Table 82

(9) Hydropower:	<u>Lower Economic Growth</u>
Table 34	Table 83
(10) Public sewerage:	<u>Lower Economic Growth</u>
Tables 35 to 38	Tables 84 to 85
(11) Flood mitigation:	<u>Lower Economic Growth</u>
Tables 39 to 51	Tables 86 to 89

They are summarized in Tables 52 to 63 and 90 to 98. Public recurrent expenditure (O&M cost) is summarized for the recommended plans in Tables 64 and 72 and 99 to 107.

Private investment costs for water supply, sewerage and palm and rubber plants purification facilities and for those under the condition of lower economic growth are given in the following tables with fuller detail:

(1) Water supply:	<u>Lower Economic Growth</u>
Table 108	Table 117
(2) Sewerage:	<u>Lower Economic Growth</u>
Tables 109 to 112	Tables 118 to 119
(3) Palm and rubber:	<u>Lower Economic Growth</u>
Tables 113 to 115	Table 120

They are summarized in Tables 116 and 121.

3. MANPOWER REQUIREMENT

3.1 Basic Assumptions

Requirement for the government staff for construction and O&M of the relevant public facilities was estimated, assuming that consultants should be fully utilized for design and construction supervision and that construction works should be carried out by contractors. O&M was assumed to be conducted by the respective public agencies. For estimating the requirement, present level of staffing in the public sector of Malaysia and these of the advanced countries as well as the prospective automation of the facilities were taken into consideration.

Only the manpower for the management offices and construction offices required for the construction and O&M of water supply facilities proposed in this Study was considered, excluding the staffs at the headquarters.

The government staffs requirement was estimated according to the classification currently adopted in Malaysia as given hereunder:

	<u>Category</u>
A (Engineer):	Engineer, Superscale F Engineer, Superscale G Engineer, Senior Timescale Engineer, Timescale Quantity surveyor
B (Technical Assistant):	Technical Assistant, Special Grade Technical Assistant, Timescale
C (Technician):	Special Grade Technician Timescale Technician Draftsman Grade I Draftsman Grade II Stenographer Clerk Storekeeper
D (Others):	Typist Junior Clerk Junior Storekeeper Office Boy Drivers I.M.G.

3.2 Estimated Manpower Requirement

Estimated manpower requirement by sector is given for the recommended plans and alternatives for Peninsular Malaysia in Tables 122 to 128.

The figures under the condition of lower economic growth are given in Tables 129 to 132.

4. BENEFICIAL AND ADVERSE EFFECTS

4.1 General

The beneficial and adverse effects of the recommended and alternative plans were evaluated in the following three independent accounts:

- (1) National economic development (NED),
- (2) Environmental quality (EQ), and
- (3) Social well-being (SW).

NED was estimated in terms of annual equivalents of economic benefit and cost and economic internal rate of return (EIRR), attributable to the plans.

Since EQ and SW have strong impacts on the affected population though they cannot be quantified in monetary terms, an attempt was made to quantify them, choosing appropriate indices.

4.2 National Economic Development Account

4.2.1 Basic assumptions

The beneficial and adverse effects of proposed plans in the national economic development account were calculated as the annual equivalents of economic benefits and costs, assuming an evaluation period of 50 years from 1981 through 2030 and a discount rate of 8% which is considered as the minimum acceptable rate of return on the water resources development projects in Malaysia.

The prices of internationally traded goods and services were estimated based on the World Bank projection up to 1990, or the international market prices in December, 1980. The prices of locally traded goods and services were the normalized price in December, 1980. The transfer payments such as tax and local contractors' profit were deducted from financial cost. The ratio of transfer payment to the financial cost was assumed at 20% of financial cost considering the ratio of tax revenue to GDP at purchasers' price in 1980.

The domestic and industrial water supply benefit was estimated based on the least-costly alternative facilities cost criteria. The water deficit was preliminarily allocated to domestic and industrial water supply and irrigation water supply in proportion to the demand. A construction schedule of dams to meet the deficit allocated to domestic and industrial water supply was thus prepared, choosing the least-costly dams among those which are not included in the recommended plan. The cost of the least-costly dams and the recommended intake, conveyance, treatment and distribution systems was regarded as the benefit derived from domestic and industrial water supply.

The economic farmgate price of paddy during the evaluation period was estimated at M\$640/ton based on the projected price of 5% broken rice, FOB Bangkok. Paddy yield, gross value, production cost and net value were estimated for 1990 and 2000 by type of irrigation. The hectareage of newly reclaimed land and upgraded lands from rainfed paddy to irrigated or control drained paddy, single crop to double crop and minor scheme to major scheme were estimated for the future. Then the net incremental production value was obtained for without drought condition.

It was preliminarily assumed that water withdrawal for irrigation would be allowed until the river flow reduces to the level equal to the essential minimum flow during drought periods and that no further abstraction would be permitted. With this assumption, the reduction in supply of irrigation water demand was calculated for the period for which runoff record is available. The irrigation benefit was obtained by deducting the benefit reduction due to the droughts which was assumed to be proportional to the reduction in the irrigation water supply from the net incremental production value.

The fish culture benefit was estimated based on the productivity and price of fish. It was estimated at M\$2,000/ha/y for the fish pond and M\$1.6 million/reservoir/y for the cage culture in the created dam reservoir.

The benefit of reservoir recreation in the created dam reservoir was estimated the willingness-to-pay of the visitor to the reservoir. The willingness-to-pay was measured by the travelling cost or fuel cost of the vehicles to visit the recreation area, M\$0.1/km.

Hydropower benefit was estimated by the equivalent cost of the least-costly alternative power plant. In Peninsular Malaysia oil-fired thermal plant of 350 MW unit capacity was selected as the least-costly alternative plant considering total power demand, type and unit capacity of the power plants planned by NEB and other relevant matters. The unit capacity value thus estimated is M\$175/kW and unit energy value is M\$0.122/kWh.

The sewerage benefit was estimated by the willingness-to-pay of the served population and saving in the cost of purification of industrial wastes. The benefit was tentatively assumed to be 0.6% of real income of served people and gross value of manufacturing production of served industries.

Pretreatment is needed if BOD concentration in raw water is more than 2 mg/lit in the case of domestic water supply and 5 mg/lit in the case of industrial water supply. The costs could be saved, if the proposed water pollution abatement measures reduce the concentration below these limits. This saving in cost was assumed to constitute a part of water pollution abatement benefit.

Under the flood mitigation benefit, only average value of reduction in annual damage by the proposed measures was counted, while land enhancement benefit was included in the irrigation benefit. It was assumed that the damageable value in the flood prone area will increase at a certain moderate rate, assuming lower growth rates for population and per capita GDP.

The economic cost was calculated as the annual equivalent of the construction cost and OMR cost. It was noted that the private sector cost of water supply facilities, purification facilities in palm oil mills and rubber factories and sewerage facilities are included in the economic cost.

The economic internal rate of return (EIRR) was obtained as the discount rate with which the present worth of benefit equals to that of cost.

4.2.2 Estimated effects in NED account

Estimated effects in NED account for the recommended plan and alternatives and those under the condition of lower economic growth are given in the following tables:

Water Demand and Supply Balance:

Tables 133 to 142

Lower Economic Growth

Tables 152 to 155

Hydropower Generation:

Table 143

Lower Economic Growth

Table 156

Water Pollution Abatement:

Tables 144 to 147

Lower Economic Growth

Tables 157 to 158

Flood Mitigation:

Tables 148 to 151

Lower Economic Growth

Table 159

4.3 Environmental Quality Account

4.3.1 Basic assumptions

The beneficial and adverse effects of the proposed plans in the environmental quality account are represented by the quantities of appropriate indices.

The river maintenance flow is the requisite for the conservation of river environment and adequate water use. The effect on the river maintenance flow was evaluated as the number of days when the river maintenance flow could be sustained under the condition identical with that in the driest year ever recorded.

The water surface of created reservoir provides favorable scenery, place of recreation and enhancement of wildlife. The beneficial effect of created reservoir was counted by the water surface area.

The clean water provides favorable scenery, place of recreation and enhancement of wildlife. The reduction in length of river stretches in which BOD concentration will be more than 5 mg/lit is regarded as the beneficial effect of water pollution abatement.

The channel improvement contributes to the stabilization of the river channel and provides favorable condition for navigation and other instream water uses. The length of improved river stretches was counted as an index showing the beneficial effect on environmental quality.

If a dam is constructed, some species of fish might disappear in certain length of river stretch immediately downstream of the dam, causing an adverse effect to ecological system, though such adverse effect could be compensated by possible cage culture in the created reservoir.

4.3.2 Estimated effects in EQ account

Estimated effects in EQ for the recommended plan and alternatives and those under the condition of lower economic growth are given in the following tables:

Water Demand and Supply Balance:	<u>Lower Economic Growth</u>
Tables 160 to 168	Tables 181 to 183
Hydropower Generation:	<u>Lower Economic Growth</u>
Table 169	Table 184
Water Pollution Abatement:	<u>Lower Economic Growth</u>
Tables 170 to 172	Table 185
Flood Mitigation:	<u>Lower Economic Growth</u>
Tables 173 to 180	Tables 186 to 187

4.4 Social Well-being Account

4.4.1 Basic assumptions

The increased and more stable income, improved public health, saving of lives and emergency preparedness, better access to safe water, increased utility and reduced risk in water supply were counted as the beneficial effects in social well-being account. The adverse effect is the inevitable removal of people for the purpose of construction of proposed facilities.

4.4.2 Estimated effects in SW account

Estimated effects in SW account are given in the following tables:

Water Demand and Supply Balance:

Tables 160 to 163, 188 to 194
and 200 to 202

Lower Economic Growth

Tables 181 to 182,
206 to 210
and 214

Hydropower Generation:

Table 203

Lower Economic Growth

Table 215

Water Pollution Abatement:

Tables 195 to 198

Lower Economic Growth

Tables 211 to 212

Flood Mitigation:

Tables 173 to 180, 199 and
204 to 205

Lower Economic Growth

Tables 186 to 187,
213 and 216

4.5 Effects Matrices

In order to illustrate the overall effects and impacts in the three independent accounts of the proposed plans, effects matrices were prepared for the recommended plans for the States in Peninsular Malaysia and Peninsular Malaysia as a whole as shown in Tables 217 to 241. Those under the condition of lower economic growth are given in Tables 242 to 266.

TABLES

Table 1 PROPORTION OF FOREIGN AND LOCAL CURRENCY PORTIONS

Sector	Proportion of Foreign Currency
D&I Water Supply	60
Irrigation	45
Dams and Barrages	60
Fish Culture	0
Hydropower/ <u>1</u>	80
Sewerage/ <u>2</u>	20
Private Purification (Palm & Rubber)	20
River Improvement	40

Remarks; (1): The above figures are only approximations.

/1: Only power facilities excluding dam and ancillary facilities

/2: Central sewerage

Table 2 ASSUMED UNIT CONSTRUCTION COST (1/2)

1. Compensation on Land (M\$10⁶/km²)

Irrigated paddy	2.5	Urban area class S	100
Rainfed paddy	1.5	Urban area class A	10
Tree crop field classes A&B	1.5	Urban area class B	5
Tree crop field class C	0.5	Village area class A	5
Forest class A	0.5	Village area class B	1
Forest class B	0.1		

S: very good access, A: good access, B: poor access,
C: very poor access

2. Resettlement (M\$10³/household)

Urban	30	Rural	10
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3. Civilwork

Dam	M\$48-66 per m ³ of embankment volume
Canal	M\$50-94/m per m ³ /s of discharge capacity
Tunnel	M\$160-182/m per m ³ /s of discharge capacity
Pipeline	M\$990-1,980/m per m ³ /s of discharge capacity
Barrage/Weir	M\$1,320/m per m ³ /s of 100-y maximum capacity
Pumping station	M\$7,700-14,300 m ³ /s of discharge capacity

4. River Facilities

<u>Channel improvement (M\$10⁶/km)</u>		<u>Floodway (M\$10⁶/km)</u>	
200 m ³ /s	0.2 - 0.4	200 m ³ /s	0.2 - 0.5
500 m ³ /s	0.3 - 0.6	500 m ³ /s	0.4 - 0.9
1,000 m ³ /s	0.4 - 0.8	1,000 m ³ /s	0.5 - 1.2
10,000 m ³ /s	1.2 - 2.9	2,000 m ³ /s	0.7 - 1.8

Polder

Protection bund	M\$150-700 x 10 ³ /km
Drainage system	M\$540 x 10 ³ /km
Drainage pump	M\$150-380 x 10 ³ per m ³ /s

Remarks; Unit construction costs include the engineering and administration cost, but the physical contingency is not included.

Table 3 ASSUMED UNIT CONSTRUCTION COST (2/2)

5. <u>D&I Water Supply System</u>	
Pipeline	M\$430/m per m ³ /s of discharge capacity
Treatment plant	M\$710 per m ³ /d of capacity
Distribution system	M\$1,300 per m ³ /d of capacity
6. <u>Sewerage System</u>	
	M\$157 x 10 ⁶ per 100 x 10 ³ m ³ /d
7. <u>D&I Pre-treatment System</u>	
Aerated lagoon	M\$38 x 10 ⁶ per 100 x 10 ³ m ³ /d
Rapid sandfilter bed	M\$112 x 10 ⁶ per 100 x 10 ³ m ³ /d
8. <u>Power Facilities</u>	
<u>Generating equipment</u>	
Rated head more than 140 m	M\$275-440 per kW
Rated head 20 - 80 m	M\$550-880 per kW
Rated less than 30 m	M\$1,320-1,540 per kW
<u>Transmission line</u>	
	M\$162-194 x 10 ³ per km
9. <u>Irrigation Facilities</u>	
From rainfed paddy to irrigated paddy	M\$11,370 per ha
From new reclaimed land to irrigated paddy	M\$12,300 per ha
From irrigated single cropped paddy to double	M\$6,150 per ha
Tertiary development and rehabilitation	M\$5,470 per ha

Remarks; Unit construction costs include the engineering and administration cost, but the physical contingency is not included.

