

Chapter 8 RECOMMENDED SHORT-TERM ACTIONS

8. RECOMMENDED SHORT-TERM ACTIONS

The recommended short-term actions cover traffic engineering and management as well as public transport. They presume the completion of the committed projects such as the Penang Bridge, Dispersal Road and New Federal Route I, by the end of 1985. However, from the view point of the improvement of existing traffic conditions, the short-term actions are expected to be just as effective even if the committed projects are not completed by the given date. Besides this, the principal policies of the recommended short-term actions are part of the envisaged long-term transport plan.

8.1 Traffic Engineering and Management

8.1.1 General Policies

The main concern of the traffic engineering and management study is the provision of short-term actions to utilize the existing road infrastructure more smoothly, effectively and safely, with or without the implementation of the committed projects. This is because the problems of traffic flow will be greatly improved if the existing road space can be optimized for traffic capacity.

In this connection, the following policies for traffic engineering and management are listed.

1. To improve the existing road conditions and system so as to make possible the most effective road usage.
2. To provide a better transport environment.
3. To provide a more traffic safe environment.

8.1.2 Present and Future Problems of Traffic Engineering and Management

Resulting from careful examination of present traffic engineering and management and from predicted traffic demands, the following problems are identified.

1. Inefficient traffic flow on roads and at intersections in C.B.D area caused by inadequate intersections structures, mixed use of road, insufficient traffic signals, and road-side parking.

2. Ineffective traffic regulatory measures such as traffic signs, markings etc.
3. Insufficient visibility of traffic signals at many signalized intersections.
4. Non-functional road network configuration.
5. Insufficient and non-functional pedestrian facilities such as sidewalks and pedestrian crossings.
6. Exceeding of the highest possible capacity on major roads in 1985.

8.1.3 Recommended Traffic Engineering and Management System

On the basis of the policies mentioned in 8.1.1 and the problems identified in 8.1.2, the following recommendations are made with the short-term actions expected to be completed by the end of 1985.

1. Restructuring the road network

The streets serve many urban activities such as for the movement of vehicle traffic, pedestrian traffic, loading and unloading of merchandise, short-term parking, delivery services, bus services, taxi stands and emergency services. Also, their functions change from hour to hour and day to day. However, functions that are not directly related to traffic movement should be assigned to off-street areas. This is especially the case during peak hour traffic when many usually permitted roadway functions should be banned to increase the capacity for traffic movement.

From the point of view of the functional use of streets, it is suggested that streets in the central areas of the city be classified under the following five (5) categories.

1. Primary Distributors (Inter-Urban)
2. Primary Distributors (Intra-Urban)
3. District Distributors
4. Local Distributors
5. Access Roads

On the basis of the above-mentioned classification, the roads should be restructured in order to use the road network more effectively.

2. Traffic Circulation Plan

The main purpose of the traffic circulation plan in the C.B.D. of George Town is to guide the main traffic flow and to avoid usage of minor roads by through traffic. For this purpose, it is recommended that some Primary Distributors and some District Distributors be made into one-way streets which will result in higher capacity, thereby easing traffic at critical intersections. This will, however, also force drivers to make longer trips. At this stage, three (3) alternatives for the traffic circulation plan for the C.B.D of George Town are proposed. They are shown in Figs. 8.1 to 8.3 . Alternatives A and B are the original plans here while Alternative C is the proposed plan by the Municipal Council of Penang Island. Each of these three (3) alternatives has advantages and disadvantages which are described under each plan.

Resulting from a comparative analysis of the alternatives at this stage from a qualitative view-point, Alternative A is the most desirable for the traffic circulation plan in the C.B.D.of George Town.

However, a detailed study of the socio-economic influences on the inhabitants along the corridors of the circulation plan will be required before the circulation plan can be implemented.

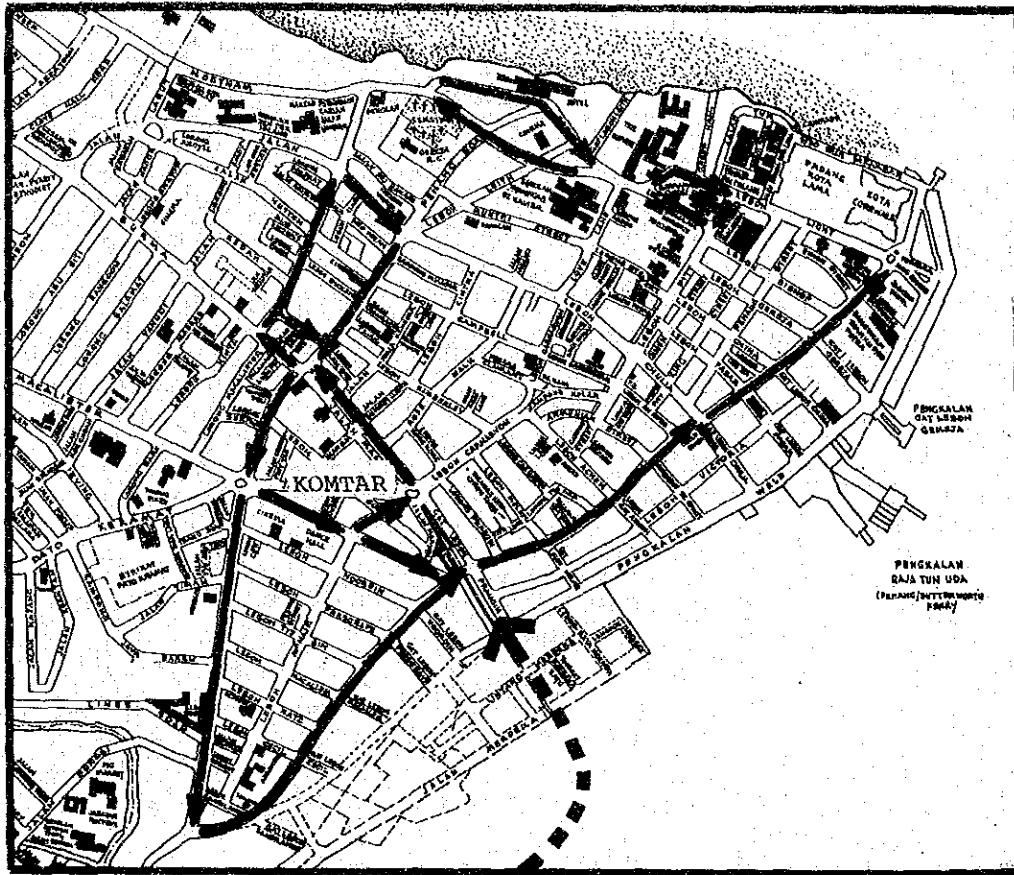


Fig. 8.1 Traffic Circulation Plan for George Town
ALTERNATIVE A

(A) Advantages

- This plan allows for a smooth circulation system in the C.B.D of George Town without the need of any great changes in the existing one-way street system.
- The traffic flowing towards Magazine Circus will be reduced from four (4) to three (3) directions so that traffic control at this intersection will be easier.
- The traffic flowing into the Jalan Burma/Jalan Prangin/Penang Road intersection will be reduced from three (3) to two (2) directions so that traffic control at this intersection will also become easier.
- Traffic flow around KOMTAR will be counter-clockwise which facilitates easy access to KOMTAR.

(B) Disadvantages

- It will be necessary to change existing bus routes around Komtar.
- The traffic from Jalan Burma towards Jalan Prangin will have to be detoured.
- Traffic signal control will be necessary at the Jalan Jelutong/Brick Kiln Road/Bridge Street intersection.

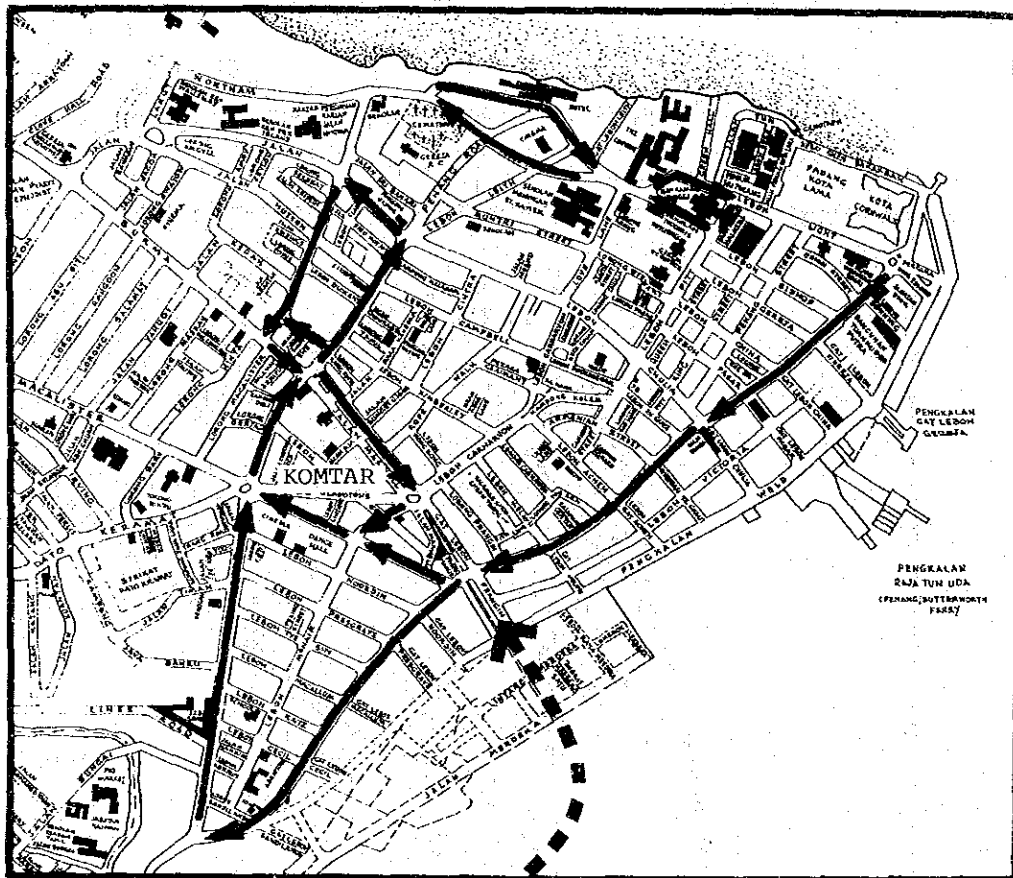


Fig. 8.2 Traffic Circulation Plan for George Town
ALTERNATIVE B

(A) Advantages

- The traffic flowing into the Jalan Burma/Jalan Prangin/Penang Road intersection will be reduced from three (3) to two (2) directions so that traffic control at this intersection will be easier.
- Traffic signal control will not be necessary at the Jalan Jelutong/Brick Kiln Road/Bridge Street intersection.

- Traffic congestion along Jalan Pantai will be solved.

(B) Disadvantages

- It will be necessary to change the existing one-way street system to achieve a smooth circulation system in the C.B.D of George Town.

- Traffic flow around KOMTAR will be clockwise which will produce many right turn movements and hence hinder easy access to KOMTAR.

- It will be necessary to change existing bus routes around KOMTAR.

- The traffic from Jalan Prangin to Jalan Burma will have to be detoured.

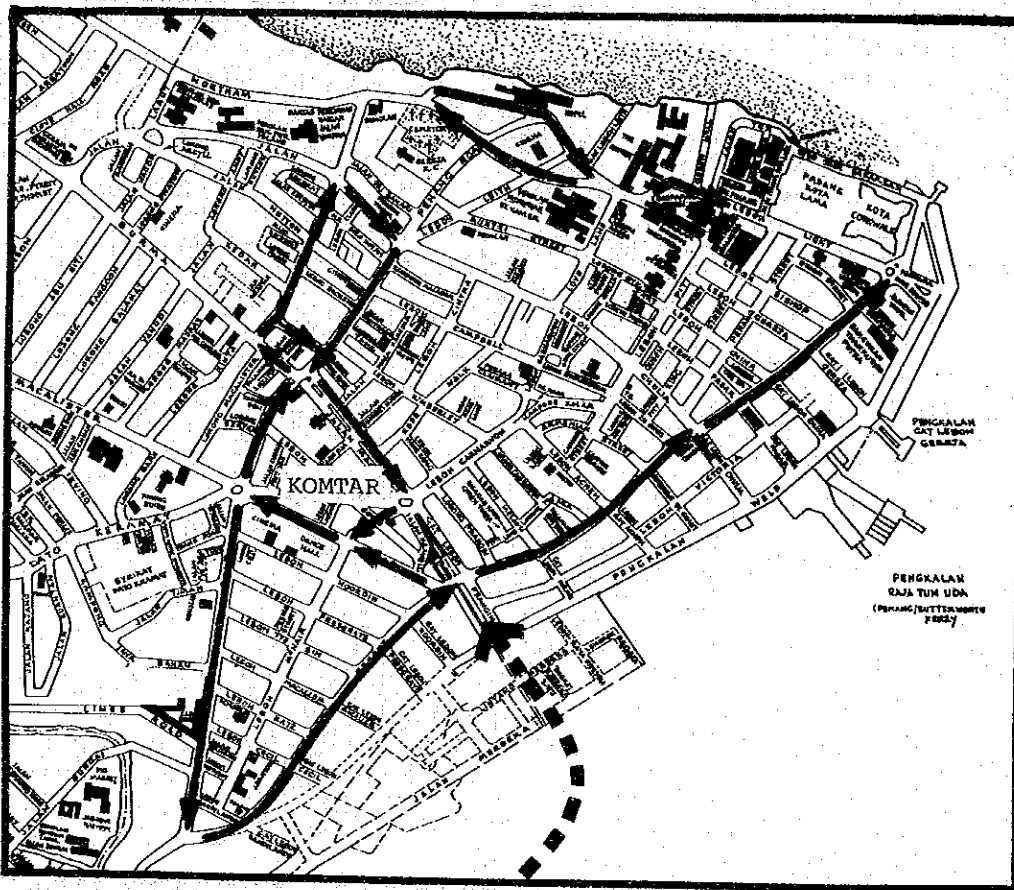


Fig. 8.3 Traffic Circulation Plan for George Town
ALTERNATIVE C (MPPP PROPOSAL)

(A) Advantages

- The traffic flowing into Magazine Circus will be reduced from four (4) to three (3) directions so that traffic control at

this intersection will become easier.

