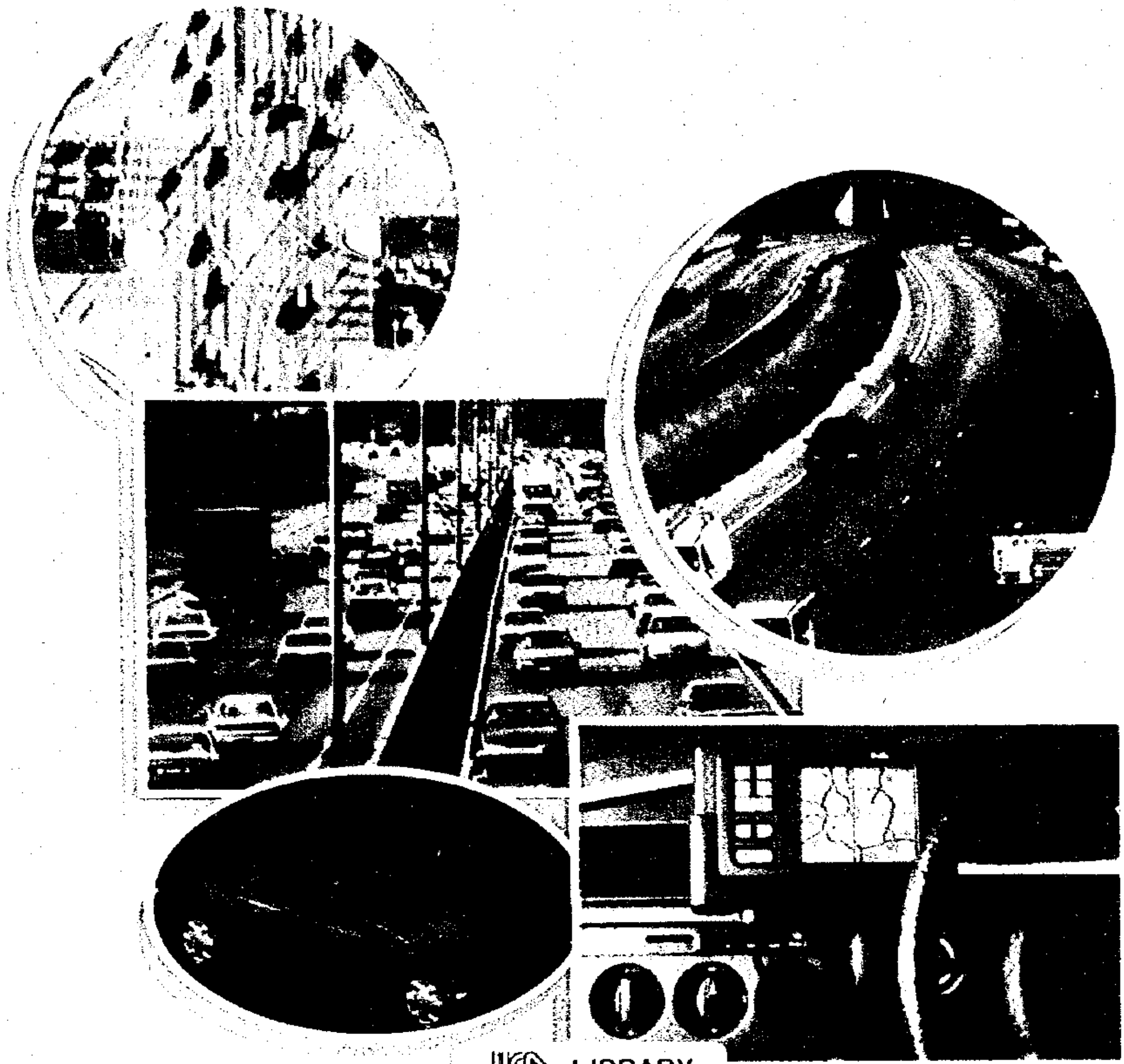
社会開発調査部報告書

Study On Integrated Transport Information Systems (ITIS) In Klang Valley And The MSC In Malaysia
Final Report Summary October 1999



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PREFACE

At the request of the Government of Malaysia, the Government of Japan decided conduct a Study on Integrated Transport Information Systems (ITIS) in Klang Valley and the MSC in Malaysia and entrusted the study to the Japan International Cooperation Agency (JICA).

JICA Malaysia Office selected and engaged a study team headed by Dr. Tai Tuck Leong of Perunding Trafik Klasik Sdn. Bhd. and consisting of an Intelligent Transport System (ITS) Expert Mr. Seiya Matsuoka from Japan and other Telecommunication & Electronics Experts from Malaysia for a period between March 1999 and September 1999.

The Coordinating Committee headed by Dato' Chua Soon Poh, Director-General of Malaysian Highway Authority (MHA), was set up to coordinate, examine and guide the study team from a technical point of view.

In addition, JICA HQ dispatched to Malaysia Mr. Tomokazu Wachi, Pacific Consultants International, and Mr. Shozo Shirasaki, Fukuyama Consultants Co., Ltd., four times between February 1999 and October 1999, who monitored and assisted in the conduct of the study.

The study team held discussions with the officials concerned of the Government of Malaysia, conducted field surveys at the study area, analyzed a lot of relevant data and prepared this final report.

I hope that this report will contribute to the realization of the project and to the enhancement of friendly relationship between our two countries.

Finally, I wish to express my sincere appreciation to the stakeholders concerned from both the private and public sectors in Malaysia for their close cooperation extended to the study.

October 1999

Kazutoshi Iwanami
Resident Representative
Japan International Cooperation Agency
Malaysia Office

October 1999

Resident Representative
Japan International Cooperation Agency
Malaysia Office

Dear Mr. Kazutoshi IWANAMI,

Letter of Transmittal

We are pleased to formally submit herewith the final report on "A Study of Integrated Transport Information Systems (ITIS) in Klang Valley and the MSC in Malaysia".

This report prepares the groundwork and basis for the introduction of an Integrated Transport Information Systems (ITIS) for the Klang Valley and the MSC. A conceptual planning and design of an ITIS is also provided. It includes deliberations on a system architecture, estimate of costs and benefits, implementation schedules and the necessary institutional arrangements.

The successful completion of this project was made possible with the efforts and contributions from many people. And hence we would like to express our sincere gratitude and appreciation to all those people for their kind assistance and co-operation to the Study Team. In particular, officials from the Malaysia Highway Authority, the counterpart agency, have provided us with invaluable assistance.

At the same time, we would also like to acknowledge the kind help from all the officials of your agency, the JICA Technical Advisory Committee and the Embassy of Japan in Malaysia.

We hope the report would be able to contribute substantially to the improvement of urban transport environment in the Klang Valley and the MSC.

Very truly yours,

Dr. Tai Tuck Leong
Team Leader
ITIS Study Team

LIST OF ABBREVIATIONS

		Chapter
MSC	Multimedia Super Corridor	1
ITS	Intelligent Transport System	1
ITIS	Integrated Transport Information System	1
BOT	Build-Operate-Transfer	1
KLCC	Kuala Lumpur City Centre	2
KLIA	Kuala Lumpur International Airport	2
MPSJ	Subang Jaya Municipality in Petaling Jaya	2
IRR	Inner Ring Road	2
MRRI	Middle Ring Road I	2
MRRII	Middle Ring Road II	2
NSCL	North South Central Link	2
LDP	Lebuhraya Damansara Puchong	2
SAE	Shah Alam Expressway	2
NKVE	North Klang Valley Expressway	2
EWL	East-West Link	2
NKBP	North Klang Bypass	2
CPA	Central Planning Area	2
KTM	Keretapi Tanah Melayu	2
STAR	Sistem Transit Aliran Ringan	2
PUTRA	Projek Usahasama Transit Automatik Sdn Bhd	2
PLUS	Projek Lebuhraya Utara Selatan	2
TCS	Traffic Control Signals	3
SCATS	Sydney Coordinated Adaptive Traffic System	3
HDD	Hard Disk Drive	3
CCTV	Closed Circuit Television	3
PTZ	Pan-Tilt-Zoom	3
VMS	Variable Message Signage	3
TMB	Telekom Malaysia Berhad	3
TP	Toll Plaza	3
HQ	Head Quarters	3
EVA	Enhanced Variable Actuation	3
LLM	Malaysian Highway Authority	3
NEP	National Enterprise Privatisation	3
NTP	National Telecommunication Policy	3
UPM	University Putra Malaysia	3
OPP	Outline Perspective Plan	4

		Chapter
HNDP	Highway Network Development Plan	4
AVI	Automatic Vehicle Identification	6
DRGS	Dynamic Route Guidance System	7
UPS	Un-interruptible Power Supply	8
TPM	Technology Park Malaysia	8
GPS	Global Positioning System	8
RM	Malaysian Ringgit	9
SMS	Short Messaging System	10
MDC	Multimedia Development Corporation	11
NITC	National Information Technology Council	11
CCC	City Command Centre	11
PDC	Putrajaya Development Corporation	11
REAM	Road Engineering Association of Malaysia	11

EXECUTIVE SUMMARY

EXECUTIVE SUMMARY

1.0 BACKGROUND

It has become increasingly obvious to urban transport planners that better management of travel demand and the optimal use of existing facilities are some of the crucial measures to take in overcoming traffic-related problems. Development in the field of Intelligent Transport Systems (ITS) in recent years has provided a powerful tool in this endeavour to mitigate traffic congestion on roads, improve transport efficiency, improve traffic safety and the general urban environment. The ability to remotely control and monitor traffic using new technology has presented a new dimension in managing traffic in highly congested and saturated road networks.

The prime objective of ITS is to create a safe, comfortable, efficient, environment-friendly and highly mobile society. ITS integrates human, road and vehicle using the leading edge information and communication technologies. It covers a wide range of systems, which gather and disseminate various road and traffic-related information to road users.

The Malaysian Government recognises the necessity of ITS, particularly the role of transport information, to achieve an effective and optimal utilisation of road infrastructure in the metropolitan area. Mid-term Review of the Seventh Malaysia Plan 1996 – 2000 endorses this recognition and stipulates that "Intelligent Transport Systems (ITS), which involve the deployment of advanced electronics, communications and IT for monitoring, tracking and real-time information on traffic flows and volumes, will be used on a wider scale." Under such circumstances, the Malaysian Government requested the Japanese Government to conduct a study on the Integrated Transport Information System (ITIS) in Klang Valley and Multimedia Super Corridor (MSC).

The Japanese Government accepted the request and Japan International Co-operation Agency (JICA) the official agency responsible for the implementation of the technical co-operation program of the Government of Japan is to undertake the study. A local consultant was subsequently engaged by JICA to carry out the work. The study officially started on 22nd of March 1999 and was completed after six (6) months on 21st September 1999.

2.0 OBJECTIVES OF THE STUDY

The objectives of the study, as stipulated in the Terms of Reference, are as follows:

- To provide assistance for Malaysia to go into the Information Technology Society in the field of transportation which is believed to ensure the betterment of quality of life;
- To obtain necessary data and information for the introduction of the Integrated Transportation Information System (hereinafter referred to as "ITIS"); and
- To formulate a guideline on the Integrated Transport Information System in Klang Valley, which will contribute to solve the traffic woes in the region.

The Study area covers the whole Klang Valley region and Multimedia Super Corridor.

3.0 INTEGRATED TRANSPORT INFORMATION SYSTEMS (ITIS) AND INTELLIGENT TRANSPORT SYSTEM (ITS)

3.1 ITS And ITIS

Intelligent Transport System (ITS) may be defined as a transport system in which human, vehicle, road and transport facilities are dynamically integrated for the purpose of achieving a safe, efficient, comfortable and environmentally sound transportation system.

Integrated Transport Information System (ITIS) is a subset of ITS. It focuses more on the use of information in road traffic. The system collects, processes and disseminates information related to road traffic for road users and road administrators in a comprehensive and timely manner to promote safe and efficient road traffic. This relationship between ITS and ITIS is shown in *Figure ES1.0*.

