VOLUME 4 – SECTOR VIII

ECONOMIC EVALUATION

THE STUDY ON INTEGRATED URBAN DRAINAGE IMPROVEMENT FOR MELAKA AND SUNGAI PETANI IN MALAYSIA

FINAL REPORT

VOLUME 4: SUPPORTING REPORT ON FEASIBILITY STUDY

SECTOR VIII: ECONOMIC EVALUATION

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SECTOR VIII

ECONOMIC EVALUATION

1. INTRODUCTION

The economic evaluation for priority projects is made through comparison between the present values of economic benefits and costs of projects. The major economic benefit of the urban drainage improvement project could be presented as the expected reduction of effect of flood damage by implementing the project, i.e., the economic difference between "with-project" and "without-project" situations. Moreover, if the project is not implemented, such damage will continue to occur in proportion to the increase of population and growth of the economy, that is, to the land enhancement, which is taken into account in this study.

The comparison on economic benefit and cost is carried out using the Economic Internal Rate of Return (EIRR), together with the Benefit-Cost Ratio (B/C) and the Net Present Value (NPV).

2. CONDITIONS OF ECONOMIC EVALUATION

The economic cost and benefit is estimated using the economic prices under the conditions and assumptions given below:

- Transfer payments such as sales tax of 10% on the average shall not be included in the economic cost and benefit;
- Standard conversion rate applied to general property, as well as equipment and materials procured locally is assumed to be 99%, taking the export and import situations of Malaysia in recent years into consideration (SCR: refer to Table VIII-1 and Table VIII-2);
- Opportunity cost of wages for laborers is assumed to be 97% of existing cost, taking unemployment situations in recent years into consideration (Table VIII-3);
- Opportunity cost of land to be acquired for the project is assumed to be 90% of the existing cost, taking into account the vacant condition of land to be acquired for the project;
- Inflation factor is not taken into account for economic evaluation;

- Economic life of the project (hereinafter referred to as the "project life") is taken as 50 years after the completion of construction work;

- Construction period is to be 5 years;

- Economic benefit accruing from the land enhancement in the future is estimated on the basis of population increase, improvement of people's living standard or per capita income and GRDP, all of which are involved and more actually represented in the change of land use of objective areas. Therefore, in this study, the increase of the average annual damage amount between the present and 2020 are adopted as the coefficients for the land enhancement until 2020 year (refer to Table VIII-16).

- The benefit of the project and the OM cost (operation and maintenance cost) for the construction facilities are expected to accrue every year during the period of project life after completion of the construction work;

- Partial benefits of the project in the construction period are assumed to accrue in proportion to the progress of construction work, i.e., the benefits are estimated by a ratio of the invested construction cost to the total construction cost; and

- Opportunity cost of capital is assumed to be 13%. (Source: The Government of Malaysia, National Parameters for Project Appraisal in Malaysia, Volume I, with assistance from the Regional Planning Section, EPU, 1986).

3. ESTIMATION OF POTENTIAL FLOOD DAMAGE VALUE

The implementation of the urban drainage improvement projects will mitigate the extent and duration of flood inundation and reduce its resultant damage. In order to evaluate the benefits of the projects, the methodology for estimation of flood damage potential was studied.

The sampling questionnaire survey on flood damage in Sungai Petani and Melaka was carried out in cooperation with the respective DID office. The samples were collected from 80 holders of houses/buildings that is divided into 40 holders for households, 20 for commerce/institution, 10 for industry and 10 for infrastructure. Sample survey was further strengthened through supplementary interview survey in the field, collection of various official statistical data and review of previous similar studies. The results of the preliminary study are described below.

3.1 Types of Flood Damage

Flood damage is classified into the direct and the indirect damages. The direct damage is brought about due to the direct destruction by flood of houses, household effects, commercial and industrial establishments, institutions, agricultural crops and infrastructure. The indirect damage is such as the loss of household income, the loss of earnings and overtime wage payment by commerce/industry due to stoppage of the operation caused by flood, which is called economic activities loss. The indirect damage could further extend to influence to the traffic, the outbreak of water-bone epidemics, expenditure for rescue and relief, psychological sufferings, etc.

Among these various categories of flood damage, the direct damages other than the agricultural damage are taken up as the objectives for estimation in this study. As for the damage to agricultural crops, there scarcely exist agricultural land in the study area, and therefore, its damage is excluded from the objectives of estimation.

