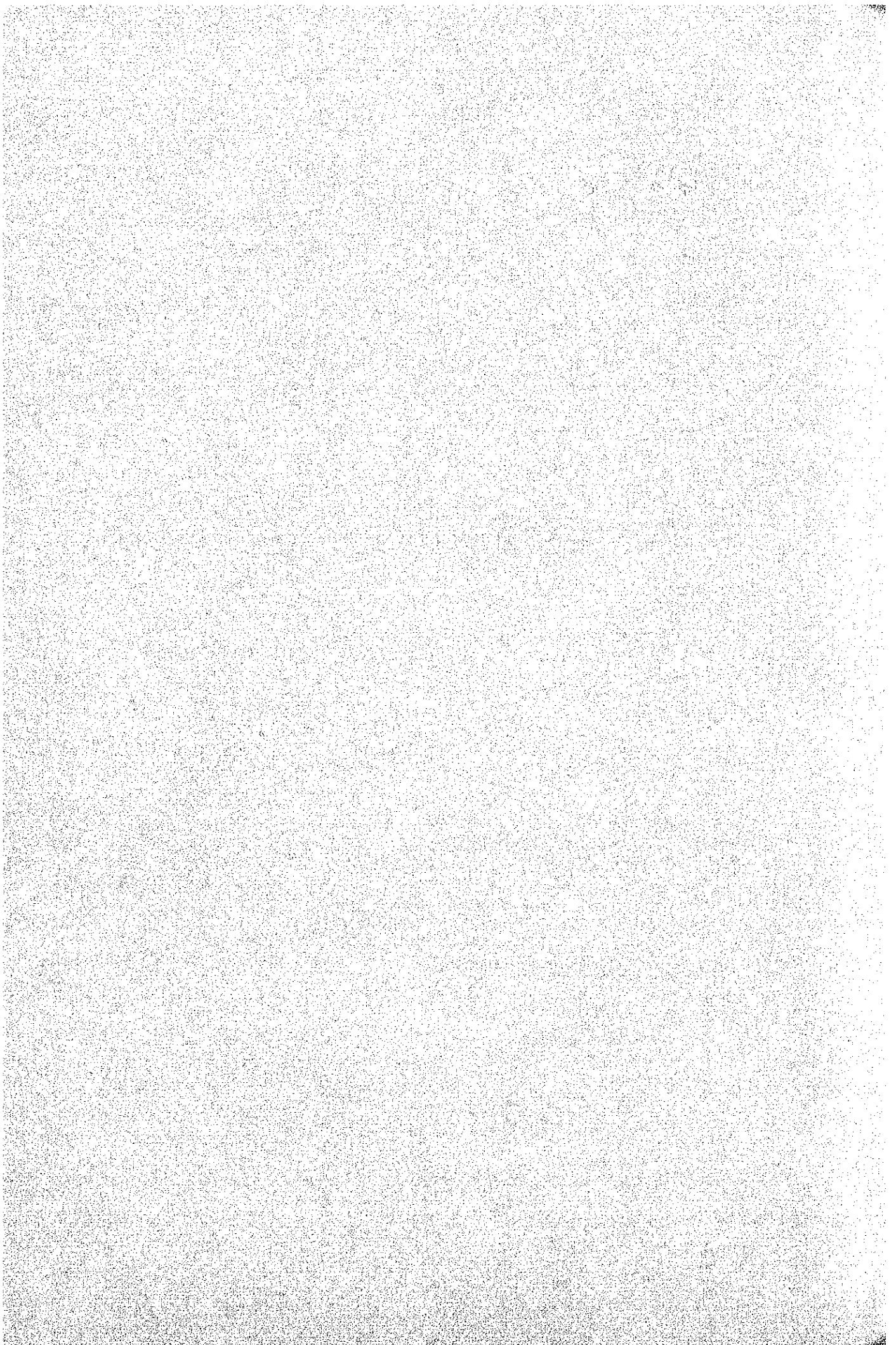


10. 短期計画一公共交通



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10.1 バス

10.1.1 はじめに

バス交通の改善はまず、信頼性の確保からはじめ、将来家用自動車の増大により交通問題が顕在化した時点では、バス優先策を導入し、輸送力の強化を行う。

10.1.2 現況の問題、課題

- 1) バスは本地域の主要な交通手段であり、ペナン島では1976年をピークにして利用客が減少しているが、ウエルスリー県では微増傾向を維持している。
- 2) バスの走行状態は必ずしも良くなく、路上駐車、二輪車やトライシヨ-のために低速を余儀なくされている。
- 3) スケジュール通りの運行がなされていず頻度が低い。
- 4) バス車輛の大型化、増車および新型の導入が必要である。
- 5) ターミナル施設やバス停留所の改善が必要である。
- 6) バス関連の管理行政体制の改善が望まれる。
- 7) 各バス会社とも経営状態は良くなく、赤字のところさえある。

10.1.3 短期計画における勧告

以下のような施策がとられるべきであろう。

- 1) 適切なバス車輛の供給
- 2) バスルートの拡大
- 3) バスサービス頻度の増大
- 4) バス運行システムの改善
- 5) バス交通委員会の設置
- 6) ミニバスサービス
- 7) 道路環境の整備

10.2 工場バス、学校バス

10.2.1 工場バス

工場バスはそのサービスの快適さから工場労働者の主要な通勤手段となっている。今後ともこのサービスは続くと思われるが、サービスの改善、交通混雑の緩和、道路交通への障害の除去等を目標にしていく必要がある。

10.2.2 学校バス

学校バスも工場バスと同様、その便利さから増加を続けている。

しかし、今後は、そのサービスの改善、運行システムの合理化、安全性の確保、乗降施設の整備等に努力しなければならない。

10.3 タクシー

10.3.1 タクシーの役割

クアラルンプールと異なりペナンでは、現在、都市間輸送としての役割が大きいが、今後は、トライショーの衰退とあわせ、都市内交通機関としての本来の役割となっていくであろう。

10.3.2 短期計画における提案

タクシー台数の増強、経営組織の改善、料金体系の明確化、さらにタクシー乗降場の整備やC.B.D.内部での自由な乗降など、利用客へのサービス改善が必要となるであろう。

10.4 トライショー

ペナンは、その地形的条件により、トライショーが普及し、現在でも主要な交通機関の一つとなっているが、前近代的な交通手段であり、運転手も転職を希望しているものが多い。

現在新規登録は禁止されており、漸時削減の方向にあるが、短期計画の提案としては、混合交通のため交通サービスの低下をきたしている一定の道路における通行を禁止すると共に、専用レーンを一部では設置し混合交通の緩和を計る等の方策が考えられる。

10. SHORT TERM ACTIONS-PUBLIC TRANSPORT

10.1 Bus Transport

10.1.1 General

After careful consideration of the prevailing conditions within the Study Area, the following policies are applicable at each stage in order to improve the level of efficiency of the existing bus services.