Table 4 O&M COSTS

Sector	Unit: % O&M Cost
D&I Water Supply	2.0
Irrigation	1.5
Dams and Barrages	0.5
Pond Culture	1.0
Cage Culture	2.0
Hydropower/ <u>1</u>	2.0
Sewerage/ <u>2</u>	4.0
Private Purification (Palm & Rubber)	2.0
River Improvement	2.0

Remarks; (1): % of the investment cost

1: Only power facilities excluding dam and ancillary facilities

2: Central sewerage

Table 5 PRINCIPAL FEATURES AND INVESTMENT COST FOR DAMS AND BARRAGES BY PROJECT BY BASIN BY MP FOR RECOMMENDED PLANS (1/3)

Basin No.	Water Source Facilities	Catchment Area (km ²)	Active Storage Capacity (10 ⁶ m ³)	Net Supply Capacity (10 ⁶ m ³ /y)	Investment Cost (M\$10 ⁶)				
					4MP	5MP	6MP	7MP	Total
(Kedah/Perlis/Pulau Pinang)									
1	Timah-Tasoh dam	150	6	20	8.4	5.6	-	-	14
3	Ahning dam	120	27	73	30.6	20.4	-	-	51
3	Badak-Temin dam	114	19	59	2.1	18.9	-	-	21
3	Sari dam	61	14	38	-	20.7	2.3	-	23
3	Durian dam	75	17	45	-	-	25.0	-	25
(Sub-total)		(370)	(77)	(215)	(32.7)	(60.0)	(27.3)	-	(120)
5	Naok-Reman dams	-	-	350	73.8	49.2	-	-	123
5	Beris dam	115	15	55	-	11.4	7.6	-	19
(Sub-total)		(115)	(15)	(405)	(73.8)	(60.6)	(7.6)	-	(142)
6	Mengkuang Phase I & II	4	24	24	55.0	-	-	-	55
10	Rui dam	215	145	140	44.7	402.3	-	-	447
2	Aver Tawar dam	11	2	6	13.1	117.9	-	-	131
2	Ulu Melaka dam	7	2	5	1.2	10.8	-	-	12
(Sub-total)		(18)	(4)	(11)	(14.3)	(128.7)	-	-	(143)
(The Kerian and Kurau river basins)									
8	Kerian dam	112	9	40	5.4	48.6	-	-	54
(Kinta Valley)									
10	Kinta (B) dam	155	53	55	36.4	327.6	-	-	364
(Kelang Valley)									
13	Selangor dam	201	270	186	54.1	486.9	-	-	541
13	Batang Kali dam	49	72	45	7.6	68.4	-	-	76
(Sub-total)		(250)	(342)	(231)	(61.7)	(555.3)	-	-	(617)
15	Batu dam	50	-	39	80.0	-	-	-	80
15	Gombak dam	87	28	60	-	28.0	-	-	28
(Sub-total)		(137)	(28)	(99)	(80.0)	(28.0)	-	-	(108)

Remarks; (1): In 1980 end constant price
 /1: Total incremental capacity of the proposed facilities during 4MP through 7MP

Table 6 PRINCIPAL FEATURES AND INVESTMENT COST FOR DAMS AND BARRAGES BY PROJECT BY BASIN BY MP FOR RECOMMENDED PLANS (2/3)

Basin No.	Water Source Facilities	Catchment Area (km ²)	Active Storage Capacity (10 ⁶ m ³)	Net Supply Capacity (10 ⁶ m ³ /y)	Investment Cost (M\$10 ⁶)				Total
					4MP	5MP	6MP	7MP	
16	Semenyih dam	54	-	44	89.0	-	-	-	89
30	Kenaboi dam	118	136	83	-	142.2	94.8	-	237
30	Perting dam	88	119	59	-	-	64.2	149.8	214
30	Kong Koi dam	54	69	33	-	-	201.6	22.4	224
(Sub-total)		(260)	(324)	(175)	(-)	(142.2)	(360.6)	(172.2)	(675)
(Sepang river basin)									
30	Teriang dam	60	105	42	22.5	202.5	-	-	225
30	Gelami dam	58	9	18	-	2.7	24.3	-	27
(Sub-total)		(118)	(114)	(60)	(22.5)	(205.2)	(24.3)	-	(252)
(Linggi river basin)									
18	Terip dam	23	43	41	2.1	18.9	-	-	21
(Melaka, Kesang and Muar river basins)									
21	Muar dam	209	36	37	-	2.0	18.0	-	20
21	Palong dam	316	140	107	2.7	24.3	-	-	27
(Sub-total)		(525)	(176)	(144)	(2.7)	(26.3)	(18.0)	(-)	(47)
(Johor Bahru and Singapor area)									
24	Semangar dam	160	137	123	5.4	48.6	-	-	54
24	Linggiu dam	237	203	182	2.5	22.5	-	-	25
24	Pengeli dam	143	65	84	-	9.0	21.0	-	30
(Sub-total)		(540)	(405)	(389)	(7.9)	(80.1)	(21.0)	(-)	(109)
25	Sedili dam	227	124	164	1.8	16.2	-	-	18
(Anak Endau river basin)									
27	Anak Endau dam	36	26	11	22.8	15.2	-	-	38
27	Kemelai dam	44	31	13	9.0	6.0	-	-	15
(Sub-total)		(80)	(57)	(24)	(31.8)	(21.2)	(-)	(-)	(53)

Remarks; (1): In 1980 end constant price
 /1: Total incremental capacity of the proposed facilities during 4MP through 7MP

Table 7 PRINCIPAL FEATURES AND INVESTMENT COST FOR DAMS AND BARRAGES BY PROJECT BY BASIN BY MP FOR RECOMMENDED PLANS (3/3)

Basin No.	Water Source Facilities	Catchment Area (km ²)	Active Storage Capacity (10 ⁶ m ³)	Net Supply Capacity (10 ⁶ m ³ /y)	Investment Cost (M\$10 ⁶)				Total
					4MP	5MP	6MP	7MP	
(Kuantan river basin)									
31	Kuantan barrage	-	-	20	20.0	-	-	-	20
(Kemasin, Kelantan and Golok river basins)									
40	Nenggiri dam	3,940	35	360	99.0	66.0	-	-	165
(Golok plain)									
41	Golok dam	64	5	32	3.9	35.1	-	-	39
Total		7,357	1,986	2,693	693.1	2,227.9	458.8	172.2	3,552

Remarks; (1): In 1980 end constant price
 /1: Total incremental capacity of the proposed facilities during 4MP through 7MP

Table 8 PRINCIPAL FEATURES AND INVESTMENT COST FOR DAMS AND BARRAGES BY PROJECT BY BASIN BY MP FOR ALTERNATIVE B1 (1/3)

Basin No.	Water Source Facilities	Catchment Area (km ²)	Active Storage Capacity (10 ⁶ m ³)	Net Supply Capacity (10 ⁶ m ³ /y)	Investment Cost (M\$10 ⁶)				Total
					4MP	5MP	6MP	7MP	
(The State of Perlis, Kedah and Pulau Pinang)									
1	Arau dam	50	37	36	15.0	10.0	-	-	25
1	Timah-Tasoh dam	150	6	20	-	4.2	9.8	-	14
(Sub-total)		(200)	(43)	(56)	(15.0)	(14.2)	(9.8)	-	(39)
3	Ahning dam	120	116	100	42.0	28.0	-	-	70
3	Badak-Temin dam	114	137	95	20.4	13.6	-	-	34
3	Sari dam	61	73	51	-	31.0	-	-	31
3	Durian dam	75	88	63	-	3.5	31.5	-	35
(Sub-total)		(370)	(414)	(309)	(62.4)	(76.1)	(31.5)	-	(170)
4	4-A dam	16	15	21	1.7	15.3	-	-	17
5	Naok-Reman dams	-	-	350	73.8	49.2	-	-	123
5	Beris dam	115	21	75	15.0	10.0	-	-	25
5	Tawar-Muda dam	135	21	75	3.7	33.3	-	-	37
5	Legong dam	44	44	45	3.2	28.8	-	-	32
5	Weng dam	37	37	38	2.7	24.3	-	-	27
5	Charock Teber dam	38	38	39	2.7	24.3	-	-	27
5	Chiak dam	23	23	24	-	17.0	-	-	17
(Sub-total)		(392)	(184)	(646)	(101.1)	(186.9)	-	-	(288)
6	Mengkuang Phase I & II	4	24	24	55.0	-	-	-	55
10	Rui dam	215	313	163	477.6	318.4	-	-	796
2	Aver Tawar dam	11	8	10	21.9	197.1	-	-	219
2	Ulu Melaka dam	7	3	6	1.5	13.5	-	-	15
2	Nylor dam	4	0.5	2	0.8	7.2	-	-	8
(Sub-total)		(22)	(11.5)	(18)	(24.2)	(217.8)	-	-	(242)

Remarks; (1): In 1980 end constant price
 /1: Total incremental capacity of the proposed facilities during 4MP through 7MP

Table 9 PRINCIPAL FEATURES AND INVESTMENT COST FOR DAMS AND BARRAGES BY PROJECT BY BASIN BY MP FOR ALTERNATIVE B1 (2/3)

Basin No.	Water Source Facilities	Catchment Area (km ²)	Active Storage Capacity (10 ⁶ m ³)	Net Supply Capacity (10 ⁶ m ³ /y)	Investment Cost (M\$10 ⁶)				
					4MP	5MP	6MP	7MP	Total
(Sepang river basin)									
30	Teriang dam	60	105	42	22.5	202.5	-	-	225
30	Gelami dam	58	9	18	-	2.7	24.3	-	27
(Sub-total)		(118)	(114)	(60)	(22.5)	(205.2)	(24.3)	-	(252)
(Linggi river basin)									
18	Terip dam	23	43	41	2.1	18.9	-	-	21
(Melaka, Kesang and Muar river basins)									
21	Muar dam	209	36	37	-	2.0	18.0	-	20
21	Palong dam	316	140	107	2.7	24.3	-	-	27
(Sub-total)		(525)	(176)	(144)	(2.7)	(26.3)	(18.0)	-	(47)
30	Bera dam	258	171	180	2.1	18.9	-	-	21
(Johor Bahru and Singapor area)									
24	Semangar dam	160	137	123	5.4	48.6	-	-	54
24	Linggiu dam	237	203	182	2.5	22.5	-	-	25
24	Pengeli dam	143	65	84	3.0	27.0	-	-	30
(Sub-total)		(540)	(405)	(389)	(10.9)	(98.1)	-	-	(109)
25	Sedili dam	227	124	164	1.8	16.2	-	-	18
(Anak Endau river basin)									
27	Anak Endau dam	36	38	33	45.6	30.4	-	-	76
27	Kemelai dam	44	47	41	18.0	12.0	-	-	30
(Sub-total)		(80)	(85)	(74)	(63.6)	(47.4)	-	-	(106)
(The Kerian and Kurau river basins)									
8	Kerian dam	112	208	134	135.6	1,220.4	-	-	1,356
8	Sira dam	29	32	47	17.8	160.2	-	-	178
(Sub-total)		(141)	(240)	(181)	(153.4)	(1,380.6)	-	-	(1,534)

Remarks; (1): In 1980 end constant price
 /1: Total incremental capacity of the proposed facilities during 4MP through 7MP

Table 10 PRINCIPAL FEATURES AND INVESTMENT COST FOR DAMS AND BARRAGES BY PROJECT BY BASIN BY MP FOR ALTERNATIVE B1 (3/3)

Basin No.	Water Source Facilities	Catchment Area (km ²)	Active Storage Capacity (10 ⁶ m ³)	Net Supply Capacity (10 ⁶ m ³ /y)	Investment Cost (M\$10 ⁶)				
					4MP	5MP	6MP	7MP	Total
9	9-A(2) dam	-	-	15	-	1.8	16.2	-	18
(Kinta Valley)									
10	Kinta (B) dam	155	53	55	36.4	327.6	-	-	364
(Bernam and Tenggi river basins)									
11	Geling dam	56	30	32	8.9	80.1	-	-	89
11	Bil dam	26	13	15	7.4	66.6	-	-	74
11	Sungkai dam	193	161	100	53.0	477.0	-	-	530
11	Hypothetical	-	-	153	81.1	729.9	-	-	811
(Sub-total)		(275)	(204)	(300)	(150.4)	(1,353.6)			(1,504)
(Kelang Valley)									
13	Selangor dam	201	270	186	54.1	486.9	-	-	541
13	Batan Kali dam	49	72	45	7.6	68.4	-	-	76
(Sub-total)		(250)	(342)	(231)	(61.7)	(555.3)	-	-	(617)
15	Batu dam	50	-	39	80.0	-	-	-	80
15	Gombak dam	87	28	60	-	28.0	-	-	28
(Sub-total)		(137)	(28)	(99)	(80.0)	(28.0)	-	-	(108)
16	Semenyih dam	54	-	44	89.0	-	-	-	89
30	Kenaboi dam	118	-	83	-	142.2	94.8	-	237
30	Perting dam	88	119	59	-	-	64.2	149.8	214
30	Kong Koi dam	54	69	33	-	-	201.6	22.4	224
(Sub-total)		(260)	(188)	(175)	-	(142.2)	(360.6)	(172.2)	(675)
(Kuantan river basin)									
31	Kuantan Barrage	-	-	20	20.0	-	-	-	20
(Kemasin, Kelantan and Golok river basins)									
40	Nenggiri dam	3,940	201	960	-	-	24.3	218.7	243
Total		8,202	3,378.5	4,369	1,433.6	5,043.8	484.7	390.9	7,353

Remarks; (1): In 1980 end constant price
 /1: Total incremental capacity of the proposed facilities during 4MP through 7MP