The study also highlights the economic activities loss and traffic damage among the indirect damage as the objectives of estimation, because they could be enumerated as the major and representative damages in the objective study areas.

3.2 Estimation of Direct Damage to Private Properties

The direct damage will be estimated according to the following procedures.

(1) Formula for Estimation

Flood damage of general property damage is estimated according to the following formula:

$$Di = Ni \times Ai \times Ri \qquad \text{(Eq. VIII.1)}$$

Where i : Kind of building/assets
Di : Flood damage to Building/assets for i-kind of building/assets
Ni : Number of i-kind of building/assets
Ai : Average appraisal values per general building/assets of I-kind of building/assets
Ri : Average damage rate for i-building/assets

(2) Average Appraisal Value of Property

The average appraisal value of each item was set with referring to the results of interview survey, the official statistical figures and the record of and consultation with Valuation Department, as shown below.

Financial Average Appraisal Value per Unit

Unit: RM

Item of Asset	Average Value/Unit	Item of Asset	Average Value/Unit
Residential Building	100,000	Commercial Building	200,000
Household Effects	13,000	Commercial Assets/stock	52,170
Factory Building	600,000	Institutional Building	200,000
Factory Assets/stock	141,000	Institutional Assets	30,000

Source: (1) Valuation and Property Service Department, Municipal Council and JICA
(2) Interview Survey in industrial estate in Sg. Petani.
Remark: Commercial assets/stock and profit assumed to be 0.37 of factory' one in proportion to GDP composition.

Economic Average Appraisal Value per Unit

Unit: RM

Item of Asset	Average Value/Unit	Item of Asset	Average Value/Unit
Residential Building	80,190	Commercial Building	160,380
Household Effects	11,583	Commercial Assets/stock	46,483
Factory Building	481,140	Institutional Building	160,380
Factory Assets/stock	125,631	Institutional Assets	24,057

(3) Damage Rate

The rates of flood damages in the inundated areas are expressed by the regression function derived from the results of interview survey and the review on similar/previous study, as follows:

Flood Damage Rate

Water Depth (H-cm)	Building	Building Assets	Commercial/ Factory Assets/Stock
0 <H < 50	0.035	0.057	0.066
50 <H < 100	0.045	0.096	0.121
100 <H < 150	0.061	0.119	0.144
150 <H <200	0.068	0.135	0.161
200 <H <300	0.112	0.336	0.208
300 <H	0.170	0.687	0.243

(4) Number of Properties in the Inundated Area

The number of existing and projected properties in the probable flood inundation areas is estimated through overlaying the land use maps and the probable extent of flood

inundation area derived from the hydrological analysis. The details of the land use and the possible flood inundation area are as described in Volume 4, Sector I. On the other hand, the average site area of respective properties was assumed through the interviews with property owners, the factory owners in the industrial estate, the Valuation and Property Service Department, and the Municipal Council. Then, the number of respective properties in each inundated area were counted dividing the inundated area by the corresponding site area (refer to Table VIII-10).

3.3 Estimation of Direct Damage to Public Facilities

Public facilities include roads, bridges, power supply facilities, telecommunication facilities, water supply facilities, irrigation facilities, etc. According to the interview survey with the related agencies, damage to these facilities other than roads in the objective study areas has not been recorded. However, damage to roads frequently occurs. The road surface and structure would be deteriorated by the frequent flood inundation, and major re-pavement works are required in almost every three years in the inundated areas, while every seven years in non-inundated areas. This balance of cost for the re-pavement work interval could be calculated by the following formula:

$$Di = Ai \times Bi \qquad \text{(Eq. VIII.2)}$$

Where i : i-Kind of road
Di : Flood damage for i-kind of road area
Ai : Area of i-kind of road
Bi : Average damage balance for i-road area

The damage amount derived for the road re-pavement has been estimated as shown in Table VIII-4.

3.4 Estimation of Indirect Damage to Economic Activities

The residential, commercial and industrial units in and around the inundated areas will suspend all or a part of their business and productive activities during a certain period of and after the flooding. Industrial factories would also be forced to shoulder the double wage payment to workers because of their absence from the factories due to inundation of factories and/or their residential houses. Moreover, the factories have to bear the extra wage payment for overtime work in order to recoup with the suspended production and this is estimated to be 1.5 times of the usual wage payment per hour.