1. At the first stage, the policy for bus transport will be to ensure reliability.
2. 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 since it is expected that the increase in number of traffic movement by private cars will exceed the capacity of roads and parking spaces.

To achieve the aims of the immediate action policy, the following counter measures should be taken:-

- The up-grading of the service level in terms of frequency and punctuality.
- The improvement of bus fleets through 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 details are discussed as follows.

10.1.2 Present Problems and Improvement Required

1. General

As regards bus transport in the Study Area, it can be recognized from the analysis of present conditions described previously that bus transport plays a significant role in public land transport.

There exists a slight difference between the present situation in Penang Island and that in Province Wellesley.

In Penang Island, the bus service seems to be relatively adequate

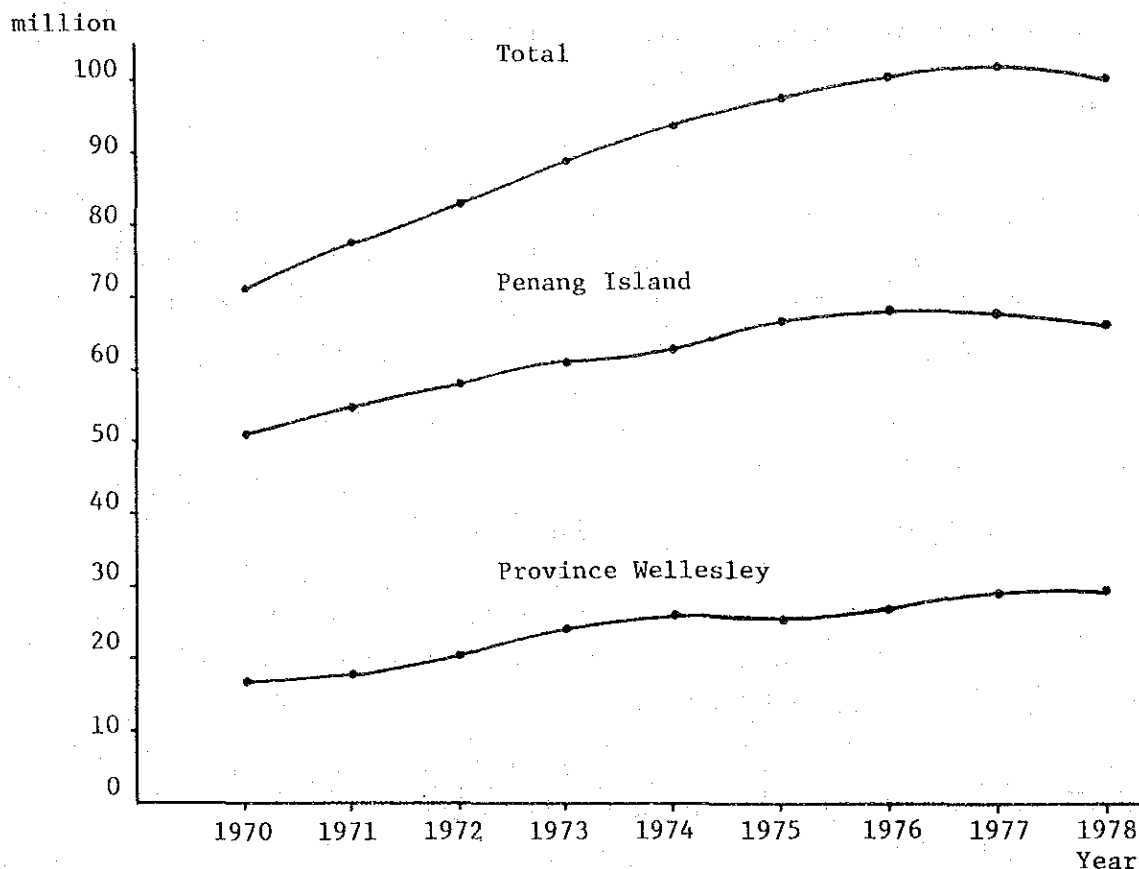


Fig. 10.1 TREND OF BUS PASSENGERS

in its present stage, although there are some minor problems to be solved. For example, almost the whole of the urbanized areas are covered by the existing bus network as shown in the network coverage with the time period in which buses operate, i.e from 6.00 am. to 1.00 am. , coincides with the public's activities.

There are no decisive disadvantages since the total number of passengers has decreased since 1976 mainly because of the growing popularity of individual motorized vehicles such as cars and motor-cycles.

But in Province Wellesley, bus users have increased constantly and further extension of the bus network is desired especially in the southern part. (See Fig. 10.1)

The following aspects in detail are considered as existing problems of bus transport.

2. Problems regarding running conditions

Almost all the bus companies indicated that the delay and irregularity of their schedule is caused by road congestion.

In the future, with the increase in traffic volume, the congestion will become worse due to difficulties in widening roads and in the construction of new roads.

It follows that the improvement of road conditions is one of the best solutions in attaining the smooth operation of buses.

(A) Road-side parking

The present bus routes have a carriage-way of about 8 m - 9 m, but almost all the main sections are too narrow due to parking on the road-side.

All buses travel along the left side of the lane as they have to stop at bus-stops. Thus, when there is parking by the road-side, buses are forced to weave. This causes interruption to the traffic flow along such sections which also slows down running speed.

(B) Motor-cycle and trishaw

Furthermore, motor-cycles and trishaws are usually running two or three abreast along the roads due to parking by the roadside and as a result always interrupt the bus flow forcing them to reduce speed.

(C) Specific intersections

The difficulty for a large volume of traffic to negotiate roundabouts at the same time leads to traffic congestion. It is easier to control traffic flow at such intersections by using traffic signals in order to increase traffic capacity.

3. Irregularity of bus operations

At present, bus operations usually do not follow their own time schedule with this being a serious problem as it reduces bus frequency.

No real effort is made to follow the time schedule and also there are no time-tables set up at bus-stops. Buses either come too early or too late, so bus frequency is not constant and since there is a lack of information regarding bus schedules at bus-stops, the passenger has to wait for an unnecessarily long periods of time at the bus-stop.

Such poor reliability of bus transport should be improved with urgency.

The causes in operation system seem to be as follows:

- (i) The frequent breakdown of buses.
- (ii) Lack of control of the operation of the time-table at the terminals.
- (iii) No system of following the time schedule.

4. Bus Fleets

In order to maintain regular frequency and increase services, it is necessary to introduce more buses in the Study Area.