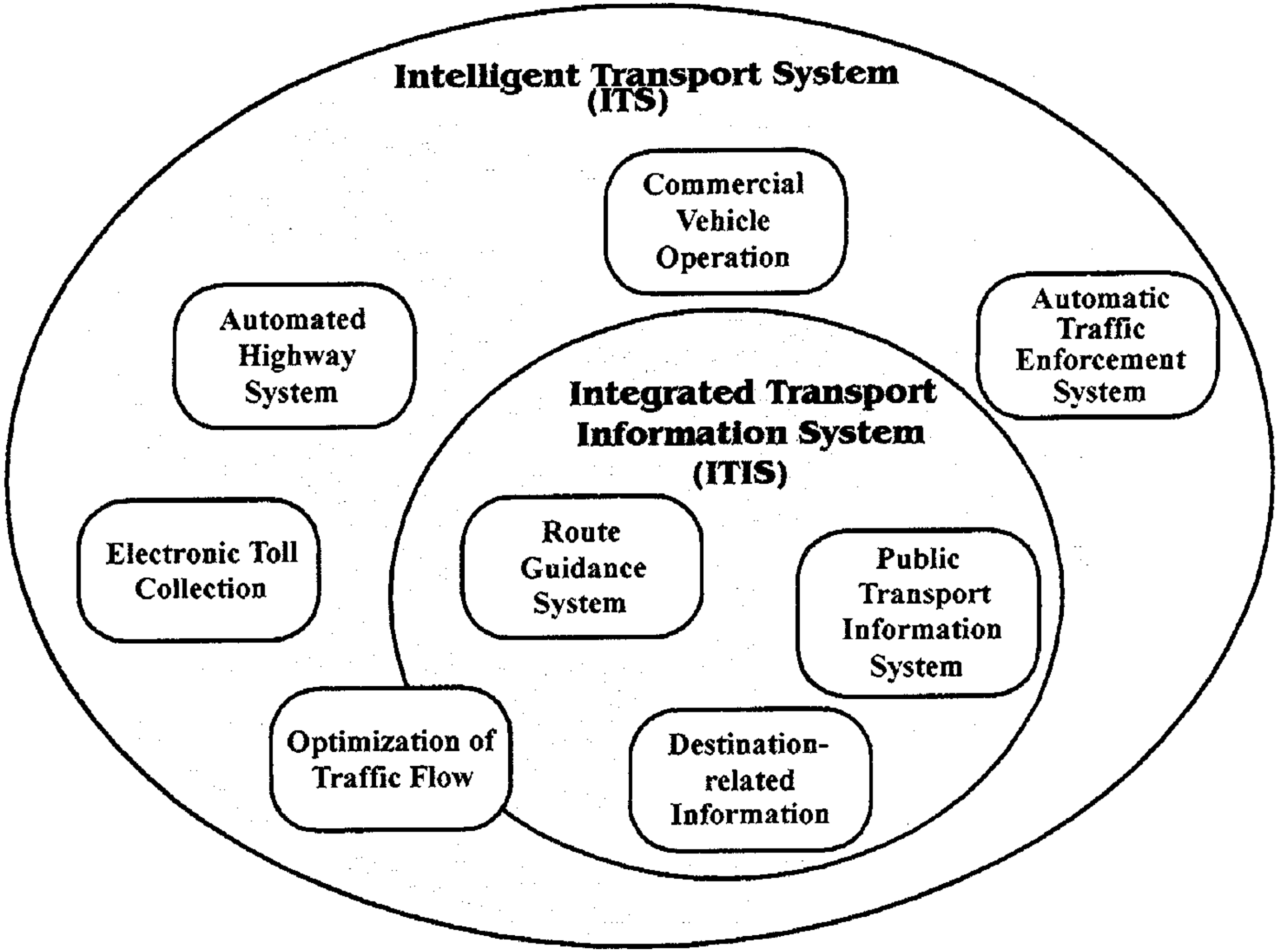


FIGURE ES1.0 : RELATIONSHIP BETWEEN ITS, ITIS AND USER SERVICE

3.2 Necessity of ITIS

The current traffic situation in the Study Area suggests great potential for the deployment of ITIS to optimise the utilisation of existing road transport infrastructure and the SMURT-KL Study conducted in 1998 lends support to its need.

According to the opinion survey conducted in this Study, more than 60% of the drivers interviewed regard various traffic information as important to them. Among the information, 'severity of congestion', 'route guidance' and 'cause of congestion' ranked highest and the percentage of respondents who consider these kinds of information very important or important, are 96%, 89% and 83%, respectively.

According to the same opinion survey, an overwhelming 94% of drivers responded that they would take alternative routes if information on traffic congestion were provided to them.

The collective loss time of all drivers could be very substantial and the nation's productivity is thus seriously affected by traffic problems. ITIS can contribute significantly in mitigating CO_2 emissions thereby preserving the environment.

3.3 Selection ITIS Services in the Study Area

Eight (8) ITIS user services were selected for further examination for purposes of introducing them to the Klang Valley and the MSC:

- Pre-trip traveller information system
- En-route driver information system
- Traveller services information system
- Route guidance system
- Parking availability information system
- Environmental monitoring system
- Emergency vehicle management system
- Public transportation information system

The factors in the prioritising of user services are as follows:

- Need for user service
- Beneficiary and potential amount of benefits
- Information availability
- Technology used
- Ease of implementation

Each user service is rated according to the evaluation criterion. The priority is finally classified into four groups, A through D, where A has the highest priority whilst D has the lowest. See Table 3.1.

Pre-trip traveller information and en-route driver information systems belong to Group A. They are highly needed, produce large benefit and are relatively simple to implement. Their immediate introduction is recommended.

Route guidance system, parking guidance system and public transport information system are rated as Group B. They have high demand and large to medium benefits. Although data collection for route guidance system is a complex task, data already collected for the pre-trip traveller information and en-route driver information systems can provide a strong foundation for establishing a route guidance system. For this reason, route guidance system is considered as an expansion of the pre-trip traveller and en-route driver systems and can be introduced one or two years later.

Table 3.1 Priority Ranking of User Services

	User Services	Needs	Benefits	Information availability	Technology	Implementation	Overall Priority
1	Pre-trip traveller information system	Large (3)	Large (3)	Moderate (2)	Moderate (2)	Simple (3)	A (13)
2	En-route driver information system	Large (3)	Large (3)	Moderate (2)	Moderate (2)	Simple (3)	A (13)
3	Traveller service information system	Small (1)	Small (1)	Moderate (2)	Moderate (2)	Moderate (2)	D (8)
4	Route guidance system	Large (3)	Large (3)	Complex (1)	Advanced (3)	Complex (1)	B (11)
5	Parking guidance system	Large (3)	Medium (2)	Simple (3)	Conventional (1)	Simple (3)	B (12)
6	Environmental monitoring system	Medium (2)	Small (1)	Simple (3)	Moderate (2)	Moderate (2)	C (10)
7	Emergency vehicle management system	Medium (2)	Small (1)	Moderate (2)	Advanced (3)	Moderate (2)	C (10)
8	Public transportation information system	Large (3)	Medium (2)	Moderate (2)	Advanced (3)	Moderate (2)	B (12)

Note : numbers in () are scores

4.0 ROAD USERS AWARENESS AND OPINIONS ON ITIS

The opinion surveys were conducted at a variety of land uses at various locations. The locations selected to conduct these surveys include Kuala Lumpur city centre, Petaling Jaya, Klang, Shah Alam, Subang Jaya and Gombak.

In total, more than 800 forms were distributed, following which a return of approx. 560 forms was achieved.

For private vehicle users, the overwhelming majority of those interviewed considered congestion or route guidance information as very important or important, followed by estimated journey time and parking information.

Between 30% to 40% of those interviewed are willing to pay for the items of such traffic information. This is considered to be an encouraging response, as many of them have had little or no direct experience on the workings of this Integrated Traffic Information System.

For public transport users, it is clear that the general public in the Klang Valley area is very interested in traffic information, in particular in traffic congestion and route choice information for private vehicle users, and in bus route information for public transport users. More than 90% of those surveyed considered the above-mentioned information as important or very important.

5.0 CONCEPTUAL PLANNING AND DESIGN OF AN ITIS IN KLANG VALLEY

5.1 Pre-Trip Traveller And En-Route Driver Information Systems

The Integrated Traffic Information System, which offers pre-trip traveller information and en-route driver information, will be installed to the study area in two phases, Phase 1 system and Phase 2 system, in terms of system functions and coverage area. The functions of Phase 1 and Phase 2 system are summarised in Table 5.1. Conceptual system configuration of the traffic information system at the final stage is presented in *Figure ES2.0.*

It is expected that in Year 2003 the Phase 1 system becomes operational, while the Phase 2 system in Year 2006.

Table 5.1 System Functions

	Phase 1	Phase 2
Concept	Basic traffic information system	Advanced in-vehicle traffic information system
Information collection	**Objective** • Monitor traffic flow/condition • Detect Incidents/queues • Estimate travel times along selected routes • Exchange data with other systems	**Objective (additional)** • Compute travel time • Estimate travel time for car navigation service
	Location • All toll roads and highways • Frequent congestion/queue and bottleneck road section/spots • High traffic volume road sections on arterial and major distributors	**Location (additional)** • Other arterial and distributor roads within the study area
	Equipment • Vehicle detector (ultrasonic and inductive loop) • TV camera	**Equipment** • AVI detector • Additional detector • Additional TV camera
Information processing	**Information to be processed and compiled :** • Congestion levels • Queue length • Incident • Travel time • Other information manually collected and input (accident, roadwork, regulation, events, etc.) • Processing of data obtained from other systems	**Information to be processed and compiled :** • Enhancement of coverage area and accuracy of information processed in Phase 1 • Link travel time for car navigation
Information dissemination	**Information to be disseminated :** • Congestion levels • Incident • Travel time • Manually input information	**Additional information to be disseminated :** • Travel time for car navigation
	Equipment for pre-trip • Radio broadcasting • Telephone inquiry • Internet • Cable TV	
	Equipment for en-route • Variable message sign • Graphic display panel • Travel time display • Highway radio	**Equipment for en-route** • FM sub-carrier broadcasting

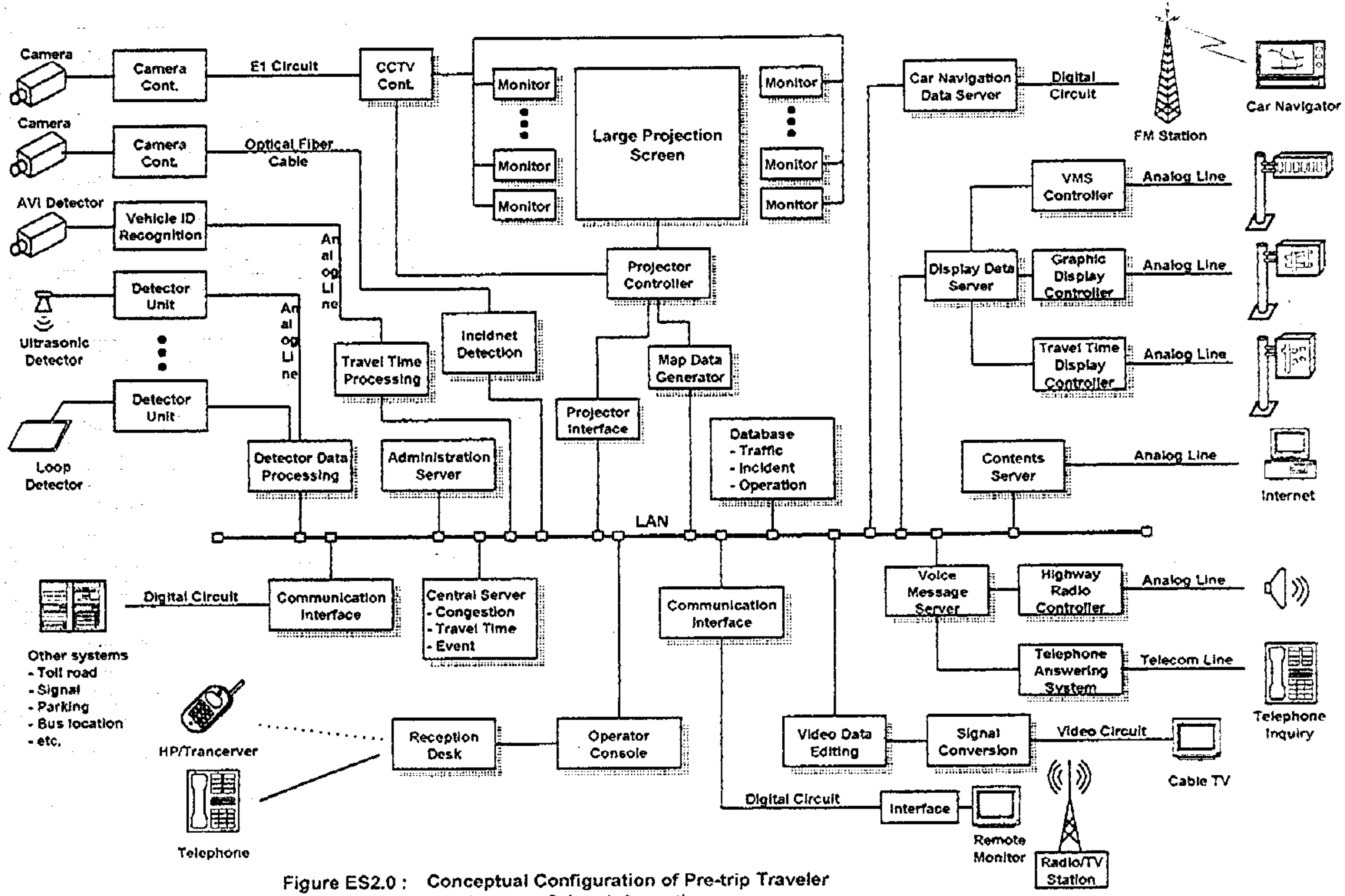


Figure ES2.0 : Conceptual Configuration of Pre-trip Traveler and En-route Driver Information

The proposed system will cover the Klang Valley and the Multimedia Super Corridor with a lesser number of links included in Phase 1. In Phase 1, traffic condition data will be gathered at all the toll roads and highways such as Federal Highway II in the study area, and arterial roads mostly within Kuala Lumpur and Petaling Jaya. Phase 1 will therefore covers a total of 564.2km of roads, out of which 290.8km are highways. In Phase 2, links will be added which include newly opened toll roads and highways, if any, and more arterial and distributor roads in the study area. Phase 2 will cover another 414.4km of road. Table 5.2 shows the road network and their breakdown by categories for Phase 1 and 2. *Figure ES3.0* shows the road network selected for ITIS deployment.

Table 5.2 Details of Road Network

		Phase 1	Phase 2	Total
Network	No. of road sections	260	143	403
	No. of links	520	286	806
Distance by road type	Total (km)	564.2	414.4	978.6
	Highway	290.8	69.6	360.4
	Arterial	180.8	55.9	236.7
	Distributor	92.6	288.9	381.5
By Toll & Non-Toll	Toll (km)	276.5	59.7	336.2
	Non-toll	287.7	354.7	642.4
By Traffic volume	Heavy volume (km)	332.7	112.4	445.1
	Medium/light volume	231.5	302.0	544.5

The ITIS Centre is a nucleus of the proposed integrated traffic information system where data are gathered and processed, communications directed, decisions made, information and instruction issued and traffic and operation data stored.