- The traffic flowing into the Jalan Burma/Jalan Prangin/Penang Road intersection will be reduced from three (3) to two (2) directions so that traffic control at this intersection will become easier.
- It will be unnecessary to amend the existing one-way street system.
- It will be unnecessary to amend the existing bus routes.
- Traffic congestion along Jalan Pantai will be solved.

(B) Disadvantages

- This plan will not produce a smooth circulation system in the C.B.D. of George Town.
- Traffic flow around KOMTAR will be clockwise which will produce many right turn movements and hence hinder easy access to KOMTAR.
- The traffic from Penang Road (north part) towards Magazine Circus will have to be detoured.
- Traffic signal control will be necessary at the Jalan Jelutong/Brick Kiln Road/Bridge Street intersection.

3. Traffic Regulation Proposal

The main concern of traffic regulations in George Town, Butterworth and Bukit Mertajam is one-way streets. A one-way street system in the central area for some Primary Distributors and some District Distributors in George Town is already explained in 8.1.3 (2). However, it is also recommended that Local Distributors in busy areas be made into one-way streets to provide parking spaces and/or pedestrian facilities. Figs. 8.4 to 8.6 illustrate the recommended one-way street system in George Town, Butterworth and Bukit Mertajam.

It is also recommended that stop signs be installed on the approaches of Local Distributors (minor roads) at their intersections with Primary Distributors (Intra-Urban) or/and District Distributors to facilitate traffic flow.

Lane markings should be clearly installed so that cars and motorcycles can easily follow the road space allocated to them, thereby avoiding too much confusion and mixing with trishaws and

bicycles. Besides this, it is desirable to have markings on outer lanes as space allocated to bicycles and trishaws to separate them from the other vehicles on the road.

Hawkers should be prohibited from selling their wares on the carriage-ways of Primary Distributors (Intra-Urban) except during specific hours of special days and should also be prohibited from hawking at Local Distributors as much as possible.



Hawkers along streets

One major concern of the Municipal Council is the parking regulations. This will be discussed in 8.1.3 (6) under Parking Regulation Proposal.

4. Traffic Signals

Many traffic signals having obsolete lenses with 65 watt - 250 volt screw-in bulbs can still be seen. To improve visibility, it is recommended that these be replaced with new 12 volt - 50 watt tungsten halogen projector lenses, bulbs and plastic acrylic lenses as soon as possible. At busy and large intersections with four or more lane carriageways mast arms, horizontal overhead displays with 10-inch diameter lenses are recommended.

In the central areas of George Town, Butterworth and Bukit Mertajam, it is desirable to have a traffic signal control system of the fixed type, which can be modified to function as a coordinated or interlinked unit in the future.

If traffic signal control is deemed necessary for isolated intersections in the peripheral and suburban areas of George Town, Butterworth and Bukit Mertajam, traffic signal control is recommended as the most suitable measure for achieving higher capacity on these roads.

It is recommended that pedestrian traffic signals be installed where pedestrian traffic is heavy. At the same time, a pedestrian phase at signallized intersections is necessary.

5. Traffic Safety

One of the counter measures against traffic accidents is to establish a so-called delineation system which involves the demarcation of the centreline and the outer border of car lanes, bicycle-lanes or road shoulders with clear visible lines, delineators, guard-rails and so forth. The delineation system, if applied properly according to the existing road and traffic circumstances, can remove the problem of mixed traffic, which is one of the major problems in Penang. Experience has shown that this will lead to a reduction of accidents.

It is also recommended that enforcement of traffic regulations, especially regarding speed limits, which reduces traffic accidents, be strengthened.

6. Parking Regulation Proposal

It is recommended that, in the future, there should be no parking on Primary Distributors (Intra-Urban), Access Roads, and busy streets under the category of District Distributor and/or Local Distributor, where parking and loading obstruct pedestrian movement and severely hamper vehicular traffic. However, steps should be taken to strengthen control to ensure that, first, parking is prohibited within 100 feet of intersections, then on one side of the streets and finally along a whole section of streets. Another step will be the prohibition of parking, first only during peak hours and then for the whole day. The public should be informed in advance of any new program of parking control so that those affected can arrange for alternative parking. Parking prohibition proposals for the central area of George Town, Butterworth and Bukit Mertajam are illustrated in Figs. 8.4 to 8.6.

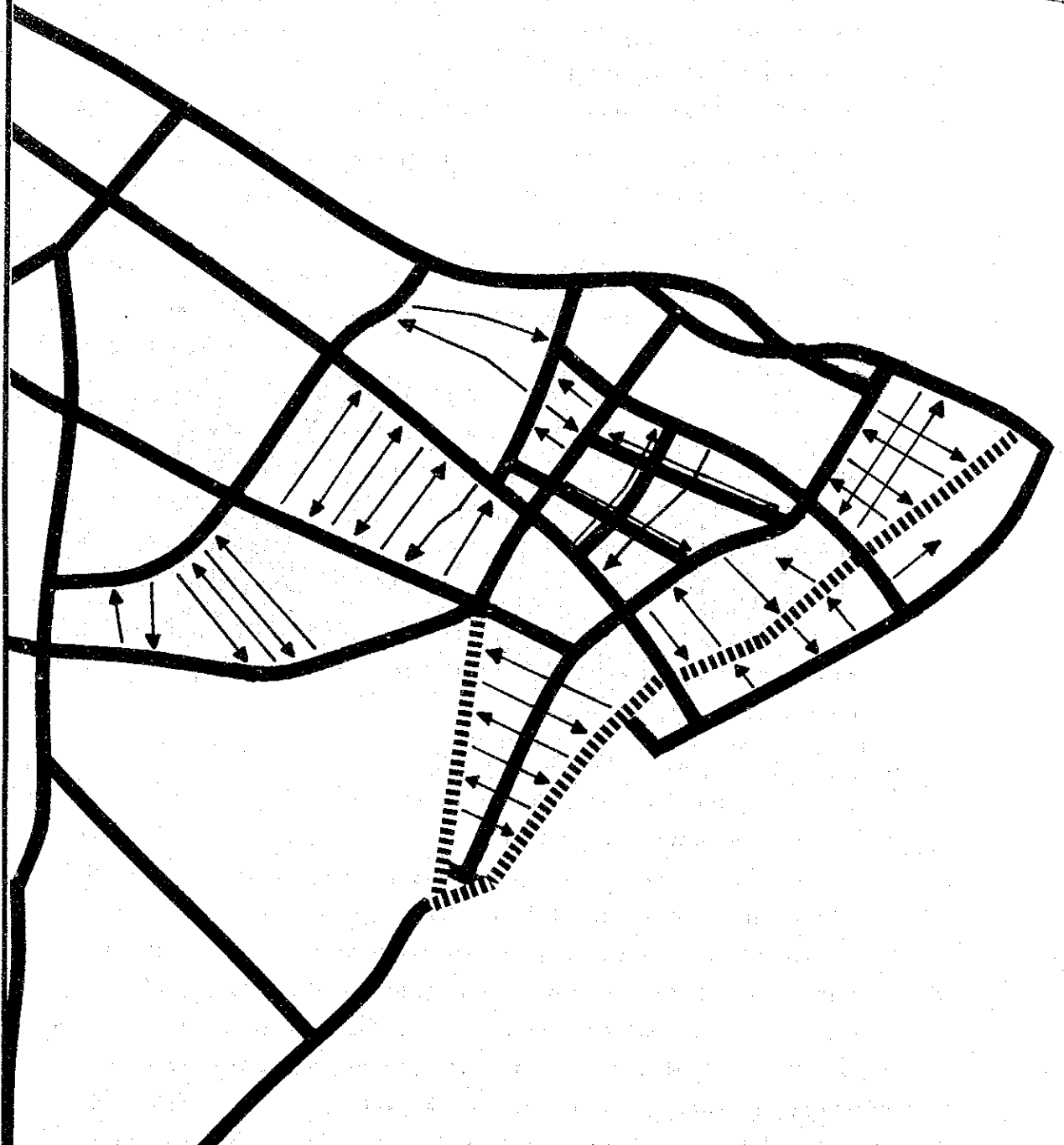
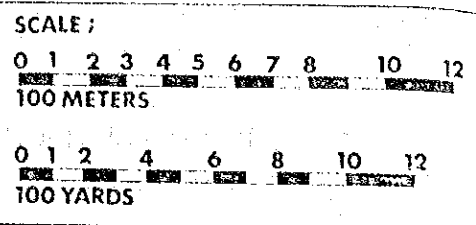


Fig. 8.4 The Recommended One-Way Street System and Parking Prohibition Proposal in George Town

- ← Recommended One-way
- ▬ No Parking
- ▬▬▬▬ One Side Parking

Fig.8.5 The Recommended One-Way Street System and Parking Prohibition Proposal in Butterworth

- ← Recommended One-way
- ▬ No Parking
- ▬▬▬▬▬ One Side Parking

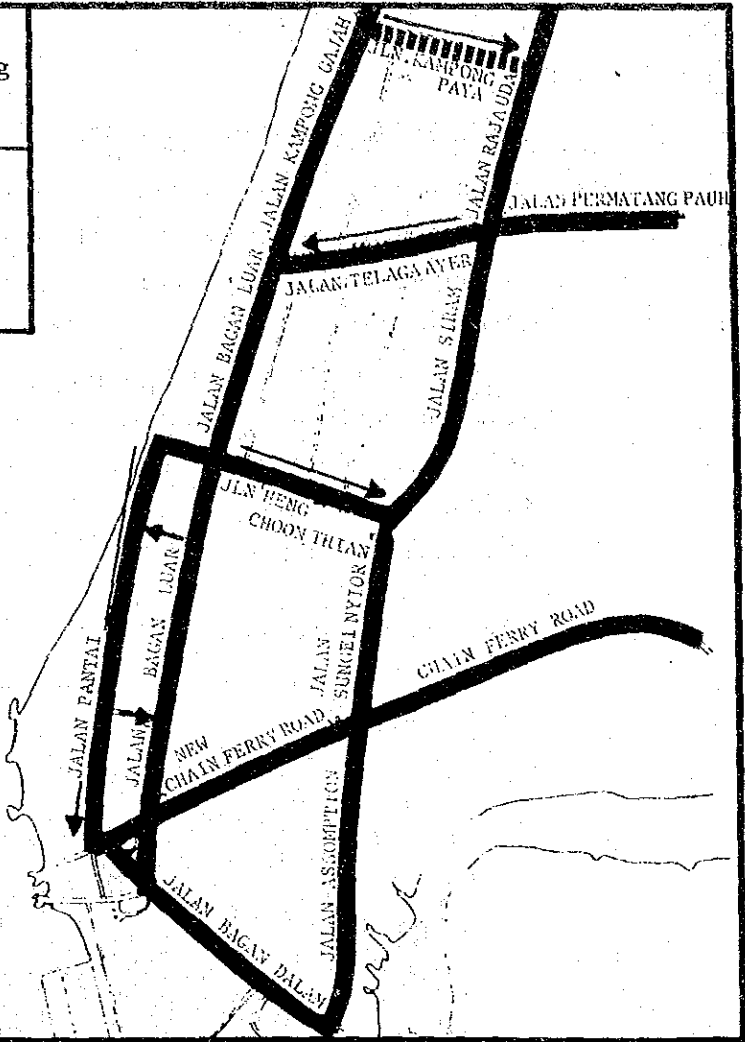
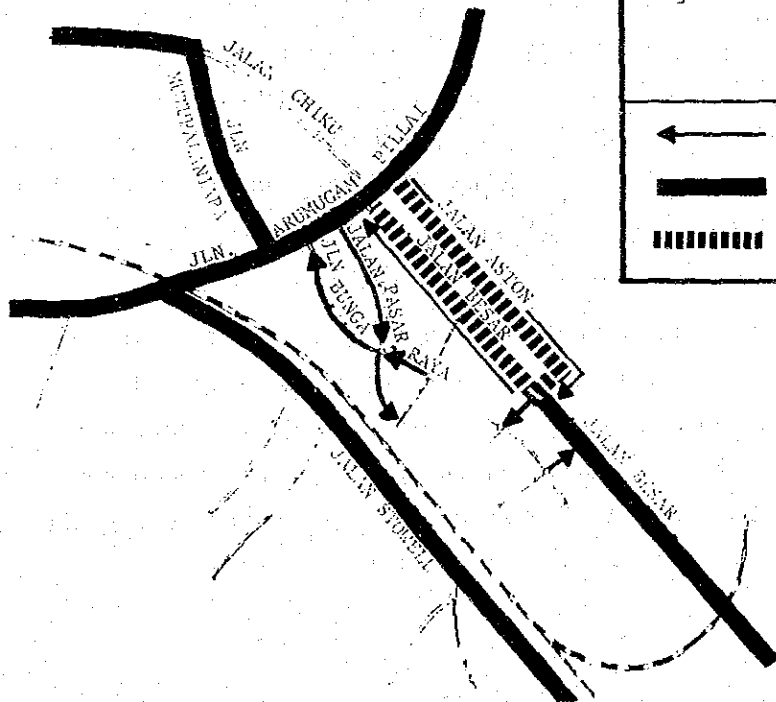


Fig.8.6 The Recommended One-Way Street System and Parking Prohibition Proposal in Bukit Mertajam

- ← Recommended One-way
- ▬ No Parking
- ▬▬▬▬▬ One Side Parking



7. Pedestrian Facilities Proposal

To ensure not only traffic safety but also smooth traffic flow, it is recommended that sidewalks be installed on the Primary Distributors (Intra-Urban) and District Distributors. It is also recommended that guardrails be installed, not only to prevent traffic accidents involving pedestrians, but also to stop indiscriminate crossing of roads by pedestrians. Sidewalks are also recommended to be installed along the Local Distributors in busy areas. However, steps should be taken to install sidewalks which follow the parking regulation schedule, as these two are related to each other.