During the morning and evening peak hours, most of the buses are fully loaded due to heavy demand exceeding their capacities. The load factor is more than 100 percent during peak hours and 40 percent during off-peak hours. This high load factor is due to the small capacity of each bus taking in only 43 to 48 passengers. Therefore, it is expected that the capacity of each bus fleet be increased by introducing standee type buses which have more standing space.

Most bus companies use many old buses with almost one third (1/3) of the total bus fleet being over 7 years old and therefore buses experience breakdowns during scheduled trips. In order to maintain frequent services and have effective operations it is necessary to introduce new buses as well as to improve the maintenance system. (See Table 10.1).

Also for greater convenience some improvement of bus fleets should be done, such as the lowering of bus floors, equipping double doors for boarding/alighting, and installing airconditioners.

Table 10.1 PERCENTAGE OF BUS FLEET BY AGE

Years	1-2	3-4	5-6	7-10	11 and above
Percentage to the total	22.5	20.6	23.1	23.7	10.1
Cumulative Percentage	100.0	77.5	56.9	33.8	0

5. Bus Facilities

The City Council Bus Terminal and the Private Bus Terminal are located separately and are not within walking distance of each other. This impedes the effective utilization of the urban and regional buses.

Regarding Bus Terminals, the following problems have been noted.

- Inadequate waiting space.
- Narrow and dark terminals.
- Lack of information on time schedules, bus routes, and bus-fares.

Regarding Bus-Stops, the problems are:

- No bus-stop signs.
- No information on time schedules, bus routes, and bus fares.
- No lights.
- No bus bays.
- No shelter and waiting facilities.

6. Organisation

Bus companies are under the administration of two (2) government offices; the RIMV, which is under the Ministry of Transport and the Public Transport Licensing Board of the Ministry of Public Enterprise. The two ministries are under the EPU (Economic Planning Unit) and HPU (Highway Planning Unit). The EPU and HPU are responsible for policy-making regarding public transport. Bus fares and routes are the concern of the Federal Government which goes through the Public Transport Licensing Board in Kuala Lumpur.

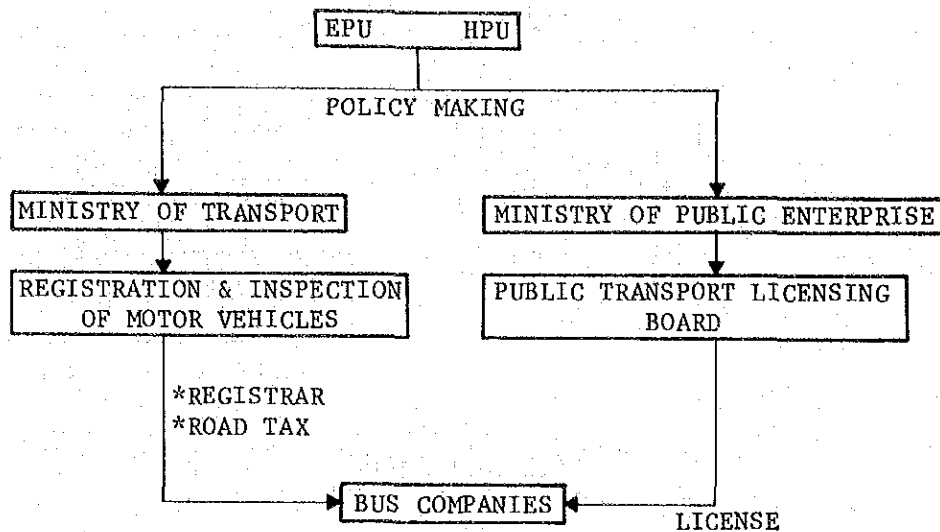


Fig. 10.2 ADMINISTRATIVE STRUCTURE OF BUS TRANSPORT

The team can pin-point the problems of this organization.

They are:

- (i) One of the administrative problems is that the bus companies are supervised by two (2) parallel ministries viz. the Ministry of Public Enterprise and the Ministry of Transport.
- (ii) There seems to be a lack of expertise in the fields of planning and policy-making.

7. Financial Analysis

On the basis of financial data collected, the team analysed the present financial aspect of the bus companies. However, some of the collected data is unreliable because of undisclosed profits of bus companies. In this study, the analysis is made with careful inspection comparing the financial aspects of each bus operator with Kuala Lumpur bus operators.

Table 10.2 shows the revenues and expenditures of scheduled bus operators in 1978.

According to Table 10.2, most of the bus companies do not make adequate profits while one of them has deficits.

Table 10.3 shows the operating cost of each bus operator.

The operating cost ranges from 0.897 to 0.829 M\$ per fleet-

kilometers. The highest operating cost is 0.897 M\$ per fleet-kilometers which does not include depreciation.

At present the average fare is about 3.9 cents per passenger kilometer. Therefore, when an average loading factor is more than 23 persons per fleet-kilometer, the operators make profits.

Considering these, most of the bus companies are going through a very bad financial situation due to bus fares being relatively low. As a result, they cannot afford to renew their bus fleet and therefore are forced to provide only poor service to the public.

Therefore, it can be judged that their financial situation should be improved in the near future in order to give incentive to the bus operators to strengthen the public transport services.

Table 10.2 REVENUE AND EXPENDITURE IN 1978

(M\$'000)

Company	A	B	C	D	E
<u>°Revenue</u>					
Fare	4,248	5,765	2,375	3,051	1,019
Others	103	374	78	88	19
Total	4,351	6,139	2,453	3,139	1,038
<u>°Expenditure</u>					
<u>Operating Expenses</u>					
Wage	3,291	2,444	837	583	438
Fuel & Oil	867	2,180	522	677	204
Maintenance & others	1,223	660	417	940	122
Sub-Total	5,381	5,284	1,776	2,200	764
<u>Depreciation</u>	0	462	217	135	41
<u>Interest</u>	189	15	- *	- *	16
<u>Total</u>	5,570	5,761	1,993	2,335	821
<u>Operating Income</u>	Δ1,219	378	460	804	217
Tax	-	189	230	402	109
Net Income	Δ1,219	189	230	402	109
Percentage -					
Net Income / Revenue	-	3.1%	9.4%	12.8%	10.6%

Note : * Figures unknown.

