No.

Republic of the Philippines

DOTC*MMDA*DPWH*NEDA*PNP-NCR*HUDCC*UP-NCTS*EMB
Japan International Cooperation Agency (JICA)

METRO MANILA URBAN TRANSPORTATION INTEGRATION STUDY

TECHNICAL REPORT NO. 8

TRAFFIC MANAGEMENT

March 1999

mmutis

MMUTIS STUDY TEAM

SSF
JR
99-036 (11/16)

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1. INTRODUCTION

1.1 Role of Traffic Management

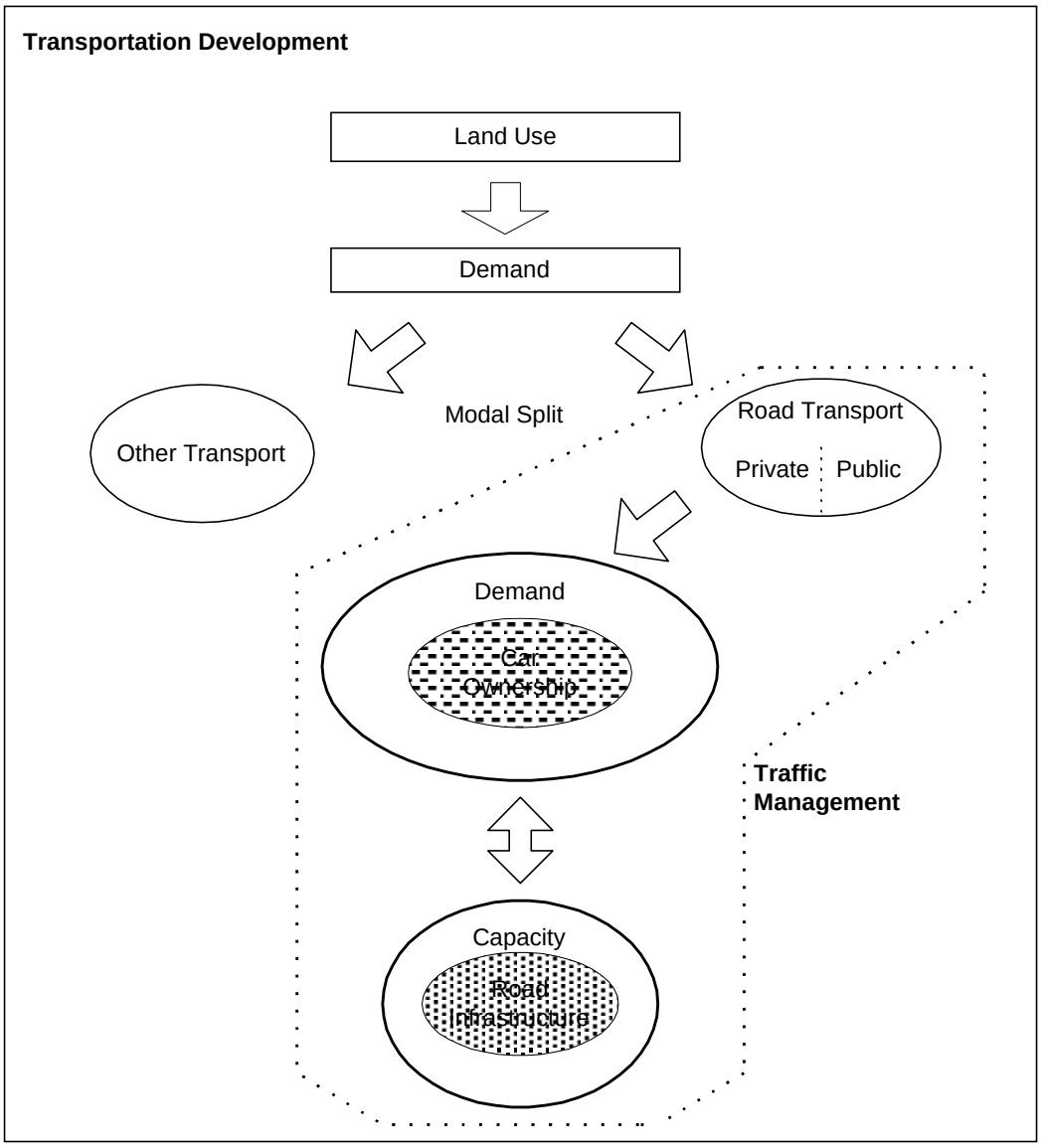
Traffic management refers to a wide range of actions and measures that are taken to rationalize traffic flow and improve the traffic environment without infusing substantial capital investments or acquisition of right of way. It intends to attain the goal of a better traffic environment mainly through legislative, traffic engineering, and operational measures. Traffic management becomes crucial as significant improvements on road transport infrastructure become increasingly difficult in urban areas. But traffic management should not be considered merely as a unique set of tools. It is one of the most comprehensive and strategic components of urban development, with an enormous impact on the social, political, economic and environmental conditions of a society. Thus urban development policy must clearly be defined in order for traffic management to work.