Pedestrians forced to walk on the carriage-way.

It is recommended that clearly marked zebra-crossings be installed at intersections of streets. Furthermore, pelican crossing and/or overhead bridges and under pass should be installed at intersections where vehicle traffic is too heavy.

In the case of pedestrian crossings installed away from intersections as in the case of those installed along a certain stretch of road, signs showing "Give way" or "Yield" should be reinforced with traffic signals of the push-button type with yellow flashing globes. An increased use of pedestrian signals in conjunction with traffic signals is also recommended.

Campbell Street in George Town and Jalan Pasar in Bukit Mertajam were once closed to all traffic except pedestrians. In areas where pedestrian needs exceed those of vehicle traffic, as in the case of Campbell Street and Jalan Pasar, street closures, even on a part-time basis, are worth experimenting with.

Generally speaking, the following merits and demerits will exist when the pedestrian malls are introduced;

- Merits
- a. to ensure traffic safety of pedestrians
 - b. to ensure better amenity for shopping and walking
 - c. to increase the sales of shops along the malls
(from various cases recorded shops usually experience a 20 percent to 30 percent increase in sales.)

- Demerits
- a. to force the system of delivery services to be changed
 - b. to avoid parking convenience along the mall
 - c. to force the present traffic systems to be rearranged

In the case of the proposed malls, the above mentioned demerits are judged to be almost negligible. However, prior to the mall being introduced, it will be necessary to get the agreement and cooperation of shop owners. Considering these, detailed investigation is deemed necessary before introducing the mall.

8. Intersection Improvement Plan

Regarding existing and future problems of intersections, intersection improvement and the installation of traffic signals are recommended for some intersections so that a smooth flow of traffic along both directions can be achieved. Figs. 8.7 and 8.8 show the location of intersections which are recommended to be improved by 1983 and 1985.

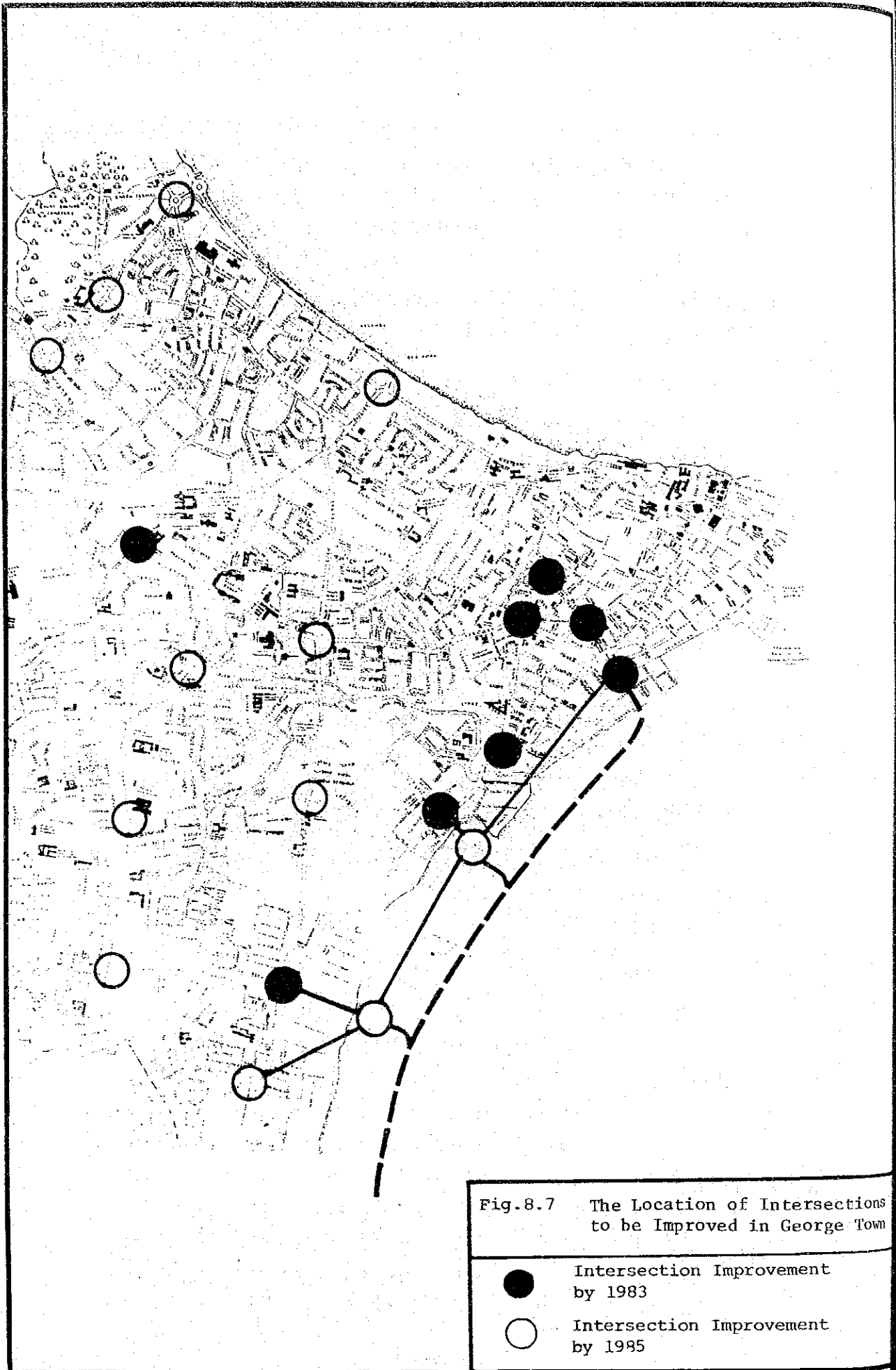
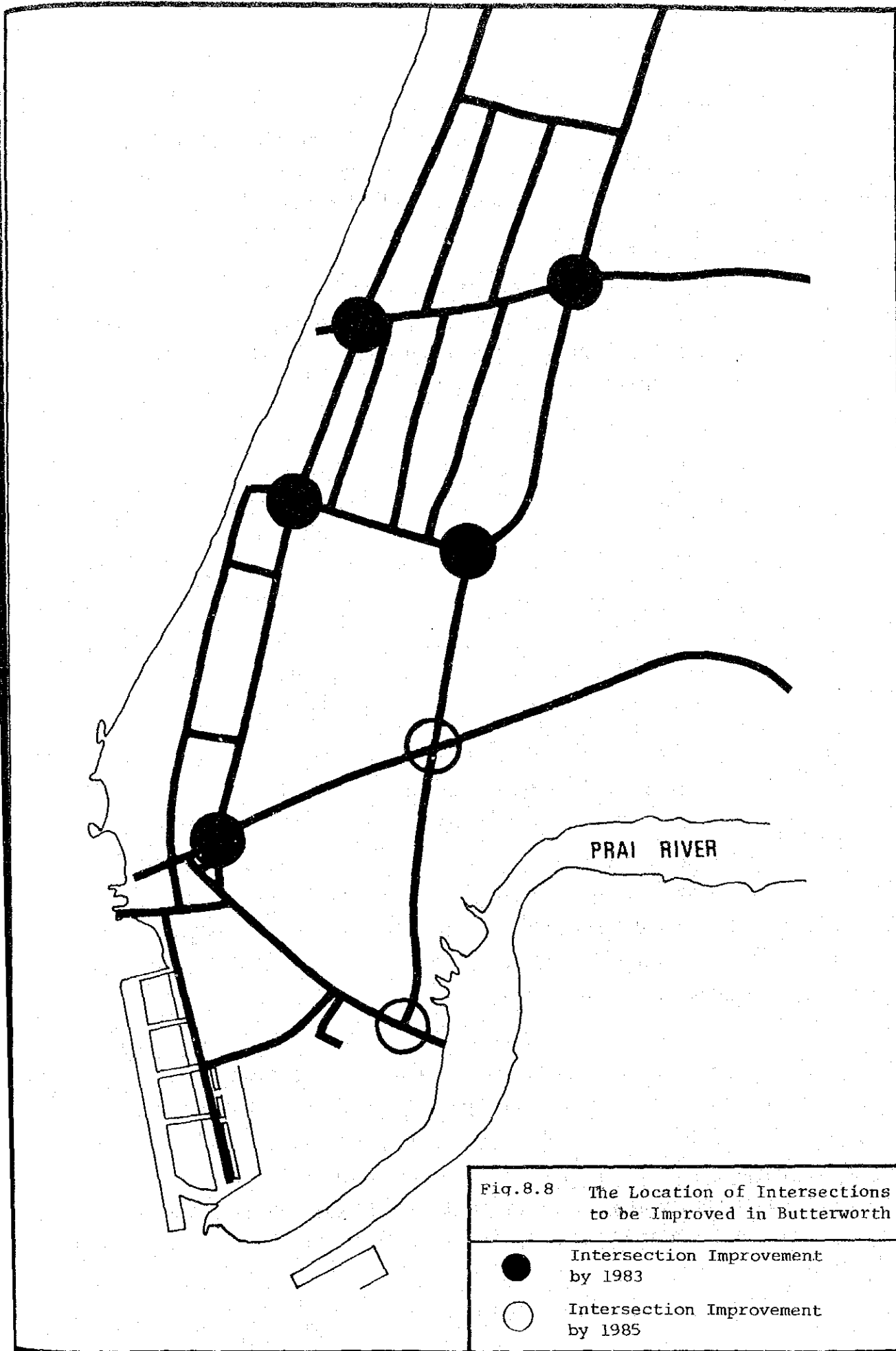


Fig.8.7 The Location of Intersections to be Improved in George Town

- Intersection Improvement by 1983
- Intersection Improvement by 1985



8.1.4 Summary of Immediate and Short-Term Actions

For the implementation of the recommended traffic engineering and management system which is described in 8.1.3, the team recommends a proposal for immediate action by the middle of 1983.

Immediate Action Proposal

1. Implementation of Traffic Circulation Plan

The circulation plan, previously described, should be implemented as soon as possible in order to achieve smooth dispersal at critical intersections.

2. Traffic Regulation Proposal

- a. Introduction of one-way street system.
- b. Installation of stop signs.
- c. Clear installation of lane markings.
- d. Limitation of hawking on the road.

3. Traffic Signal Improvement

- a. Replacement of old display lenses.
- b. Introduction of mast arms, horizontal overhead displays at busy and large intersections.

4. Traffic Safety

- a. Introduction of delineation system.
- b. Stricter enforcement of traffic regulations.

5. Parking Regulation Proposal

Parking prohibition at Primary Distributors (Intra-Urban), Access Roads and busy streets under the category of District Distributors and/or Local Distributors.

6. Pedestrian Facilities Proposal

- a. Installation of sidewalks.
- b. Installation of zebra crossings at intersections.
- c. Road closure on a part-time basis at Campbell Street and Jalan Pasar.

7. Intersection Improvement Plan

It is recommended that the following intersections be improved by mid-1983.

Penang Island

- a. Jalan Western, Jalan Macalister.
- b. Penang Road, Burma Road, Prangin Road.
- c. Penang Road, Magazine Road, Macalister Road. (Magazine circus)
- d. Prangin Road, Maxwell Road, Carnavon Street, Prangin Ghat, Gladstone Road.
- e. Weld Quay, Prangin Ghat. (Grade Sep.)
- f. Sungai Pinang, Jalan Jelutong.
- g. Jalan Jelutong, Jalan Perak, Jalan Batu Lanchang.
- h. Jelutong Road, Bridge Street, Brick Kiln Road.

Province Wellesley

- a. Jalan Bagan Ajam, Jalan Dragon Tempe, Jalan Paku Lima, Jalan Sungai Dua.
- b. Jalan Sungai Dua, Jalan Raja Uda.
- c. Jalan Bagan Luar, Jalan Kampung Gajah, Jalan Jeti Lama, Jalan Telaga Ayer.
- d. Jalan Siram, Jalan Raja Ua.
- e. Jalan Bagan Luar, Jalan Pantai, Jalan Heng Choon Thiam
- f. Jalan Pantai, Pier Road, Mitchell Road, New Ferry Road, Bagan Luar Road, Bagan Dalam Road.
- g. Siram Road, Heng Choon Thiam Road

8.2 Public Transport

8.2.1 Bus Transport

1. General

The general policy of the proposed bus transport system is to improve the existing bus service level. Many possible strategies can be adopted to achieve the aims of the policy and they should be examined in accordance with each planning stage.