Table 10.3 OPERATING COST IN 1978

Company	A	B	C	D	D
Operating Cost	0.867	0.790	0.770	0.808	0.772
Wage	0.530	0.365	0.363	0.214	0.443
Fuel & Oil	0.140	0.326	0.226	0.248	0.206
Maintenance	0.197	0.099	0.181	0.346	0.123
Depreciation	0	0.069	0.094	0.050	0.041
Interest	0.030	0.002	0	0	0.016
<u>Total</u>	0.897	0.861	0.864	0.858	0.829

Note: M\$ per fleet-kilometers

10.1.3 Recommendation of Short-Term Actions

As a result of a careful examination of present and probable situations in the future, the team recommends the following measures:

1. Provision of Adequate Bus Service Fleets

As pointed out in 10.1.2, the bus fleet is in a very bad state right now. The possibility of strengthening and improving the bus fleet is largely dependant upon the financial situation of bus companies. However, the team recommends that the bus fleet be improved as follows:

- (i) Covered soft seats should be introduced in order to provide more comfort to passengers.
- (ii) Standee buses for short distance routes should be introduced in order to avoid by-passing bus-stops owing to a fully loaded bus. Buses of larger seating capacity are suitable for long distance routes.
- (iii) In addition, the two-door type of bus would be 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.

2. Expansion of Bus Routes

The present coverage of bus routes in George Town is almost

100 percent by a 500m radius of bus-stops with A 250m radius having coverage of 80 percent.

However, the new development areas such as Bayan Lepas and Seberang Jaya are not adequately covered by bus routes. Therefore, the bus routes should be expanded to cover these areas as follows:-

Inside George Town	250m
Other Urbanized Areas	500m
Rural Areas	500m - 700m

By introducing the mini-bus to the adequate routes, the target mentioned above should be accomplished.

3. Provision of Bus Services

The most important counter measure in the bus transport system in the Penang area would be 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 view point of demand but also from the financial aspects.

As a result of examining the present condition of bus enterprises, the team proposes the following guidelines for the frequency of bus transport services which should be acceptable to the bus operating enterprises :-

Inside of George Town	5 minute intervals	at peak hours
	10-15 min. intervals	at off-peak hours
Other Urbanized Areas	10 minute intervals	at peak hours
	20-30 min. intervals	at off-peak hours

4. Improvement of Bus Operating System

The following improvement measures for bus operation are proposed:-

- (i) In order to attain and maintain the regularity of the bus system in operation, a checker or inspector should carefully examine its operation.
- (ii) The time schedule for bus operation should clearly be 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.
- (iv) To attain effective services to bus users, the adjustment of bus operating schedules between bus operators should be done.

5. Establishment of a Bus Transport Committee

At present, there are many problems underlying the bus transport system one of which is the financial aspect. To solve these problems, many measures are required. For instance, revision of seat tax, new establishment of subsidy for bus transport and introduction of lower-loan, etc.

However, at present, negotiations between Government and public or private operators are ineffective. Therefore, the team suggests that a bus transport committee should be established under the supervision of the Ministry of Public Enterprise and/or the Ministry of Transport. This committee should consist of government, bus operators, consumer representatives and experts of public transport operation and management. This committee should come into being at the earliest possible time.

6. 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 the running-kilometer by one-third (1/3) after introduction of the mini-bus system.

In view of this data, the team suggests that the routing of the mini-bus system will be revised in such a way that there is no competition with the big bus companies.

7. 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 conditions of buses.

10.2 **Factory and School Bus**

10.2.1 Factory Bus

1. Introduction

Over the last decade of rapid industrialization in the Study Area, the factory bus has gained much popularity among factory workers. Beginning with only 1 bus in 1971, there are now, in 1979, 320 buses in operation.

Despite the various problems faced by the factory bus, the system has many advantages over the existing public bus system; for instance, it is able to provide a more efficient bus service level that matches the timing of the shifts. At the same time it provides almost door-to-door service to the workers and this serves as an incentive provided by the factories to their workers. Fares are paid on a monthly basis by the factory so there is no need for a bus conductor with this reducing the operation cost.

In addition, there is greater flexibility as routes can be changed to suit demands. Moreover, the factory bus reduces congestion in the industrial estates and nearby roads as these buses utilize the road space more efficiently than individual transport modes.

Based on the above, we conclude that the factory bus will continue to be the most important mode of transport for factory workers. This is further supported by the views of the factory management of different factories.

2. Problems and Short-Term Actions

The existing factory buses are rented by individual factories on contract basis. As such, for passengers from different factories although living in the same neighbourhood, separate

buses or separate bus trips are required irrespective of the number of passengers. This naturally results in overlapping of routes.

Such inefficient utilization of resources not only increases the operation cost, but adds a large number of additional bus trips during peak hours, thus further aggravating the problems of congestion and high traffic volume on the main trunk roads.

Furthermore, in view of the rapid industrialization programmes planned by the Penang Government, it is anticipated that the demand of factory buses will continue to increase rapidly. In such a situation, heavy congestion on routes surrounding the industrial estates is to be expected.

The need for a more systematic organization becomes obvious. The team suggests that an association or co-operative should be set up for this purpose. Factories can then register their workers as members of this association. With information on the addresses and work shifts of the workers, the association can then plan out routes and trips according to location of residence and factory. This will cut down unnecessary trips and minimize cost of operation. This procedure would not be difficult as factories generally tend to cluster in industrial estates and many have similar shift hours.

On the operation part, instead of identifying by factory for each trip, the factory bus may be identified by routes as the public bus. An exception should be made only for those isolated factories located in the midst of residential areas where a system of individually run buses is more efficient.

The association or co-operation can also play a role in controlling the level of services for the protection of the users and at the same time could provide help to individual operators in getting loans and solving administrative problems.

At present legislation exists which prohibits standing passengers. This is, of course, more comfortable for the workers but in terms of minimizing bus trips and reducing congestion problems, standing passengers should be allowed.

The frequent halts of buses to drop or pick up passengers along the road is often one of the causes of traffic jams. This can clearly be seen on Jalan Glugor. Stricter rules should therefore be enforced on factory buses regarding stops on their route. Perhaps their stops can be integrated in the planning of bus-stops for the public bus.

10.2.2 School Bus

1. Introduction

Over the last fifteen years, the school bus has shown a great increase in demand. The number of school bus operators and the number of buses has grown each year as demand and profits have been big enough to attract new entrepreneurs.

The school bus serves to meet the two (2) main concerns of parents, i.e. the safety of the school children and the convenience of a door-to-door service. Compared with the public route bus, the school bus eliminates the need for children to be exposed to certain safety problems like, for example, traffic problems, as these buses pick them up right from their homes and let them down at the school gate, eliminating any need to walk long distances or to change buses. It is also convenient on rainy days and is a reliable means of transport every day without fail.

From these advantages, we can understand why the school bus has been greatly popular for the middle and higher income groups despite the fact that the rates charged are sometimes as high as five times that of the public route bus. Hence, it is most likely that the school bus will continue with increasing demand.

From the policy point of view, school buses should also be continued as they reduce unnecessary traffic in the form of individual parents taking their children to and from school in private vehicles. In many ways the school bus is a good compromise between public and private transport, providing safety and convenience at a lower cost.