Traffic management is a major component in the overall transport development framework (Figure 1.1). It deals with both the demand and supply sides of the transportation system. Demand management controls the generation of demand in terms of size, type, place and time. In general, traffic demand is served by road and non-road transport systems. The latter is further divided into public and private transport systems. Traffic management also covers a modal split between these sub-systems.

The following are the objectives of traffic management:

- Enhance efficiency of the transportation system by reducing demand while increasing supply.
- Promote balanced modal split between different modes of transport.
- Improve environmental conditions by reducing congestion.
- Promote sound and balanced development of a society through an efficient transportation system.

FIGURE 1.1
ROLE OF TRAFFIC MANAGEMENT



1.2 Study on Traffic Management

This technical report presents the results of a study on traffic management in Metro Manila. The following were the study's objectives:

- Review of existing traffic management system in Metro Manila.
- Identify problems and issues related to traffic management.
- Develop future improvement directions for traffic management.
- Formulate and recommend traffic management measures.

The various traffic management projects implemented in the past as well as those still being planned were first reviewed. Then, current traffic management practices were also assessed in terms of institution, organization, relevant laws and regulations, and enforcement.

Traffic conditions and management along major corridors and in the primary areas were likewise assessed. The areas and routes selected for review included the CBD, major arterial roads, secondary arterial roads, the LRT corridors, suburban roads and the expressways.

Based on the results of preceding studies, problems and issues were identified and discussed. Finally, the future direction of traffic management policy is presented and measures to improve the current traffic conditions, as well as traffic management capabilities are then recommended.

2. REVIEW OF TRAFFIC MANAGEMENT IN METRO MANILA

2.1 History of Traffic Management in Metro Manila

For the past two decades, various traffic management measures were planned and implemented in Metro Manila. Table 2.1 chronologically show traffic management measures that were undertaken and the consequent results or events that arose from the implementation of these measures. The major projects that were undertaken before are briefly described below. The Metro Manila Traffic Engineering and Management (TEAM) project is presented in a separate section.

(1) Bus Waiting Shed

Enhancing the attractiveness of public transportation is one of the traffic management measures aimed at reducing the number of private vehicles. But passenger conversion from private vehicles to public transport is hardly practiced in Metro Manila. For example, under the TEAM projects, bus waiting sheds were built only for the convenience of bus and jeepney commuters. Rehabilitation of damaged bus waiting sheds is now being planned by the Metro Manila Development Authority (MMDA).

(2) Yellow Box

In the early 1980s, Metro Manila introduced a yellow box pavement marking at crucial intersections. A yellow box is a yellow pavement marking in the shape of a box featuring diagonal lines and which are applied inside intersections. The markings indicate that a vehicle should not enter an intersection when the exit is not yet clear. It is intended to prevent blocking of intersections and thus avoid the congestion which results from random crossing practices. Intersection blocking is commonly done at many intersections in Metro Manila. The practice worsens the already severe traffic situation. Enforced properly, the yellow box scheme often proved effective in lessening perennial congestion. However, even though many intersections feature the yellow box markings, drivers often ignore them. Enforcement lacked legal basis. Because of this, traffic enforcers seldom enforced it and the scheme has fallen into disregard.

(3) Pedestrian Barriers

To prevent pedestrians from crossing streets haphazardly, pedestrian barriers were built on medians of major thoroughfares like EDSA, Taft Avenue, España, etc. Pedestrian barriers have also been erected on the edge of sidewalks in some intersections or in some road sections to prevent pedestrians from spilling onto the road to wait for buses or jeepneys at inappropriate locations. Pedestrian barriers have proven effective in preventing pedestrians from making unwarranted road crossings.

(4) One-way System

The one-way system has shown effectiveness in improving traffic flow. The system made signal coordination easier and reduced conflicting movements in intersections. But successful implementation depended on certain factors. For example, it at least needed two contiguous streets to be effective. In Metro Manila, the one-way system

has been adopted at many locations since the 1970s. Early implementation included Mabini Street and Del Pilar Street in the City of Manila. In 1986, the one-way system was introduced in Makati, a premiere business and residential district. Some one-way systems, however, were not well planned and failed to rationalize congestion. The one-way system introduced at the Domestic Road, in Pasay City, and at Quirino Highway, in Paranaque, are examples of poor planning. An off-again, on-again style of implementation created confusion among motorists and traffic enforcers alike.