After careful consideration of the prevailing conditions within the Study Area, the following policies will be applicable.

- (i) At the first stage, the policy for bus transport will be to ensure reliability.
- (ii) On the basis of the results of the first stage, the aim of the second stage will be to provide priority measures for

bus transport. It is expected that the increasing traffic movement of private cars will exceed the capacity of roads and parking spaces.

To achieve the aims of the immediate action policy, the following countermeasures should be taken.

- The up-grading of service level in terms of frequency and punctuality.
- The improvement of bus fleets by adequate maintenance.
- The improvement of the bus operation system.
- The expansion of bus services to new development areas.
- The improvement of existing road conditions.

The detailed recommendations will be discussed below.

2. Recommendations

A. Improvement of Bus Services:

The most important countermeasure in the bus transport system in the Penang area is to provide more convenient and comfortable services in order to encourage more bus usage.

Basically, the frequency of bus transport services should be determined not only from the viewpoint of demand but also from finance.

As a result of examining the present condition of bus enterprises, the following guidelines for the frequency of bus transport services which should be acceptable to the bus operating enterprises are proposed.

Inside George Town	5 minutes interval	at peak hours
	10-15 min. interval	at off-peak hours
Other Urbanized Areas	10 minutes interval	at peak hours
	20-30 min. interval	at off-peak hours

B. Improvement of Bus Operating System:

The following improvements for bus operation are proposed.

- (i) In order to attain and maintain the regularity of the bus system in operation, the checker or inspector should carefully examine its operation.

- (ii) The time schedule for bus operation should be clearly posted or marked at terminals and at each bus-stop in order that passengers may know when the bus is expected.
- (iii) To protect against breakdown of bus fleets, strengthening of the maintenance system periodically is required.

C. Expansion of Bus Routes:

The present coverage of bus routes in George Town is almost 100 percent within a 500m-radius of bus-stops and 80 percent within a 250m radius. However, the new development areas such as Bayan Lepas and Seberang Jaya are not adequately covered by bus routes. Therefore, bus routes should be expanded to cover these areas.

The completed Penang Bridge will encourage the expansion of the new bus route between Penang Island and the Mainland. The passenger demand crossing the straits is projected to be as follows:

1979	39,800	Passengers/day
1985	65,800	"
{ Ferry	43,180	"
{ Bridge	22,620	"

Judging from the projected traffic demand, it is clear that the new bus routes on the Penang Bridge should be established.

Therefore, the licencing of the following routes for bus operators is suggested:

(i) Long-Distance Bus Route

- a. Proposed Penang Transport Terminal - Alor Star
- b. - Do - - East Coast via Kulim
- c. - Do - - Kuala Lumpur via Ipoh

(ii) Intra-Urban Bus Route

- a. Proposed Transport Terminal - Bukit Mertajam
- b. Bayan Lepas - Butterworth
- c. Bayan Lepas - Bukit Mertajam

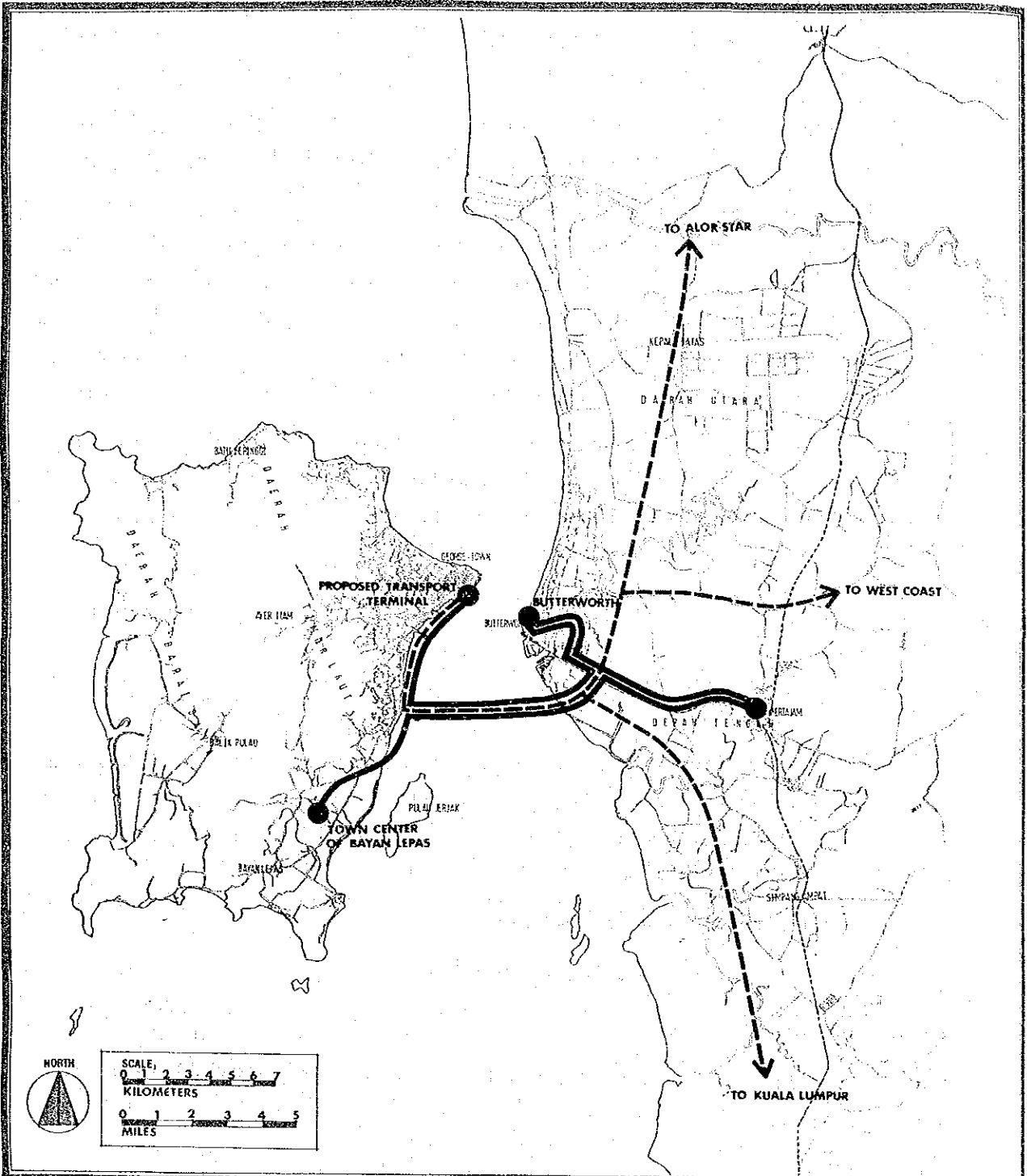


FIG. 8.9: CONCEPTUAL BUS ROUTING OF PENINSULAR MALAYSIA ISLAND AND PROVINCE WELLESLE



URBAN TRANSPORT STUDY IN GREATER METROPOLITAN AREAS OF GEORGE TOWN, BUTTERWORTH AND BUKIT MERTAJAM.

- Intra Urban Bus Route
- - - Long Distance Bus Route

Town service buses should connect intra urban services at the transport terminals and the bus interchange proposed in connection with the Penang Bridge.

Moreover, various bus route systems should be examined in the implementation stage, such as express service, ferry-link service, inter-companies service and so on.

D. Provision of Adequate Bus Fleets:

The large-size, standing-space type of bus is suitable for the bus transport service within urbanized areas in order to achieve maximum transport efficiency and to avoid passing of stops owing to full capacity.

In addition, the two-door type of bus is better as it offers entrance and exit separately. A low floor structure would permit women and the elderly to get on and off the bus more safely and easily.

Furthermore, the air-conditioned bus fleets are expected to be introduced in order to attract more patrons for buses by increasing comfort in trips.

E. Establishment of a Bus Transport Committee:

At present, there are many problems underlying the bus transport system, one of which is financial. To solve these problems, many measures are required. For instance, new establishment of subsidy for bus transport and introduction of low interest loans, etc.

However, at present, negotiations between Government and public or private operators are ineffective. Therefore, it is suggested that a bus transport committee should be established under the supervision of the Road Transport Licensing Board in the Ministry of Public Enterprise. This committee should consist of financial, operational and management experts.

F. Introduction of Mini-Bus System:

The Government has already decided to introduce a mini-bus system in George Town. According to the introduction plan, the Government intends to operate a mini-bus system between the C.B.D. area and the residential areas which are located in the suburbs of

George Town.

According to a mini-bus study in Kuala Lumpur, the big bus companies have reduced their running-kilometer by one-third after the introduction of the mini-bus system.

In view of this data, the routing of the mini-bus system should be revised in such a way that there is no competition with the scheduled bus services.

G. Improvement of Road Conditions:

As far as the improvement of road conditions is concerned, the proposals in traffic engineering and management should be implemented as soon as possible in order to improve the running condition of buses.

8.2.2 Taxi

The taxi provides a quick and convenient form of door-to-door service. It is especially indispensable to people who have goods to carry or for those who live far away from bus-stops.

In view of the small number of taxis in the Study Area, more consideration should be given to the taxis as they will play a greater role in the future since trishaws are declining in number. In this context, the team recommends that the taxis should be increased in number. At present, the number of taxis per 1000 population is only 0.5. This is very low compared to other metropolitan areas. Therefore, the percentage should be increased to 0.7 taxis per 1000 population by 1985.

As for the administrative control and management of the taxis, the team suggests that an association or co-operative be set up. This will help individual taxi operators in many ways, like making loans available whenever needed and helping them to solve various technical and management problems. At the same time, it would ensure a better standard of service to taxi-users and would give the authorities some means of control over the whole system.

In addition, it is suggested that taxi stands be set up at strategic positions, not only within the C.B.D. but also in peripheral areas like Ayer Itam, Glugor, Tanjong Bungah and Bayan Baru.

This will provide convenience to users and promote a more efficient utilization of taxi services.

8.2.3 Trishaw

Rapid development in the Study Area will inevitably lead to a dispersal of activities from the city area into the suburbs. Coupled with a general increase in traffic volume, it is anticipated that the trishaw will face a decrease in demand in the future. In addition, in view of the present economic policy promoting industrialization aimed towards creating more employment and higher income levels, together with the desire of the majority of the trishawmen to change their jobs as shown by the surveys conducted, it is most likely that many of the trishawmen, particularly the younger ones, will leave their jobs for others with better salaries.

In this context, in addition to the present government policy of suspending the registration of trishaws, further measures should be taken to effectively reduce the number of trishaws. These measures include a stricter prohibition of illegal trishaws since they form a significant proportion in the present number of trishaws.

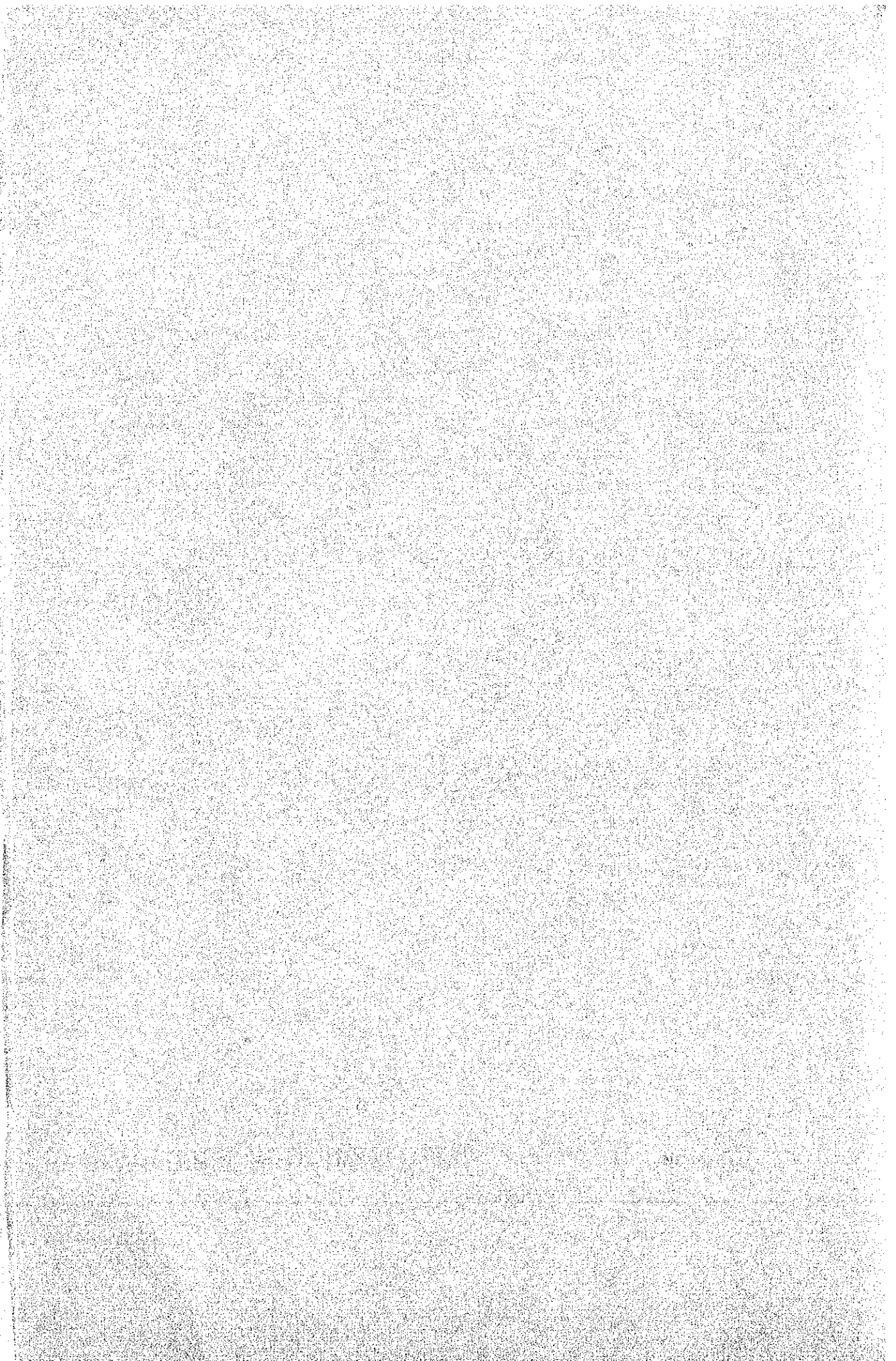
In addition on primary roads with heavy traffic volume and/or limited road space and on other roads with heavy traffic, restrictions for trishaws should be made even for certain peak hours like 7 to 9 in the morning and 4.30 to 6.30 in the evening in order to provide enough space for vehicle traffic. In areas where trishaws are prohibited, taxis should be utilized as a substitute for short-distance travel.