Table 11 PRINCIPAL FEATURES AND INVESTMENT COST FOR DAMS AND BARRAGES BY PROJECT BY BASIN BY MP FOR ALTERNATIVE B2 (1/2)

Basin No.	Water Source Facilities	Catchment Area (km ²)	Active Storage Capacity /1 (10 ⁶ m ³)	Net Supply Capacity /1 (10 ⁶ m ³ /y)	Investment Cost (M\$10 ⁶)				Total
					4MP	5MP	6MP	7MP	
(The State of Peris, Kedah and Pulau Pinang)									
1.	Timah-Tasoh dam	150	6	20	-	14.0	-	-	14
3.	Ahning dam	120	27	73	30.6	20.4	-	-	51
3.	Badak-Temin dam	114	137	95	20.4	13.6	-	-	34
3.	Sari dam	61	73	51	-	31.0	-	-	31
3.	Durian dam	75	88	63	-	3.5	31.5	-	35
	(Sub-Total)	(370)	(325)	(282)	(51.0)	(68.5)	(31.5)	-	(151)
5.	Naok-Peman dams	-	-	350	73.8	49.2	-	-	123
5.	Beris dam	115	21	75	2.5	22.5	-	-	25
5.	Tawar-Muda dam	135	21	75	3.7	33.3	-	-	37
5.	Legong dam	44	44	45	-	32.0	-	-	32
	(Sub-Total)	(294)	(86)	(545)	(80.0)	(137.0)	-	-	(217)
6.	Mengkuang Phase I & II	4	24	24	55.0	-	-	-	55
10.	Rui dam	215	313	163	477.6	318.4	-	-	796
2.	Aver Tawar dam	11	8	10	21.9	197.1	-	-	219
2.	Ulu Melaka dam	7	3	6	1.5	13.5	-	-	15
	(Sub-Total)	(18)	(11)	(16)	(23.4)	(210.6)	-	-	(234)
(The Kerlan and Kurau river basins)									
8.	Kerian dam	112	92	120	97.0	873.0	-	-	970
(Kinta Valley)									
10.	Kinta (B) dam	155	27	37	16.9	152.1	-	-	169
(Bernam and Tenggi river basins)									
11.	Geling dam	56	12	13	3.6	32.4	-	-	36
(Kelang Valley)									
13.	Selangor dam	201	270	190	57.5	517.5	-	-	575
13.	Batang Kali dam	49	72	45	-	76.0	-	-	76
	(Sub-Total)	(250)	(342)	(235)	(57.5)	(593.5)	-	-	(651)
15.	Batu dam	50	-	39	89.0	-	-	-	89
15.	Gombak dam	87	28	60	-	16.8	11.2	-	28
	(Sub-Total)	(137)	(28)	(99)	(89.0)	(16.8)	(11.2)	-	(117)
16.	Semenyih dam	54	-	44	80.0	-	-	-	80
30.	Kenaboi dam	118	136	83	-	23.7	213.3	-	237
30.	Perting dam	88	119	59	-	-	64.2	149.8	214
	(Sub-Total)	(206)	(255)	(142)	-	(23.7)	(277.5)	(149.8)	(451)
(Sepan river basin)									
30.	Teriang dam	60	105	42	22.5	202.5	-	-	225
30.	Gelami dam	58	9	15	-	2.5	22.5	-	25
	(Sub-Total)	(118)	(114)	(57)	(22.5)	(205.0)	(22.5)	-	(250)

Remarks; (1): In 1980 end constant price
 /1: Total incremental capacity of the proposed facilities during 4MP through 7MP

Table 12 PRINCIPAL FEATURES AND INVESTMENT COST FOR DAMS AND BARRAGES BY PROJECT BY BASIN BY MP FOR ALTERNATIVE B2 (2/2)

Basin No.	Water Source Facilities	Catchment Area (km ²)	Active Storage Capacity /1 (10 ⁶ m ³)	Net Survey Capacity /1 (10 ⁶ m ³ /y)	Investment Cost (M\$10 ⁶)				
					4MP	5MP	6MP	7MP	Total
(Linggi river basin)									
18.	Terip dam	23	40	38	1.9	17.1	-	-	19
(Melaka, Kesang and Muar river basins)									
21.	Palong dam	316	56	46	1.6	14.4	-	-	16
(Johor Bahru and Singapor area)									
24.	Semangar dam	160	137	123	5.4	48.6	-	-	54
24.	Linggiu dam	237	203	182	2.5	22.5	-	-	25
	(Sub-Total)	(397)	(340)	(305)	(7.9)	(71.1)	-	-	(79)
25.	Sedili dam	227	124	164	1.8	16.2	-	-	18
(Anak Endau river basin)									
27.	Anak Endau dam	36	28	12	27.0	18.0	-	-	45
27.	Kemerai dam	44	34	15	10.8	7.2	-	-	18
	(Sub-Total)	(80)	(62)	(27)	(37.8)	(25.2)	-	-	(63)
(Kuantan river basin)									
31.	Kuantan barrnge	-	-	20	20.0	-	-	-	20
(Kemasin, Kerantan and Golok river basins)									
40.	Nenggiri dam	3,940	49	490	-	-	19.5	175.5	195
	Total	7,122	2,306	2,887	1,124.5	2,789.0	362.2	325.3	4,601

Remarks; (1): In 1980 end constant price
 /1: Total incremental capacity of the proposed facilities during 4MP through 7MP

Table 13 PRINCIPAL FEATURES AND INVESTMENT COST
FOR DAMS AND BARRAGES BY PROJECT BY
BASIN BY MP FOR ALTERNATIVE B3

Basin No.	Water Source Facilities	Catchment Area (km ²)	Active Storage Capacity/1 (10 ⁶ m ³)	Net Supply Capacity/1 (10 ⁶ m ³ /y)	Investment Cost (M\$10 ⁶)				Total
					4MP	5MP	6MP	7MP	
(The State of Perlis, Kedah and Pulau Pinang)									
1.	Timah-Tasoh dam	150	6	20	1.4	12.6	-	-	14
3.	Ahning dam	120	27	73	30.6	20.4	-	-	51
3.	Badak-Temin dam	114	19	59	12.6	8.4	-	-	21
3.	Sari dam	61	14	38	-	20.7	2.3	-	23
3.	Durian dam	75	17	45	-	-	25.0	-	25
	(Sub-total)	(370)	(77)	(215)	(43.2)	(49.5)	(27.3)	-	(120)
5.	Naok-Reman dams	-	-	350	73.8	49.2	-	-	123
5.	Beris dam	115	12	35	-	15.0	-	-	15
	(Sub-total)	(115)	(12)	(385)	(73.8)	(64.2)	-	-	(138)
6.	Mengkuang Phase I & II	4	24	24	55.0	-	-	-	55
2.	Ulu Melaka dam	7	2	5	1.2	10.8	-	-	12
2.	Ayer Tawar dam	11	2	6	13.1	117.9	-	-	131
	(Sub-total)	(18)	(4)	(11)	(14.3)	(128.7)	-	-	(143)
(The Kerian and Kurau river basins)									
8.	Kerian dam	112	9	40	5.4	48.6	-	-	54
(Kinta Valley)									
10.	Kinta (B) dam	155	25	35	15.5	139.5	-	-	155
(Kelang Valley)									
13.	Selangor dam	201	270	182	50.4	453.6	-	-	504
13.	Batang Kali dam	49	72	45	-	-	68.4	7.6	76
	(Sub-total)	(250)	(342)	(227)	(50.4)	(453.6)	(68.4)	(7.6)	(580)
15.	Batu dam	50	-	39	89.0	-	-	-	89
15.	Gombak dam	87	28	28	-	-	2.1	4.9	7
	(Sub-total)	(137)	(28)	(67)	(89.0)	-	(2.1)	(4.9)	(96)
(Sepang river basin)									
30.	Teriang dam	23	26	25	16.6	149.4	-	-	166
(Linggi river basin)									
18.	Terip dam	316	30	20	1.3	11.7	-	-	13
(Melaka, Kesang and Muar river basins)									
21.	Palong dam	60	70	36	1.3	11.7	-	-	13
(Johor Bahru and Singapor area)									
24.	Semangar dam	160	137	123	5.4	48.6	-	-	54
24.	Linggiu dam	237	203	182	2.5	22.5	-	-	25
	(Sub-total)	(397)	(340)	(305)	(7.9)	(71.1)	-	-	(79)
25.	Sedili dam	227	87	115	-	13.0	-	-	13
(Anok Endau river basin)									
27.	Anok Endau dam	36	26	11	22.8	15.2	-	-	38
27.	Kemerai dam	44	31	13	9.0	6.0	-	-	15
	(Sub-total)	(80)	(57)	(24)	(31.8)	(21.2)	-	-	(53)
(Kuantan river basin)									
31.	Kuantan barrage	-	-	20	20.0	-	-	-	20
(Kemasin, Kelantan and Colok river basins)									
40.	Nenggiri dam	3,940	35	360	-	-	16.5	148.5	165
Total		6,354	1,172	1,929	426.9	1,174.8	114.3	161.0	1,877

Remarks; (1): In 1980 end constant price
/1: Total incremental capacity of the proposed-facilities during
4MP through 7MP

Table 14 PRINCIPAL FEATURES AND INVESTMENT COST
FOR DIVERSION FACILITIES BY PROJECT
BY BASIN BY MP FOR RECOMMENDED PLANS

Basin No.	Diversion Facilities	Discharge/ ¹ Capacity (m ³ /s)	Length (km)	Investment cost (M\$10 ⁶)				
				4MP	5MP	6MP	7MP	Total
(The State of Perlis, Kedah and Pulau Pinang)								
3	Jeniang diversion (barrage & canal)	8.4	20	-	-	-	-	-
10	Ruidiversion (tunnel)	9	6	-	-	-	-	-
(Kelang Valley)								
30	Kenaboi diversion (tunnel)	5	10	-	6.6	4.4	-	11
30	Perting diversion (tunnel)	4	8	-	-	1.8	4.2	6
30	Kang Koi diversion	2	8	-	-	1.8	0.2	2
(Sub-total)		(11)	(26)	(-)	(6.6)	(8.0)	(4.4)	(19)
(Sapang river basin)								
30	Teriang diversion (pipe line)	Stage 1:3 Stage 2:1	90 90	52.5 -	472.5 30	- 270.0	- -	525 300
(Sub-total)		(4)	(180)	(52.5)	(502.5)	(270.0)	(-)	(825)
(Melaka, Kesang and Muar river basin)								
21	Muar diversion (barrage & canal)	15	80	16	144	-	-	160
(Johor Bahru and Singapor area)								
23	Teberau diversion (barrage)	35	-	0.9	8.1	-	-	9
24	Semangar diversion (canal)	35	7	3.6	32.4	-	-	36
24	Johor diversion (barrage & canal)	27	7	2.5	22.5	-	-	25
(Sub-total)		(62)	(14)	(6.1)	(54.9)	(-)	(-)	(61)
25	Sadili diversion (canal & pipe line)	10	15	(8.3)	(74.7)	-	-	83
Total			341	83.8	790.8	278.0	4.4	1157

Remarks; (1): In 1980 end constant price
/1: Total incremental capacity of the proposed facilities
during 4MP through 7MP

Table 15 PRINCIPAL FEATURES AND INVESTMENT COST
FOR DIVERSION FACILITIES BY PROJECT BY
BASIN BY MP FOR ALTERNATIVE B1

Basin No.	Diversion Facilities	Discharge Capacity (m ³ /s) / 1	Length (km)	Investment cost (M\$10 ⁶)				
				4MP	5MP	6MP	7MP	Total
(The State of Peris, Kedah and Pulau Pirang)								
3	Jenianadiversion (barrage & carae)	21.1	20	-	-	-	-	-
10	Rui diversion (tunnel)	10.5	6	-	-	-	-	-
(Kelang Valley)								
30	Kenaboi diversion (tunnel)	5	10	-	6.6	4.4	-	11
30	Perting diversion (tunnel)	4	8	-	-	1.8	4.2	6
30	Kong Koi diversion	2	8	-	-	1.8	0.2	2
(Sub-total)		(11)	(26)	(-)	(6.6)	(8.0)	(4.4)	(19)
(Sepang river basin)								
30	Teriang diversion (pipe line)	Stage 1:3	90	52.5	472.5	-	-	525
		Stage 2:1	90	-	30.0	270.0	-	300
(Sub-total)			(180)	(52.5)	(502.5)	(270.0)	(-)	(825)
(Melaka, Kesang and Muar river basins)								
21	Muar diversion (barrag & canal)	15	80	16	144	-	-	160
30	Bera diversion (canal)	13	30	3.2	28.8	-	-	32
(Johor Bahru and Singaporarea)								
23	Teberau diversion (barrage)	35	-	0.9	8.1	-	-	9
24	Semangar diversion (canal)	35	7	3.6	32.4	-	-	36
24	Johor diversion (barrage & canal)	27	7	2.5	22.5	-	-	25
(Sub-total)		(62)	(14)	(6.1)	(54.9)	(-)	(-)	(61)
25	Sedili diversion (canal & pipe line)	10	15	8.3	74.7	(-)	(-)	83
Total			371	87.0	819.6	278.0	4.4	1189

Remarks; (1): In 1980 end constant price
/1: Total incremental capacity of the proposed facilities during 4MP through 7MP