2. Problems and Short-Term Actions

School bus operators work as individuals and they often obtain

their passengers through a random method of advertising their services through friends and by word-of-mouth. As a result, a bus operator often gets passengers from various residential locations and from different schools. The direct result is a wastage of resources and higher operating cost. Journey length and time become unnecessarily long. In many cases, the journey time may be even longer than that of the ordinary public bus.

In order to deliver the children to school in time, they have to start very early, as early as 5.30am. The situation is even worse on the journey home as children from different schools and different levels have different dismissal times.

There obviously is a need to organize the system more efficiently in order to cut down operating and journey time, not to mention a reduction in traffic volume during peak hours. The problem may not be as easy to solve as that for the factory bus as homes and schools tend to be more dispersed in location. Nevertheless, the team suggests that some form of association or co-operative should be set up to organize the routes more efficiently. This association could also be responsible for a certain level of service to protect the interest of the school children, particularly in terms of safety. At the same time it could help operators in getting loans and solving administrative and technical problems in the everyday running of the bus.

Many of the schools in the Study Area do not have places designated as school bus stops. As a result these buses often stop at the road-side causing a bad congestion problem during the school dismissal hours. A possible short-term solution is to provide lay-bys and other facilities where school buses can stop to pick up or let down school children safely and without holding up the other traffic on the road.

10.3 Taxi

10.3.1 Future Role of the Taxi

The taxi is an important mode of public transport in metropolitan areas. It provides a useful, efficient and relatively cheap service within the city and also for intra-regional and inter-regional trips between different towns. In Kuala Lumpur, taxis provide a good coverage and help partly, to make up for the lack a well-integrated city bus service. Despite the higher fare, people are willing to pay for the convenient and quick service.

However, in the Study Area, the taxi is still a comparatively unpopular mode of transport for short-distance, intra-city travel. In many cases, use is limited to foreign and local visitors. The small number of taxis and the low daily passenger trips are a reflection of this. In 1979 there are only 350 taxis in Penang Island and 124 in Province Wellesley. This is very low when compared to Kuala Lumpur where, in 1979, 1750 taxis made 30,000 passenger trips a day.

In view of the decreasing demand of the trishaw and the dispersal of activities away from the central areas, the taxi is expected to play a greater role in the future for short distance travel. As the metropolitan areas grow, the demand for the taxi also increases correspondingly. The present situation whereby the taxi is limited to only certain transport terminals and hotels will most likely change for one more like Kuala Lumpur where the taxi is used mainly by the local population.

10.3.2 Problems & Short - Term Action Proposals

The unpopularity among the local people is not just due to competition from the trishaws but to certain inherent problems. Although a fare system has been laid down by the government, it is almost never adhered to, unlike in Kuala Lumpur, thus reducing the number of short occasional trips. It is often only used by those who have no other alternative, that is, visitors or others at the transport terminals.

The root of the problem can be traced back to the system itself.

The ownership structure is such that the majority of the operators are not owners. They often rent their vehicles at very high rentals. With these high rentals and only few passengers a day, they refuse to charge the fares set down by the government but overcharge, claiming they are otherwise unable to sustain their high rental rates.

The overcharging of taxi operators causes a lack of trust in the taxi service. Many users can also not afford to use the service because of the unreasonably high prices. Hence, the problems must be tackled from both sides: On the one hand, the users must be assured of a reasonable level of service at a standard rate. On the other hand, the taxi operators must be assured of enough passengers per day to sustain their operating cost and leave some profit margin.

In order to upgrade the level of service, the team suggests that the number of taxis be increased. The ratio of only 0.5 taxis per 1,000 population is much smaller than in other metropolitan areas and should be increased to 0.7 taxis per 1,000 population in 1985. This increase will encourage the use of taxis by the local population as taxis will then be easily available in all parts of the metropolitan areas.

As a measure to encourage the use of taxis, the practice of overcharging must be prohibited so that users will have more confidence in the service. This will lead inevitably to an increase in passengers per taxi, despite the overall increase in the number of taxis.

The team also suggests that an agency or co-operative be set up in order to aid taxi operators in owning their own vehicles by making loans available, thus eliminating the problem of high rentals. The formation of a co-operative would help the operators in further reducing costs of maintenance and solve other management and social problems. The co-operative will not only be advantageous to the operator but will be a means of control over the quality of service to protect the interest of users, for example in the prevention of overcharging of fares.

In order to improve the taxi system, more taxi stands and other

related facilities must be located at various places where there is a demand, for example in large residential areas like Ayer Itam, Tanjung Bungah, Green Lane, Glugor and Bayan Baru. In the C.B.D. itself, in addition to those existing, new ones should be set up particularly at roads where the trishaw is prohibited.

New rules should be set up for the taxis. At present taxis are not allowed to pick up passengers in many areas of the C.B.D. If trishaws are prohibited, taxis should be allowed to pick up passengers in many areas of the C.B.D. If trishaws are prohibited, taxis should be allowed to pick up passengers from these roads. However, an increase in the number of taxis with additional problems of stopping at unsuitable places can cause much congestion if adequate facilities for the picking-up of passengers are not planned. The expected number of taxis in such areas should therefore be considered in relation to traffic volume on the roads.

10.4 Trishaw

10.4.1 Continuity of the Trishaw

Penang had historically been known for the abundance of trishaws. Over the past few decades, trishaws have slowly disappeared from the urban scene in many Malaysian towns but, up to this day, it remains George Town's most important mode of land public transport, after the bus. It serves over 20,000 passengers a day.

The trishaw has been popular in George Town for various reasons. For one, it is an added attraction to tourists and this aspect is important as Penang Island is an established tourist centre. However, although tourists form a large percentage of the users, the local people are still the main users and the viability still depends, to a large extent on local demand. It will be difficult to find a substitute for the trishaw as a tourist attraction. As to local demand, as soon as an alternative mode with a similar level of service and charge can be provided, users would not have many objections.

In fact, it would probably be welcomed by many users who feel that the trishaw is a too hazardous and too slow mode of transport.

The trishaw itself is basically a very primitive method of transport and many of the trishawmen have indicated in the survey conducted that they wished to change their job for ones with better prospects. With the rapid industrialization programme, expected to provide more employment opportunities, it is probable that many of these trishawmen would leave their jobs for better and more secure jobs.

Furthermore, with the dispersal of activities away from the C.B.D in to the suburbs, the trishaw will become less feasible as a mode of intra-city travel.

In view of all the above points, the team feels that, for the moment the trishaws can continue but they must be reduced in number in order to alleviate congestion on the roads.