In due consideration of the above conditions, the loss of economic activities is counted as reduction of household income, and sales profits of business activity, i.e. the sales profit of commerce and industries. In addition, the overtime and/or double payment to laborers caused by business suspension due to flood is also counted as flood damage. The flood damage of business activities is estimated through the following formula:

$$Di = Ni \times Pi \times Ti \qquad \text{(Eq. VIII.3)}$$

Where i : Kind of business activity
Di : Flood damage to i-kind of business activity
Ni : Number of i-kind of business activity
P i: Average income, sales profit overtime wage payment per time of i-kind of business activity, and
Ti : Suspension time due to inundation

The present average appraisal values of business activities are set as below, and its future unit value is estimated by applying the average annual growth rate of GRDP and of Per Capita Income.

Average Appraisal Value per Unit

Unit : RM

Household Income/year	23,200	Commercial Profit/year	39,100
Factory Profit/year	170,000	Overtime payment/day	3,200

Note: (1) Factory profit and wage derived from Interview Survey at Insustrial Estate in Sg.Petani.(refer to Table VIII-86).
(2) Commercial profit assumed to be 0.23 of factory's one in proportion with GDP composition.; Economic Report,1996-98, Ministry of Finance.
(3) Overtime payment is per day/per factory.

On the other hand, damage rate of economic activities is set as the number of hours business activities would be suspended during and after the flooding.

3.5 Estimation of Indirect Damage to Traffic

Once inundation hits the feasibility study (F/S) area, vehicular traffic will be affected in various ways. The vehicle operation cost (VOC) per km/hour will rise as vehicle speed is slowed down. The time cost (TC) will be incurred because of the additional driving hours required. Those damages shall be counted in monetary terms through the following procedures:

(1) Incremental Vehicle Operation Cost

The travel speed of vehicle would be forced to slow down during the inundation, which would result in more vehicle operation cost (VOC) due to inefficient usage of fuel and

oil and other running cost of the vehicle. This flood damage to vehicle operation cost is estimated according to the following formula:

$$IVOC(i,v) = [KMf(v) \times VOCf(v) - KMn(v) \times VOCn(v)] \quad \text{(Eq. VIII. 4)}$$

Where,

IVOC (i,v) : Incremental vehicle operation cost by inundation area by vehicle

KMf (v) : Vehicle operation km during inundation by vehicle

VOCf (v) : Vehicle operation cost per km/hr during inundation by vehicle

N : Normal condition

In this study, the vehicle operation cost by travel speed is adopted for the calculation of operation cost (refer to Table VIII-6). In the meantime, the operation costs of vehicles or traffic damage are calculated as shown in Table VIII- 8.

(2) Time Cost

The lower driving speed and detouring due to flooding would result in longer traveling hours that could also be expressed in monetary terms. The time cost per vehicle is the function of additional hours necessitated per vehicle and number of inundated vehicles in which traffic impediment is prevalent. Flood damage to time cost is estimated according to the following formula:

$$TC(i,v) = [KMf(v) / SPf(v) - KMn(v) / SPn(v)] \times TI \times NP(v) \times LP \times HW \times NV(iv) \quad \text{(Eq. VIII-5)}$$

Where,

TC (i ,v) : Time cost by inundation area by vehicle

KMf(v) : Operation kilometers per day during inundation by vehicle

SPf(v) : Operation speed per hour during inundation by vehicle

(KMn(v) : Operation kilometers per day in normal time by vehicle

SPn(v) : Operation speed per hour during inundation by vehicle

TI : Number of inundated days in which traffic impediment is prevalent

NP (v) : Average number of passengers by vehicle

LP : Labor participation rate

HW : Hourly wages/salary

NV(I,v) : Number of vehicles on road by inundation area by vehicle

(3) Number of Vehicles

The present number of vehicles running through the objective study areas is provided from the traffic volume survey records of the Public Works Department (PWD) and the DID District Offices (refer to Table VIII-6 and VIII-7).

In the meantime, the time costs of vehicles or traffic damage are calculated, as shown in Table VIII-9.

3.6 Estimation of Average Annual Flood Damage

To make an economic evaluation of the proposed project, the average annual flood damage is used as the benefit to be brought forth by the project.