Table 16 PRINCIPAL FEATURES AND INVESTMENT COST
FOR DIVERSION FACILITIES BY PROJECT BY
BASIN BY MP FOR ALTERNATIVE B2

Basin No.	Diversion Facilities	Discharge/ Capacity (m ³ /s)	Length (km)	Investment cost (M\$10 ⁶)				
				4MP	5MP	6MP	7MP	Total
(The State of Perlis, Kedah and Pulau Pirang)								
10	Rui diversion (tunnel)	10.5	6	-	-	-	-	-
(Kelang Valley)								
30	Kenaboi diversion (tunnel)	5	10	-	1.1	9.9	-	11
30	Perting diversion (tunnel)	4	8	-	-	1.8	4.2	6
(Sub-total)		(9)	(18)	(-)	(1.1)	(11.7)	(4.2)	(17)
(Sepang river basin)								
30	Teriang diversion (pipe line)	Stage 1:3	90	52.5	472.5	-	-	525
		Stage 2:1	90	-	25.3	227.7	-	253
(Sub-total)		(4)	(180)	(52.5)	(497.8)	(227.7)	(-)	(778)
(Melaka, Kesand and Muar river basins)								
21	Muar diversion (barrage & canal)	13	80	13.9	125.1	-	-	139
(Johor Bahru and Singapor area)								
23	Teherau diversion (barrage)	30	-	0.9	8.1	-	-	9
24	Semangar diversion (canal)	30	7	3.0	27.0	-	-	30
24	Johor diversion (barrage & canal)	22	7	2.1	18.9	-	-	21
(Sub-total)		(52)	(14)	(5.1)	(45.9)	(-)	(-)	(51)
25	Sedili diversion (canal & pipe line)	10	15	8.3	74.7	-	-	83
Total			313	80.7	752.7	239.4	4.2	1077

Remarks; (1): In 1980 end constant price
/1: Total incremental capacity of the proposed facilities
during 4MP through 7MP

Table 17 PRINCIPAL FEATURES AND INVESTMENT COST FOR DIVERSION FACILITIES BY PROJECT BY BASIN BY MP FOR ALTERNATIVE B3

Basin No.	Diversion Facilities	Discharge ^{/1} Capacity (m ³ /s)	Length (km)	Investment cost (M\$10 ⁶)				
				4MP	5MP	6MP	7MP	Total
(The State of Perlis, Kedah and Pulau Pinang)								
3	Jeniang diversion (barrage & canal)	5.0	20	-	-	-	-	-
(Sepang river basin)								
30	Teriang diversion (pipe line)	1	90	47.7	429.3	-	-	477
(Melaka, Kesang and Muar river basins)								
21	Muar diversion (barrage & canal)	8	80	8.0	72.0	-	-	80
(Johor Bahru and Singapor area)								
23	Teberau diversion (barrage)	27	-	0.9	8.1	-	-	9
24	Semangar diversion (canal)	27	7	2.7	24.3	-	-	27
24	Johor diversion (barrage & canal)	19	7	1.8	16.2	-	-	18
	(Sub-total)	(46)	(14)	(4.5)	(40.5)	-	-	(45)
25	Sedili diversion (canal & pipe line)	7	15	-	67	-	-	67
	Total		219	61.1	616.9	-	-	678

Remarks; (1): In 1980 end constant price

/1: Total incremental capacity of the proposed facilities during 4MP through 7MP

Table 18 CAPACITY AND INVESTMENT COST FOR PUBLIC WATER SUPPLY PROJECTS IN URBAN AREA BY CITY BY MP (1/3)

Basin Code		City/Town	TC/1 (10 ³ m ³ /d)	Investment Cost (M\$ 10 ⁶)				Total
No.	No.			4MP	5MP	6MP	7MP	
1	1	Kangar	33.0	4.8	13.6	17.3	6.9	42.6
3	101	Jitra	11.3	4.0	8.5	9.7	3.9	26.1
	2	Alor Setar	105.7	13.6	42.4	55.6	22.3	133.9
	102	Gura Chempedak	12.1	1.8	5.4	7.0	2.8	17.0
	103	Yen	11.0	1.7	5.4	7.1	2.8	17.0
4	3	Sungai Petani	69.4	10.2	29.6	38.0	15.2	93.0
5	104	Tikan Batu	12.7	1.8	6.0	8.0	3.2	19.0
6	4	Kulim	17.1	5.3	11.5	13.2	5.3	35.3
	5	Butterworth	76.9	30.8	39.8	32.1	12.8	115.5
	109	Kg. Pmtg Kuching	10.7	3.8	5.8	5.5	2.2	17.3
	6	Bukit Mertajam	26.7	8.4	13.0	12.4	4.9	38.7
	110	Perai	47.8	13.8	19.7	17.5	7.0	58.0
7	8	Georgetown	56.9	16.6	31.6	34.2	13.7	96.1
	105	Air Itam	33.0	9.7	15.7	15.4	6.1	46.9
	106	Tg. Tokong	10.0	3.2	5.2	5.1	2.1	15.6
	107	Gelugor	5.9	2.6	4.5	4.5	1.8	13.4
	108	Tg. Bunga	8.4	2.8	4.7	4.7	1.9	14.1
9	112	Bagan Serai	16.4	3.4	6.9	7.8	3.1	21.2
	10	Taiping	146.2	36.0	68.9	74.9	30.0	209.8
10	11	Kuala Kangsar	14.8	2.9	6.0	6.9	2.8	18.6
	12	Sg. Siput Utara	8.2	2.2	4.8	5.6	2.2	14.8
	13	Ipoh	165.9	37.5	77.6	87.6	35.0	237.7
	14	Batu Gajah	7.7	1.3	3.2	3.8	1.5	9.8
	15	Kampar	10.4	2.5	5.5	6.4	2.6	17.0
	111	Baru Mambang	6.0	1.2	3.1	3.8	1.5	9.6
	113	Jelapang	3.0	2.0	2.7	2.3	0.9	7.9
	17	Telok Anson	43.5	8.0	18.0	21.1	8.5	55.6
	18	Tapah	9.2	1.8	3.7	4.1	1.6	11.2
13	21	Kuala Kubu Baru	2.9	1.2	2.3	2.5	1.0	7.0
14	114	Sg. Buloh	5.1	1.3	3.5	4.4	1.8	11.0
15	22	Klang	192.9	57.3	139.9	169.5	67.8	434.5
	23	Shah Alam	58.8	14.1	36.7	45.5	18.2	114.5
	24	Petaling Jaya	403.7	102.9	249.0	300.7	120.3	772.9
	25	W. Persekutuan	512.0	595.0	1025.7	1048.3	419.3	3088.3
	116	Ampang	3.4	1.2	2.8	3.4	1.3	8.7
	117	Serdang Baru	4.2	2.0	3.7	4.0	1.6	11.3
16	26	Kajang	12.5	5.3	10.2	11.1	4.4	31.0
	115	Semenyih	2.1	1.1	2.1	2.2	0.9	6.3
17	28	Port Dickson	89.2	22.6	42.2	45.2	18.1	128.1
18	29	Seremban	63.2	25.0	46.8	50.2	20.1	142.1
19	119	Tampin	3.5	1.4	2.6	2.8	1.1	7.9
	31	Melaka	69.6	14.4	32.4	38.0	15.2	100.0
	120	Kelebang	8.4	2.2	4.2	4.6	1.8	12.8
	121	Bukit Baru	16.8	3.9	7.6	8.3	3.3	23.1

Remarks; (1): In 1980 end constant price
(2): The original budget for 4MP is not included.
/1: Total incremental capacity of the proposed facilities during 4MP through 7MP

Table 19 CAPACITY AND INVESTMENT COST FOR PUBLIC WATER SUPPLY PROJECTS IN URBAN AREA BY CITY BY MP (2/3)

Basin Code		City/Town	TC ^{/1} (10 ³ m ³ /d)	Investment Cost (M\$ 10 ⁶)				Total
No.	No.			4MP	5MP	6MP	7MP	
20	33	Tangkak	2.9	1.1	2.6	3.1	1.2	8.0
21	30	Kuala Pilah	5.2	1.4	2.8	3.2	1.3	8.7
	32	Segamat	31.8	10.0	22.7	26.8	10.7	70.2
	122	Labis	8.8	2.1	4.6	5.3	2.1	14.1
	125	Jementah	4.4	2.3	3.4	3.2	1.3	10.2
	34	Muar	34.3	9.0	17.8	19.7	7.9	54.4
	145	PT 9	4.8	1.0	2.8	3.6	1.4	8.8
22	35	Batu Pahat	45.2	10.7	24.2	28.5	11.4	74.8
	123	Yong Peng	14.3	2.7	5.5	6.1	2.4	16.7
23	37	Pontian Kechil	33.4	8.1	18.6	21.9	8.8	57.4
	124	Pekan Nanas	4.1	1.4	2.9	3.3	1.3	8.9
	38	Kulai	49.0	10.0	22.5	26.4	10.6	69.5
	39	Johor Bahru	216.7	58.5	137.3	163.8	65.5	425.1
	127	Senai	6.2	2.0	3.7	4.0	1.6	11.3
	128	Kelapa Sawit	4.7	0.8	3.0	4.1	1.7	9.6
	129	Masai	10.8	4.3	7.2	7.3	2.9	21.7
24	126	Ulu Tiram	22.3	3.8	8.8	10.4	4.2	27.2
	40	Kota Tinggi	15.1	3.5	8.1	9.6	3.8	25.0
26	42	Mersing	17.7	4.6	9.8	11.2	4.5	30.1
27	41	Kluang	43.7	9.6	20.3	23.2	9.3	62.4
	151	PT 15	8.6	4.4	5.4	4.0	1.6	15.4
28	139	PT 3	5.9	2.2	3.7	3.7	1.5	11.1
	141	PT 5	9.5	4.9	6.0	4.7	1.9	17.5
	142	PT 6	20.4	6.6	11.2	11.4	4.5	33.7
	143	PT 7	5.3	1.5	3.2	3.7	1.5	9.9
	146	PT 10	4.7	2.6	3.3	2.6	1.0	9.5
	147	PT 11	6.5	2.2	3.7	3.7	1.5	11.1
	148	PT 12	8.9	4.2	5.4	4.3	1.7	15.6
	149	PT 13	6.8	3.0	4.5	4.1	1.6	13.2
	150	PT 14	9.2	4.2	5.3	4.1	1.7	15.3
29	140	PT 4	5.9	1.0	3.4	4.6	1.8	10.8
30	118	Bahau	3.8	1.4	2.9	3.3	1.3	8.9
	137	PT 1	11.2	3.8	6.1	6.0	2.4	18.3
	138	PT 2	8.7	4.3	5.7	4.7	1.9	16.6
	144	PT 8	12.5	7.9	8.0	4.6	1.8	22.3
	152	PT 16	9.6	5.7	6.2	4.0	1.6	17.5
	153	PT 17	3.8	1.0	2.3	2.7	1.1	7.1
	154	PT 18	3.6	1.0	2.2	2.6	1.0	6.8
	155	PT 19	6.5	4.4	4.6	2.7	1.1	12.8
	156	PT 20	22.3	16.1	14.6	6.4	2.6	39.7
	130	Mentakab	34.8	4.2	11.9	15.2	6.1	37.4
	45	Temerloh	45.0	5.6	15.1	19.0	7.6	47.3
	131	Teriang	7.8	2.2	4.6	5.1	2.1	14.0

Remarks; (1): In 1980 end constant price
(2): The original budget for 4MP is not included.
/1: Total incremental capacity of the proposed facilities during 4MP through 7MP

Table 20 CAPACITY AND INVESTMENT COST FOR
PUBLIC WATER SUPPLY PROJECTS IN
URBAN AREA BY CITY BY MP (3/3)

Basin Code No.	No.	City/Town	TC /1 (10 ³ m ³ /d)	Investment Cost (M\$ 10 ⁶)				Total
				4MP	5MP	6MP	7MP	
	46	Bentong	11.2	2.4	5.4	6.4	2.6	16.8
	48	Jerantut	48.8	6.7	17.0	20.8	8.3	52.8
	49	Raub	26.2	4.7	11.4	13.7	5.5	35.3
	50	Kuala Lipis	5.8	1.3	2.8	3.2	1.3	8.6
31	47	Kuantan	270.9	63.9	169.3	211.2	84.5	528.9
32	51	Chukai	37.2	5.1	15.1	19.5	7.8	47.5
34	52	Dungun	38.1	12.2	27.9	32.9	13.2	86.2
36	132	Ulu Trengganu	8.3	2.9	5.4	5.8	2.3	16.4
	53	Kuala Trengganu	255.7	59.5	151.6	186.7	74.7	472.5
39	56	Peringat	11.1	1.3	5.5	7.7	3.1	17.6
	57	Pengkak Kalong	31.8	5.6	16.3	20.9	8.3	51.1
	134	Kadok	12.2	3.3	6.9	7.9	3.2	21.3
40	135	Gua Musang	10.5	2.5	6.2	7.6	3.0	19.3
	54	Tanah Merah	32.7	3.0	11.6	16.0	6.4	37.0
	55	Kota Bharu	294.3	61.4	173.3	220.6	88.2	543.5
	58	Pasir Mas	14.8	2.7	7.3	9.2	3.7	22.9
	133	Kuala Krai	44.3	5.9	19.7	26.2	10.5	62.3
41	136	Rantau Panjang	7.1	1.3	4.1	5.4	2.2	13.0
Total			4425.9	1571.6	3199.2	3585.9	1434.4	9791.1

Remarks; (1): In 1980 end constant price
(2): The original budget for 4MP is not included.
/1: Total incremental capacity of the proposed facilities
during 4MP through 7MP