In this study, the location of the ITIS centre is set at Technology Park Malaysia (TPM) in Bukit Jalil for the basic design purpose. The proposed TPM site has the advantages of being centrally located within the coverage network, within the MSC corridor to enjoy MSC status and in the hub of high technology research activities in Malaysia.

5.3 Parking Guidance System

Parking guidance system is intended to provide parking availability information to the drivers looking for a parking space so that driver can save the time spent in searching for a vacant parking slot. Parking lot availability can be expressed in two levels. At a macro level, availability is expressed as the number of remaining parking lots, while at a micro level, location of vacant lot is identified.

Table 5.3 Function of Parking Guidance System

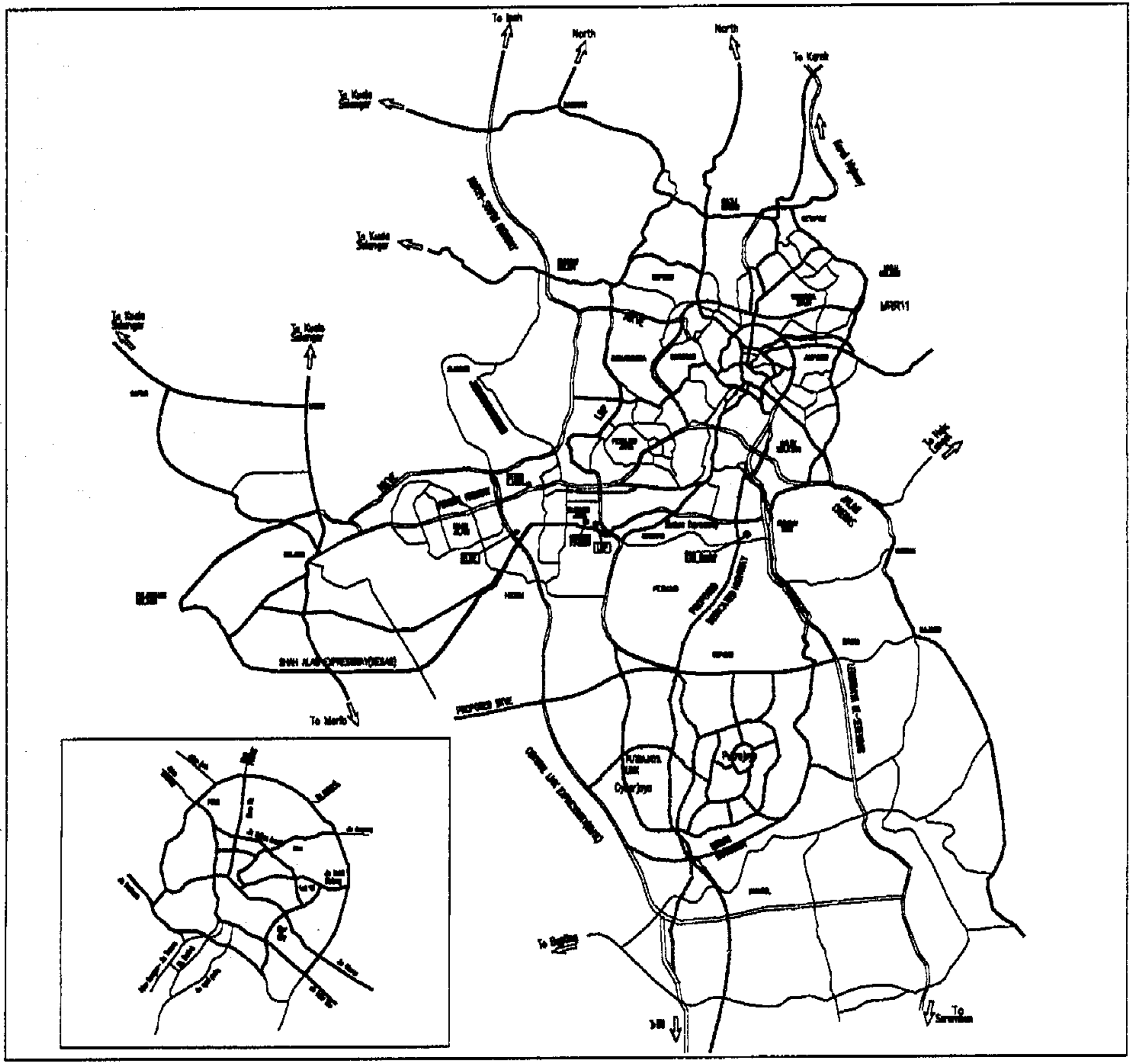
Sub-system	Function
Information collection	• Collects information on - Open/close status of parking area - Number of parking lots available
Information processing	• Determines display contents • Monitors the operation of the equipment comprising the system • Exchanges information with ITIS Centre • Logging of system operation
Information dissemination	• Displays on signboard - Open/close status of parking area - Number of parking lots available

5.4 Public Transport Information System

Public transport information system is useful to both bus users and bus operators. For bus passengers waiting at bus stop, bus location information provides approximate waiting time until the next bus arrives thus relieves the user's stress of uncertainty.

Table 5.4 Function of Public Transport Information System

Sub-system	Function
Information collection	• Collects information on - Bus ID, route number, status - Geographical location data
Information processing	• Determines bus location along the route • Prepares display data on the signboard • Monitors the operation of the equipment comprising the system • Exchanges with ITIS Centre • Logging of system operation
Information dissemination	• Displays on the signboard at bus stop - Location of bus for the requested route - Bus routes and their destinations/timetables



A Study on Integrated Transport Information System (ITIS) in Klang Valley And The MSC in Malaysia

Figure : ES3.0

Phase 2 Road Network

LEGEND :

- EXPRESSWAY/HIGHWAY
- MAJOR ARTERIALS
- MAJOR DISTRIBUTORS
- FUTURE ROADS

Scale : 0 5 10km

N

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6.0 PRELIMINARY DESIGN FOR PRE-TRIP TRAVELER AND EN-ROUTE DRIVER INFORMATION SYSTEMS

6.1 System Architecture & Functional Subsystems

The proposed integrated traffic information system which offers two main user services of pre-trip traveller information and en-route driver information systems, consists of three functional subsystems, namely information collection, information processing and information dissemination subsystems. The system architecture is shown in *Figure ES4.0.*

Traffic congestion, incidents, construction work, temporary regulation, and other information that affect the traffic flow will be collected both automatically and manually.

Information processing system at the ITIS Centre will be a computer network, in which several computers and other devices are inter-connected through a local area network (LAN).

A real-time database will be established in the control centre system. The database must be capable of coping with the requirements of the on-line real-time traffic information system and operating without manual intervention or periodic shutdown. The database will collect and store the following data:

- Traffic information
- Incident information
- System administration

Information is disseminated to drivers and potential road users through various means.

The proposed ITIS network will utilise a mix of digital and analogue leased circuits from telecommunication operators. Use of the existing transmission system facilities owned by the toll road operator and installing self-owned cable network may be exploited to find out the most suitable transmission system. In this basic design, however, leased line in a star network is assumed for simplicity and time constraint.

6.2 Cost Estimates & Expected Benefits

Cost of the proposed integrated traffic information system project is estimated by examining the costs for three different components of the project; namely engineering services, system construction, and operation and maintenance. It must be noted that the project cost presented here is only a rough estimate meant to be an indication on the size of project. The estimated costs are shown below:

Table 6.1 Cost Summary

	Phase 1 (RM Million)	Phase 2 (RM Million)
Engineering service	26.7	15.9
System construction	460.4	282.8
Annual operation and maintenance	21.7	28.0

The proposed integrated traffic information system in Klang Valley and MSC can be expected to produce significant benefits. Among them, time saving brought about by the efficient use of the existing road network will be the biggest benefit. Other benefits include improved traffic safety, reduced adverse environmental impacts by traffic, and enhanced comfort and reliability in vehicular travel.

An attempt is made to estimate the amount of direct benefits to road users due to improved efficiency. Only savings in vehicle operating costs and travel time costs of drivers and passengers, which can be expressed in monetary terms, are considered in this report. The amount of benefits for the first ten years is shown in Table 6.2.

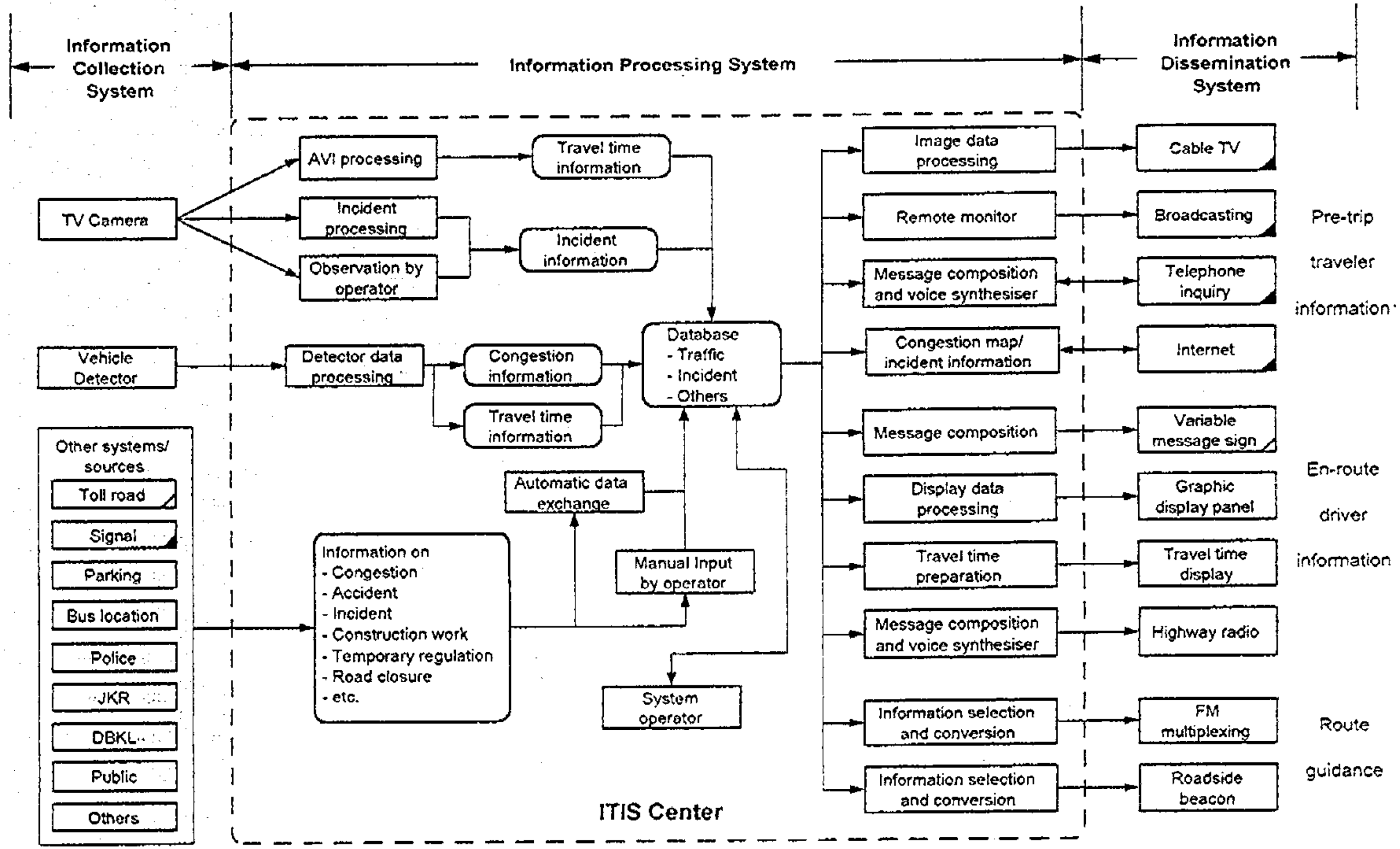

Figure ES4.0 : System Architecture of Pre-trip Traveler Information and En-route Driver Information Systems

Table 6.2 **Annual Benefit by Travel Time Savings**

Year	Benefit from Travel Time Saving		Total Benefits (RM – Million)
	Benefits by saving in travel time cost (RM - Million)	Benefits by saving in car operating cost (RM - Million)	
0	36.92	19.52	56.44
1	82.70	43.73	126.43
2	90.97	48.11	139.08
3	138.49	73.24	211.73
4	163.98	86.72	250.70
5	193.60	102.39	295.99
6	228.30	120.73	349.03
7	265.96	140.65	406.61
8	306.00	161.83	467.83
9	345.46	182.70	528.16
10	385.47	203.85	589.32
Total	**2,237.86**	**1,183.48**	**3,421.33**

Based on the estimated cost of engineering service, system construction, operation and maintenance, the amount of benefits shown above, and project implementation schedule presented in the next section, an economic internal rate of return of the project is calculated at 14.1% assuming the annual discount rate of 12%.

7.0 THE FUTURE AHEAD

7.1 Rationale For The Setting Up Of A Malaysia Traffic Information Authority

The implementation and operation of a successful ITIS involves many key industries notably the transport sector, telecommunication, broadcasting and so on. It also requires the active roles from both the public and private sectors. An administrative body is proposed for the implementation of ITIS in Malaysia with the following considerations.