The average annual flood damage is calculated by using the following formula:

$$D = \Sigma [(Nm\text{-}1 - Nm) \times (Lm\text{-}1 + Lm) / 2] \qquad \text{(Eq. VIII-6)}$$

where, D : Average annual flood damage
N : Probability of floods
L : Damage potential corresponding to probability of flood
m : Ordinal number to return period

In the procedure of estimating the average annual flood damage, the 5-year return period flood is adopted as the maximum frequency for rivers because this return period corresponds to the design flood frequency of flood mitigation implementation. The damage amount of the 5-year return period is obtained by applying the damage rates, appraisal value and number of respective properties (refer to Table VIII-11, VIII-12 and VIII-13). In the meantime, the damage amount of a 1-year return period flood is assumed to be almost nil, because the flood damage of 1-year return period is to some extent protected by the present implementation. Furthermore, the inhabitants are accustomed to protecting themselves from the damage of a 1-year return period flood. By using the two points of flood damage, a logarithmic approximation function is obtained and the damage amount between the 1-year and 5-year return period flood could be estimated (refer to Table VIII-14).

4. CALCULATION OF AVERAGE ANNUAL ECONOMIC BENEFIT

The average annual damage reduction is equivalent to the expected average annual benefit. This benefit is expected to accrue every year during the project life of 50 years after the completion of the construction work. The average annual economic benefit for each project is

obtained from the calculation formula of average annual flood damage (refer to Table VIII-15 and VIII-16). The expected average annual damage reductions are summarized below.

Amount of Average Annual Damage

Unit: RM 1,000

	Sungai Petani		Melaka		Total
	Sg. Air Mendidih	Line G	Ayer Salak	Pokok Mangga	
Present	974	277	2,658	2,244	6,153
2020 year	2,415	1,588	16,015	8,958	29,027
Average Annual Increase Rate (%)	4.6	9.1	9.4	7.2	8.1

The average annual economic amount or benefits are reflected in Table VIII-18 (1/5-5/5) for the purpose of economic analysis of the projects.

4.1. Economic Cost

The economic costs are converted from the project financial costs under the conditions and assumptions described before. In addition to these conditions and assumptions, the following conditions are taken into consideration for the conversion.

As the result of the conversion, the economic costs and OM cost per annum are estimated (refer to Table VIII-17).

Financial Cost of the Project

Unit: RM 1,000

	Sungai Petani		Melaka		
	Sg.Air Mendidih	Line G	Ayer Salak	Pokok Mangga	Total
Construction Cost	11,058	6,580	36,724	18,507	72,869
Annual OM Cost	148	105	533	54	840

Note: Price Contingency included.

Economic Cost of the Project

Unit: RM 1,000

	Sungai Petani		Melaka		
	Sg. Air Mendidih	Line G	Ayer Salak	Popok Mangga	Total
Construction Cost	8,333	5,109	26,681	14,326	54,449
Annual OM Cost	132	94	475	48	749

Note: Price Contingency excluded.

The annual flow of the economic cost and economic OM cost are reflected in Table VIII 18 (1/5-5/5) for the purpose of the economic analysis of the projects.

4.2 Economic Evaluation

The average annual flood damage reduction amount could be converted into the expected Average Annual Benefit. This benefit is expected to accrue every year during the project life of 50 years after completion of the construction work.

The land enhancement would be counted in every year until 2020, taking an average annual increase rate of the average annual damage amount into consideration (refer to Table VIII-16).

A partial benefit for the construction period is assumed to accrue in proportion to the progress of construction work, i.e., the benefit is approximately estimated by the ratio of invested construction cost to total construction cost.

The project evaluation has been done on the basis of the above-mentioned conditions, assumption and figures. The results of the evaluation indices are summarized below (refer to Table VIII-18 (1/5-5/5).

Economic Evaluation of Project

Unit: RM 1,000

	Sungai Petani		Melaka		
	Sg.Air Mendidih	Line G	Ayer Salak	Popok Mangga	Total
Average Annual Economic Benefit	974	277	2,658	2,244	6,153
Economic Construction Cost	8,333	5,109	26,681	14,326	54,449
Economic Annual OM Cost	132	94	475	48	749
EIRR (%)	16.8	13.8	20.7	25.9	19.6
B/C(Ratio) at discount rate of 13%	1.7	1.4	2.5	3.3	2.3
NPV at discount rate of 13%	4,472	1,488	30,982	22,318	50,616

The economic feasibility of the projects has been examined under the conditions mentioned above, using the cash flow of economic cost and benefit shown in Table VIII-18 (1/5-5/5).