8.2.4 Railway

The future demand for commuter railway service between Butterworth and Bukit Mertajam will not be sufficient to make its expansion financially viable from our examination. If any financial relief measures and/or intensive development of the adjacent land are undertaken, it is recommended to conduct a detailed survey and study at that time.

Chapter 9

IMPLEMENTATION PROGRAMS



9. IMPLEMENTATION PROGRAMS

9.1 Financial Aspects

9.1.1 Trend of Transport Expenditures

The transport expenditures consist of two (2) funds: one is the operating expenditure, mainly used for administrative and maintenance expenses, and the other is the development fund, mainly used for transport development. Table 9.1 shows the past trend of transport expenditures. The annual growth rate of transport expenditures was over 13 percent during 1972 to 1978, while that of the operating expenditure was 11 percent and that of the development fund was 15 percent during the same period.

Table 9.2 shows the past trend of road expenditures during 1972 to 1978. The share of road expenditure to transport expenditure was approximately 45 percent. The growth rate of road expenditure was 14 percent per annum during 1972 to 1978. The road expenditure is further sub-divided into two: one is Federal road expenditure and the other is State road expenditure. Data on these are limited for the 1972 to 1978 period. However, the annual growth of Federal road expenditure was higher than that of the State road expenditure.

9.1.2 Forecast of Transport and Road Expenditures

The amount of road expenditure is largely dependent upon the national revenue. The revenue is proportionate to the G.D.P. Therefore, in this forecast, it is assumed that the road expenditure will grow in proportion to the G.D.P. (see chapter 2) As a result, the road expenditure is expected to increase from \$445.9 million in 1978 to \$711.5 million in 1985 and to \$2149.7 million in the year 2000. The allocation of road expenditure to the Study Area is assumed at 2 percent, 4 percent, 6 percent and 8 percent to total road expenditure. The results are shown in Table 9.3 and 9.4.

Table 9.1 Transport Expenditures

1972 - 1978

(Million dollars at current prices)

Year	Transport Expenditure	Operation Expenditure on Transport	Development Fund on Transport
1972	369	135	234
1973	317	133	184
1974	546	232	314
1975	704	218	486
1976	801	240	561
1977	916	264	652
1978	895	285	610

Source : Highway Planning Unit (HPU)

Table 9.2 Road Expenditures

1972 - 1975

(Million dollars at current prices)

Year	Road Expenditure	Federal Road Expenditure	State Road Expenditure
1972	167.4	59.5	107.9
1973	203.9	94.3	109.6
1974	280.1	131.2	148.9
1975	325.9	173.6	152.3
1976*	370.8	-	-
1977*	424.0	-	-
1978*	414.0	-	-

Source: Highway Planning Unit

* Estimated provisionally by HPU

Table 9.3 Forecast of Budget

1981 - 2000

(Million dollars at 1979 prices)

Year	Road Expenditure	Federal Road Expenditure	State Road Expenditure
1979	445.9	252.0	193.9
1985	711.5	602.0	309.5
2000	2149.7	1214.6	935.1

Table 9.4 Forecast of Budget Allocated
to the Study Area

(Million dollars at 1979 prices)

Year	Road Expenditure	Allocation to Study Area			
		2%	4%	6%	8%
1981	521.1	10.4	20.8	31.3	42.7
1985	711.5	14.2	28.5	42.7	56.9
1990	1,028.6	20.6	41.1	61.7	82.7
2000	2,149.7	43.0	86.0	129.0	174.0

9.2 Implementation Program

9.2.1 Guideline

As a result of evaluation of the alternatives, the combinations of the road network plans and the demand control plans are as follows:

Table 9.5 Recommended Alternatives

	1985	1990	2000
Road Network Plan	(Plan 3) Under Planning + Parts of Proposed Roads + Ferry	(Plan 3) Under Planning + Proposed Roads + Ferry	(Plan 4-A) Ultimate Roads + Ferry
Demand Control Plan	(Plan B)* Exclusive Bus Lane, Parking Control	(Plan B) Exclusive Bus Lane, Parking Control	(Plan B)** Exclusive Bus Lane, Parking Control

* These two (2) measures are not in a fully completed stage.

** Car-pooling system should be introduced only when the road network has reached the level of Plan 3, even if it is in the year 2000.

The following measures and projects are also recommended as short-term or long-term actions.

Table 9.6 Recommended Projects

Objectives	Stage					
	To Achieve Traffic Safety	To Achieve Smooth Traffic	To Meet Transport Demand	To Control Transport Demand	Short-Term Action	Long-Term Action
Circulation System			*	*	*	*
Lane Marking	*	*	*		*	*
Traffic Signs	*	*	*		*	*
Traffic Signals	*	*	*		*	*
Parking Control				*	*	*
Off-street Parking Div.				*	*	*
Sidewalks	*	*			*	*
Intersections	*	*			*	*
Traffic Amusement Park	*					*
Highways			*	*	*	*
Bus Services				*	*	*
Ferry Services				*	*	*
Trishaw Restraint		*			*	*
Taxi Services			*		*	*
New Transport System			*	*		
Transport Complex			*		*	*

The implementation program is prepared in accordance with the recommended alternatives and the action programs of the projects.

9.2.2 Phasing Plans

The implementation program is prepared according to the following phases.

Phase 1-A	1981 - mid of 1983 Immediate Action projects
Phase 1-B	mid of 1983 - 1985 Short-term projects
Phase 2	1986 - 1990 Mid-term projects
Phase 3	1991 - 2000 Long-term projects

1985 is the year when the Penang Bridge will be completed and this will bring about new transport conditions in the Study Area. Therefore, the projects which aim to cope with the change of transport conditions should be implemented in Phase 1-A and Phase 1-B.

In the case of the mid- and long-term projects, the actual program will be formulated through feasibility studies and/or adjusted if any unexpected conditions occur in the future.

Policies for the implementation program at each phase are as follows:

Phases 1-A and 1-B

Though the State of Penang will experience a great change in the road network in about 1985 when the Penang Bridge, the New Federal Route I and the Traffic Dispersal road are completed, the transport demand pattern will almost follow the present pattern. No serious critical situations are likely to occur if all the roads mentioned above are completed simultaneously with the proper improvement of traffic management proposed as a short-term action program in this study.

Therefore, in phases 1-A and 1-B, the improvement of signals, intersections, markings and control of parking will be of utmost importance, as well as the improvement of some roads that connect directly with the Traffic Dispersal roads.

In phase 1-B, it is also necessary to prepare for the implementation of trunk roads which will form the basic structure of the future transport network.

Phase 2

This phase is extremely important for establishing the future road network proposed in this study, since it will be necessary to prepare an appropriate road network to cope with the increase in transport demand generated by the various types of developments.

At this phase the future urban structure of the Study Area will also become clearer through the development of Bayan Lepas, full development of the Prai industrial estate and other developments.

With regards to the ferry service, the team recommends its continuation based on the traffic demand study and financial analysis.

Phase 3

The future transport systems proposed in this study will be completed within this phase.

After the completion of the road network, there will be two (2) alternatives to cope with the further increase of traffic demand, viz.

- 1) Restraint of traffic demand
- 2) Introduction of a new transport system.

However, it will not be necessary to implement the latter within this phase.

9.2.3 Implementation Program of Projects

1. Road Network Implementation Program

Provided the Penang Bridge, the New Federal Route I and the Traffic Dispersal roads will be completed within Phase 1-B and the supporting road of the East-West Highway will be completed around 1990, implementation of other road programs is recommended as shown in the following table. A major policy of the program is to formulate a basic structure of road network in the earlier phases.

2. Implementation Program for Smooth Traffic Flow

(a) Circulation System

Introduction of this system into the C.B.D. of George Town

Table 9.7 Implementation Program of Roads

Name of Roads	Total Length (km)	Phase				Project Cost MS000 (at 1979) prices
		1-A	1-B	2	3	
Penang Island						
1. Gurney Drive Extension	4.6	-----	-----	-----		45,588
2. Outer Ring Road (Bagan Jerimat - Ayer Itam)	5.5	-----	-----	-----		54,007
3. Outer Ring Road (Ayer Itam - Green Lane)	9.5		-----	-----	-----	53,975
4. Green Lane (Ayer Itam Road - Roundabout)	5.0	-----				3,980
5. Scotland Road (Ayer Itam Road - Western Road)	1.4	-----				2,795
6. Western Road (Scotland - Gottlieb)	1.5	-----				2,994
7. Middle Ring Road (Perak Road, Pangkor Road)	2.4		-----	-----		1,910
8. Weld Quay Extension	4.0		-----	-----		5,486
9. Paired Road (Ayer Itam - Outer Ring Road)	5.3		-----	-----		11,289
10. Paired Road (Outer Ring Road - Dispersal Road)	3.5	-----				7,318
11. Bayan Lepas Road	3.6	-----				9,258
12. East Coast Road	5.8				-----	6,327
13. North Coast Road (Tanjong Bungah - Batu Feringgi)	11.5			-----	-----	29,850
14. Penang Island Road (Airport - Telok Kumbar)	4.6				-----	7,540
15. Penang Hill Road Section 1	5.0				-----	10,454
16. Penang Hill Road Section 2	13.0				-----	27,180
17. Penang Hill Road Section 3	2.0				-----	4,182
18. Jelutong Road	0.3	-----				3,939
19. Leboh Mc. Nair	0.2	-----				2,559
20. Maxwell Road	0.9	-----				7,322
21. Dato Keramat (Ayer Itam Road - Ayer Itam Intersection)	2.2	-----	-----	-----		30,133
22. Ayer Itam Road from Ayer Itam	4.0			-----	-----	54,780
23. Penang View Road	6.5			-----	-----	21,340
Province Wellesley						
1. S. Dua Road (Kg. Bagan Ajam - S. Dua)	4.5	-----	-----	-----		10,080
2. West Coastal Road (Kg. Bagan Ajam - New Port)	5.5	-----	-----	-----		36,609
3. West Coastal Road (New Port - New Route I)	5.0	-----	-----	-----		32,675
4. Federal Route I (New Route I - J. Methopalaniapa)	7.5	-----	-----	-----		16,800
5. Ring Road (B. Mertajam - P. Jatoh)	2.5				-----	8,575
6. Ring Road (P. Jatoh - New Route I)	5.5				-----	18,544
7. Permatang Pauh Road (Kg. Sama - S. Ampat)	6.5				-----	14,560
8. B. Tengah Road (S. Ampat - Kg. Bukit Minyak)	5.0				-----	11,202
9. B. Minyak Road to New Federal Route I	3.9				-----	13,377
10. Jalan Mohamed Saad - Jalan Bagan Lalang	4.0				-----	3,718
11. Road from S. Puyu to Mak Mandin	3.7				-----	3,080
12. Road (Mak. Mandin - Chain Ferry Road)	1.8				-----	1,499
13. Heng Choon Thiam Extension	3.8				-----	3,163
14. Prai Road	2.6	-----				8,766
15. Permatang Pauh Road	5.0	-----	-----	-----		14,078
16. Frontage Road (Kg. Tok Hamid - Kg. Bagan Serai)	4.0				-----	4,533
17. Frontage Road (Kg. Bagan Serai - Kg. Telok)	3.9		-----	-----		4,420
18. Frontage Road (Prai - Kg. Tok Kangar)	5.8				-----	6,573
19. Jalan Raja Uda (Jalan Siram - Jalan S. Nyior)	2.5				-----	8,645
20. Sg. Nyior, Siram, Raja Uda Roads	2.8			-----	-----	4,188

* The team recommends that the Penang View Road should be constructed as a toll road in view of its future function.