(5) Pedestrian Overpass/Underpass

Pedestrian overpasses were built in the past two decades in Metro Manila. In TEAM Phase III, additional overpasses were constructed across major streets like EDSA. To sheperd pedestrians and encourage the use of an overpass, pedestrian barriers were also built along the medians leading to an overpass. The large pedestrian volume necessitated the construction of these structures. Also, crossing by pedestrians in intersections takes more time than vehicle crossing. Pedestrian crossing limited the flexibility of the signal timing adjustment. Under standard signal phasing, movement of turning vehicles conflicts with the pedestrian flow, thus increasing accidents involving pedestrians. Pedestrian overpasses physically separates the movement of pedestrians from the vehicle flow and removes these problems. But overpasses can sometimes be an inconvenience to pedestrians, particularly to the handicapped and elderly.

In terms of traffic management, a pedestrian underpass has the same benefit as that of a pedestrian overpass. The construction and maintenance cost of a pedestrian underpass is, however, higher than that of an overpass. A pedestrian underpass with escalators was introduced in Makati City in 1996. Another two similar underpasses are being constructed along Ayala Avenue, Makati's primary thoroughfare.

(6) Bus Stop Separator

To restrict unwarranted overtaking by buses of other buses at bus stops using inner lanes, bus stop separators, with a length of about 60 to 100 meters, were constructed between the bus lane and the lanes for general traffic at most of the bus stops along EDSA. Buses were required to stay within the outer two lanes and to follow the buses ahead of them. Although the intention was understandable, the bus stop separator did not work as intended. Some buses still stayed outside the bus lane especially those avoiding delay. Some buses even use the separators to load and unload passengers. In a way, the separators also posed a hazard to other traffic because it was not highly marked and visible. Because of these shortcomings, bus separators were eventually removed.

(7) Pook Batayan

Pook Batayan (or place of discipline) was a joint project participated by government agencies, private companies and non-governmental organizations. In this scheme, traffic enforcers and traffic volunteers, from the participating organizations, formed traffic watches at critical intersections. Normally, private companies were assigned an intersection near their office. These companies donated funds to help purchase and install traffic signs, guide signs, and pavement markings. Watch huts, where team members conducted enforcement and provided guidance to motorists, were

constructed. To some extent, the project was effective in cultivating discipline among drivers. However, the project gradually died due to a lack of effort to sustain it.

(8) EDSA Bus Lanes

In 1990, a bus lane system was introduced along EDSA. Two outside lanes of the six-lane avenue were designated as bus lanes on weekdays. A yellow lane line marking was applied between the bus lanes and the other lanes. Initially, the bus lane was enforced during the morning and afternoon peak hours. It was later extended to whole days except for Saturdays, Sundays and Holidays. A minimal information campaign however restricted drivers and traffic enforcers from fully understanding the objectives of the program. Some thought that the bus lane was intended to confine buses within the bus lanes and that they should not take the inner lanes. The rules for right-turning vehicles were also not clearly defined. But the scheme helped streamline and improve bus operation. The scheme is still in effect although minor changes were instituted. Enforcement however has became lax. Today, because the number of buses plying EDSA is so large, two outer lanes are always occupied by buses. These lanes have become de facto bus lanes although the ruling does not strictly say so.

(9) Bicutan Traffic Discipline Project

In 1991, the Traffic Engineering Center (TEC) together with the Southern Police Command, the City Government of Parañaque, the association of jeepneys and bus companies, launched the Bicutan Traffic Discipline Project to ease the chaotic traffic condition at the Bicutan Interchange. The cause of the problem was analyzed then a staffing schedule, a logistics program, and handouts were prepared. Personnel were assigned at specific points and instructed to do specific tasks such as instructing bus drivers not to load and unload passengers other than at bus stops, or warning pedestrians not to jaywalk. After implementation, the disorderly condition disappeared, resulting in lesser congestion. The project showed that traffic could be improved if discipline is observed. The project, however, was not sustained due to a lack of enthusiasm from the enforcers.

(10) Toll Free Hours

In 1990, the Philippine National Construction Corporation (PNCC), a company managing the North and South superhighways, made the expressway toll free until 7:00 A.M. The measure was intended to disperse traffic volume and lower the peak hour demand. To some extent, the move eased the traffic congestion during peak hours. But the project was terminated for unknown reasons.

(11) Reversible Lane

The reversible lane scheme has been tried and implemented at various thoroughfares (e.g. EDSA, the South Superhighway, Commonwealth Avenue, etc.) where traffic demand tended to be unbalanced during certain hours and one lane in the opposite direction is used to relieve the flow in the road with higher demand. Effects of the reversible lane scheme varied per location. It worked well for the South Expressway. For EDSA, the reversible lane was not so effective as its capacity was often restricted by constant bottlenecks. The queue length on the congested side became shorter

because of the additional lanes but travel time remained the same. It should be noted that at certain locations, drivers, without being told to, automatically adopt the reversible lane scheme when congestion happens.