As a result, the EIRR of the projects indicate 16.8% for Sg. Air Mendidih/Sungai Petani, 13.8% for Line G/Sungai Petani, 20.7% for Sg. Ayer Salak/Melaka, and 25.9% for Pokok Mangga/Melaka. These percentages indicate that the projects are feasible for Sg. Air Mendidih/Sungai Petani, for Line G/Sungai Petani, for Sg. Ayer Salak/Melaka, and for Prt. Popok Mangga/Melaka considering the opportunity cost of capital (assumed at 13%). In addition, the respective B/C of 1.7 and 1.4 at the discount rate of 13% supports the feasibility of the projects for Sg. Air Mendidih and Line G in Sungai Petani. The B/Cs of 2.5 and of 3.3 at the discount rate of 13% also supports the feasibility of the projects for Sg.Ayer Salak and Popok Mangga in Melaka. At the same time, the EIRR of all projects together in whole study area indicates 19.6% and B/C is 2.3, both of which also indicates the viability of the projects.

4.3 Sensitivity Analysis

Sensitivity analysis is conducted to assess whether a project can maintain its viability and robustness when placed under unfavorable circumstances during and after implementation. A test was therefore carried out to judge the sensitivity of EIRR affected by variations in the economic benefits and costs.

EIRR sensitivity analysis has been examined under the conditions of 5% and 10% increase in economic costs and 5% and 10% decrease in economic benefits. The result are summarized as follows:

EIRR Sensitivity Analysis of the Projects

Sg.Air Mendidih (Sungai Petani)			
Decrease in Benefit	Increase in Cost		
	0%	5%	10%
0%	16.8	16.1	15.4
5%	16.2	15.5	14.9
10%	15.6	14.9	14.4

Line G (Sungai Petani)			
Decrese in Benefit	Increase in Cost		
	0%	5%	10%
0%	13.8	13.3	12.8
5%	13.4	12.9	12.5
10%	13.0	12.6	12.1

Ayer Salak (Melaka)			
Decrease in Benefit	Increase in Cost		
	0%	5%	10%
0%	20.7	20.0	19.2
5%	20.1	19.4	18.6
10%	19.5	18.8	18.1

Pokok Mangga (Melaka)			
Decrease in Benefit	Increase in Cost		
	0%	5%	10%
0%	25.9	25.0	24.1
5%	25.0	24.1	23.3
10%	24.1	23.3	22.5

Whole Study Area

Decrease in Benefit	Increase in Cost		
	0%	5%	10%
0%	19.6	18.4	17.8
5%	18.5	17.8	17.2
10%	17.9	17.3	16.7

Note: Refer to the case of Air Mendidih in Table VIII-20 (1/8-8/8) as an example.

As shown above, in the worst case of cost and benefit, EIRR for the respective projects maintains the figures of 14.4% for Sg. Air Mendidih, 18.1% for Ayer Salak, 22.5% for Pokok Mangga, and of 16.7% for the Whole Area. These results indicate the economic feasibility of the projects in comparison with the opportunity cost of capital of 13%. The figure of Line G shows 12.1%, which is very close to the OCC of 13%.

4.4 Intangible Benefits

Apart from the direct tangible effects of the drainage improvement, there will be indirect intangible effects during and after the project implementation. The direct tangible effects have

been examined quantitatively as discussed above, while the indirect intangible effects are examined qualitatively below.

Indirect effects of the drainage improvement would extend mainly to the following items, contributing to development of the economic society and improvement of living conditions of the people.

(1) Land Use

Frequent inundation would limit land use in the objective areas. The potential of land use in inundated areas would increase considerably by the implementation of drainage improvement, because much less frequency of inundation secures land from damage. Therefore, implementation of the priority projects would devolve to the increase in value of currently inundated areas.

(2) Multiplier Effects of Project Cost Investment

The project cost investment brings multiplier effects to the project area and its vicinity. The employment opportunity is one aspect. During the construction period, investment is made for the local portion of labor and for engineering and administration in response to the creation of employment opportunities. Consequently, the consumption coming out from wages paid to the people concerned accelerates the commercial and economic activities in the area surrounding the project sites. The compensation cost for land acquisition also brings multiplier effects to the economy in the area.