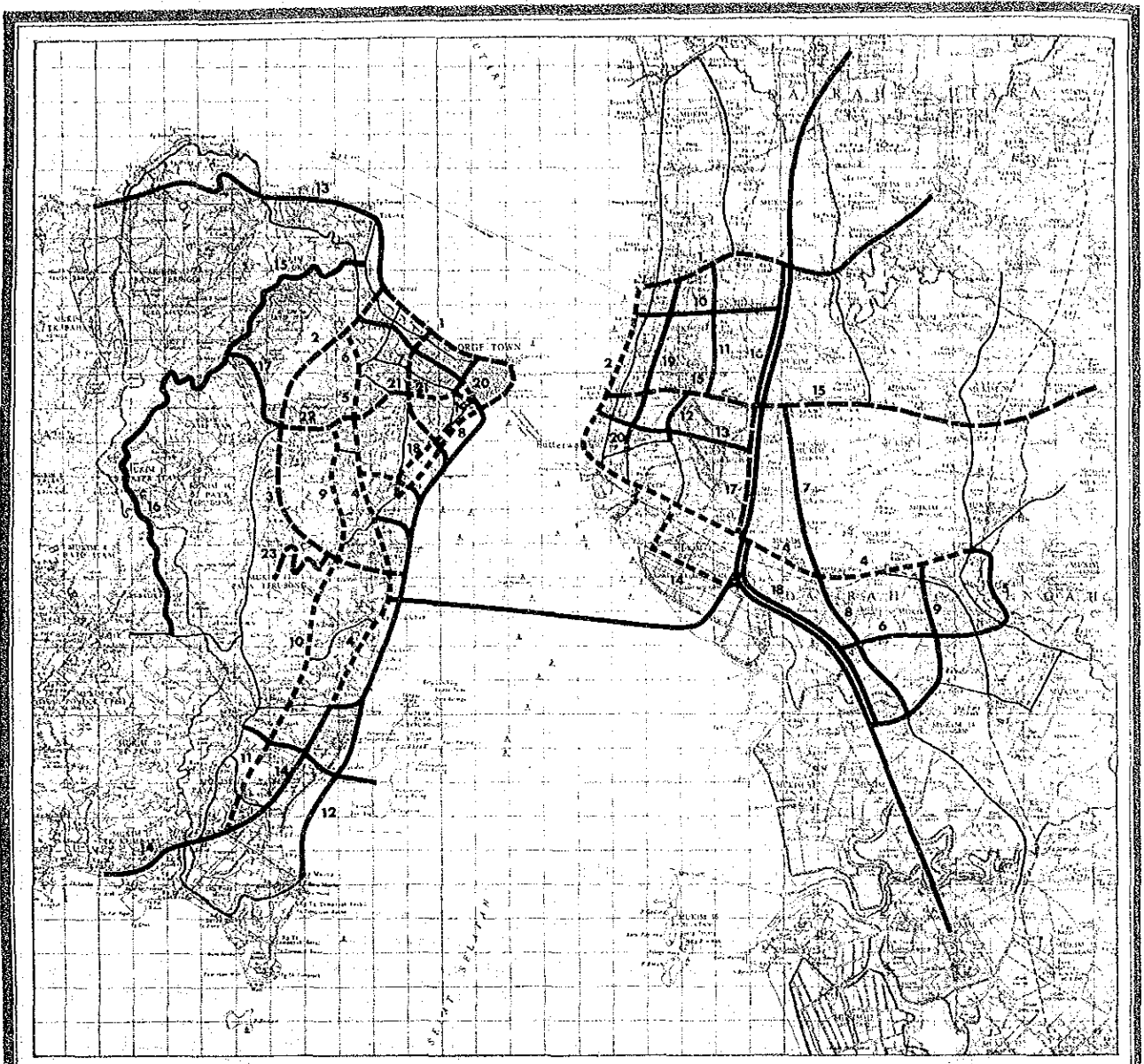


Fig.9.1 Implementation Program of Roads



Phase 1 (1981-1985)

Phase 2 (1986-1990)

Existing Roads

Phase 3 (1991-2000)



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should not fall behind the completion of the Penang Bridge.

It is recommended therefore that this system be carried out in Phase 1-B.

(b) Intersection

Regarding the intersection development, forty four (44) intersections should be improved: nine (9) intersections should be grade-separated and thirty five (35) intersections should be at-grade.

Together with the improvement of the road network and a new circulation system in the C.B.D. of George Town, the following number of intersections per phase are to be improved.

Table 9.8 Number of Intersections to be Improved

	Phase			
	1-A	1-B	2	3
<u>At-Grade Intersection</u>				
Penang Island	7	13	0	2
Province Wellesley	7	5	1	0
S.T.	14	18	1	2
<u>Grade Separation</u>				
Penang Island	1	3	2	1
Province Wellesley	0	2	0	0
S.T.	1	5	2	
Total	15	23	3	3

(c) Signals

Improvement of the existing signals and installation of new signals in the C.B.D. should be carried out early. An area control system will be introduced in Phase 2 into George Town, if necessary.

3. Implementation Program for Safe Traffic

(a) Sidewalks:

Since the present state of sidewalks is quite poor and a safe traffic environment is considered to be one of the most important aspects of transport planning, improvement of sidewalks is recommended as a short-term action.

The areas which need improvement of sidewalks in the first place are the C.B.D. of George Town, Butterworth and B. Mertajam where the concentration of commercial and public activities attracts many pedestrians.

Parking control in the C.B.D. is inevitable in order to secure spaces for sidewalks as there is no allowance for the widening of streets.

(b) Traffic Sign and Marking:

Reduction of traffic accidents is of such great importance that a delineation system should be installed within 5 years.

Traffic signs should also be improved as soon as possible.

(c) Traffic Amusement Park:

The main objective of the transport amusement park is to educate people, drivers as well as children, cyclists, housewives, etc., traffic rules and manners. Therefore, the organization operating the transport amusement park, should cater to all categories of people.

Since it is advisable to carry out this project at the same time as that of the transport terminal complex, Phase 2 will be adequate for implementation.

4. Parking Control Program

(a) On-Street Parking Control:

In order to achieve a smooth traffic flow, to provide spaces for sidewalks and to construct bus-stops, on-street parking should be prohibited and effectively enforced, otherwise the private sector will be discouraged from developing off-street parking. The procedures of parking control are

as follows:

Table 9.9 Parking Prohibition Enforcement

Phase 1-A (Reduction Rate 17%)	* Within 100 feet from busy intersections. * Primary Distributors in the C.B.D. of George Town.
Phase 1-B (Reduction Rate 25%)	* Primary distributors in the C.B.D. of Butterworth, Bukit Mertajam and other urbanized areas. * District distributors in the C.B.D. of George Town. * Restraint of night-time parking on streets of the C.B.D. of George Town.
Phase 2 (Reduction Rate 42%)	* Compulsory garage installation for car owners in the C.B.D. of George Town. * District Distributors in the C.B.D. of Butterworth and Bukit Mertajam. * Local distributors identified as busy commercial streets.

Prohibition of on-street parking is recommended at first with peak time prohibition and to be extended to whole day prohibition. Since the number of cars owned by residents of the C.B.D. will exceed the parking capacity after 1985, regulations for compulsory garage installation for car-owners will have to be introduced.

(b) Development of off-street parking:

Development of off-street parking relies mainly on the supply by the private sectors who can meet the parking demand more efficiently than the public sector. However, the public sector should develop off-street parking in areas where the private sectors will be unlikely to do so, and it should encourage the private sectors through efficient parking control and financial incentives. For this purpose, it is suggested to raise the present parking charge for on-street parking gradually.

Capacity of off-street parking to be developed in the C.B.D. of George Town is estimated below, although it depends upon the degree of on-street parking prohibition and the future parking demand which should be restrained so as not to produce serious traffic congestion.

Table 9.10 Plan of Off-street Parking Development

	(units)		
	1979	1985	2000
Potential Demand (During Peak Hours)	-	21,300	35,650
Recommended Parking Supply	-	18,000	21,000
On-street Parking	14,130	11,500	10,000
Off-street Parking			
zoned area	0	2,500	6,500
others	3,490	4,000	4,500

5. Implementation Program for Bus Transport Improvement

(a) Bus Fleet:

Based on Plan B, the number of new buses to be introduced is estimated as follows :

Table 9.11 Number of New Buses

	Phase			
	1-A	1-B	2	3
Number of New Buses	240	260	560	1,310

Assumptions: Life span of bus is 5 years.

The existing buses will be replaced in 3 years.

(b) Bus-stops:

Four hundred and forty (440) bus-stops are proposed to be improved since all these bus-stops will be used in future stages. It is recommended to improve these in phases over a period of five years.

(c) Exclusive Bus Lane:

Exclusive Bus Lanes should be provided before 1990. The following program is prepared according to Plan B.

Name of Roads	Phase		
	1-A	1-B	2
Green Lane			*
{ Ayer Item Road			*
{ Dato Keramat Road			*
{ Bridge Street			*
{ Brick Kiln Road			*
{ Jelutong Road			*
{ Existing Federal Route 1			*
{ Permatang Rawa			*

(d) Transport Terminal Complex:

In order to cope with the traffic coming into the C.B.D. of George Town through the Dispersal Roads, at least the transport facilities should be constructed by 1985.

Other facilities such as commercial buildings, hotels and amusement zones will be constructed in stages after 1985.

Three (3) alternative plans for the terminal complex can be selected, depending on the intentions of the Government Development Policy.

While each of the plans is considered as a final goal in itself, together they are continuous stages in the development process for the year 2000.

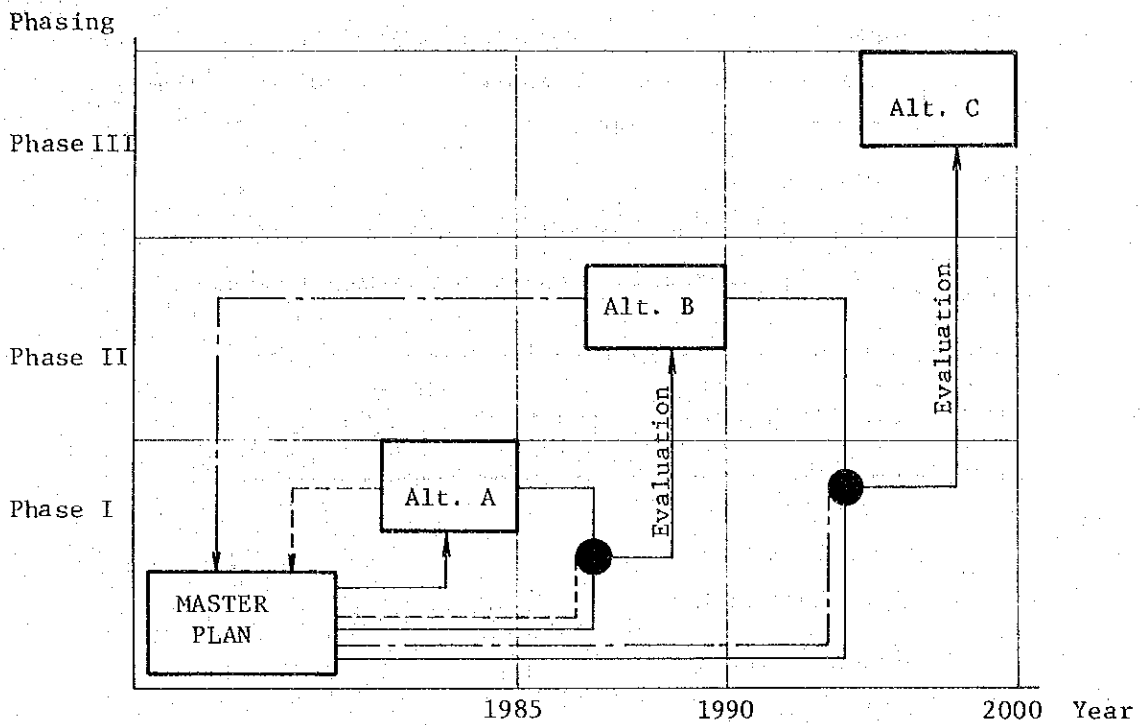


Fig. 9.2 Transport Complex Development Program

This means that the Government may choose any of them for a start and then reevaluate its effect as feedback for the next phase: i.e., whether to continue with or without modifications.

This flexible type of development program will be one of the most important strategies for the long-term development policies of this projects.

The following chart shows how Malaysian organizations, either public or private, or both, will have the initiative in the full range of managing processes for the project.

The Urban Development Authority and the Penang Development Corporation have sufficient potential for the management of the project, with the possibility of participation of private sectors.

Table 9.12 Management and Financial Background

(shown as an example)

Organization Involved Project Stage	Malaysia		International	
	Public	Private	International	Other Govt. Organization
Planning & Design	0	D	NA	NA
Construction	0	D	NA	NA
Maintenance	0	0	NA	NA
Budgeting Source	0	0	0	0

0 : Full participation

D : Partial participation

NA : Not available

9.2.4 Package Programs for the C.B.D. of George Town

Most of the projects proposed in Phase 1-A and 1-B should be implemented simultaneously, especially in the C.B.D. of George Town, in order to achieve a smooth traffic flow in one functional system. If all proposed roads can be completed within Plan B, traffic congestion in the C.B.D. will be less than at present, even in the year 2000. Therefore, the introduction of demand control measures largely depends on the progress of road network implementation. Foremost, a parking control system is very important not only in terms of reducing traffic demand but also in terms of providing space for carriage-ways and sidewalks. It should be implemented very strictly.