Table 21 CAPACITY AND INVESTMENT COST FOR TREATED WATER SUPPLY IN RURAL AREA BY BASIN BY MP

Basin No.	Name	TC/1 (10 ³ m ³ /d)	Investment Cost (M\$ 10 ⁶)				Total
			4MP	5MP	6MP	7MP	
1	Perlis	15.7	8.6	13.6	13.2	5.3	40.7
2	P. Langkawi	3.7	2.1	3.5	3.5	1.4	10.5
3	Kedah	57.8	32.6	48.9	45.4	18.1	145.0
4	Merbock & Others	9.1	5.8	8.2	7.1	2.9	24.0
5	Muda	30.7	17.7	26.5	24.5	9.8	78.5
6	Perai & Others	43.1	27.4	36.8	30.9	12.4	107.5
7	P. Pinang	22.6	15.7	19.8	15.5	6.2	57.2
8	Kerian	5.8	3.1	4.4	3.9	1.6	13.0
9	Kurau & Others	126.6	38.3	68.0	70.7	28.3	205.3
10	Perak	264.8	85.1	108.7	86.6	34.6	315.0
11	Bernam	46.6	19.8	29.0	26.4	10.6	85.8
12	Tengi & Others	3.3	1.6	3.1	3.5	1.4	9.6
13	Selangor	22.0	19.0	20.2	12.5	5.0	56.7
14	Buloh & Others	7.2	4.2	6.6	6.4	2.5	19.7
15	Kelang	34.4	27.8	31.0	20.8	8.3	87.9
16	Langat	35.3	28.5	31.7	21.2	8.5	89.9
17	Sepang & Others	8.1	5.4	7.6	6.7	2.7	22.4
18	Linggi & Others	22.0	10.4	18.8	19.7	7.9	56.8
19	Melaka & Others	27.4	18.2	24.0	19.7	7.9	69.8
20	Kesang	12.1	7.2	10.7	9.9	4.0	31.8
21	Muar & Others	50.3	31.2	43.5	37.8	15.1	127.6
22	Batu Pahat & Others	45.8	25.5	39.2	37.0	14.8	116.5
23	Pontian Kechil & Others	35.9	19.0	30.5	29.8	11.9	91.2
24	Johor & Others	18.1	13.3	16.4	12.5	5.0	47.2
25	Sedili Besar & Sedili Kechil	7.0	5.8	6.9	5.1	2.0	19.8
26	Mersing & Others	1.6	1.1	1.5	1.3	0.5	4.4
27	Endau	14.2	9.5	12.7	10.7	4.3	37.2
28	Rompin & Pontian	0.03	0.2	0.3	0.2	0.1	0.8
29	Bebar & Merchong	0	0	0	0	0	0
30	Pahang & Penor	46.8	25.5	39.8	37.9	15.2	118.4
31	Kuantan & Others	0.9	0.7	1.2	1.3	0.5	3.7
32	Kemaman & Others	2.8	3.1	2.7	1.1	0.4	7.3
33	Paka	0.03	0.2	0.3	0.2	0.1	0.8
34	Dungun	0.6	0.4	0.5	0.3	0.1	1.3
35	Marang & Others	2.1	1.8	2.0	1.3	0.5	5.6
36	Trengganu	1.3	0.4	0.7	0.6	0.3	2.0
37	Setiu & Others	1.2	1.8	1.3	0.2	0.1	3.4
38	Besut & Keluang	1.5	2.3	1.6	0.2	0.1	4.2
39	Kemasin & Semarak	11.2	7.2	10.0	8.7	3.5	29.4
40	Kelantan & Others	13.4	10.5	12.1	8.5	3.4	34.5
41	Golok	3.6	3.6	3.7	2.1	0.8	10.2
Total		1056.7	541.6	748.0	644.9	258.1	2192.6

Table 22 CAPACITY AND INVESTMENT COST FOR UNTREATED WATER SUPPLY IN RURAL AREA BY BASIN BY MP

Basin No.	Name	SD/ ¹ (m ³ /d)	Investment Cost (M\$ 10 ⁶)				Total
			4MP	5MP	6MP	7MP	
1	Perlis	2.7	0.2	1.1	1.2	1.0	3.5
2	P. Langkawi	0.5	0.1	0.3	0.2	0.1	0.7
3	Kedah	9.6	1.1	5.2	3.4	2.7	12.4
4	Merbock & Others	1.7	0.2	1.1	1.4	1.1	3.8
5	Muda	5.1	0.6	3.1	2.8	2.2	8.7
6	Perai & Others	7.6	0.2	1.4	3.7	2.9	8.2
7	P. Pinang	1.8	0.1	1.0	0.8	0.7	2.6
8	Kerian	1.5	0.1	0.5	0.6	0.5	1.7
9	Kurau & Others	7.4	0.5	2.5	3.2	2.5	8.7
10	Perak	6.8	0.7	3.1	2.2	1.8	7.8
11	Bernam	0.8	0.1	0.6	0.1	0.1	0.9
12	Tengi & Others	0	0	0	0	0	0
13	Selangor	0.5	0	0.2	0.2	0.1	0.5
14	Buloh & Others	1.0	0.1	0.3	0.3	0.3	1.0
15	Kelang	1.4	0.1	0.6	0.4	0.3	1.4
16	Langat	2.0	0.2	0.8	0.7	0.6	2.3
17	Sepang & Others	1.2	0.1	0.6	0.4	0.4	1.5
18	Linggi & Others	2.4	0.2	1.2	1.2	1.0	3.6
19	Melaka & Others	2.2	0.2	1.1	1.3	1.0	3.6
20	Kesang	0.7	0.1	0.4	0.2	0.2	0.9
21	Muar & Others	3.0	0.3	1.3	0.9	0.7	3.2
22	Batu Pahat & Others	1.5	0.0	0.2	0.7	0.6	1.5
23	Pontian Kechil & Others	1.7	0.1	0.4	0.7	0.6	1.8
24	Johor & Others	2.5	0	0.4	1.2	1	2.6
25	Sedili Besar & Sedili Kechil	0.4	0	0.1	0.2	0.2	0.5
26	Mersing & Others	0	0	0	0	0	0
27	Endau	1.6	0	0.3	0.7	0.6	1.6
28	Rompin & Pontian	0	0	0	0	0	0
29	Bebar & Merchong	0	0	0	0	0	0
30	Pahang & Penor	10.4	0.6	3.4	4.4	3.5	11.9
31	Kuantan & Others	2.0	0.1	0.4	0.9	0.7	2.1
32	Kemaman & Others	1.0	0.2	0.9	0.1	0.1	1.3
33	Paka	0	0	0	0	0	0
34	Dungun	0	0	0	0	0	0
35	Marang & Others	0.8	0.1	0.6	0.2	0.1	1.0
36	Trengganu	0.3	0	0.1	0.1	0.1	0.3
37	Setiu & Others	0.3	0.1	0.3	0	0	0.4
38	Besut & Keluang	0.6	0.1	0.6	0	0	0.7
39	Kemasin & Semarak	5.3	0.6	2.9	1.8	1.4	6.7
40	Kelantan & Others	6.2	1.0	4.4	1.7	1.3	8.4
41	Golock	1.7	0.4	1.4	0.2	0.2	2.2
Total		96.2	8.5	42.8	38.1	30.6	120.0

Remarks; (1): In 1980 end constant price
(2): Untreated water supply under RESP
¹: Total incremental capacity in terms of source demand of the proposed facilities during 4MP through 7MP

Table 23 TREATMENT CAPACITY AND INVESTMENT COST FOR
PRE-TREATMENT FACILITIES BY BASIN BY MP

Basin No.	Treatment Capacity ^{/1} (10 ³ m ³ /day)	Investment Cost (M\$10 ⁶)				Total
		4MP	5MP	6MP	7MP	
3	5.5	1	7	10	4	22
5	4.4	0	1	0	0	1
6	55.4	13	9	1	0	23
9	5.4	0	1	0	0	1
10	22.1	3	4	3	1	11
16	1.7	0	0	0	0	0
18	4.9	20	17	6	2	45
19	34.2	29	41	38	15	123
20	1.6	0	1	0	0	1
21	33.7	15	17	13	5	50
22	21.9	55	36	0	0	91
28	10.0	0	1	2	1	4
30	22.2	6	6	3	1	16
31	55.5	0	6	9	4	19
39	2.8	0	1	0	0	1
Total	281.3	142	148	85	33	408

Remarks; (1): In 1980 end constant price

/1: Total incremental capacity of the proposed
facilities during 4MP through 7MP

Table 24 TREATMENT CAPACITY AND INVESTMENT COST
FOR PRE-TREATMENT FACILITIES BY BASIN
BY MP FOR ALTERNATIVE P1

Basin No.	Treatment Capacity/1 (10 ³ m ³ /day)	Investment Cost (M\$10 ⁶)				Total
		4MP	5MP	6MP	7MP	
3	5.5	3	13	17	7	40
5	4.4	0	1	0	0	1
6	55.4	6	5	2	1	14
9	5.4	0	1	0	0	1
10	22.1	5	12	16	6	39
16	1.7	1	0	0	0	1
18	4.9	14	16	11	4	45
19	34.2	29	41	38	15	123
20	1.6	0	1	0	0	1
21	33.7	12	17	15	6	50
22	21.9	55	36	0	0	91
28	10.0	0	1	2	1	4
30	22.2	6	6	3	1	16
31	55.5	0	6	9	4	19
39	2.8	1	0	0	0	1
Total	281.3	132	156	113	45	446

Remarks; (1): In 1980 end constant price

/1: Total incremental capacity of the proposed facilities during 4MP through 7MP

Table 25 TREATMENT CAPACITY AND INVESTMENT COST
FOR PRE-TREATMENT FACILITIES BY BASIN
BY MP FOR ALTERNATIVE P2

Basin No.	Treatment Capacity/ ¹ (10 ³ m ³ /day)	Investment Cost (M\$10 ⁶)				Total
		4MP	5MP	6MP	7MP	
3	5.5	3	13	17	7	40
5	4.4	0	1	0	0	1
6	58.5	14	10	3	1	28
9	5.4	0	1	0	0	1
10	22.1	7	17	21	8	53
16	2.9	1	1	0	0	2
18	4.9	14	16	11	4	45
19	34.2	31	42	36	14	123
20	1.6	0	1	0	0	1
21	21.5	18	30	30	12	90
22	21.9	55	36	0	0	91
28	10.0	0	1	2	1	4
30	22.2	6	6	3	1	16
31	55.5	0	6	9	4	19
39	2.8	1	1	3	1	6
Total	273.4	150	182	135	53	520

Remarks; (1): In 1980 end constant price
/1: Total incremental capacity of the proposed
facilities during 4MP through 7MP

Table 26 TREATMENT CAPACITY AND INVESTMENT COST
FOR PRE-TREATMENT FACILITIES BY BASIN
BY MP UNDER WITHOUT PROJECT CONDITION

Basin No.	Treatment Capacity ^{/1} (10 ³ m ³ /day)	Investment Cost (M\$10 ⁶)				Total
		4MP	5MP	6MP	7MP	
3	5.5	3	13	17	7	40
4	19.0	23	48	55	22	149
5	4.4	0	0	0	0	1
6	63.5	34	99	127	51	311
9	5.4	0	0	0	0	1
10	22.1	7	17	21	8	53
16	2.9	1	1	0	0	2
18	4.9	23	23	13	5	63
19	35.4	101	110	71	28	310
20	1.6	6	5	2	1	15
21	35.0	107	112	68	27	313
22	28.1	78	85	56	22	241
24	15.9	18	18	11	4	51
27	20.7	3	3	2	1	9
28	10.0	15	10	0	0	25
30	22.2	6	6	3	1	16
31	55.5	5	19	27	11	61
32	9.6	2	1	0	0	3
39	2.8	1	6	9	4	19
Total	364.5	433	576	482	192	1,683

Remarks; (1): In 1980 end constant price
/1: Total incremental capacity of the proposed
facilities during 4MP through 7MP

Table 27 AREA AND INVESTMENT COST FOR MAJOR IRRIGATION SCHEMES BY SCHEME BY BASIN BY MP

Name of Project	Basin No.	Area (ha) ^{/1}	Investment Cost (M\$10 ⁶)				Total
			4MP	5MP	6MP	7MP	
Muda II	1 & 3	93,291	85.0	67.1	254.2	254.2	660.5
Krian/Sg-Manik	8, 9 & 10	26,916	75.0	-	-	-	75.0
Trans Perak IV	10	11,334	-	153.0	13.0	-	166.0
Tg. Karang	11 & 12	15,441	75.0	-	-	-	75.0
Sawah Endau	27	8,092	-	83.6	32.4	-	116.0
Rompin Endau	27 & 28	12,951	7.4	171.6	-	-	179.0
Trans Pahang	30	13,354	-	65.6	77.6	28.2	171.4
Besut	38	536	3.1	-	-	-	3.1
Kemasin Semerak	39	8,904	22.0	109.8	-	-	131.8
North Kelantan	40	11,700	41.7	-	-	-	41.7
KADA II	40	29,893	-	110.0	110.0	-	220.0
Total		232,412	309.2	760.7	487.2	282.4	1,839.5

Remarks; (1): In 1980 end constant price
(2): The original budget for 4MP is not included.