10.4.2 Problems and Short-Term Actions

Congestion is given as one of the main reasons for banning the trishaw in the surveys conducted. From the traffic point of view, the trishaw, as a slow moving mode of transport, can be truly a major cause of congestion when found in large numbers. In addition, many trishawmen have been guilty of violating the Highway Code. They often travel on the wrong lanes and park their trishaws at narrow roadsides holding up other traffic modes.

In addition to the present policy of stopping the registration of new vehicles, in order to reduce the number even further, illegal trishawmen should not be allowed to continue to operate. Enforcement officers can be allocated to enforce this policy and to prohibit these trishawmen from operating. However, in order not to cause excessive hardship, these trishawmen should be helped in some way in order to find some alternative means of employment. Their lack of skills must be considered here. The initial problem of finding employment for almost 1000 trishawmen would be no minor problem. Perhaps in this context, some social organization could be set up to help these trishawmen find alternative jobs in which to settle down.

Many of them are of low education status and, left on their own, would find it difficult to find their own way or to take advantage

of various government aids.

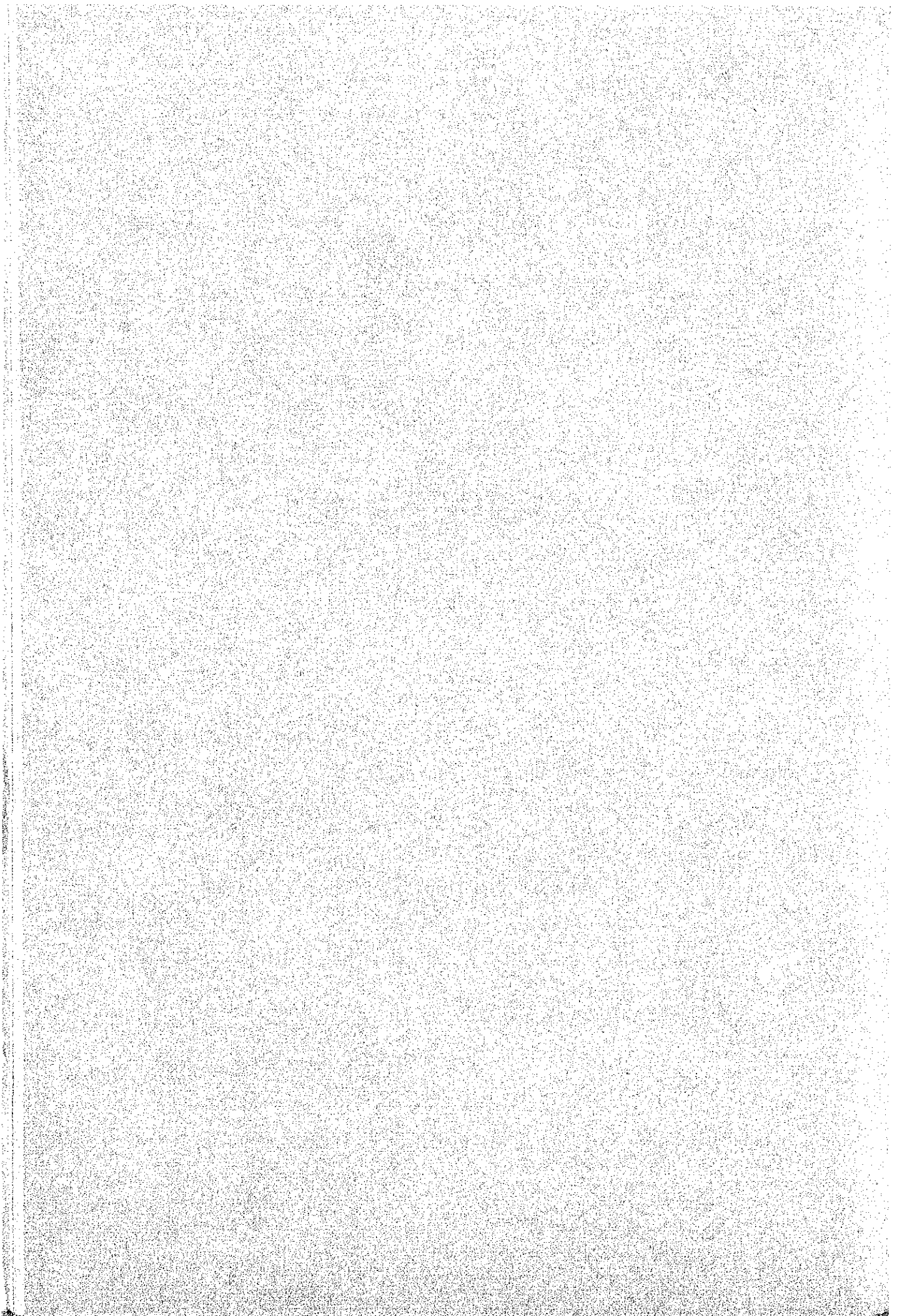
Cutting down the number of trishaws, will not completely solve the present and future congestion problems. Stricter laws must be enforced on the trishaw in the same way as laws are enforced on private automobiles. Despite the trishaw being a non-motorized mode it should not be exempted from abiding by the Highway Code. Strict parking rules must be enforced and parking limited only to parking stands or areas without traffic obstruction problems.

A more organized system of trishaw operation should be carried out in the future in order to prevent excessive disturbance for other fast-moving vehicles on the road. Certain roads with heavy traffic and limited road space should be forbidden for trishaws completely, while other roads, less heavy in volume, should be closed for certain hours like peak periods in the mornings and evenings. In other places, trishaw lanes can be provided eg. in pedestrian precincts. Tourist demand should be kept in mind as sightseeing tourists find it an attraction to move around in a trishaw.

Reducing the trishaw will generate a demand for a substitute mode of public transport for short-distance travel. The taxi would meet this demand best. The charges on a mile to mile basis will be similar, but service will be much faster.

It is anticipated that the taxi will gain popularity as in other Malaysian towns.

11. 実施プログラム



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11. 実施プログラム

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1.1.1 はじめに

各プロジェクトの実施は、さらに個々の調査によってより具体的に検討されるべきである。

1.1.2 フェーズ

1981～2000年を4つのフェーズに分ける。

1.1.3 コスト配分

1.1.3.1 道路

道路のプロジェクト費用は6.08億ドルと推計される。

1.1.3.2 交差点

44ヶ所の交差点を道路建設等と整合して改良、整備する。

1.1.3.3 駐車規制

駐車規制のプランに従って、CBDの路上駐車台数の推計を行った。

11. IMPLEMENTATION PROGRAM

11.1 Introduction

This chapter describes only the implementation program of major projects based on the short-term and long-term recommendations. Due to the rapid increase of traffic and the insufficient state of the present transport structure, most of the projects should be implemented on a short-term basis. However, due consideration should be given to the feasibility of these projects. The available funds for road expenditure also defines the extent of road network construction at every stage.