Table 9.13. Packaged Programs in the C.B.D. of George Town

Road-Traffic Capacity Improvement Package				
	1980	1985	1990	2000
Improvement of Radial Roads	—————			
Improvement of Ring Roads		—————		
Improvement of Intersections	—————			
Improvement of Traffic Signals	—————			
Circulation System		●		
Parking Control in Main Streets	—————			
Control Package in Transport Demand and Mode				
	1980	1985	1990	2000
Strict Parking Control		—————→		
Compulsory Garage Installation (Car Pooling)		→	Alternative —————→	
Exclusive Bus Lane		—————→		
Transport Terminal (New Transport System)		—————→		
Traffic Safety Improvement Package				
	1980	1985	1990	2000
Improvement of Sidewalks	—————			
Installation of Delineator	—————			
Installation of Traffic Signals		—————		
Transport Amusement Park Development		—————		

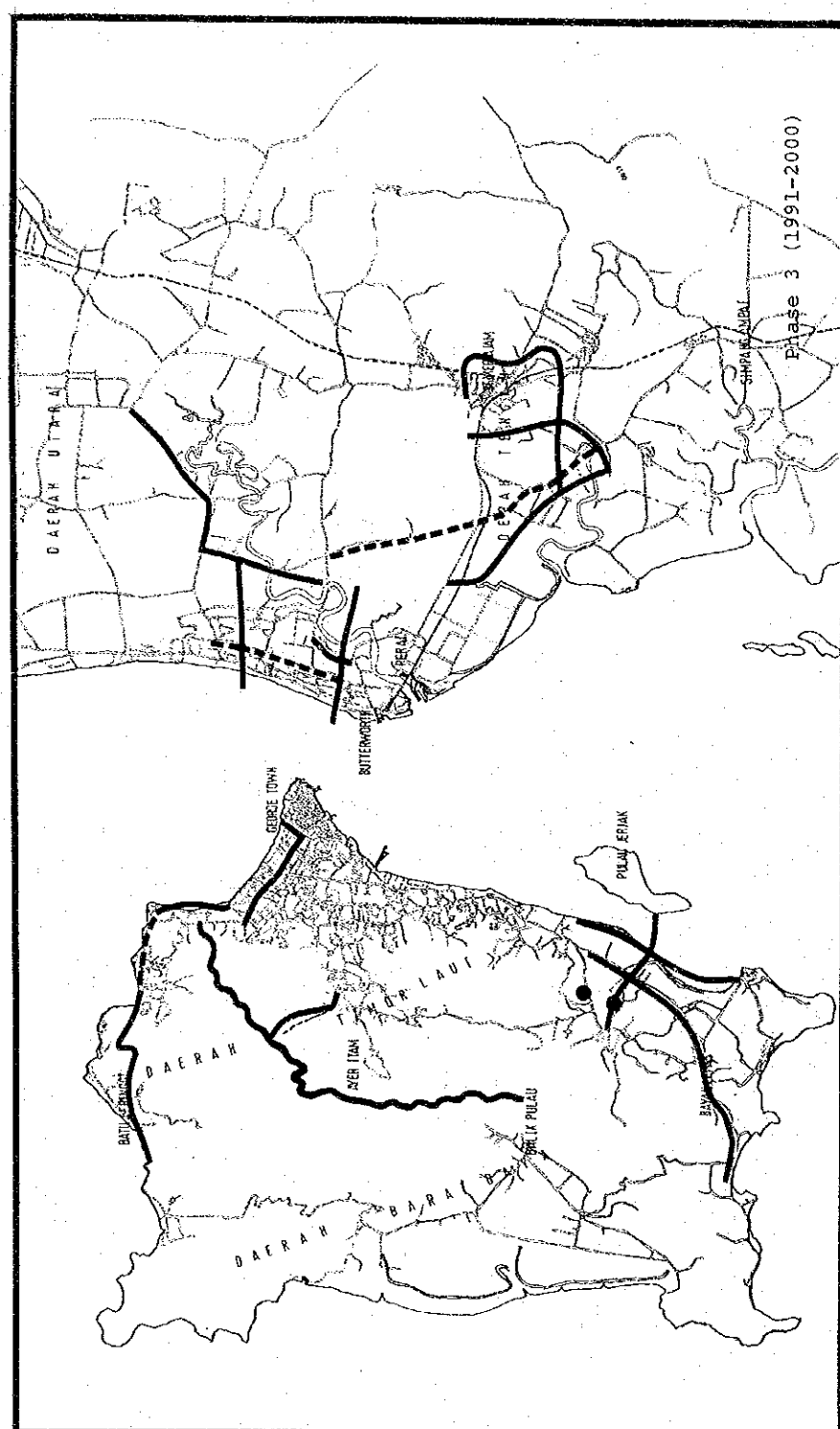
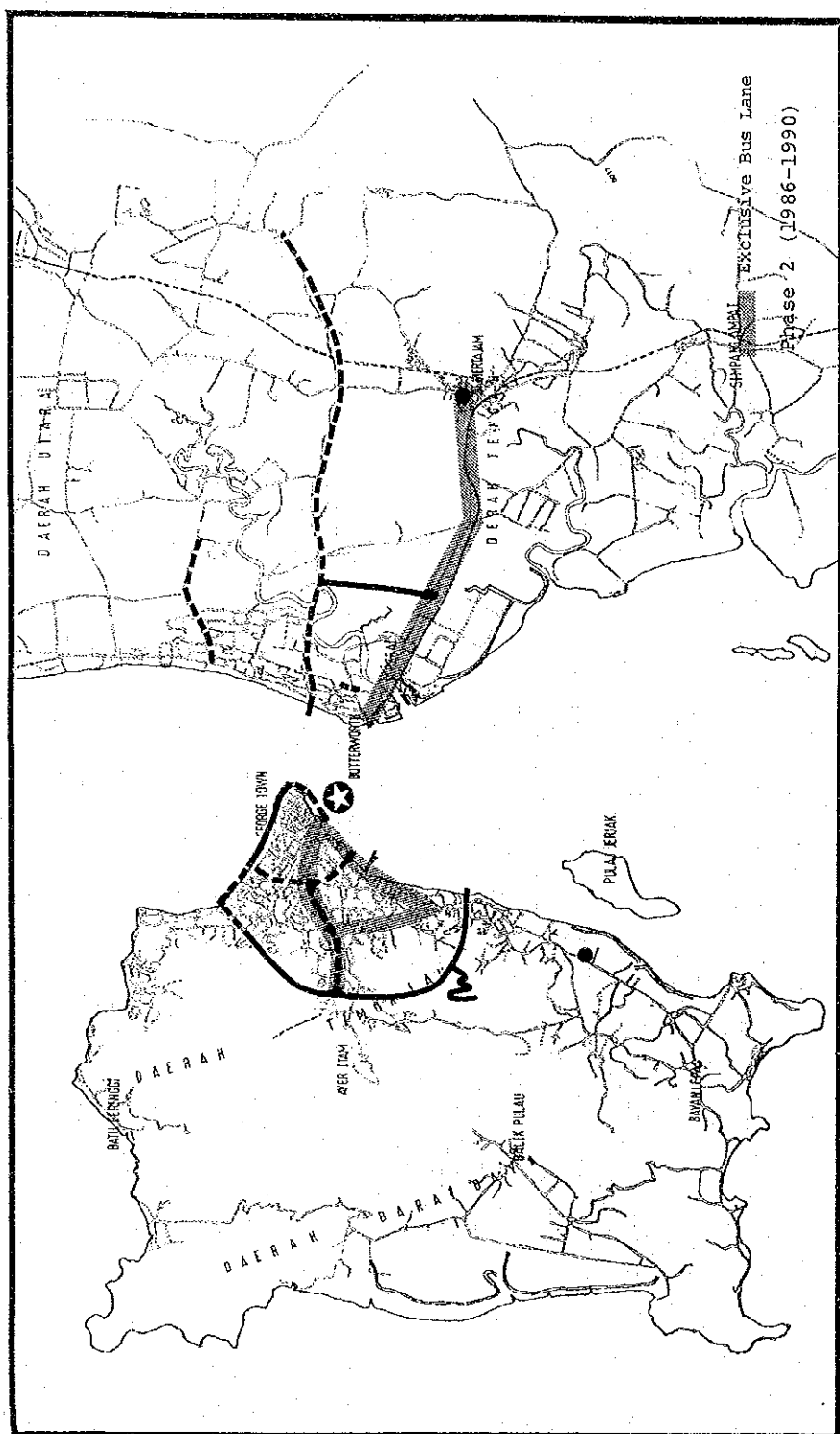
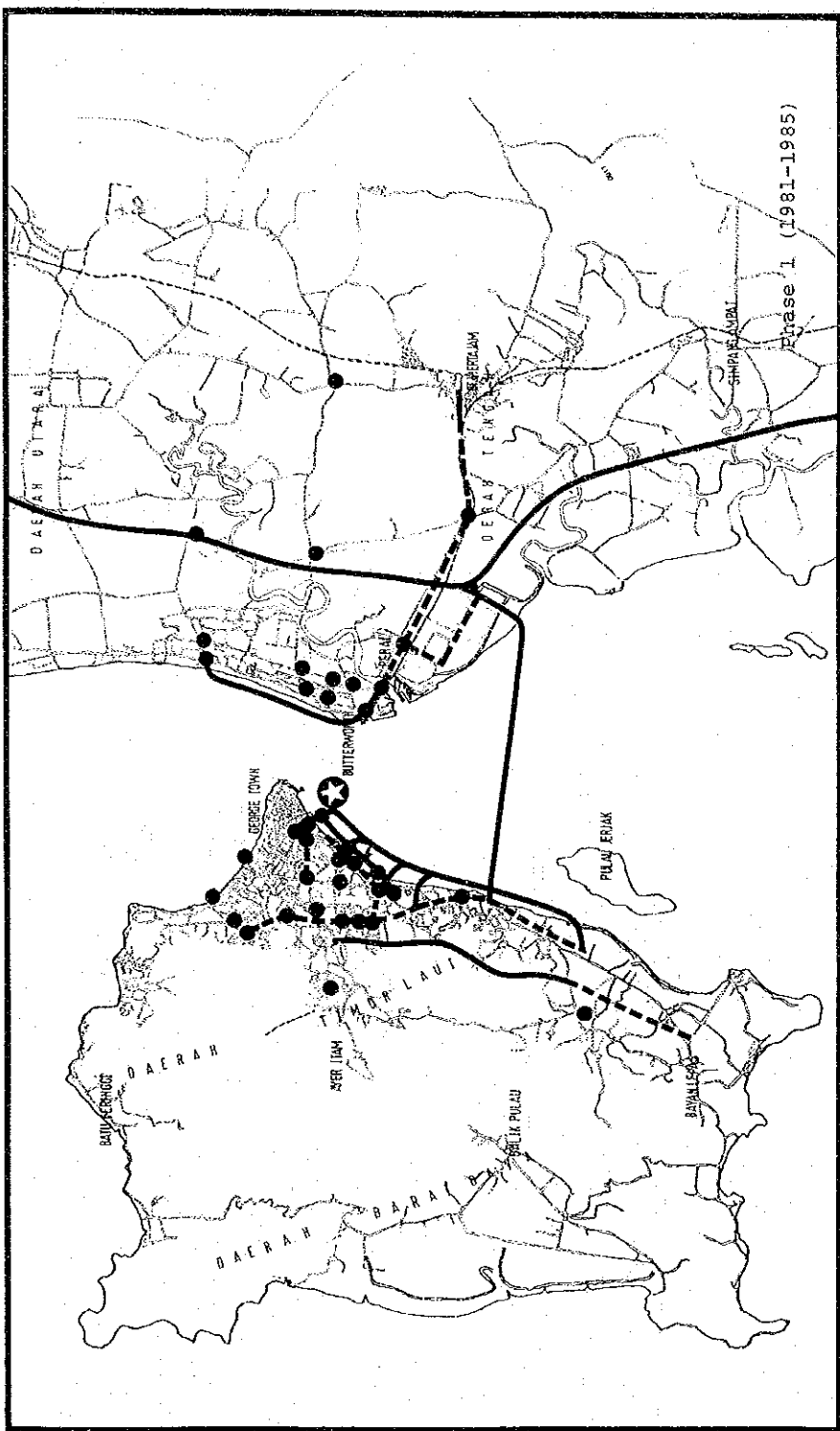


Fig.9.3 Highway Improvement by Phase

Construction Improvement

 Intersection Improvement
 Transport Complex

9.2.5 Cost

1. Premise

In order to implement transport development in the Penang Metropolitan Area, the capital investment for the next 20 years is estimated of over MS 1,085 million.

Sources of funds to carry out these projects will differ according to the type of project. Some of the projects should be constructed with public funds and others with private funds. Sometimes a project can be carried out with financial investments or loans from the public sector.

As far as the implementation of the transport plans is concerned, the following executors are expected.

Table 9.14 Executors of Projects

(Proposal)

Executors

Public Sectors	Expenditure								
	Loans								
	Investment & Corporation								
	Private Sectors			*					
Projects	Roads, sidewalks		A	*		*	*	*	
	Penang View Road								
	Signals, Delineators								
	Bus-Stops								
	Exclusive Bus Lanes								
	Bus Fleet, Taxi								
	Transport Terminal & Amusement Park								
	Off-Street Parking								

A: Sometimes access roads are provided by the private sectors.
 B: Alternative executors of project.

2. Public Expenditure

According to the implementation program, public expenditure is estimated as follows:

Table 9.15 Public Expenditure by Phase*

(In thousand M\$ at 1979 prices)

Phase Items	1 - A	1 - B	2	3	Total (%)
	'81-mid'83	mid'83-85	'86-'90	'91-2000	
Road Network	99,147	100,378	218,712	189,714	607,951 (88.6)
Intersection	7,894	30,847	19,755	7,030	65,526 (9.5)
Traffic Signal	1,337	2,400	679	172	4,588 (0.7)
Traffic Sign, Marking	637	638			1,275 (0.2)
Sidewalk	1,356	1,350			2,706 (0.4)
Bus Facility	1,950	1,990	50		3,990 (0.6)
Total	112,321	137,603	239,196	196,916	686,036 (100.0)

* Construction cost including costs of detailed engineering and supervision, and land acquisition cost

Total expenditure is estimated at about M\$686m. An annual expenditure of M\$34.3m will be necessary to implement all the plans.