/1: Total incremental area to be developed during 4MP through 7MP

Table 28

AREA AND INVESTMENT COST FOR MINOR
IRRIGATION SCHEMES BY BASIN BY MP

Basin No.	Area (ha) ^{/1}	Investment Cost (M\$10 ⁶)				Total
		4MP	5MP	6MP	7MP	
1	8,968	11.5	79.0	10.4	15.2	116.1
2	428	6.3	-	-	-	6.3
3	14,133	24.6	70.3	49.6	49.6	194.1
4	976	-	11.5	-	-	11.5
5	11,464	30.5	70.8	22.2	22.2	145.7
6	458	-	6.8	-	-	6.8
7	304	-	2.0	0.4	-	2.4
8	1,477	12.3	2.0	6.5	-	20.8
9	157	2.3	-	-	-	2.3
10	1,004	5.0	5.3	-	-	10.3
16	60	0.2	0.3	0.2	-	0.7
18	632	2.7	3.6	0.9	-	7.2
19	2,976	12.7	13.0	6.0	-	31.7
20	325	2.3	2.7	-	-	5.0
21	2,323	10.6	13.6	1.7	-	25.9
28	69	1.0	-	-	-	1.0
29	648	5.2	5.2	-	-	10.4
30	12,990	31.4	63.3	31.0	31.0	156.7
31	316	2.5	2.5	-	-	5.0
32	72	5.0	0.3	-	-	5.3
34	1,435	12.5	5.7	2.8	-	21.0
35	2,775	6.5	6.5	8.3	8.3	29.6
36	3,352	18.4	18.4	1.7	1.8	40.3
37	2,345	7.2	7.2	6.6	6.6	27.6
38	789	-	9.4	-	-	9.4
39	6,096	27.1	-	31.5	31.5	90.1
40	8,465	38.8	23.8	31.3	31.3	125.2
41	25,638	37.5	152.2	94.8	94.9	379.4
Total	112,816	323.8	587.3	312.0	292.4	1,515.5

Remarks; (1): In 1980 end constant price
(2): The original budget for 4MP is not included.
/1: Total incremental area to be developed during 4MP through 7MP

Table 29 AREA AND INVESTMENT COST FOR INLAND FISHERY
IN CONSTRUCTED PONDS BY STATE BY MP

State	Pond Area (ha)	Investment Cost (M\$10 ⁶)				Total
		4MP	5MP	6MP	7MP	
Perlis	63	0.3	0.3	0.4	0.4	1.4
Kedah	486	2.2	2.2	2.9	2.9	10.2
P. Pinang	182	0.9	0.9	1.0	1.0	3.8
Perak	902	2.8	2.8	6.6	6.6	18.8
Selangor	562	2.5	2.5	3.3	3.3	11.6
N. Sembilan	811	2.9	2.9	5.5	5.5	16.8
Melaka	203	0.7	0.7	1.4	1.4	4.2
Johor	821	3.3	3.3	5.2	5.2	17.0
Pahang	957	3.9	3.9	6.0	6.0	19.8
Trengganu	697	3.5	3.5	3.7	3.7	14.4
Kelantan	708	3.6	3.6	3.7	3.7	14.6
Total	6,392	26.6	26.6	39.7	39.7	132.6

Table 30 AREA AND INVESTMENT COST FOR INLAND FISHERY IN RESERVOIRS BY BASIN BY MP

Basin No.	Area ^{/1} (ha)	Investment Cost (M\$ 10 ⁶)				Total
		4MP	5MP	6MP	7MP	
1	20	0.0	0.0	23.7	11.8	35.5
2	10	0.0	0.0	11.8	5.9	17.7
3	40	0.0	11.8	17.8	23.7	53.3
5	20	0.0	5.9	11.8	11.8	29.5
6	10	0.0	5.9	11.8	5.9	23.6
8	10	0.0	0.0	11.8	5.9	17.7
10	20	0.0	0.0	23.7	11.8	35.5
13	20	0.0	0.0	23.7	11.8	35.5
15	20	0.0	5.9	17.8	17.8	41.5
16	10	0.0	5.9	11.8	5.9	23.6
18	10	0.0	0.0	11.8	5.9	17.7
21	20	0.0	0.0	0.0	11.8	11.8
24	30	0.0	0.0	35.5	17.8	53.3
25	10	0.0	0.0	11.8	5.9	17.7
27	20	0.0	11.8	11.8	11.8	35.4
30	120	0.0	5.9	47.4	82.9	136.2
36	10	0.0	5.9	5.9	5.9	17.7
40	50	0.0	11.8	29.6	35.5	76.9
41	10	0.0	0.0	11.8	5.9	17.7
Total	460	0.0	70.8	331.3	295.7	697.8

Remarks; (1): In 1980 end constant price
 /1: Total incremental area to be developed during 4MP through 7MP

Table 31 AREA AND INVESTMENT COST FOR INLAND FISHERY IN RESERVOIRS BY BASIN BY MP FOR ALTERNATIVE B1

Basin No.	Area/ ¹ (ha)	Investment Cost (M\$ 10 ⁶)				Total
		4MP	5MP	6MP	7MP	
1	30	0.0	5.9	23.7	17.8	47.4
2	20	0.0	0.0	23.7	11.8	35.5
3	40	0.0	11.8	17.8	35.5	65.1
4	10	0.0	0.0	11.8	5.9	17.7
5	70	0.0	11.8	65.1	47.4	124.3
6	10	0.0	5.9	11.8	5.9	23.6
8	20	0.0	0.0	23.7	11.8	35.5
9	10	0.0	0.0	0.0	11.8	11.8
10	20	0.0	5.9	17.8	11.8	35.5
11	30	0.0	0.0	23.7	11.8	35.5
13	20	0.0	0.0	23.7	11.8	35.5
15	20	0.0	5.9	17.8	17.8	41.5
16	10	0.0	5.9	11.8	5.9	23.6
18	10	0.0	0.0	11.8	5.9	17.7
21	20	0.0	0.0	0.0	11.8	11.8
24	30	0.0	0.0	35.5	17.8	53.3
25	10	0.0	0.0	11.8	5.9	17.7
27	20	0.0	11.8	11.8	11.8	35.4
30	60	0.0	0.0	29.6	41.4	71.0
Total	460	0.0	64.9	372.9	301.6	739.4

Remarks; (1): In 1980 end constant price
¹: Total incremental area to be developed during 4MP through 7MP.

Table 32 AREA AND INVESTMENT COST FOR INLAND
FISHERY IN RESERVOIRS BY BASIN BY MP
FOR ALTERNATIVE B2

Basin No.	Area/ ¹ (ha)	Investment Cost (M\$ 10 ⁶)				Total
		4MP	5MP	6MP	7MP	
1	20	0.0	0.0	17.8	17.8	35.6
2	10	0.0	0.0	11.8	5.9	17.7
3	40	0.0	11.8	17.8	35.5	65.1
5	40	0.0	5.9	35.5	29.6	71.0
6	10	0.0	5.9	11.8	5.9	23.6
8	10	0.0	0.0	11.8	5.9	17.7
10	20	0.0	5.9	17.8	11.8	35.5
13	20	0.0	0.0	17.8	17.8	35.6
15	20	0.0	5.9	17.8	11.8	35.5
16	10	0.0	5.9	11.8	5.9	23.6
18	10	0.0	0.0	11.8	5.9	17.7
24	20	0.0	0.0	23.7	11.8	35.5
25	10	0.0	0.0	11.8	5.9	17.7
27	20	0.0	11.8	11.8	11.8	35.4
30	40	0.0	0.0	11.8	35.5	47.3
Total	300	0.0	53.1	242.6	218.8	514.5

Remarks; (1): In 1980 end constant price
/1: Total incremental area to be developed during
4MP through 7MP

Table 33 AREA AND INVESTMENT COST FOR INLAND
FISHERY IN RESERVOIRS BY BASIN BY MP
FOR ALTERNATIVE B3

Basin No.	Area ^{/1} (ha)	Investment Cost (M\$ 10 ⁶)				Total
		4MP	5MP	6MP	7MP	
1	20	0.0	0.0	23.7	11.8	35.5
2	10	0.0	0.0	11.8	5.9	17.7
3	40	0.0	11.8	17.8	23.7	53.3
5	20	0.0	5.9	11.8	17.8	35.5
6	10	0.0	5.9	11.8	5.9	23.6
8	10	0.0	0.0	11.8	5.9	17.7
10	10	0.0	0.0	11.8	5.9	17.7
13	20	0.0	0.0	11.8	11.8	23.6
15	20	0.0	5.9	11.8	11.8	29.5
18	10	0.0	0.0	11.8	5.9	17.7
24	20	0.0	0.0	23.7	11.8	35.5
25	10	0.0	0.0	11.8	5.9	17.7
27	20	0.0	11.8	11.8	11.8	35.4
30	10	0.0	0.0	11.8	5.9	17.7
Total	230	0.0	41.3	195.0	141.8	378.1

Remarks; (1): In 1980 end constant price
/1: Total incremental area to be developed during 4MP
through 7MP

Table 34 PRINCIPAL FEATURES AND INVESTMENT COST FOR HYDROPOWER PROJECTS BY PROJECT BY BASIN BY MP

Basin No.	Project Name	Catchment Area (km ²)	Active Storage Capacity (10 ⁶ m ³) /1	Installed Capacity (MW) /1	Annual Energy Output (GWH)	Investment Cost (M\$10 ⁶)				
						4MP	5MP	6MP	7MP	Total
30	Tembeling (Upper)	2,850	1,730	110	440	186.0	124.0	-	-	310
30	Tekai & Penuit	1,390	1,070	74	370	25.8	232.2	-	-	258
30	Telom Hilir	1,200	500	98	480	-	191.0	-	-	191
30	Jelai Kechil	890	560	60	300	-	225.0	25.0	-	250
30	Maran	25,000	-	130	680	-	258.6	172.4	-	431
30	Jelai	3,060	138	10	34	-	-	69.0	-	69
30	Tarum 1	730	140	5	14	-	-	53.1	5.9	59
36	Ulu Trengganu	420	600	100	360	132.6	88.4	-	-	221
40	Pergau	227	68	100	540	114.0	76.0	-	-	190
40	Lebir	2,474	2,834	120	410	-	568.0	-	-	568
40	Nenggiri	3,940	200	82	430	117.6	78.4	-	-	196
40	Galas (Dabong)	7,480	580	97	530	-	110.4	257.6	-	368
40	Kelantan barrage	12,100	-	40	275	-	30.0	270.0	-	300
Total				1,026	4,863	576.0	1982.0	847.1	5.9	3,411

Remarks; (1): In 1980 end constant price
 /1: Total incremental capacity of the proposed facilities during 4MP through 7MP

Table 35 TREATMENT CAPACITY AND INVESTMENT COST FOR
PUBLIC SEWERAGE SYSTEMS AFFECTING RIVER
WATER QUALITY BY CITY/TOWN BY BASIN BY MP

Basin No.	City/Town	Treatment Capacity /1 (10 ³ m ³ /d)	Investment Cost (M\$10 ⁶)				
			4MP	5MP	6MP	7MP	Total
4	C3 Sungai Petani	128	28	51	53	21	153
6	C4 Kulim	27	7	12	11	5	35
15	C23 Shah Alam	89	18	29	29	12	88
15	C24 Petaling Jaya	949	198	321	315	126	960
15	C25 W. Persekutuan	975	223	372	373	149	1,117
16	C26 Kajang/Semenyih	35	8	14	14	6	42
18	C29 Seremban	115	27	45	46	18	136
21	C32 Segamat	47	9	16	16	7	48
23	C38 Kulai/Senai	121	26	44	44	18	132
27	C41 Kluang	330	20	33	34	13	100
39	C57 Pengkal Kalong	47	9	16	17	7	49
Total		2,863	574	954	952	381	2,861

Remarks; (1): In 1980 end constant price

/1: Total incremental capacity of the proposed facilities
during 4MP through 7MP

Table 36 TREATMENT CAPACITY AND INVESTMENT COST FOR PUBLIC SEWERAGE SYSTEMS NOT AFFECTING RIVER WATER QUALITY BY CITY/TOWN BY BASIN BY MP

Basin No.	City/Town	Treatment Capacity ^{/1} (10 ³ m ³ /d)	Investment Cost (M\$10 ⁶)				
			4MP	5MP	6MP	7MP	Total
3	C2 Alor Setar	119	25	44	46	19	134
6	C5 Butterworth	148	33	59	61	24	177
6	C6 Bukit Mertajam	54	14	24	24	10	72
7	C8 Georgetown	82	34	39	27	11	111
9	C10 Taiping	246	50	86	86	35	257
10	C13 Ipoh	297	72	118	117	47	354
10	C17 Telok Anson	76	18	32	33	13	96
15	C22 Klang	180	34	58	59	23	174
17	C28 Port Dickson	206	40	68	70	28	206
19	C31 Melaka	112	28	48	49	20	145
23	C39 Johor Bahru	330	61	106	109	43	319
31	C47 Kuantan	288	46	80	81	32	239
36	C53 Kuala Trengganu	218	40	63	61	25	189
40	C55 Kota Bahru	333	52	93	96	38	279
Total		2,689	547	918	919	368	2,752

Remarks; (1): In 1980 end constant price

/1: Total incremental capacity of the proposed facilities during 4MP through 7MP

Table 37 TREATMENT CAPACITY AND INVESTMENT COST
FOR PUBLIC SEWERAGE SYSTEMS BY CITY
BY BASIN BY MP FOR ALTERNATIVE P1

Basin No.	City/Town	Treatment Capacity ^{/1} (10 ³ m ³ /day)	Investment Cost (M\$10 ⁶)					Total
			4MP	5MP	6MP	7MP		
4	C3	Sungai Petani	128	33	52	49	20	153
6	C4	Kulim	27	6	11	13	5	35
15	C23	Shah Alam	89	29	31	20	8	88
15	C24	Petaling Jaya	949	422	358	129	51	960
15	C25	W. Persekutuan	975	506	420	137	55	1,117
16	C26	Kajan/Semenyih	115	13	15	10	4	42
18	C29	Seremban	121	61	51	18	7	137
21	C32	Segamat	84	14	16	12	5	47
23	C38	Kurai/Senai	47	52	48	22	9	131
27	C41	Kluang	35	34	34	19	8	95
39	C57	Pengkal Kalong	47	3	15	22	9	49
Total			2,617	1,173	1,051	451	181	2,854

Remarks; (1): In 1980 end constant price

/1: Total incremental capacity of the proposed facilities during 4MP through 7MP

Table 38 TREATMENT CAPACITY AND INVESTMENT COST
FOR PUBLIC SEWERAGE SYSTEMS BY CITY
BY BASIN BY MP FOR ALTERNATIVE P2

Basin No.	City/Town	Treatment Capacity ^{/1} (10 ³ m ³ /day)	Investment Cost (M\$10 ⁶)					Total
			4MP	5MP	6MP	7MP		
4	C3	Sungai Petani	128	18	53	67	27	165
6	C4	Kulim	19	1	7	11	4	23
15	C23	Shah Alam	89	29	31	20	8	88
15	C24	Petaling Jaya	949	422	358	129	51	960
15	C25	W. Persekutuan	975	477	415	161	65	1,117
18	C29	Seremban	115	61	51	18	7	137
23	C38	Kurai/Senai	121	52	48	22	9	131
27	C41	Kluang	42	6	17	21	9	52
39	C57	Pengkal Kalong	37	0	12	20	8	39
Total			2,475	1,066	992	469	188	2,712