Therefore, it is suggested that the implementation program should be re-examined after certain intervals of time as a rooling system.

11.2 Phases

The implementation program is prepared according to the following phases:

Phase 1-A 1981 to mid-1983 ----- Immediate Action Projects.

Phase 1-B mid-1983 to 1985 ----- Short-term projects.

Phase 2 1986 to 1990 ----- Mid-term projects.

Phase 3 1991 to 2000 ----- Long-term projects.

11.3 Cost Allocation of Selected Projects

11.3.1 Highways

According to the highway development recommendation a total length of 188 kms of highway is deemed necessary for improvement and/or construction by the year 2000, of which 102 kms are in Penang Island and 86 kms in Province Wellesley. The construction cost including cost of detailed engineering and supervision is estimated at over M\$ 608 million while in Penang Island M\$ 383 million and in Province Wellesley M\$ 225 million.

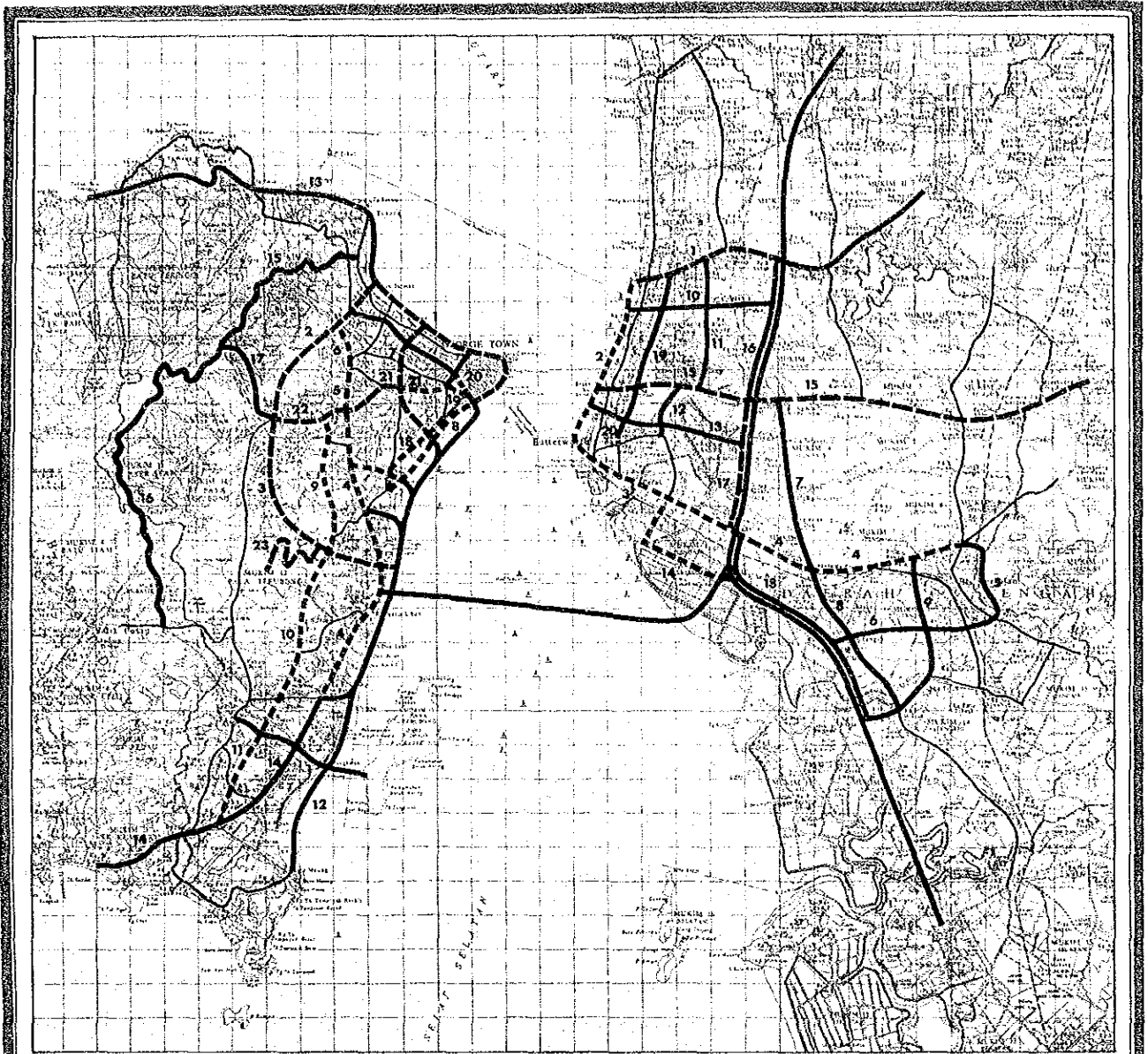


Fig. 11.1 Implementation Program of Roads



- Phase 1 (1981-1985)
- . - . - . Phase 2 (1986-1990)
- Existing Roads
- Phase 3 (1991-2000)



Table 11.1 PHASING PROGRAM OF ROAD IMPROVEMENT (Penang Island)
(In Thousand Dollars at 1979 Prices)

Name of Roads	Detailed Engineer and Construction	Total Project	Phasing			
			1981-Mid-1983	Mid-1983-1985	1986-1990	1991-2000
1. Gurney Drive Extension	3,377	45,588	6,500	14,915	24,173	
2. Outer Ring Road from Bagan Jermal to Ayer Itam	2,241	54,007	1,120	17,629	35,258	
3. Outer Ring Road from Ayer Itam to Green Lane	1,900	53,975		633	33,992	19,350
4. Green Lane from Ayer Itam Road to Roundabout	295	3,980	3,980			
5. Scotland Road from Ayer Itam Road to Western Road	83	2,795	2,795			
6. Western Road from Scotland Road to Gottlieb	88	2,994	2,994			
7. Middle Ring Road (Perak Road, Pangkor Road)	141	1,910		141	1,769	
8. Weld Quay Extension	406	5,486	-	5,486		
9. Pair Route from Ayer Itam to Outer Ring Road	444	11,289				11,289
10. Pair Rote from Outer Ring Road to Dispersal Road	283	7,318				7,318
11. Bayan Lepas Road	366	9,258	9,258			
12. East Coastal Road	469	6,327				6,327
13. North Coast Road from Tanjong Bungah to Batu Feringgi	1,116	29,850			12,638	17,212
14. Penang Island Road from Airport to Telok Kumbar	320	7,540				7,540
15. Penang Hill Road Section 1	404	10,454				10,454
16. Penang Hill Road Section 2	1,050	27,180				27,180
17. Penang Hill Road Section 3	162	4,182				4,182
18. Jelutong Road	25	3,939	3,939			
19. Leboh Mc.Nair	12	2,559	2,559			
20. Maxwell Road	187	7,322	7,322			
21. Dato Keramat-Ayer Itam Road to Ayer Itam Intersection	2,112	30,133	9,629	10,252	10,252	
22. Ayer Itam Road from Ayer Itam	3,832	54,780			54,780	
23. Penang View Road	1,099	21,340			21,340	
Total	20,412	404,206	50,096	49,056	194,202	110,852