About 90 percent of total expenditure is allocated for the completion of the road network.

3. Public Corporation and Others

The total costs of all the projects which will be executed by public corporation, public investment or private sectors is shown in Table 9.16.

Table 9.16 Public Corporation and Private SectorInvestment by Phase**

(In thousand M\$ at 1979 prices)

Phase Items	1 - A	1 - B	2	3	Total (%)
	'81-mid '83	mid '83-85	'86-'90	'91-2000	
Penang View Road			21,340		21,340 (5.3)
Transport Terminal Complex		1,252	5,222	12,445	19,919 (5.0)
Transport Amusement Park			7,640		7,640 (1.9)
Off-Street Parking*		54,782	27,300	54,600	136,682 (34.3)
Bus Fleet	21,600	23,040	50,490	118,260	213,390 (53.5)
Total	21,600	79,074	112,992	185,305	398,971(100.0)

* Estimated on the assumption that all the off-street parking demand will be supplied by four-storied parking buildings.

** Construction cost and land acquisition cost only

4. Comparison between Funds and Expenditure

It seems possible to complete all the projects proposed by public expenditure if the study area is allocated an average of about 3 percent above the total road budget of Malaysia during 1981 to 2000.

Table 9.17 Estimate of Annual Budget
for the Projects

(M\$ Million at 1979 prices)

Phase Stage	1 - A	1 - B	2	3	Annual Expenditure 1981-2000
	'81-'83	'83-'85	'86-'90	'91-2000	
Proposed Projects*	44.9	55.0	47.8	19.7	34.3
Dispersal Road	5.6	5.6	1.3	1.3	3.4
Total	50.5	60.6	49.1	21.0	37.7

* Engineering Fee & Contingency Included.

However, during the period of 1981 - 1990 the necessary expenditure will be above the normal level and it will be necessary to issue bonds or to obtain loans.

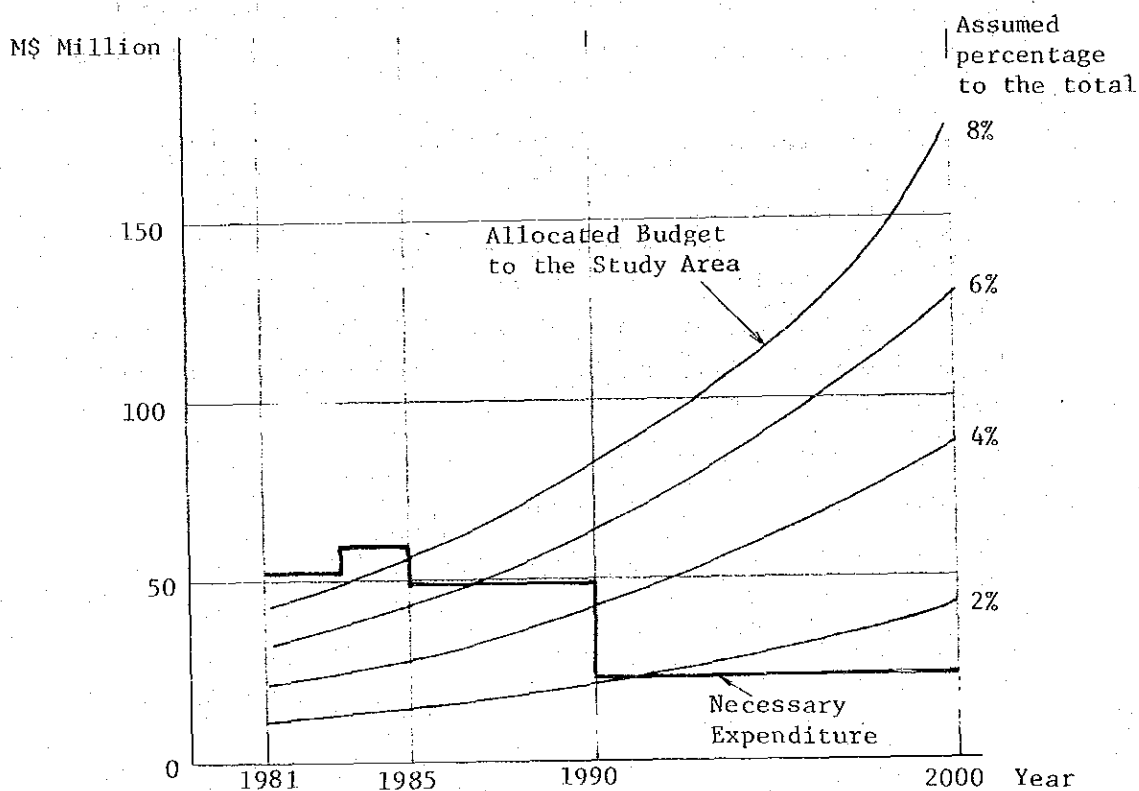
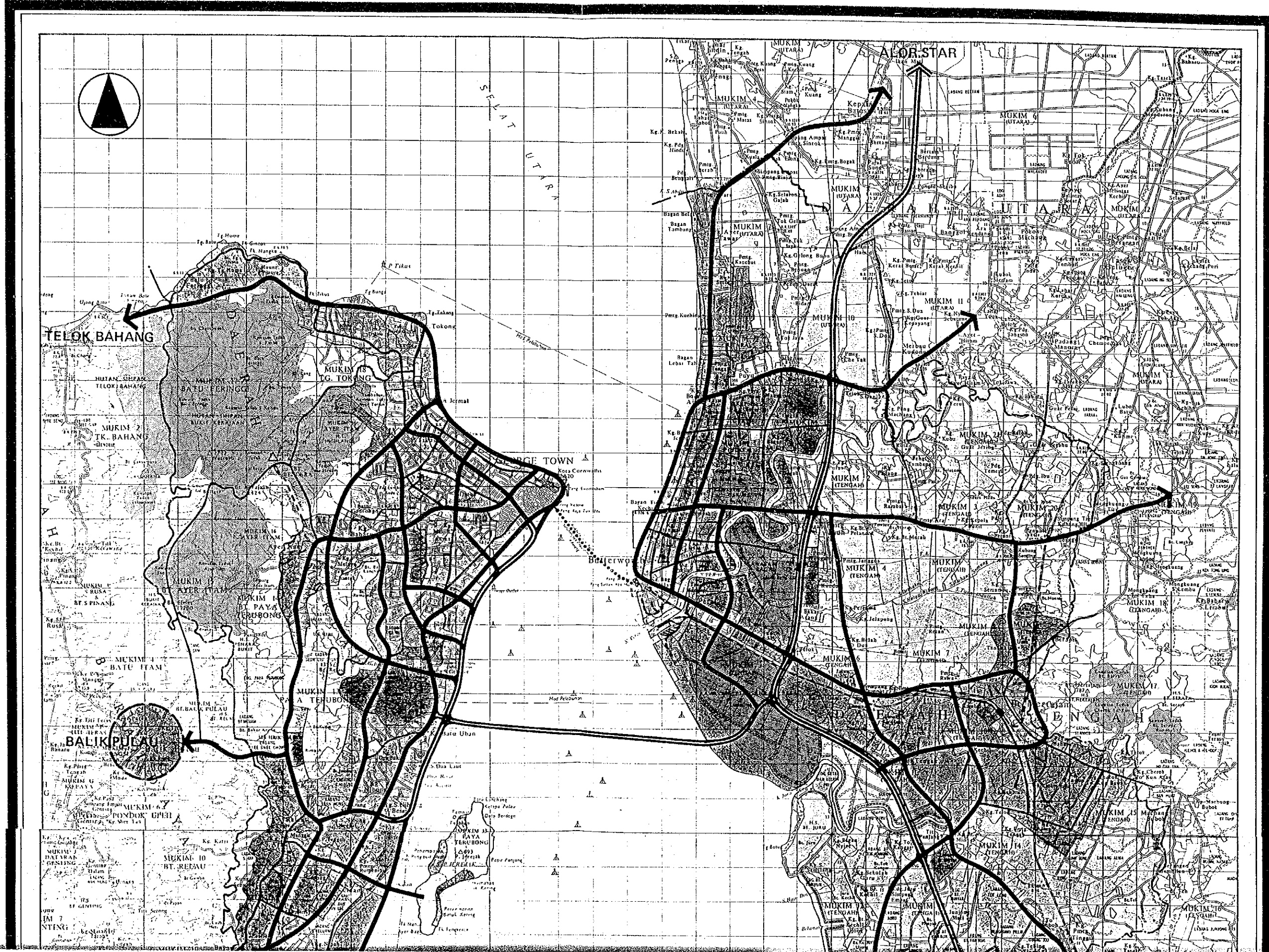
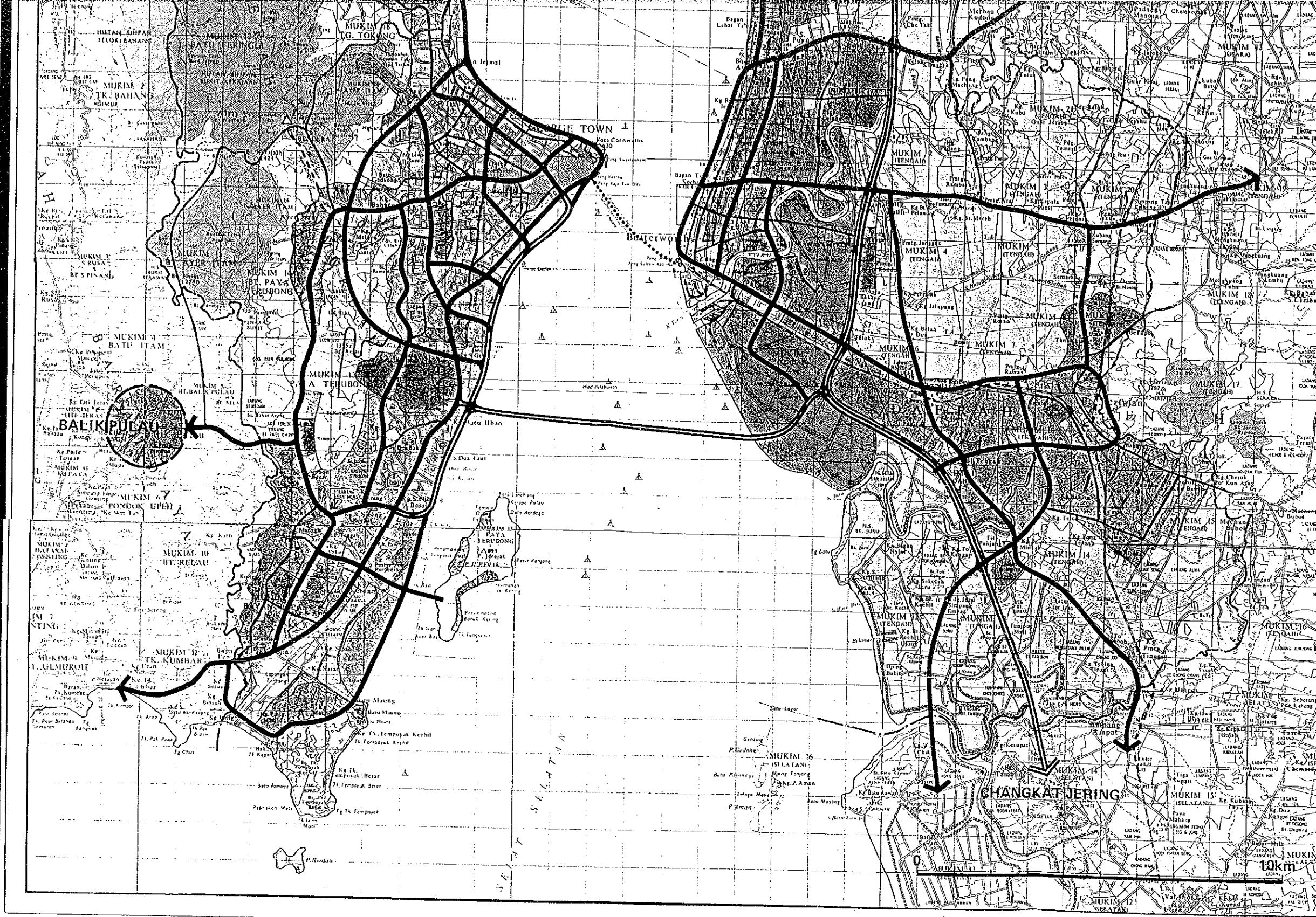



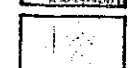

Fig. 9.4 Road Budget Allocation Ratio

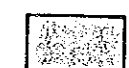
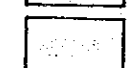

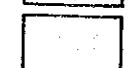




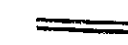


**PENANG URBAN TRANSPORT STUDY
 MASTER PLAN
 FUTURE LAND USE
 & TRANSPORTATION NETWORK**

LAND USE

-  RESIDENTIAL AREA
-  COMMERCIAL AREA
-  INSTITUTION

-  INDUSTRIAL AREA
-  TRANSPORTATION
-  OPEN SPACES
-  AGRICULTURAL & FOREST

ROAD NETWORK

-  PRIMARY DISTRIBUTORS (INTER-URBAN)
-  PRIMARY DISTRIBUTORS (INTRA-URBAN)
-  DISTRICT DISTRIBUTORS