Remarks; (1): In 1980 end constant price

/1: Total incremental capacity of the proposed facilities
during 4MP through 7MP

Table 39 PRINCIPAL FEATURES AND INVESTMENT COST
FOR FLOOD MITIGATION PROJECTS BY PROJECT
BY BASIN BY MP (1/3)

Basin No.	Basin Name	Project	Principal Features/ ¹	Investment Cost (M\$10 ⁶)				
				4MP	5MP	6MP	7MP	Total
1	Perlis							
		Timah Tasoh dam	28.0x10 ⁶ m ³	-	4.4	-	-	4.4
		River improvement	34 km	-	17.6	-	-	17.6
5	Muda							
		River improvement	75 km	0.0	26.5	14.9	18.8	60.2
6	Peral							
		River improvement	4 km	-	-	-	3.6	3.6
7	P. Pinang							
		River improvement	2 km	-	15.0	15.0	-	30.0
9	Kurau							
		River improvement	13 km	-	18.0	-	-	18.0
10	Perak							
		Bypass floodway	50 km	-	-	100.0	150.0	250.0
		Polder	10.0 km ²	-	32.5	32.5	-	65.0
15	Kelang							
		Batu dam	4.6x10 ⁶ m ³	10.3	-	-	-	10.3
		Gombak dam	7.8x10 ⁶ m ³	12.5	-	-	-	12.5
		River improvement	36 km	-	59.1	54.6	-	113.7
18	Linggi							
		River improvement	41 km	4.8	5.3	-	5.5	15.6
19	Melaka							
		Bypass floodway	5 km	-	8.5	-	-	8.5
20	Kesang							
		River improvement	38 km	1.8	1.7	11.4	11.4	26.3
21	Muar							
		Upper Muar dam	24.4x10 ⁶ m ³	-	-	5.3	-	5.3
		River improvement	53 km	-	-	9.0	11.5	20.5
		Polder	1.3 km ²	-	-	-	5.6	4.6

Remarks; (1): In 1980 end constant price
/1: Total incremental capacity of the proposed facilities during 4MP through 7MP

Table 40 PRINCIPAL FEATURES AND INVESTMENT COST
FOR FLOOD MITIGATION PROJECTS BY PROJECT
BY BASIN BY MP (2/3)

Basin No.	Basin Name	Project	Principal Features ^{/1}	Investment Cost (M\$10 ⁶)				
				4MP	5MP	6MP	7MP	Total
22	Batu Pahat							
		Semberong dam	25.5x10 ⁶ m ³	24.4	25.1	-	-	49.5
		Bekok dam	90.7x10 ⁶ m ³	15.6	-	-	-	15.6
		River improvement	93 km	-	9.9	35.0	25.9	70.8
		Bypass floodway	19 km	-	-	20.0	-	20.0
23	Pontian Kechil							
		River improvement	25 km	1.5	13.7	-	-	15.2
24	Johor							
		Polder	1.2 km ²	-	-	-	8.0	8.0
26	Mersing							
		River improvement	6 km	-	-	-	6.6	6.6
27	Endau							
		River improvement	11 km	-	-	5.6	-	5.6
30	Pahang							
		Telom/Jelai Kechil dam	1,740x10 ⁶ m ³	-	-	45.6	-	45.6
		Tembeling Upper dam	2,110x10 ⁶ m ³	-	36.5	-	-	36.5
		Tekai Lower dam	510x10 ⁶ m ³	-	17.0	-	-	17.0
		Polder	28.5 km ²	5.4	11.9	8.7	41.0	67.0
		Land use change	111.7 km ²	-	61.7	92.2	92.2	246.1
31	Kuantan							
		River improvement	6 km	-	-	-	34.1	34.1
32	Kemaman							
		Polder	20.0 km ²	-	9.8	-	-	9.8
36	Trengganu							
		River improvement	29 km	-	-	18.5	58.1	76.6
		Polder	8.6 km ²	-	-	2.3	-	2.3
37	Setiu							
		River improvement	9 km	1.5	6.2	-	-	7.7

Remarks; (1): In 1980 end constant price
/1: Total incremental capacity of the proposed facilities during 4MP through 7MP

Table 41 PRINCIPAL FEATURES AND INVESTMENT COST
FOR FLOOD MITIGATION PROJECTS BY PROJECT
BY BASIN BY MP (3/3)

Basin No.	Basin Name	Project	Principal Features /1	Investment Cost (M\$10 ⁶)				Total
				4MP	5MP	6MP	7MP	
38	Besut							
		River improvement	33 km	-	24.7	33.0	-	57.7
40	Kelantan							
		Dabong dam	1,300x10 ⁶ m ³	-	-	32.0	-	32.0
		Lebin dam	700x10 ⁶ m ³	-	24.0	-	-	24.0
		River improvement	65 km	16.7	-	80.0	215.3	312.0
		Polder	9.1 km ²	-	9.5	-	-	9.5
<hr/>								
Total	Dam		11					
	River improvement		573 km					
	Bypass floodway		74 km	94.5	438.6	615.6	686.6	1,835.3
	Polder		78.7 km ²					
	Land use change		111.7 km ²					

Remarks; (1): In 1980 end constant price
/1: Total incremental capacity of the proposed facilities during 4MP through 7MP

Table 42 PRINCIPAL FEATURES AND INVESTMENT COST FOR FLOOD MITIGATION PROJECTS BY PROJECT BY BASIN BY MP FOR ALTERNATIVE F1 (1/3)

Basin No.	Basin Name	Project	Principal Features/ ¹	Investment Cost (M\$10 ⁶)				
				4MP	5MP	6MP	7MP	Total
1	Perlis							
		Timah Tasoh dam	28.0x10 ⁶ m ³	-	4.4	-	-	4.4
		River improvement	46 km	-	21.6	-	-	21.6
3	Kedah							
		River improvement	31 km	-	-	-	31.9	31.9
5	Muda							
		River improvement	139 km	0.0	26.5	45.6	55.2	127.3
6	Perai							
		River improvement	4 km	-	-	-	3.6	3.6
7	P. Pinang							
		River improvement	2 km	-	15.0	15.0	-	30.0
9	Kurau							
		River improvement	23 km	-	22.4	-	-	22.4
10	Perak							
		River improvement	38 km	-	20.0	80.0	168.5	268.5
		Bypass floodway	50 km	-	80.0	100.0	70.0	250.0
		Polder	10.0 km ²	-	32.5	32.5	-	65.0
11	Bernam							
		River improvement	11 km	-	-	-	5.4	5.4
13	Selangor							
		River improvement	18 km	-	-	-	23.6	23.6
14	Buloh							
		River improvement	24 km	-	-	12.9	-	12.9
15	Kelang							
		Batu dam	4.6x10 ⁶ m ³	10.3	-	-	-	10.3
		Gombak dam	7.8x10 ⁶ m ³	12.5	-	-	-	12.5
		River improvement	73 km	3.6	38.7	38.7	38.7	119.7
16	Langat							
		River improvement	128 km	-	28.1	28.1	34.8	91.0

Remarks; (1): In 1980 end constant price
¹: Total incremental capacity of the proposed facilities during 4MP through 7MP

Table 43 PRINCIPAL FEATURES AND INVESTMENT COST FOR
FLOOD MITIGATION PROJECTS BY PROJECT BY
BASIN BY MP FOR ALTERNATIVE F1 (2/3)

Basin No.	Basin Name	Project	Principal Features/ ¹	Investment Cost (M\$10 ⁶)				
				4MP	5MP	6MP	7MP	Total
18	Linggi	River improvement	103 km	0.3	37.7	7.2	-	45.2
19	Melaka	River improvement	32 km	0.3	2.4	5.8	13.4	21.9
		Bypass floodway	5 km	-	8.5	-	-	8.5
20	Kesang	River improvement	68 km	1.8	1.7	16.4	16.4	36.3
21	Muar	Upper Muar dam	24.4x10 ⁶ m ³	-	-	5.3	-	5.3
		River improvement	266 km	-	120.0	184.2	172.5	476.7
22	Batu Pahat	Semberong dam	25.5x10 ⁶ m ³	24.4	25.1	-	-	49.5
		Bekok dam	90.7x10 ⁶ m ³	15.6	-	-	-	15.6
		River improvement	109 km	-	9.9	35.0	36.3	81.2
		Bypass floodway	19 km	-	-	20.0	-	20.0
23	Pontian Kechil	River improvement	30 km	1.5	16.5	-	-	18.0
24	Johor	River improvement	58 km	-	-	30.0	31.5	61.5
26	Mersing	River improvement	9 km	-	-	-	8.3	8.3
27	Endau	River improvement	37 km	-	-	5.6	14.9	20.5
30	Pahang	Telom/Jelai Kechil dam	1,740x10 ⁶ m ³	-	-	45.6	-	45.6
		Tembeling Upper dam	2,110x10 ⁶ m ³	-	36.5	-	-	36.5
		Tekai Lower dam	510x10 ⁶ m ³	-	17.0	-	-	17.0
		River improvement	547 km	5.4	409.2	650.0	767.9	1,832.5

Remarks; (1): In 1980 end constant price
¹: Total incremental capacity of the proposed facilities during 4MP through 7MP

Table 44 PRINCIPAL FEATURES AND INVESTMENT COST FOR FLOOD MITIGATION PROJECTS BY PROJECT BY BASIN BY MP FOR ALTERNATIVE F1 (3/3)

Basin No.	Basin Name	Project	Principal Features ^{/1}	Investment Cost (M\$10 ⁶)				Total
				4MP	5MP	6MP	7MP	
31	Kuantan	River improvement	56 km	-	-	-	-	105.5
32	Kemaman	River improvement	56 km	-	-	36.2	36.2	72.4
33	Paka	River improvement	12 km	-	-	-	20.4	20.4
34	Dungun	River improvement	50 km	-	-	45.0	67.6	112.6
36	Trengganu	River improvement	162 km	-	83.3	96.2	96.2	275.7
37	Setiu	River improvement	24 km	1.5	15.0	-	-	16.5
38	Besut	River improvement	66 km	-	61.3	36.3	-	97.6
39	Kemasin	Bypass floodway	16 km	-	17.0	17.0	-	34.0
		River improvement	34 km	-	34.1	34.1	-	68.2
40	Kelantan	Dabong dam	1,300x10 ⁶ m ³	-	-	32.0	-	32.0
		Lebin dam	700x10 ⁶ m ³	-	24.0	-	-	24.0
		River improvement	65 km	16.7	-	80.0	215.3	312.0
		Polder	9.1 km ²	-	9.5	-	-	9.5
41	Golok	River improvement	73 km	6.7	33.3	33.3	-	73.3
Total		Dam	11					
		River improvement	2,394 km	100.6	1,251.2	1,804.2	1,997.9	5,153.9
		Bypass floodway	90 km					
		Polder	19.1 km ²					

Remarks; (1): In 1980 end constant price
 /1: Total incremental capacity of the proposed facilities during 4MP through 7MP

Table 45 PRINCIPAL FEATURES AND INVESTMENT COST FOR
FLOOD MITIGATION PROJECTS BY PROJECT BY
BASIN BY MP FOR ALTERNATIVE F2 (1/3)

Basin No.	Basin Name	Project	Principal Features/ <u>1</u>	Investment Cost (M\$10 ⁶)				
				4MP	5MP	6MP	7MP	Total
1	Perlis							
		Timah Tasoh dam	28.0x10 ⁶ m ³	-	4.4	-	-	4.4
		River improvement	34 km	-	17.6	-	-	17.6
5	Muda							
		River improvement	75 km	0.0	26.5	14.9	18.8	60.2
6	Perai							
		River improvement	4 km	-	-	-	3.6	3.6
7	P. Pinang							
		River improvement	2 km	-	15.0	15.0	-	30.0
9	Kurau							
		River improvement	13 km	-	18.0	-	-	18.0
10	Perak							
		Bypass floodway	50 km	-	-	100.0	150.0	250.0
		Polder	10.0 km ²	-	32.5	32.5	-	65.0
15	Kelang							
		Batu dam	4.6x10 ⁶ m ³	10.3	-	-	-	10.3
		Gombak dam	7.8x10 ⁶ m ³	12.5	-	-	-	12.5
		River improvement	36 km	-	59.1	54.6	-	113.7
18	Linggi							
		River improvement	41 km	4.8	5.3	-	5.5	15.6
19	Melaka							
		Bypass floodway	5 km	-	8.5	-	-	8.5
20	Kesang							
		River improvement	38 km	1.8	1.7	11.4	11.4	26.3
21	Muar							
		Upper Muar dam	24.4x10 ⁶ m ³	-	-	5.3	-	5.3
		River improvement	53 km	-	-	9.0	11.5	20.5
		Polder	1.3 km ²	-	-	-	4.6	4.6

Remarks; (1): In 1980 end constant price
/1: Total incremental capacity of the proposed facilities
during 4MP through 7MP

Table 46 PRINCIPAL FEATURES AND INVESTMENT COST FOR FLOOD MITIGATION PROJECTS BY PROJECT BY BASIN BY MP FOR ALTERNATIVE F2 (2/3)