1. The proposed ITIS will generate a large amount of social benefits that are difficult to quantify and collect from the beneficiaries. The Project should therefore be viewed as an important social infrastructure investment by the Government of Malaysia and thus should be implemented by the Government. It is not appropriate to be privatised as these information are of national security interests to the government and social in nature;
2. Many government agencies will be involved in regulating the various aspects of the ITS industry and an advisory committee or council make up of representatives from these various ministries or agencies to oversee the implementation should be formed to ensure consensus and compliance of various sector's requirements or regulations,
3. There are various existing systems operated by different organisations both public and private, that need to be integrated into the ITIS,
4. There is a need to have a single authority to facilitate the standardisation and integration of all traffic information gathering, processing and dissemination practice and procedure in the study area.
5. With the ITS industry still in its infant development stage in most of the countries in the region, there is a great opportunity for Malaysia to encourage home-grown ITS related industries through the implementation of the ITIS Project. Locally developed ITS technology may be exported to neighbouring countries in the near future.

An independent quasi-government agency, similar to agencies like the MHA, and tentatively called the Malaysia Traffic Information Authority (MTIA) should be formed to implement the ITIS Project, and to operate and manage the ITIS centres.

MTIA shall be a single agency that implements, manages and operates the ITIS and will eventually implement and manage the future car navigation system as well. The MTIA may be headed by a Director General to be appointed by the Government and who shall work closely with a council or steering committee. The council or steering committee shall be made up of representatives from the relevant agencies as shown in *FigureES5.0*.

Under this top management will be several divisions headed by technical directors. These may include Operation (system operation and ITIS centre), Planning, and Research & Development Divisions. To further strengthen the administration of MTIA, it could include the direct participation of other quasi government bodies like MHA, MIMOS and the MDC which are experienced traffic or IT related entities. The MTIA should also set up regional centres in the northern and southern regions of Peninsular Malaysia to facilitate information gathering and dissemination on a nation wide scale.

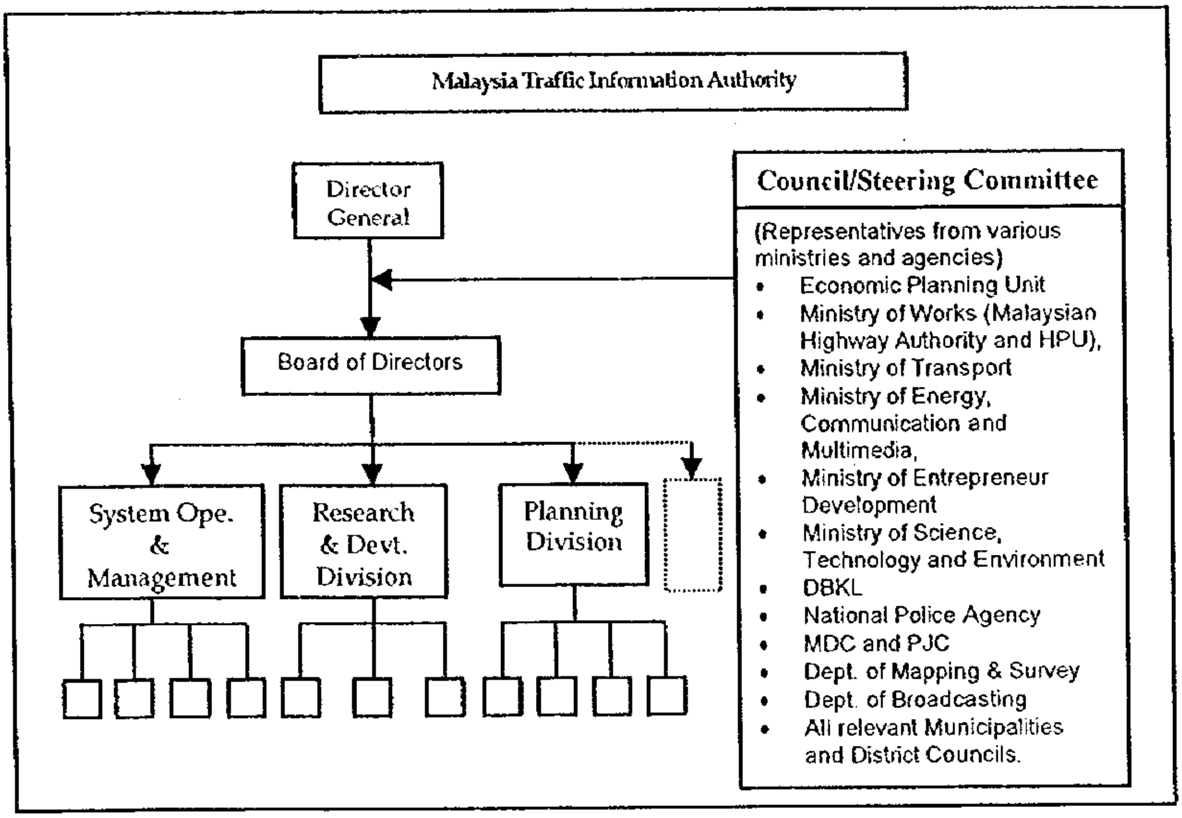

Figure ES5.0 : Proposed Administrative Set-up for MTIA

The specific roles and functions of MTIA shall therefore include:

- To implement the ITIS Project in the Klang Valley,
- To operate, manage and maintain the ITIS system,
- To facilitate the exchange of information between ITIS centre with those of the existing systems,
- To develop standard specifications, procedures and protocols to ensure interoperability among systems,
- To expand the system to other regions of the country, and
- To promote the research and development of ITS related industries in the country.

7.2 Implementation Program

A tentative schedule of project implementation is shown in *Figure ES6.0* assuming that the project is to be implemented in a shortest time. In order to realise the system, fund must be secured first of all. One of the possible fund sources is Yen credit loan offered by Japanese Government through Japan Bank for International Cooperation (JBIC, formerly Overseas Economic Cooperation Fund, OECF). The duration for this activity is difficult to estimate but it is expected that six to eight months are necessary. Then a consultant team will be selected to undertake the detailed design and tender preparation. The construction of the system itself is expected to take one and half year after the commencement of the work. If the project is initiated before the end of year 1999, the system will become operational in the middle of year 2003, about three and half years after the start.

The activities for Phase 2 system must start while the Phase 1 system is still under construction for the second phase system to be operational in 2006. The same process as Phase 1 system will be taken with shorter duration due to the less amount of work involved in Phase 2. It is pointed out, however, that new technology of car navigation system will be installed in Phase 2.

In the meantime, the Malaysian Traffic Information Authority proposed above will be established to manage the system and ITIS building will be constructed where all the central equipment will be placed.

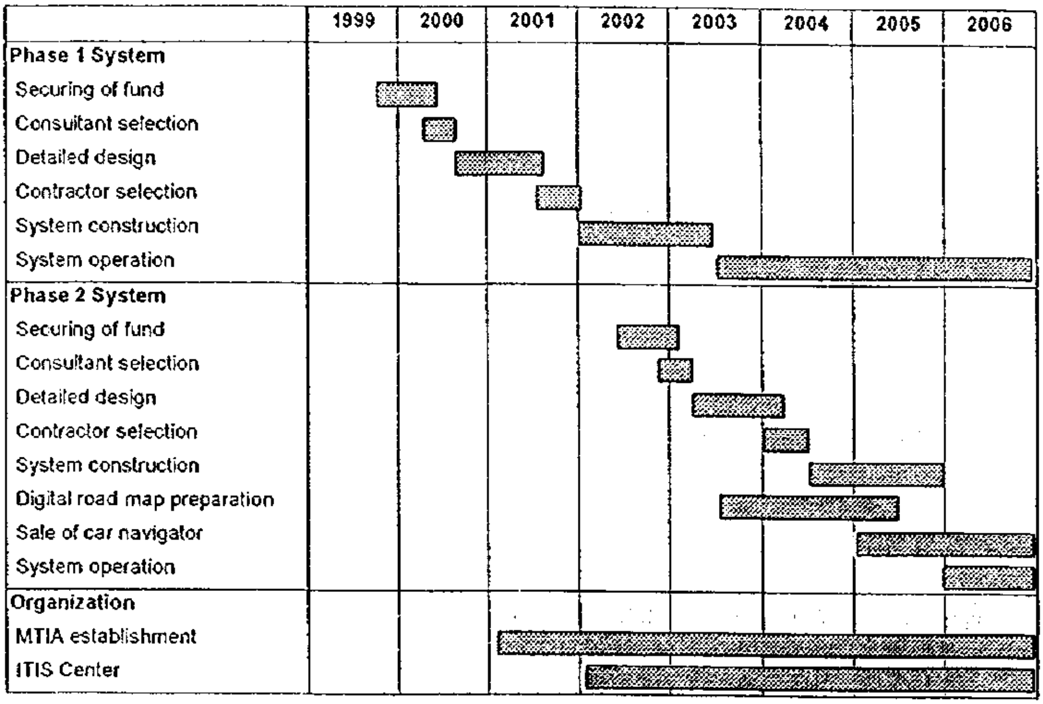

Figure ES6.0 : Implementation Schedule

7.3 Conclusion

Intelligent Transportation System (ITS) is gaining momentum in many developed countries in Europe, USA and Japan. There is a common understanding among these countries that ITS is one of the key technologies in the next millennium and without this technology, a country cannot survive in a severe international competition. It is hoped that with the good IT infrastructure already in place in Klang Valley and MSC, Malaysia would embark on the deployment of ITS now to help attain the vision of becoming a developed country in the year 2020.

PARTICIPANTS OF THE STUDY

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The Government of Malaysia

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INTRODUCTION

1.0 INTRODUCTION

1.1 Background of the Study

The progress of motorization has significantly increased people's mobility and benefited many in obtaining accesses to health, education and other services. On the other hand, however, deterioration in the urban living environment, traffic accidents, pollution, congestion are estimated to have incurred huge losses to cities in the range of billions of Malaysian Ringgits annually.

It has become increasingly obvious to urban transport planners that better management of travel demand and the optimal use of existing facilities are some of the crucial measures to take in overcoming these problems. Development in the field of Intelligent Transport Systems (ITS) in recent years has provided a powerful tool in this endeavour to mitigate traffic congestion on roads, improve transport efficiency, improve traffic safety and the general urban environment. The ability to remotely control and monitor traffic using new technology has presented a new dimension in managing traffic in highly congested and saturated road networks.

The prime objective of ITS is to create a safe, comfortable, efficient, environment-friendly and highly mobile society. ITS integrates human, road and vehicle using the leading edge information and communication technologies. It covers a wide range of systems, which gather and disseminate various road and traffic-related information to road users.

The Malaysian Government recognises the necessity of ITS, particularly the role of transport information, to achieve an effective and optimal utilisation of road infrastructure in the metropolitan area. Mid-term Review of the Seventh Malaysia Plan 1996 - 2000 endorses this recognition and stipulates that "Intelligent Transport Systems (ITS), which involve the deployment of advanced electronics, communications and IT for monitoring, tracking and real-time information on traffic flows and volumes, will be used on a wider scale." Under such circumstances, the Malaysian Government requested the Japanese Government to conduct a study on the Integrated Transport Information System (ITIS) in Klang Valley and Multimedia Super Corridor (MSC).

The Japanese Government accepted the request and Japan International Co-operation Agency (JICA) the official agency responsible for the implementation of the technical co-operation program of the Government of Japan is to undertake the study. A local consultant was subsequently retained by JICA to carry out the work. The study officially started on 22nd of March 1999 and was completed after six (6) months on 21st September 1999. This Final Report contains all the findings and outputs of the Study.

1.2 Objectives of the Study

The objectives of the study, as stipulated in the Terms of Reference, are as follows:

- To provide assistance for Malaysia to go into the Information Technology Society in the field of transportation which is believed to ensure the betterment of quality of life;
- To obtain necessary data and information for the introduction of the Integrated Transportation Information System (hereinafter referred to as "ITIS"); and
- To formulate a guideline on the Integrated Transport Information System in Klang Valley, which will contribute to solve the traffic woes in the region.

The Study area covers the whole Klang Valley region and Multimedia Super Corridor.

1.3 ITS And ITIS

Intelligent Transport System (ITS) may be defined as a transport system in which human, vehicle, road and transport facilities are dynamically integrated for the purpose of achieving a safe, efficient, comfortable and environmentally sound transportation system.

ITS introduces a new dimension backed up by new technologies to transportation system. It applies recent developments in electronic sensor, communication, and data processing technologies to transportation system to make it more intelligent, reliable and systematic. More and accurate traffic information can be given in real time through various ITS systems and devices to drivers who received almost no information in the past. Driving vehicle is made safer with additional built-in sensors that help avoid collision. Road network can be utilised more efficiently and vehicle operation can be improved, as more data are available to road administrator and vehicle operator.

Integrated Transport Information System (ITIS) is a subset of ITS. It focuses more on the use of information in road traffic. The system collects, processes and disseminates information related to road traffic for road users and road administrators in a comprehensive and timely manner to promote safe and efficient road traffic. This relationship between ITS and ITIS is shown in *Figure 1.1*.