Table 11.2 PHASING PROGRAM OF ROAD IMPROVEMENT (Province Wellesley)
(In Thousand Dollars at 1979 Prices)

Name of Roads	Detailed Engineer and Construction	Total Project	Phasing			
			1981-Mid-1983	Mid-1983-1985	1986-1990	1991-2000
1. S. Dua Road from Kg. Bagan Ajam to S. Dua	265	10,080	132	3,316	6,632	
2. West Coastal Road from Kg. Bagan Ajam to New Port	2,712	36,609	12,655	11,977	11,977	
3. West Coastal Road from New Port to intersection at Alor Star - Changkat Jering Highway	1,620	32,675	11,162	10,757	10,756	
4. Federal Route 1 of Intersection at Alor Star - Changkat Jering Highway and Jalan Methopalanipa	442	16,800	8,510	8,290		
5. Ring Road in B. Mertajam from Kg. Uma to P. Jatoh	400	8,575				8,575
6. Ring Road in B. Mertajam from P. Jatoh to Alor Star - Changkat Jering Highway	559	18,544				18,544
7. Permatang Pauh Road from Kg. Sama Gagah to S. Ampat	383	14,560				14,560
8. B. Tengah Road from S. Ampat to Kg. Bukit Minyak	297	11,202				11,202
9. Bukit Minyak Road to Alor Star - Changkat Jering Highway	624	13,377				13,377
10. Jalan Mohamed Saad - Jalan Bagan Lalang	210	3,718				3,718
11. Road from S. Puyu to Mak Mandin	168	3,080				3,080
12. Road from Mak Mandin to Chain Ferry Road	82	1,499				1,499
13. Heng Choon Thiam Extension	172	3,163				3,163
14. Prai Road	264	8,766	8,766			
15. Permatang Pauh Road	508	14,078	508	4,523	9,047	
16. Frontage Road from Kg. Tok Hamid to Kg. Bagan Serai	217	4,533				4,533
17. Frontage Road from Kg. Bagan Serai to Kg. Telok	212	4,420		1,170	3,250	
18. Frontage Road from Prai Industrial Estate to Kg. Tok Kangar	315	6,573				6,573
19. Jalan Raja Uda - Jalan Siram - Jalan S. Nyior	270	8,645				8,645
20. Sg. Nyior, Siram, Raja Uda Roads	165	4,188			4,188	
Total	9,885	225,085	41,733	40,033	45,850	97,469

Table 11.4 PHASING PROGRAM OF INTERSECTION IMPROVEMENT

	Number	Cost of Detailed Engineering and Supervision	Construction Cost	Total Project Costs	Phasing			
					1981 - Mid-1983	Mid - 1983 - 1985	1986 - 1990	1991 - 2000
At-Grade Intersection	33	213	2,661	2,874	1,133	1,568		173
Penang Island	22	142	1,774	1,916	610	1,133	-	173
Province Wellesley	13	71	887	958	523	435	-	-
Grade-Separated Intersection	9	4,641	58,011	62,652	6,761	29,279	19,755	6,857
Penang Island	7	3,609	45,117	48,726	6,761	22,003	13,105	6,857
Province Wellesley	2	1,032	12,894	13,926	-	7,276	6,650	-
Total	44	4,854	60,672	65,606	7,894	30,847	19,755	7,030

11.3.3 Parking Control

The method and procedure of parking control has various alternatives and the actual measures should be decided after careful studies of the local conditions of every city are made. The parking control program proposed by the team shows one of the most common forms of off-street parking prohibition, explained as follows.

The prohibition of off-street parking at:

Phase 1-A : Within 100 feet of busy intersections.

Primary Distributors of C.B.D of George Town.

Phase 1-B : Primary Distributors of C.B.D area of Butterworth,

Bukit Mertajam and other urbanized areas.

District Distributors in C.B.D of George Town except one-ways which allow one side parking.

Phase 2 District Distributor in C.B.D of Butterworth and Bukit Mertajam.

: Local Distributors identified as a busy commercial street.

According to the program, the reduction of the capacity of on-street parking is estimated in the following table.

Table 11.5 ON-STREET PARKING CAPACITY AFTER CONTROL

The C.B.D of George Town

Note: The C.B.D in this table is slightly different from the traffic zones of 111,121 & 131 identified as the C.B.D. in other chapters.

Phase 1-A

* Percentage reduction at Phase 1-A: 24.0%

Zone No.	Before Prohibition in Force	After Prohibition in Force	Less By:
01	3,662	2,739	923
02	1,343	967	376
03	1,830	1,744	86
04	2,286	1,388	898
05	2,393	2,149	244
06	2,112	1,625	487
07	2,506	1,765	741
Total:	16,132	12,377	3,755

Phase 1-B

* Percentage reduction at Phase 1-B: 40%

Zone No.	Before Prohibition in Force	After Prohibition in Force	Less By:
01	2,739	1,717	1,022
02	967	845	122
03	1,744	1,488	256
04	1,388	1,087	301
05	2,149	2,098	51
06	1,625	1,226	399
07	1,765	1,358	407
Total:	12,377	9,819	2,558

Phase

* Percentage reduction at Phase 2: 50%

Zone No.	Before Prohibition in Force	After Prohibition in Force	Less By:
01	1,717	706	1,011
02	845	394	451
03	1,488	1,235	253
04	1,087	1,087	-
05	2,098	2,098	-
06	1,226	1,226	-
07	1,358	1,358	-
Total:	9,819	8,104	1,715

The C.B.D. of Butterworth and Bukit Mertajam

Phase	Butterworth			Bukit Mertajam		
	Before Prohibition	After Prohibition	Percentage reduction	Before Prohibition	After Prohibition	Percentage reduction
Phase 1-A	5570	4810	13.6%	1456	1378	5.4%
Phase 1-B	4810	3684	33.8%	1378	1083	25.0%
Phase 2	3684	1988	64.0%	1083	567	61.0%

As far as the result of this estimation is concerned, off-street parking should be developed in the C.B.D. intensively.

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