Basin No.	Basin Name	Project	Principal Features/1	Investment Cost (M\$10 ⁶)				
				4MP	5MP	6MP	7MP	Total
22	Batu Pahat							
		Semberong dam	25.5x10 ⁶ m ³	24.4	25.1	-	-	49.5
		Bekok dam	90.7x10 ⁶ m ³	15.6	-	-	-	15.6
		River improvement	93 km	-	9.9	35.0	25.9	70.8
		Bypass floodway	19 km	-	-	20.0	-	20.0
23	Pontian Kechil							
		River improvement	25 km	1.5	13.7	-	-	15.2
24	Johor							
		Polder	1.2 km ²	-	-	-	8.0	8.0
26	Mersing							
		River improvement	6 km	-	-	-	6.6	6.6
27	Endau							
		River improvement	11 km	-	-	5.6	-	5.6
30	Pahang							
		Telom/Jelai Kechil dam	1,740x10 ⁶ m ³	-	-	45.6	-	45.6
		Tembeling Upper dam	2,110x10 ⁶ m ³	-	36.5	-	-	36.5
		Tekai Lower dam	510x10 ⁶ m ³	-	17.0	-	-	17.0
		Polder	28.5 km ²	5.4	11.9	8.7	41.0	67.0
		Land use change	111.7 km ²	-	61.7	92.2	92.2	246.1
31	Kuantan							
		River improvement	6 km	-	-	-	34.1	34.1
32	Kemaman							
		Polder	20.0 km ²	-	9.8	-	-	9.8
36	Trengganu							
		River improvement	29 km	-	-	18.5	58.1	76.6
		Polder	8.6 km ²	-	-	2.3	-	2.3
37	Setiu							
		River improvement	9 km	1.5	6.2	-	-	7.7

Remarks; (1): In 1980 end constant price
 /1: Total incremental capacity of the proposed facilities during 4MP through 7MP

Table 47 PRINCIPAL FEATURES AND INVESTMENT COST FOR
FLOOD MITIGATION PROJECTS BY PROJECT BY
BASIN BY MP FOR ALTERNATIVE F2 (3/3)

Basin No.	Basin Name	Project	Principal Features/ <u>1</u>	Investment Cost (M\$10 ⁶)				Total
				4MP	5MP	6MP	7MP	
38	Besut	River improvement	33 km	-	24.7	33.0	-	57.7
40	Kelantan	Dabong dam	1,300x10 ⁶ m ³	-	-	32.0	-	32.0
		Lebin dam	700x10 ⁶ m ³	-	24.0	-	-	24.0
		River improvement	65 km	16.7	-	80.0	215.3	312.0
		Polder	9.1 km ²	-	9.5	-	-	9.5
Total	Dam		11					
	River improvement		573 km					
	Bypass floodway		74 km	94.5	438.6	615.6	686.6	1,835.3
	Polder		84.7 km ²					
	Land use change		111.7 km ²					

Remarks; (1): In 1980 end constant price
/1: Total incremental capacity of the proposed facilities during 4MP through 7MP

Table 48 PRINCIPAL FEATURES AND INVESTMENT COST FOR
FLOOD MITIGATION PROJECTS BY PROJECT BY
BASIN BY MP FOR ALTERNATIVE F3 (1/3)

Basin No.	Basin Name	Project	Principal Features/ ¹	Investment Cost (M\$10 ⁶)				
				4MP	5MP	6MP	7MP	Total
1	Perlis							
		Timah Tasoh dam	28.0x10 ⁶ m ³	-	4.4	-	-	4.4
		River improvement	46 km	-	21.6	-	-	21.6
3	Kedah							
		River improvement	15.5 km	-	-	-	9.9	9.9
		Flood plain management	4 km ²	-	0.1	-	-	0.1
5	Muda							
		River improvement	75 km	0.0	26.5	14.9	18.8	60.2
6	Perai							
		River improvement	4 km	-	-	-	3.6	3.6
7	P. Pinang							
		River improvement	2 km	-	-	15.0	15.0	30.0
9	Kurau							
		River improvement	13 km	-	18.0	-	-	18.0
10	Perak							
		Bypass floodway	50 km	-	-	100.0	150.0	250.0
		Polder	10.0 km ²	-	32.5	32.5	-	65.0
11	Bernam							
		River improvement	11 km	-	-	-	5.4	5.4
14	Buloh							
		River improvement	24 km	-	-	12.9	-	12.9
15	Kelang							
		Batu dam	4.6x10 ⁶ m ³	10.3	-	-	-	10.3
		Gombak dam	7.8x10 ⁶ m ³	12.5	-	-	-	12.5
		River improvement	73 km	3.6	38.7	38.7	38.7	119.7
16	Langat							
		River improvement	128 km	-	28.1	28.1	34.8	91.0
18	Linggi							
		River improvement	103 km	0.3	37.7	7.2	-	45.2

Remarks; (1): In 1980 end constant price
/1: Total incremental capacity of the proposed facilities during 4MP through 7MP

Table 49 PRINCIPAL FEATURES AND INVESTMENT COST FOR FLOOD MITIGATION PROJECTS BY PROJECT BY BASIN BY MP FOR ALTERNATIVE F3 (2/3)

Basin No.	Basin Name	Project	Principal Features/ ¹	Investment Cost (M\$10 ⁶)				
				4MP	5MP	6MP	7MP	Total
19	Melaka	River improvement	32 km	0.3	2.4	5.8	13.4	21.9
		Bypass floodway	5 km	-	8.5	-	-	8.5
20	Kesang	River improvement	68 km	1.8	1.7	16.4	16.4	36.3
21	Muar	Upper Muar dam	24.4x10 ⁶ m ³	-	-	5.3	-	5.3
		River improvement	53 km	-	-	9.0	11.5	20.5
		Polder	1.3 km ²	-	-	-	4.6	4.6
22	Batu Pahat	Semberong dam	25.5x10 ⁶ m ³	24.4	25.1	-	-	49.5
		Bekok dam	90.7x10 ⁶ m ³	15.6	-	-	-	15.6
		River improvement	109 km	-	9.9	35.0	36.3	81.2
		Bypass floodway	19 km	-	-	20.0	-	20.0
23	Pontian Kechil	River improvement	30 km	1.5	16.5	-	-	18.0
24	Johor	Polder	1.2 km ²	-	-	-	8.0	8.0
26	Mersing	River improvement	9 km	-	-	-	8.3	8.3
27	Endau	River improvement	37 km	-	-	5.6	14.9	20.5
30	Pahang	Telom/Jelai Kechil dam	1,740x10 ⁶ m ³	-	-	45.6	-	45.6
		Tembeling Upper dam	2,110x10 ⁶ m ³	-	36.5	-	-	36.5
		Tekai Lower dam	510x10 ⁶ m ³	-	17.0	-	-	17.0
		Polder	28.5 km ²	5.4	11.9	8.7	41.0	67.0
		Land use change	111.7 km ²	-	61.7	92.2	92.2	246.1
31	Kuantan	River improvement	6 km	-	-	-	34.1	34.1

Remarks; (1): In 1980 end constant price
¹: Total incremental capacity of the proposed facilities during 4MP through 7MP

Table 50 PRINCIPAL FEATURES AND INVESTMENT COST FOR FLOOD MITIGATION PROJECTS BY PROJECT BY BASIN BY MP FOR ALTERNATIVE F3 (3/3)

Basin No.	Basin Name	Project	Principal Features/ ¹	Investment Cost (M\$10 ⁶)				Total
				4MP	5MP	6MP	7MP	
32	Kemaman	Polder	20.0 km ²	-	9.8	-	-	9.8
36	Trengganu	River improvement	5 km	-	-	-	18.5	18.5
		Flood plain management	204 km ²	-	12.6	-	-	12.6
		Polder	7.2 km ²	-	-	-	2.3	2.3
38	Besut	River improvement	66 km	-	61.3	36.3	-	97.6
39	Kemasin	Bypass floodway	16 km	-	17.0	17.0	-	34.0
		River improvement	34 km	-	34.1	34.1	-	68.2
40	Kelantan	Dabong dam	1,300x10 ⁶ m ³	-	-	32.0	-	32.0
		Lebin dam	700x10 ⁶ m ³	-	24.0	-	-	24.0
		River improvement	65 km	16.7	-	80.0	215.3	312.0
		Polder	91 km ²	-	9.5	-	-	9.5
41	Golok	River improvement	10 km	6.7	9.9	-	-	16.6
Total	Dam		11					
	River improvement		1,018.5 km					
	Bypass floodway		90 km					
	Polder		159.2 km ²	99.1	577.0	692.3	793.0	2,161.4
	Land use change		111.7 km ²					
	Flood plain management		208 km ²					

Remarks; (1): In 1980 end constant price
¹: Total incremental capacity of the proposed facilities during 4MP through 7MP

Table 51 SERVED POPULATION AND INVESTMENT COST FOR FLOOD FORECASTING AND WARNING SYSTEMS BY BASIN BY MP

Basin No.	Basin Name	People Relieved by F/F (10 ³)/1	Investment Cost (M\$10 ⁶)				
			4MP	5MP	6MP	7MP	Total
1	Perlis	9.0	-	0.9	-	-	0.9
5	Muda	10.2	-	1.2	-	-	1.2
7	Pinang	5.5	-	0.8	-	-	0.8
10	Perak/1	162.9	0.7	-	-	-	0.7
13	Selangor	4.4	-	0.5	-	-	0.5
15	Kelang	113.2	1.5	-	-	-	1.5
16	Langat	20.6	-	0.5	-	-	0.5
18	Linggi	14.6	-	0.9	-	-	0.9
19	Melaka	25.2	-	1.1	-	-	1.1
21	Muar	14.2	-	1.8	-	-	1.8
23	Sekudai	9.2	1.0	-	-	-	1.0
	Tebrau	5.8	0.5	-	-	-	0.5
24	Johor	4.4	0.8	-	-	-	0.8
30	Pahang/1	99.1	-	1.0	-	-	1.0
31	Kuantan	8.5	-	0.5	-	-	0.5
32	Kemaman	6.7	0.5	-	-	-	0.5
34	Dungun	2.6	0.6	-	-	-	0.6
36	Trengganu/1	20.5	0.4	-	-	-	0.4
38	Besut/1	15.1	0.2	-	-	-	0.2
39	Kemasin/Semarak	7.1	0.3	-	-	-	0.3
40	Kelantan/1	213.5	0.7	-	-	-	0.7
41	Golok	12.7	0.2	-	-	-	0.2
Total		785.0	7.4	9.2	-	-	16.6

Remarks; (1): In 1980 end constant price

/1: Total increment of the people served by the proposed facilities during 4MP through 7MP

Table 52 ESTIMATED PUBLIC DEVELOPMENT EXPENDITURE FOR
RECOMMENDED PLAN IN PERLIS/KEDAH/P. PINANG

Unit: M\$10⁶

		4MP	5MP	6MP	7MP	Total
Source Development		229	662	35	0	926
Irrigation	Perlis	11	79	10	15	115
	Kedah	33	220	331	326	910
	P. Pinang	0	9	1	0	10
	Sub-total	44	308	342	341	1035
Inland Fishery	Perlis	0	0	12	6	18
	Kedah	2	20	68	56	146
	P. Pinang	1	7	13	7	28
	Sub-total	3	27	93	69	192
Public Water Supply	Perlis	14	28	32	13	87
	Kedah	100	207	227	93	627
	P. Pinang	135	198	180	73	586
	Sub-total	249	433	439	179	1300
Public Water Supply (Pretreatment facilities)	Perlis	0	0	0	0	0
	Kedah	7	9	6	2	24
	P. Pinang	7	9	5	2	23
	Sub-total	14	18	11	4	47
Public Sewerage (Effective for river water pollution abatement)	Perlis	0	0	0	0	0
	Kedah	35	63	64	26	188
	P. Pinang	0	0	0	0	0
	Sub-total	35	63	64	26	188
Public Sewerage (Others)	Perlis	0	0	0	0	0
	Kedah	32	50	47	19	148
	P. Pinang	74	116	111	45	346
	Sub-total	106	166	158	64	494
Flood Mitigation	Perlis	-	23	-	-	23
	Kedah	-	28	15	-	43
	P. Pinang	0	15	15	22	52
	Sub-total	0	66	30	22	118
Total		680	1743	1172	705	4300

Remarks; (1): In 1980 end constant price

(2): The amount shown for 4MP is the additional budget, assuming that the original budget can provide the capacity necessary up to 1985 for public water supply and irrigation.

Table 53 ESTIMATED PUBLIC DEVELOPMENT EXPENDITURE
FOR RECOMMENDED PLAN IN PERAK

Sector	Unit: M\$10 ⁶				
	4MP	5MP	6MP	7MP	Total
Source Development	41	372	0	0	413
Irrigation	0	160	14	0	174
Inland Fishery	3	3	30	18	54
Public Water Supply	231	393	394	159	1177
Public Water Supply; Pre-treatment facilities	3	5	3	1	12
Public Sewerage (Effective for river water pollution abatement)	0	0	0	0	0
Public Sewerage (Others)	140	236	236	95	707
Flood Mitigation	1	51	133	150	335
Total	419	1220	810	423	2872

Remarks; (1): In 1980 end constant price
(2): The amount shown for 4MP is the additional budget, assuming that the original budget can provide the capacity necessary up to 1985 for public water supply and irrigation.

Table 54 ESTIMATED PUBLIC DEVELOPMENT EXPENDITURE
FOR RECOMMENDED PLAN IN SELANGOR

Sector	Unit: M\$10 ⁶				
	4MP	5MP	6MP	7MP	Total
Source Development	231	732	368	177	1490
Irrigation	0	0	0	0	0
Inland Fishery	3	14	57	39	113
Public Water Supply	874	1588	1674	670	4806
Public Water Supply; Pre-treatment facilities	0	0	0	0	0
Public Sewerage (Effective for river water pollution abatement)	447	736	731	293	2207
Public Sewerage (Others)	34	58	59	23	174
Flood Mitigation	24	60	55	-	139
Total	1613	3188	2944	1202	8929

Remarks; (1): In 1980 end constant price
(2): The amount shown for 4MP is the additional budget, assuming that the original budget can provide the capacity necessary up to 1985.