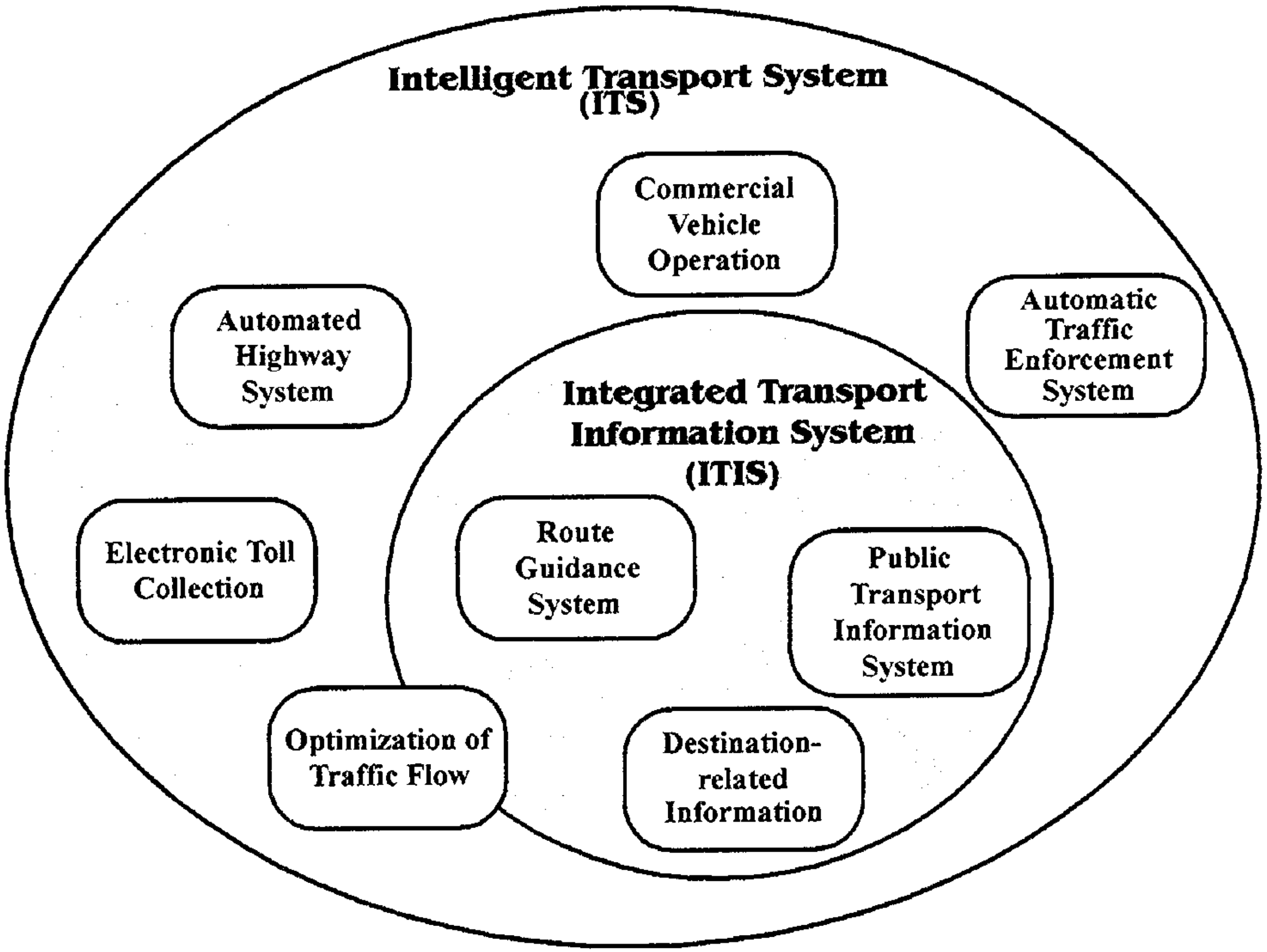


FIGURE 1.1 :RELATIONSHIP BETWEEN ITS, ITIS AND USER SERVICE

Whatever the information an ITIS handles, the process normally consists of the followings four (4) components or steps:

- Data collection (using vehicle detector, automatic vehicle identification sensor, TV camera, etc.);
- Data processing (compilation, computation, identification of congestion and incident, information selection, message editing);
- Information dissemination (through variable message sign, graphic display panel, broadcasting, highway radio, navigation system, information terminal, Internet, telephone, etc.);
- Data communication between centre and roadside equipment (voice, data, video signal over conventional and optical fibre cable in either analogue or digital form), and between roadside equipment and vehicle using wireless communication method.

2

CURRENT ROAD TRAFFIC AND PUBLIC TRANSPORT CONDITIONS

2.0 CURRENT ROAD TRAFFIC AND PUBLIC TRANSPORT CONDITIONS

2.1 Present Traffic Demand On Road Network

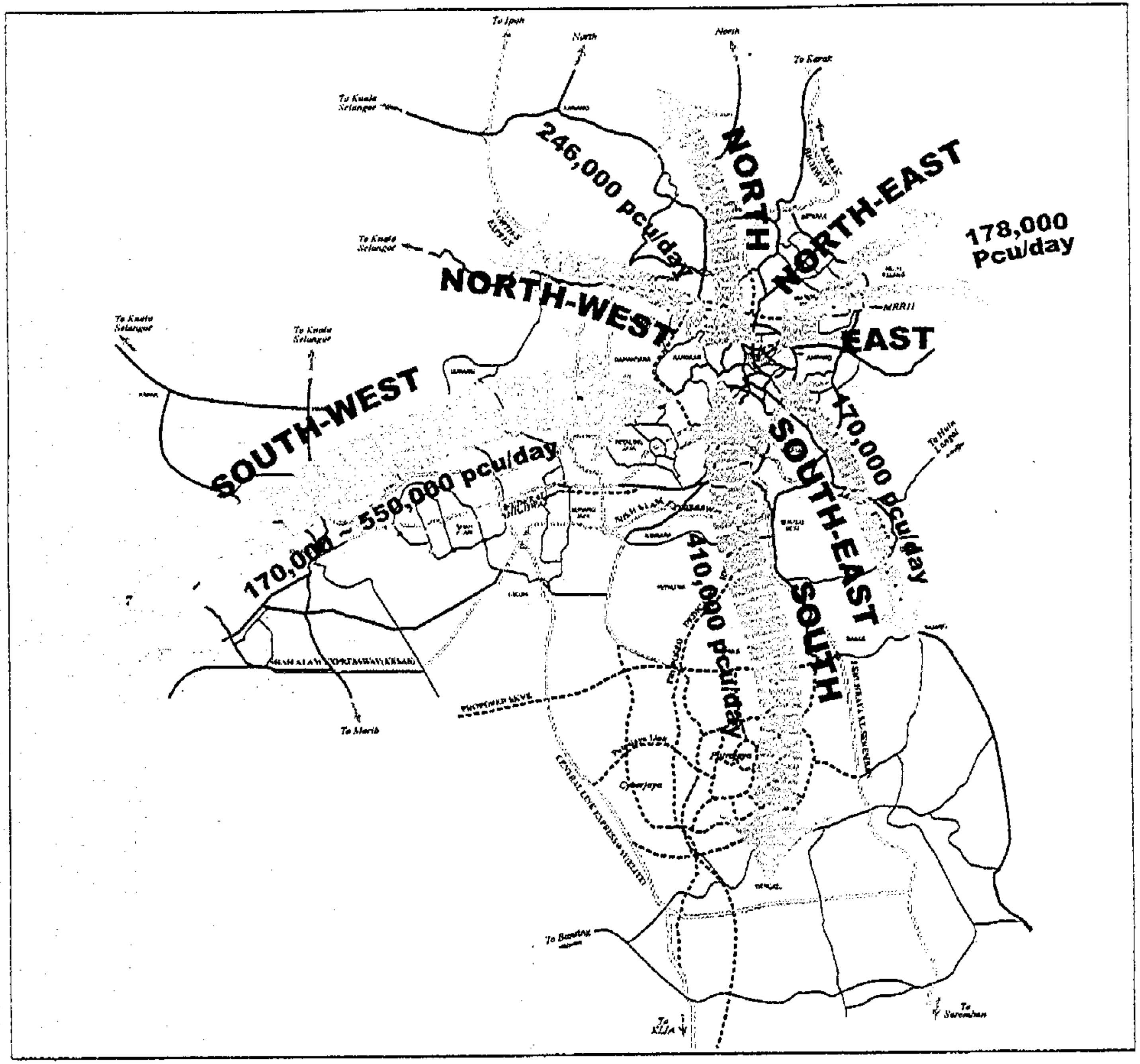
The Federal Highway by far carries one of the highest traffic volume everyday compared to most other routes in the study area. The Federal Highway in fact is said to be the backbone of total travel along the east-west axis in the Klang Valley. Section of this highway was reported to carry more than 220,000pcu/day (SMURT, 1997). Similarly, Jalan Damansara was also reported to carry more than 200,000pcu/day. The NKVE is estimated to have about 75,000pcu/day based on the screen line traffic counting survey results. The Southwest corridor thus is estimated to have a cross-sectional daily traffic demand of more than 550,000pcu/day when taking into account traffic volume on the SAE and Jalan Kelang Lama.

Traffic demand on the KL-Seremban Expressway was also reported to have exceeded 220,000pcu/day. Jalan Sg. Besi has a daily traffic demand of 120,000pcu/day. Traffic on the other major roads in the southern corridor, the NSCL (Elite) Highway and Puchong-Klang Lama Road, were observed to have a peak hour traffic of 3,100pcu/hr and 2,700pcu/hr respectively (screen line traffic count survey). Traffic on these roads is still low because the two new centres of Putrajaya and Cyberjaya are still under construction. These volumes may be expanded to be about 39,000pcu/day and 33,000pcu/day respectively. The southern corridor would therefore have a cross-sectional traffic demand of about 412,000pcu/day.

Jalan Cheras was reported to have 117,000pcu/day in SMURT. The EWL is reported to have a traffic demand of about 60,000pcu/day. This southeast corridor thus would have a total of some 170,000pcu/day.

Jalan Kepong was reported in SMURT to have a traffic volume of 100,300pcu/day. From the screenline traffic count survey, Jalan Ipoh and Jalan Lang Emas are estimated to have a daily traffic volume of about 97,000pcu/day and 48,000pcu/day, respectively. The northwest and north corridors thus would have a total traffic demand of about 246,000pcu/day.

Jalan Ampang and Jalan Pahang were reported to have daily traffic volumes of 97,000pcu/day and 47,000pcu/day respectively. Jalan Sentul is estimated to have 34,000pcu/day, based on the screenline traffic count results. The east and northeast corridor thus would have a total demand of about 178,000pcu/day. These volumes are illustrated in *Figure 2.1*.



A Study On Intergrated Transport Information System (ITIS) in Klang Valley And The MSC in Malaysia

Figure : 2.1

THE MAJOR TRAVEL CORRIDORS & TRAFFIC DEMAND

LEGEND :

EXPRESSWAY/HIGHWAY
MAJOR ARTERIALS
MAJOR DISTRIBUTORS
FUTURE ROADS

0 5 10km
Scale :

N

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Table 2.1 Traffic Demand on the Major Travel Corridors

No.	Corridor	Major Routes	Daily Traffic Demand	Total Demand
1	Southwest	• Federal Highway • Jln.Damansara • NKVE • SAE & J.K.Lama	220,000pcu/day 200,000pcu/day 75,000pcu/day 55,000pcu/day	550,000pcu/day
2	South	• KL Seremban Exp. • Jln.Sg.Besi • NSCL • Jln Puchong	220,000pcu/day 120,000pcu/day 39,000pcu/day 33,000pcu/day	412,000pcu/day
3	Southwest	• Jln.Cheras • EWL	117,000pcu/day 60,000pcu/day	170,000pcu/day
4	North & Northwest	• Jln.Ipoh • Jln Kepong • Jln. Yang Emas	97,000pcu/day 100,000pcu/day 48,000pcu/day	246,000pcu/day
5	East & Northeast	• Jln.Ampang • Jln Pahang • Jln.Sentul	97,000pcu/day 47,000pcu/day 34,000pcu/day	178,000pcu/day

Data source from SMURT study 1997 and estimates from Screen Line Survey

KLCPA is by far the major traffic attraction point in the Study Area. *Figure 2.2* shows the major traffic routes towards the CPA from all the travel corridors mentioned above. There are about 12 major access points.

In general, the rate of traffic growth in an already built-up area has been found to range between 3% to 6% per annum. This is because in a built-up area, new traffic generators are mainly confined to sites where re-developments are feasible. Conversely, in rapidly developing new areas where new townships and commercial offices are replacing green fields or agricultural land, a higher growth rate is expected.

The traffic growth pattern in the Klang Valley also appears to reflect this trend, with the South-East and North-West sectors showing greater greenfield type developments and, hence, higher growth rates than the other sectors.

During the morning peak hour, therefore, a total of 54,000 vehicles were reported to have poured into the CPA in Year 1996 or an estimated 675,000veh/day.