(3) Technology Transfer

Technology transfer during the construction and operation and maintenance may be categorized into human resource development, namely, the formation and development of capabilities of personnel through knowledge and skills. The development of people is an important aspect of social and economic development. On-the-job training during the construction period would improve the ability of the engineers and also creates capable technicians. The technology transfer for the operation and maintenance would bring not only improvement of engineers' abilities but also creates men of talent for the administration and management system.

(4) Mental Damage to Sufferers

Once people suffer inundation damage, mental anguish extends to the person himself, his relatives and neighbors. Even the people who do not suffer from inundation become

nervous when heavy rains come. These mental damages cannot be compensated in monetary terms, but have to be eradicated for a sound society.

5. BUDGETARY AFFORDABILITY FOR IMPLEMENTAION OF PRIORITY PROJECTS

The financial affordability for implementation of the proposed drainage projects in the priority areas are as evaluated below:

5.1 Construction Cost

The construction cost for the projects is estimated at RM 57.9 million in total. Out of the total cost, the construction cost of RM 2.5 million for the following five flood detention ponds could be borne to the Land Developer. Accordingly, the cost to be shared by the government budget is estimated at RM 55.4 million, which is to be disbursed for the next five-year period for 8th Malaysian Plan (2001 – 2005).

Name of Flood Detention Pond	Name of Drainage Basin	Type of Pond	Construction Cost (RM thousand)
1. Upper Line P	Sg. Air Mendidih	Dry Pond	329
2. Upper Line G	Line G	Wet Pond	467
3. Tg. Minyak (1)	Sg. Ayer Salak	Wet Pond	605
4. Upper Ayer Salak	Sg. Ayer Salak	Dry Pond	559
5. Middle AB 1	Sg. Ayer Salak	Wet Pond	536
Total			2,497

In comparison with the above required, the Federal DID has allocated a budget of RM 633 million for flood mitigation and drainage improvement during the recent five years from 1996 – 1998). Accordingly the above required cost of RM 55.5 million to be shared by the government corresponds to 8.8% of the five-year budget allocated to flood mitigation and drainage improvement.

Federal DID has allocated about 33.0% of the total budget for flood control and urban drainage to the objective states of Kedah and Melaka in the 5th Malaysian Plan (1986 – 1991) and 22.2% in the 6th Malaysian Plan (1991- 1995). The allocation is on the ad-hoc base, and therefore, the percentages allocated to each of the projects could fluctuate according to the necessity and urgency of flood control. Nevertheless, the percentages previously allocated for flood control projects to Kedah and Melaka are far larger than the above value of 8.8%. Judging from these, available budgetary conditions, it is concluded that the construction cost of the proposed projects for priority areas could be financially affordable.

5.2 Operation and Maintenance Cost

The operation and maintenance cost for the proposed projects are estimated at RM 0.25 million for Sungai Petani and RM 0.58 million for Melaka as listed below:

Proposed Facilities	Maintained by	Annual Required Maintenance Cost (RM thousand)		
		Sungai Petani	Melaka	Total
River and Trunk Drains	DID	0.04	0.25	0.29
Flood Detention Pond	Local Authority	0.21	0.33	0.54
Total		0.25	0.58	0.83

In comparison with the necessary maintenance cost, the annual average budget allocated for flood mitigation and drainage to DID as well as the Local Authorities of Sungai Petani and Melaka in the recent five (5) year from 1994 to 1998 are as enumerated bellow (refer to Sector VIII of Vol. 3):

Federal D	:	RM 126.66 million
State DID (Kedah)	:	RM 0.70 million
State DID (Melaka)	:	RM 2.26 million
Local Authority of Sg. Petani	:	RM 0.65 million
Local Authority of Melaka	:	RM 6.48 million

As listed above, all necessary maintenance cost other than that to be shared by the Local Authority of Sungai Petani takes less than 10% of the allocated annual average budget and therefore, could be financially affordable. However, the maintenance cost to be shared by the Local Authority of Sungai Petani takes about 32% of the allocated budget, and difficulties are foreseeable in securing the maintenance cost. Such less budget for the Local Authority of Sungai Petani is attributed to the fact that no major drainage facility has been constructed in Sungai Petani. A major part of the budget for the Local Authority is dependent on the Federal Fund. Hence, the Local Authority of Sungai Petani should coordinate the Federal Government (i.e., the Ministry of Housing and Local Government) to secure the necessary maintenance cost.