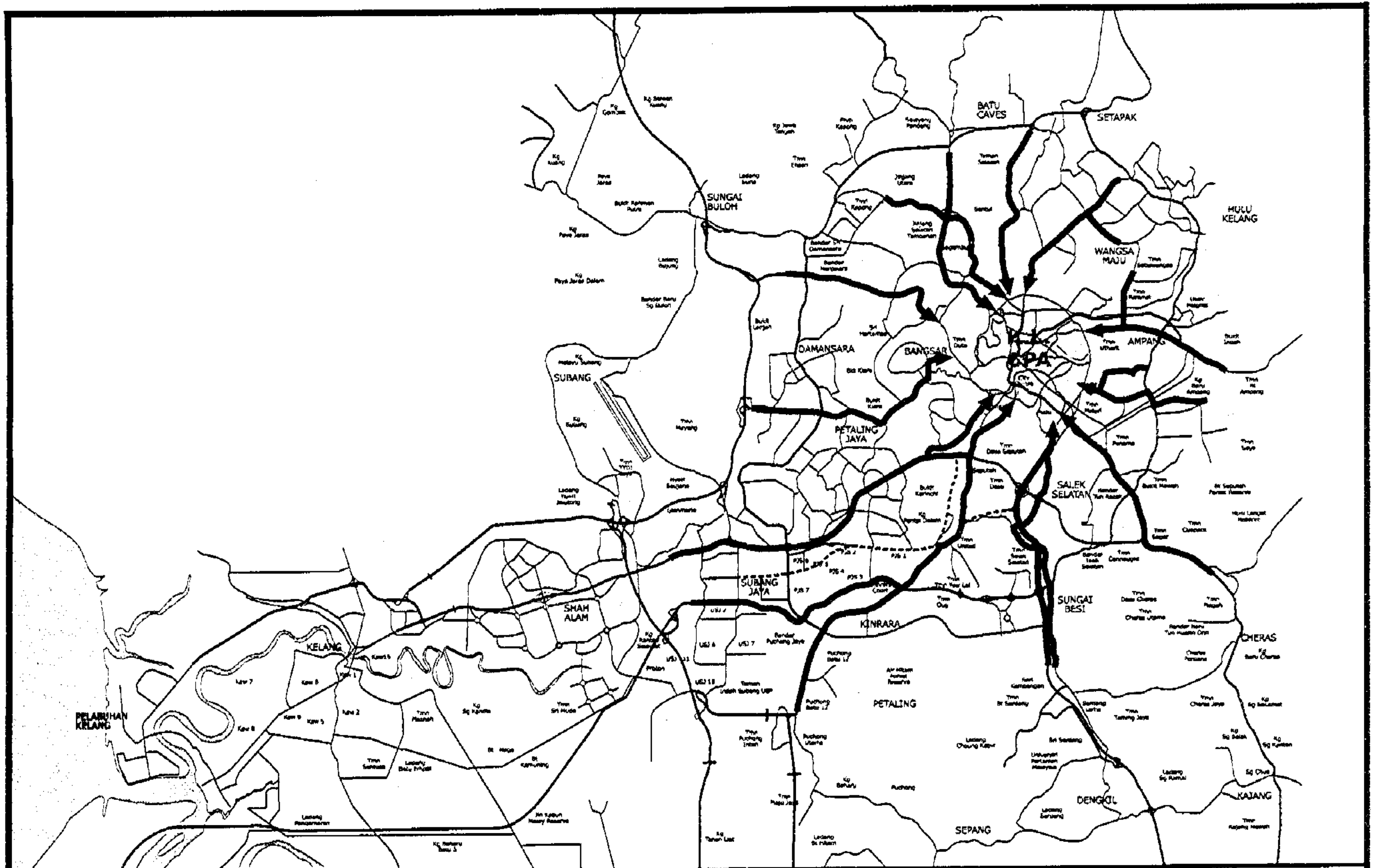


FIGURE 2.2 : MAJOR CPA - BOUND ACCESS ROUTES TO K.L. CPA

The table below tabulates the pattern and growth of CPA-bound traffic into Kuala Lumpur at the four directional corridors in the morning peak between Year 1993 and Year 1996.

Table 2.2 Pattern and Growth of CPA-Bound Traffic into Kuala Lumpur by Directional Corridor (Morning Peak; Year 1993 - Year 1996)

Directional Corridors	Morning Peak 1993 (vph)	Morning Peak 1996 (vph)	Change (%)	Growth Per Annum (%)
North West	11,000	15,000	+36	11.0
North East	8,000	9,000	+13	4.0
South West	14,000	16,000	+14	4.5
South East	10,000	14,000	+40	12.0
Total	**43,000**	**54,000**	**+26**	**8.0**

Assuming an annual rate of 8% still applies and a peak hour rate of 8%, by present day, an estimated total daily traffic of about 850,000veh.trips per day could have been attracted to the KLCPA by Year 1999. (However, some of these vehicles trip albeit marginally could have been diverted to public transport with the recent opening of the LRT lines.)

Given this pattern of access, it is not surprising that some of the most severe points of congestion are located at intersections along these access corridors or with the ring roads.

2.2 Road Traffic Congestion

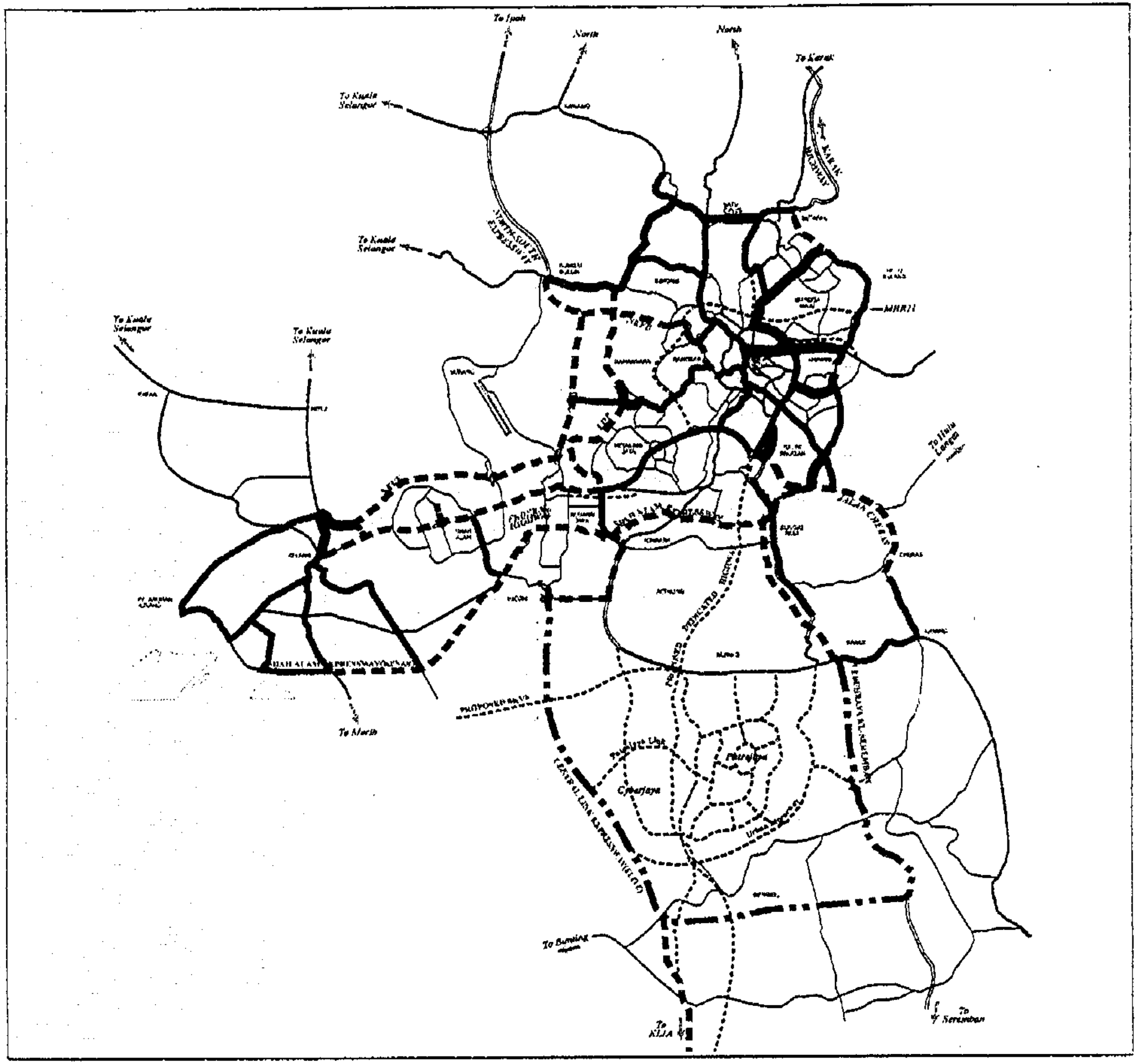
Travel speed is a good indicator of road traffic congestion. A travel time survey was conducted on selected routes in the study area. Routes were selected to cover as many major travel corridors as possible. A total of 22 routes were surveyed in both directions.

Average travel speed for each link based on results of the three days survey was computed and ranked into the four categories. *Figure* 2.3 shows the average travel speeds during the morning peak hours. Road sections with outstanding low speeds are Jalan Ampang, Jalan Pahang, Jalan Genting Kelang, and Jalan Perkasa. Sections of the MRR(I) between Jalan Pahang and Jalan Ampang were found to have low speed but this could be due to road construction work at the time of survey. Parts of the MRR (II) (between Jalan Cheras and EWL) and Jalan Batu Caves also have very low speed.

A Study On Intergrated Transport Information System (ITIS) in Klang Valley And The MSC in Malaysia

Figure : 2.3

Average Travel Speed During Morning Peak Hour



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Most of the radial roads to KLCPA have average speeds between 30kph to 60kph. Within the Klang Valley, only the toll expressway or highways have higher average travel speeds of between 60kph to 90kph. Average travel speed of more than 90kph were observed only for expressways on the NSCL and KL-Seremban Expressway towards the MSC and KLIA.

The pattern of travel speeds on the major roads in the Study Area is quite similar in the evening peak hours except that Jalan Cheras and Jalan Kajang-Bangi also had low travel speed.

Travel speeds in the off-peak hours generally were higher than the morning and evening peaks except for Jalan Ampang, Jalan Tun Razak, Jalan Kajang-Bangi and Jalan Perkasa.

From the above analysis, it is clear that Jalan Ampang, Jalan Pahang, Jalan Genting Kelang and sections of the MRR(I) and (II) are congested while most radial roads to KLCPA are either saturated or approaching congested. Only free flow traffic is maintained on the main toll highways and expressways of NKVE, NSCL, KL-Seremban Expressway, SAE and western section of Federal Highway.

Due to the concentration of traffic in and around the KLCPA, intersections in this area are some of the most congested in the Study Area. These severe traffic bottle-necks are intersections of Middle Ring Road (I) with Jalan Pahang, Jalan Semarak, Jalan Ampang, Jalan Bukit Bintang, Jalan Perkasa, Jalan Cheras, Jalan Loke Yew, Jalan Ipoh and Jalan Kuching. Intersections of the Inner Ring Road with Jalan Kuching, Jalan Parlimen, Jalan Bangsar-Travers, Jalan Syed Putra, Jalan Loke Yew, Jalan Cheras, Jalan Pudu and Jalan Ampang are also critical points.

Long queues and delays in the CPA are largely due to over-saturation at intersections or interruptions from intersections.

Outside the Kuala Lumpur area, long queues at some of the signal-controlled intersections on the slip roads on Federal Highway are also common. Sometimes these queues would extend upstream until the highway. Typical locations are intersections at Jalan University, Jalan Pantai, Jalan Utara, Jalan Barat and Jalan 222.

2.3 Present Parking Conditions in KLCPA

SMURT-KL JICA Study had conducted a parking survey in Year 1997. The study has estimated that within the CPA there was a total of 87,000 car parking lots, and more than half of these were located in the KLCC and the Golden Triangle-Bukit Bintang area.

Overall, the total estimated supply of car parking spaces in the CPA of 87,000 lots seems to be able to meet the total demand 76,000 lots adequately. However, some zones in the CPA have shortfalls of parking spaces while others have excesses.

Table 2.3 compares the parking supply and demand by zone in the CPA. The results shown that Zone 2 (Golden Triangle-Bukit. Bintang) has a shortfall of 13,500 spaces while Zone 6 has a small shortfall of 852 spaces. Zones 5, 1 and 7 have large parking excesses. This analysis shows that parking supply and demand in the CPA are not in equilibrium by locality. Zone 2, which has the major shopping centres in Kuala Lumpur, does experience shortage of parking especially during the weekends. It thus provides a good case study for the proposal of a parking information guidance system.

Table 2.3 Comparison of Parking Supply And Demand in the CPA (Year 1997)

Zone	Parking Supply	Parking Demand	Excess	Short-Fall
1 Sogo, Batu Road Area	9,506	1,776	7,730	
2 Golden Triangle - Bkt Bintang	20,692	34,201		13,509
3 ChinaTown Area	10,578	9,826	751	
4 Chow Kit Area	8,592	8,080	513	
5 KLCC	25,066	14,419	10,647	
6 Imbi Area	2,861	3,713		852
7 Pudu Area	7,184	2,694	4,490	
8 Lake Garden and Parliament	2,579	1,756	822	
Total	**87,057**	**76,465**	**24,953**	**14,361**
Nett			**10,592**	**-**

Source : SMURT, 1977

2.4 Existing Public Transport Situation

In theory, as a city grows in size, the importance of public transport is also expected to grow in tandem. However, Kuala Lumpur appears to be experiencing a paradox in that as the city grows in the last two decade, the contribution from its public transport system seems to be diminishing in significance. Transportation studies conducted for the Klang Valley have consistently recommended to the Government to take vigorous measures and strategies to reverse this trend.

Table 2.4 presents the percentage shares of various transport modes in Klang Valley for the Year 1985 and Year 1997 (Source: SMURT-KL JICA Study, 1997). The diminishing role of public transport is glaring and has become a source of concern.

Table 2.4 Percentage Shares of Various Transport Modes in Klang Valley (Year 1985 and Year 1997)

Mode	Percentage Share (%)		
	1985	1997	Difference
Car	33.8	42.9	+9.1
Motorcycle	13.8	18.0	+4.2
Stage Bus/Mini Bus	17.6	6.0	-11.6
Factory Bus/School Bus	7.2	7.7	+0.5
Rail-Based Transport	-	1.2	+1.2
Non-Motorised Transport (Walk and Bicycle)	27.6	23.9	-3.7
Other Mode	-	0.3	+0.3
Total	**100.0**	**100.0**	-

Source : SMURT, 1977

As shown from the table above, the percentage share of trips carried by the stage and mini buses has dropped drastically from 17.6% in Year 1985 to just 6.0% in Year 1997, representing a reduction of 11.6% in percentage share. The factory and school buses managed to maintain their percentage share at slightly more than 7% for the twelve intervening years from Year 1985 to Year 1997. While the nascent rail-based transport (KTM Commuter) has succeeded in securing 1.2% of the total share in Year 1997.

The most significant increase was found in the private car mode with a jump in percentage share from 33.8% to 42.9% (representing an increase of more than 9.1% points). Likewise, but to a lesser degree, the motorcycle's share has also increased by 4.2 percentage points from 13.8% in Year 1985 to 18.0% in Year 1997.

It is important to note that the non-motorised mode in the form of walking and cycling remains very significant throughout the 12-year period at close to 25% (i.e. 1 in 4 trips is either a walking trip or a cycling trip in Klang Valley in Year 1997).

Hence, it may be summarised that in Year 1997, in the Klang Valley, the significance of various transport modes in order of percentage share may be ranked as follows:

1. Private cars (42.9%)
2. Non-motorised mode of walking and cycling (23.9%)
3. Motorcycles (18.0%)
4. Buses - stage, mini, factory and school buses (13.7%)
5. Rail-based transport such as KTM commuter and LRT (1.2%)

This trend of diminishing public transport share will have to be arrested and reversed for the good of Kuala Lumpur City and the Klang Valley, as it is believed that private cars could not and will not be able to cater solely and fully for the travel demand of a growing city like Kuala Lumpur. The role and operation of the public transport in Kuala Lumpur and the Klang Valley will have to be improved and uplifted if the city is to avoid from grinding to a halt by the private vehicles. Fortunately, the City Hall of Kuala Lumpur has begun to take steps to achieve a larger mode share by public transport. With the introduction of LRT lines in 1998 (STAR and PUTRA Lines) there are now better public transport options to encourage the public to use public transport. The use of ITIS may further enhance the service level of public transport in order to induce the public to switch mode from the private to the public modes.

3

EXISTING TRAFFIC MANAGEMENT AND RELATED SYSTEM

3.0 EXISTING TRAFFIC MANAGEMENT AND RELATED SYSTEM

3.1 Traffic Signal Control System : Area Traffic Control System (ATCS) of Kuala Lumpur

As of May 1999, there are a total of 287 Traffic Control Signals (TCS) in Kuala Lumpur operated by Dewan Bandaraya Kuala Lumpur (DBKL). The TCS are essentially divided into three zones of system operations.

A total of 89 TCS located in the downtown Kuala Lumpur area (inside the Middle Ring Road) are inter-networked by the Sydney Co-ordinated Adaptive Traffic System (SCATS) under DBKL's Phase 1 and 2 ATC Programs.

A portion (approximately 40) of the remaining 189 TCS (mainly outside the Middle Ring Road) is currently being inter-networked by the ITACA system under DBKL's Phase 3 ATC System expansion program whilst the others remain as isolated/vehicle actuated systems.

DBKL is the only municipal council in the study area of Klang Valley and the Multimedia Super Corridor (MSC) that operates an inter-networked TCS system.

DBKL also operates 28 colour Closed Circuit Television (CCTV) cameras complete with Pan-Tilt-Zoom (PTZ) functions installed at 10 locations in Kuala Lumpur for the purpose of obtaining visual images of traffic situation at the selected intersections so that any incident or the real time traffic situation can be monitored. These CCTV are mounted on tall buildings around Kuala Lumpur excluding DBKL's building itself.

1. Dynasty Hotel
2. UMNO Building
3. Maybank Headquarters Building
4. Public Bank Headquarters Building
5. Wisma Mirama
6. Wisma Genting
7. Plaza Ampang (City Square)
8. RHB Headquarters Building
9. Menara Seputeh
10. Ibu Pejabat Polis Kontijen

Video signal from the colour CCTV cameras is sent via an E1 (2Mbps) leased fibre modem circuit back to DBKL's Headquarters. Each CCTV can be viewed by selecting any one camera at any time for each building.

There are also 6 black/white CCTV cameras mounted on 3 poles around Kuala Lumpur. No PTZ capabilities are available for these cameras. Video signal from these cameras' is transmitted back to DBKL via coaxial cables.

3.2 Toll Road Traffic Systems

There are presently 14 stretches of privatised toll road located in the study area, which are currently in operation. They are as follows:

1. The "North-South Expressway" (NSE) - Rawang to Bkt. Lanjan and Kuala Lumpur to Nilai sections only
2. The "North Klang Valley Expressway" (NKVE)
3. The "North-South Central Link" (NSCL)
4. The "Shah Alam Expressway" (SAE)
5. The "Damansara-Puchong Expressway" (LDP)
6. The "East-West Link" (EWL)
7. The North Klang Straits Bypass (NKSP)
8. The Federal Highway (FH) from Klang to Subang Jaya
9. The Karak Highway
10. Besraya Sg.Besi Highway
11. Cheras-Kajang Highway
12. Jalan Kuching
13. Jalan Cheras
14. Jalan Pahang

Another 3 stretches of privatised toll road are currently under construction in the study area. They are as follows:

1. The "Western Traffic Dispersal Scheme" (SPRINT)
2. The "New Pantai Highway"
3. The "PERCON Elevated Highway"

Among the above toll systems, only the Shah Alam Highway (SAE), the Damansara-Puchong Highway (LDP) and the North South Central Link (NSCL) and the North-South Expressway (NSE) have more comprehensive traffic surveillance and management systems.

Table 3.1 below gives a summary on the scope and contents of the traffic surveillance and control systems installed by the major toll road operators.

Table 3.1 Summary of Features of Some Traffic Information Systems on Existing Toll Highways

No.	Interchange/ Equipment	SAE	LDP	NSCL	NSE* /NKVE	Sg. Besi Highway	Cheras Kajang Highway	EWL
1	Operator	KESAS	LITRAK	ELITE	PLUS	BESRAYA	GRAND SAGA	METRAMAC
2	Interchanges	12	14	7	10	9	7	3
3	VMS	4	4	12	-	-	-	-
4	PTZ CCTV Cameras	8	8	6	-	1	-	-
5	VVD	21	(78 #)	14	-	-	-	-
6	Mainline Traffic Counters	-	3	-	-	-	-	-
7	Emergency Telephones	@ 1.5km	-	@ 2.0km	@ 2.0km	-	-	-
8	Main Communication network	Optic Fibre	Optic Fibre	Optic Fibre	Optic Fibre	Optic Fibre	Leased TMB Line	Leased TMB Line
9	Manual data collection	Patrol	Patrol	Patrol	Patrol	Patrol	Patrol	-
10	Toll Plaza (Open System only)	4	4	N.A	N.A.	3	2	2

** NSE sections within the Study Area only*
 # Passive infrared optical detectors at 1km interval at median and 2 detectors at one location
N.A. = Not applicable
VVD = Video Vehicle Detector

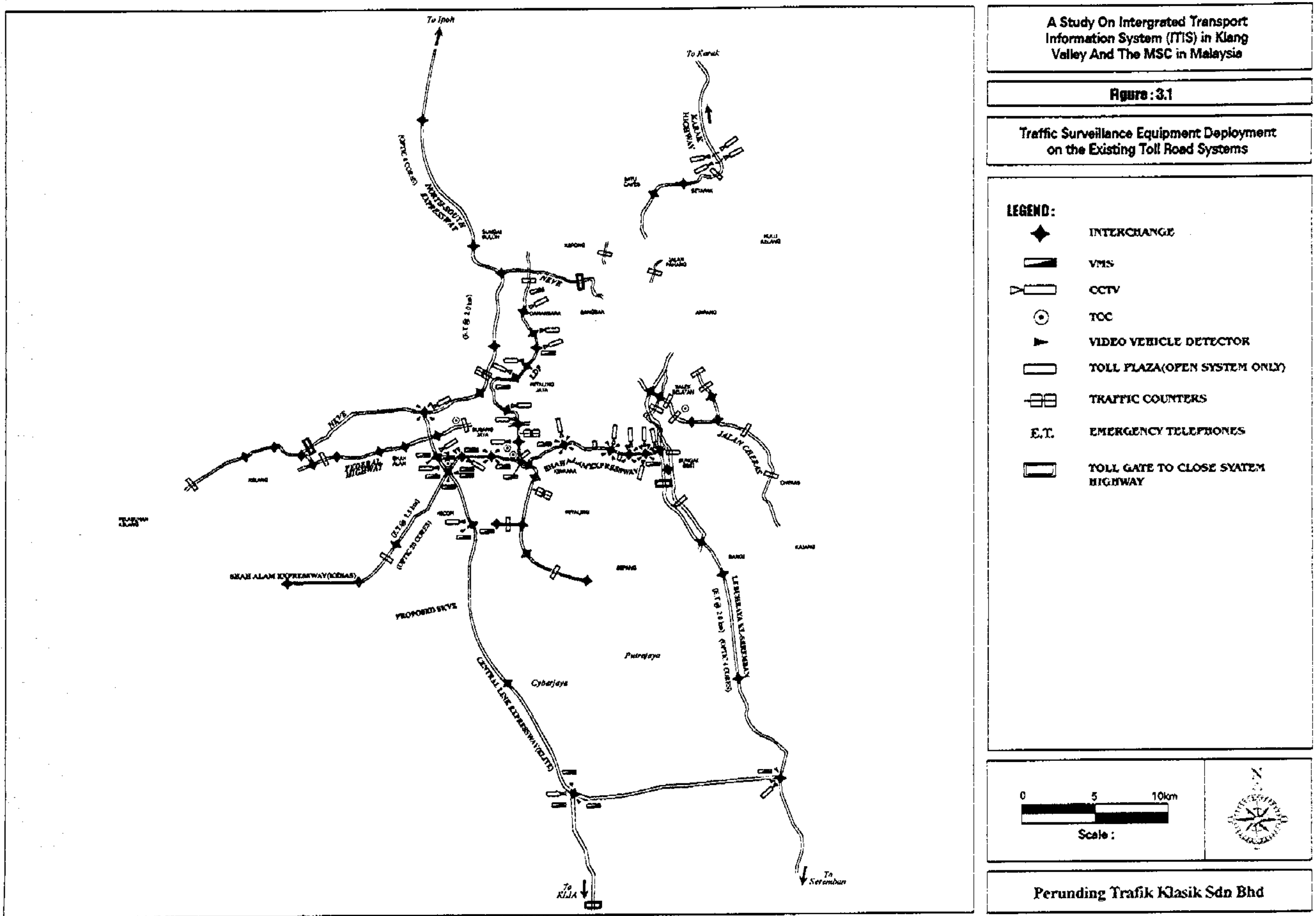
Figure 3.1 shows the location and type of traffic surveillance equipment on the existing toll roads in the Study Area.

As an existing infrastructure stock, there are therefore, a total of about 250km of optical cable network (though of varying core numbers), 20 VMS, 37 PTZ CCTV cameras (including 4 in Karak Tunnel and 10 from DBKL ATC System), 35 fixed CCTVs, 35 fixed video camera detectors and other types of vehicle detectors, which can be incorporated into the future ITIS Plan.

A Study On Intergrated Transport Information System (ITIS) in Klang Valley And The MSC in Malaysia

Figure : 3.1

Traffic Surveillance Equipment Deployment on the Existing Toll Road Systems



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3.3 Telephone/Data Communication Services

Following the liberalisation of the telecommunication industry in 1990, there are currently seven local telecommunication operators (telco) in Malaysia. They are:

- Telekom Malaysia Bhd.
- Bina Sat-Com Bhd. (a subsidiary of Binariang Berhad)
- Time Telecommunications Sdn. Bhd.
- Celcom Transmission (M) Sdn. Bhd.
- Digi Telecommunications Sdn. Bhd. (formerly known as Mutiara Telecommunications Sdn. Bhd.)
- Prismanet (M) Sdn. Bhd. (formerly known as Syarikat Telekom Wireless (M) Sdn. Bhd.)
- Fibreail Sdn. Bhd.

The largest telco in Malaysia is Telekom Malaysia Berhad which monopolises about 98% of the Malaysian market.

Telekom Malaysia Berhad provides services ranging from fixed line and cellular telephony to internet-delivered products; from urban broadband multimedia to radio in local loop for rural communities.

Maxis Communications Berhad, formerly known as Binariang Berhad, operates the country's leading GSM digital wireless network, and Maxis Fibre Network, based on the HFC architecture that is instrumental in offering cost-effective, integrated 3-in-1 cable TV, telephony and multimedia. Some areas that have already been served by Maxis' HFC architecture are Damansara Heights, Bangsar, about 200 buildings in Klang Valley, Bandar Baru Nilai, etc.

Time Telecommunications Sdn Bhd known as Time Telekom is a wholly subsidiary of Time Engineering Berhad. Time has an extensive state-of-art fibre-optic network infrastructure domestically. In June 1997, Time had completed the acquisition of 75% interests in the equity of both ADAM (a PCN cellular operator) and Payphone.

These telecommunication companies offer a variety of fixed network services including leased lines services. Although all fixed network service provider possess Internet Service Providers (ISP) licenses, the only two active ISPs are TMNet and JARING.

4

FUTURE TRAFFIC DEMAND AND PUBLIC TRANSPORT SYSTEM

4.0 FUTURE TRAFFIC DEMAND AND PUBLIC TRANSPORT SYSTEM

4.1 Traffic Demand and Socio-Economic Growth

The study area, which encompasses five administrative districts in the Klang Valley and the MSC Corridor is expected to experience continuous population and development growth. This is because the study area consists of the most developed urban region and the focal point of development and employment of the country namely:

Kuala Lumpur	-	Despite the plans to move all government offices to Putrajaya, the nation's capital is still expected to function as the focal point of economic and social activity
Petaling Jaya	-	An urban centre equipped with a large population catchment and facilitated with complete urban functions
Shah Alam	-	Selangor's capital, a newly planned urban centre with large industrial development
Klang	-	Port facility which has evolved to an urban centre equipped with commerce, trade and industrial development
MSC Corridor	-	The Putrajaya, Cyberjaya, High Tech Parks are planned to house all governmental offices; equipped with leading edge multimedia technology
Kuala Lumpur International Airport (KLIA)	-	KLIA, the nation's international airport which has been designed to cater for more than 60Million passengers per annum including transit passengers

As the most developed urban region of the country, the study area currently consists of a population of some 3.84Million people and an estimated 1.45Million vehicles (SMURT 1997). The existing population and vehicles ownership is expected to experience growth in tandem with the anticipated economic and development growth in the region.

Based on the forecasted population growth rate, it is anticipated that the Klang Valley would house a population of 5.7Million people by the Year 2020. The MSC Corridor on the other hand is forecasted to have a population of 1.26Million. Hence, the study area is anticipated to have a total population of 6.96Million in the Year 2020, an average growth of approximately 2.6% over the 23 year period.

The increase in population is expected to increase the travel demand in the study area, which in turn would be translated to an increase in traffic movement. This increase demands the provision of adequate transport infrastructure and the introduction of integrated transport systems.

4.2 Future Traffic Demand on the Major Travel Corridors

The traffic analysis as presented by the SMURT-KL study identified various major corridors of travel in the study area. Significantly it was found that in the Years 2000 to 2020, Kuala Lumpur would remain as the focal point of travel in the Klang Valley although it should be noted that a significant volume of trips would be diverted to the MSC area, specifically after the Year 2010.

In total, it is anticipated that the introduction of the MSC corridor would divert a total of 111,000pcu/day from the KLCPA.

Effectively, the major travel corridors in the Year 2020 as identified in the SMURT-KL 1997 study are tabulated below:

Table 4.1 Major Corridors of All-Purposes Trip Demand in Year 2020

Corridor	Trips/Day
KLCPA - Ampang	250,000
KLCPA - Wangsa Maju	175,000
KLCPA - Segambut/Jinjang/Kepong	200,000
Subang - Petaling Jaya	150,000
KLCPA - Pudu/Brickfields	150,000
KLCPA - Puchong	120,000
KLCPA - Subang	100,000
KLCPA - Salak Selatan/Sg. Besi	100,000
KLCPA - Selayang	100,000
KLCPA - Setapak	100,000
KLCPA - MSC Corridor	110,000

Source : SMURT-KL, 1997

The identification of the major corridors is vital, in that they provide an overview on the desire of travel between the various sectors of the study area.

As seen by the tabulation above, it is again evident that the KLCPA would continue to function as the focal point of traffic movement due to the employment catchment which it provides as the business and commercial centre of the country.

It is in view of this continuous increase in traffic demand that various expressways and tolled highways have been planned to provide direct and fast access between suburban Kuala Lumpur and the KLCPA.

Another significant travel corridor, which is expected to develop in the future, is between the KLCPA and the MSC area. This corridor is expected to generate and attract a total of 200,000 trips/day in the study area by the Year 2020.

4.3 Future Public Transport System

The public transport network of the future area is expected to comprise of:

- Urban transit rail services and feeder bus services
- Bus operations
- Trunk Bus

The future urban transit rail services would comprise of:

- LRT System I (STAR)
- LRT System II (PUTRA)
- People Mover Rapid Transit (PRT) - KL Monorail
- KTMB - KTM Komuter Services
- ERL - Express Rail Link

The bus services in the study area, on the other hand can be categorised to the following:

- Public Bus (trunk bus systems)
- Feeder Bus Services (supporting the transit rail services)

The main public transport commuter lines are as follow:

- Klang - Sentul Corridor
- Rawang - Seremban Corridor
- Ampang - KL Corridor
- Kelana Jaya - KL Corridor
- Cheras - KL Corridor
- Damansara - KL Corridor

It should be noted that efforts to reduce the use of private vehicles and encourage the use of public transport should include ITIS measures. Where, the implementation of the information system would provide public transport commuters with real-time arrival and departure times, which would allow them to plan their journeys. This will further encourage the use of public transport as the mode of travel.

5

URBAN TRANSPORT PROBLEMS AND ISSUES RELEVANT TO ITIS IN KLANG VALLEY

5.0 URBAN TRANSPORT PROBLEMS AND ISSUES RELEVANT TO ITIS IN KLANG VALLEY

5.1 Traffic Congestion Problems and the Relevance of ITIS

SMURT-KL Study has reported the following congestion levels in the morning peak at the various arterial roads leading to the CPA (Table 5.1).

Table 5.1 Congestion Ratio on Arterial Roads in Morning Peak Hour

No.	Jalan	Daily Vol. (pcu)	Hourly Vol. (pcu)	Peak Ratio	Capacity (pcu)	V/C
1.	Loke Yew	70,749	6,583	0.093	4,200	1.567
2.	Kuching	62,802	6,255	0.100	4,200	1.489
3.	Pahang	29,931	3,711	0.124	2,520	1.473
4.	Ampang	25,348	2,867	0.113	2,520	1.138
5.	Syed Putra	33,819	3,483	0.103	4,200	0.829
6.	Damansara	37,811	3,468	0.092	4,200	0.826
7.	Parlimen	23,859	1,901	0.080	2,520	0.754
8.	Wisma Putra	22,976	1,741	0.076	2,520	0.691
9.	Tun Sambanthan	17,272	1,728	0.100	2,520	0.686
10.	Bukit Bintang	17,200	1,598	0.093	2,520	0.634
11.	Pudu	19,991	1,592	0.080	2,520	0.632
12.	Ipoh	22,055	1,432	0.065	3,780	0.379
Total		**383,813**	**36,359**	**0.095**	**38,220**	**0.951**

Source: SMURT-KL, CPA Screen Line Survey
Note: In-bound traffic only

The arterial roads, which have been recorded to have a congestion or v/c (volume/capacity) ratio of more than 1.0 are (in descending order of severeness):

- Jalan Loke Yew
- Jalan Kuching
- Jalan Pahang, and
- Jalan Ampang

Those with a v/c ratio between 0.75 and 1.0 are (in descending order of severeness):

- Jalan Syed Putra
- Jalan Damansara, and
- Jalan Parlimen

Hence, in terms of congestion information collection, these arterial roads identified above should warrant close monitoring.

Among these major arterial corridors, despite their different flow demands, there appeared some commonalties in their traffic flow problems:

a) Saturated Demands Giving Rise To Unstable Flow

Traffic demands along most of these corridors are so high during peak hours that they have definitely reached the corridors capacities. Assuming a capacity of 1,500 vehicles/lane/hour, a dual three-lane highway could only accommodate a carrying capacity of 4,500vph per direction. But the situation is that many of these corridor arterials have to carry a peak hour volume of more than 5,000vph in one direction. Under such an unstable flow condition, any minor road incident alone can cause a massive traffic jam on the highway, not to mention a major traffic accident.

Prompt response to road incidents and fast removal of damaged vehicles or disturbances are therefore very important for restoring the function of a highway. Quick dissemination of information on any incident is therefore very essential to prevent any secondary accidents and to notify vehicles upstream about the occurrence of the accident so that they could make a detour to by-pass the accident site.

b) Weaving Problems

Traffic weaving can pose a problem at locations where insufficient weaving or merging lengths are provided. Serious weaving problems can be observed at certain sections of the Federal Highway II (Subang Jaya/KFC Interchange, Motorola Interchange and Jalan Syed Putra/Klang Lama Interchange), Jalan Sg. Besi (Jalan Istana Interchange), and KL-Seremban Highway (Jalan Kuchai Lama and Jalan Klang Lama/Petaling Jaya Interchange).

c) Capacity of Junctions

Some of the junctions along these arterial corridors obviously lack capacity. This is because most of these junctions were not designed as full interchanges, but as signal-controlled at-grade intersections or diamond interchanges. Such junctions lack sufficient capacity and when traffic demand is high, massive traffic jams may occur and these junctions would become flow restricting traffic bottlenecks.

To mitigate any massive traffic congestion on a highway, traffic movements on it must constantly be monitored.

When congestion occurs downstream, some of the on-coming traffic from upstream can be diverted if early warning messages are given to them. They could only do so if and only if early warnings are given and at locations where diversion can be made. Hence the importance of automatic incident detection capability for a major highway. For this reason, therefore, automatic congestion or incident detection devices such as vehicle sensors and surveillance cameras are proposed to be installed along selected major highways at about, say, 0.5km to 1.0km intervals to monitor traffic speed and to detect any congestion. Such information can be processed and disseminated or displayed via the Internet, roadside variable message signs (VMS) or LED graphic display panels, in-vehicle navigation unit, radio broadcast or other means.

Figure 5.1 provides an example of a LED Graphic Display Panel indicating that an accident had occurred at the Jalan Kinabalu/Loke Yew Interchange on the Federal Highway, and that congestion had extended upstream beyond the Jalan Mahameru/Istana Interchange, and motorists were advised to divert and exit through the Brickfields and Sg. Besi/KL-Seremban Interchange.

However, before any of these automatic incident detection and dissemination systems could be installed, appropriate arterial or corridor routes must first be identified. A demand and congestion analysis was first carried out on the major roads and highways to determine if they should be included in this ITIS road network system. Once selected, their associated alternative routes were also identified and included for surveillance.

Hence, this selected road network for inclusion in this ITIS road system represents an important step in the development of ITIS for Klang Valley and the MSC.

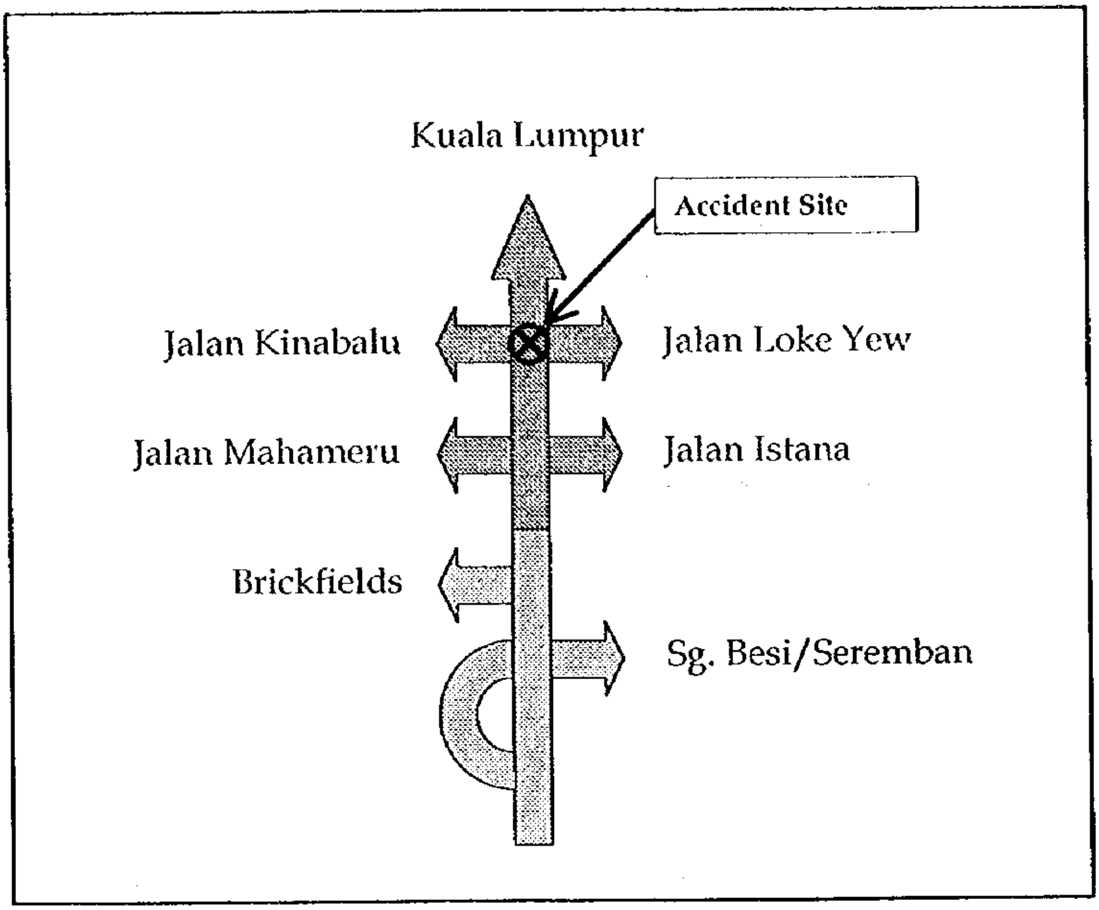

Figure 5.1 : AN EXAMPLE OF A LED GRAPHIC DISPLAY PANEL