(12) Signal Battery Back-up System

During the power outages in 1992, the Traffic Engineering Center (TEC), with financial help from the French government, installed a set of batteries and a charger at 90 signalized intersections to supply power to the signal system during brownouts. However, the system only provided power for a maximum of two hours. Its capacity was not large enough when an outage lasted longer. To improve its limitations another scheme was used to provide continuous back-up power during long brownouts. This was done by connecting a traffic signal to a nearby building with power generator. When a brownout occurred the signal was switched to the building's generator manually.

(13) Restrictions on Provincial Buses

In 1992, the City of Manila banned provincial buses plying between Metro Manila and the provinces from using its streets. The move inconvenienced bus passengers coming or going to the provinces as they were forced to alight at points outside of Manila and take another ride into the city. The ban was later lifted because of the disadvantages it created for provincial commuters.

(14) Bus Stop Segregation Scheme

The bus stop segregation scheme was intended to organize loading and unloading at bus stops. Buses plying along EDSA were divided into two groups based on their destination. Bus stops were delineated at different locations for each group with markings and signs indicating the group number. Buses were required to stop and load/unload passengers only at their designated bus stop. This scheme was aimed at enhancing the convenience of public transportation. No evaluative study was conducted to determine effectiveness of the project. The scheme is believe to be still in effect but documentation of driver compliance has not been determined.

In November 1977, the bus stop segregation scheme was modified into the Modified Bus Segregation Scheme. The modification divided the buses into three groups. Each group was given a maximum of 10 allowable stops in pre-designated areas. Groups were identified by stickers color-coded in tangerine, yellow, gold and green. Bus stops were also provided with signs indicating which color group should load and unload at specific points. Bus rides were expected to move considerably faster as the buses were allowed no more than 10 stops along the whole length of EDSA.

(15) Tulong Daan 2000

A joint undertaking participated in by the Quezon City government, the TEC, the DOTC Action Center, LTFRB/LTO, PNP Central Police District Command, MOTOR (a non-governmental organization), and the Rotary Club of Neopolitan Fairview. Its objectives were to implement traffic improvement measures (e.g. reversible lane, etc), instill discipline among road users, and to train local traffic management units in traffic management planning and implementation.

(16) Truck Ban and Truck Routes

A truck ban during peak hours and designated truck routes were implemented since the 1980s to help decongest roads and prevent the intrusion of trucks into narrow streets. In 1994, a revised truck ban was adopted by the Metropolitan Manila Authority pursuant to MMA Ordinance No. 5. The new rules prohibited trucks from using EDSA from 6:00 A.M. to 9:00 P.M. between Pasong Tamo and Balintawak. The Ordinance also enforced new truck ban hours (6:00 A.M. to 9:00 A.M. and 5:00 P.M. to 9:00 P.M. for other truck routes.) But the restrictions posed a problem since EDSA and the truck routes where the only major links connecting Manila's domestic and international freight and container port with the factories located in the northern, eastern, and southern suburbs of the metropolitan area. Limiting cargo traffic between the two points risked hampering a crucial economic activity.

(17) Odd/Even Number Scheme

In December 1995, an odd/even traffic scheme was implemented along the major thoroughfares in Metro Manila like EDSA, Buendia Avenue, España Avenue, R. Magsaysay Boulevard, etc. Vehicles with plate numbers ending in an even number were banned from 7:00 to 9:00 in the morning and 17:00 to 19:00 in the afternoon on Mondays, Wednesdays and Fridays. Those with plate numbers ending in an odd number were restricted for the same period on Tuesdays, Thursdays, and Saturdays. The measure however exempted carpoolers. Cars with three or more passengers, including the driver, were free from the restriction. The scheme should have helped reduce volume and congestion. Although a survey was conducted by the Transport Planning Service of the DOTC, no official report has been published. The effects of the measure is yet to be quantitatively evaluated.

(18) Unified Vehicular Volume Reduction Program (Color Coding System)

The odd/even scheme was modified into the color coding system in June 1996. For one day every week, all motor vehicles (excluding large trucks, emergency vehicles and other exempted vehicles) were banned from all Metro Manila thoroughfares from 7 A.M. to 7 P.M. This was based on the last digit of the license plate number. Vehicles with plate numbers ending in 1 and 2 were barred during Mondays. Those with plate numbers ending in 3 and 4 on Tuesdays, and those with 5 and 6 on Wednesdays, and so forth. During weekends and holidays the restriction was lifted. Government vehicles, ambulances, fire trucks, school buses, vehicles carrying perishable goods, etc. were exempted. Buses, jeepneys and taxis were initially included. The trucks were controlled by the truck routing scheme and the truck ban. By December 1, 1996, buses, jeepneys and taxis were exempted from the scheme to help alleviate increasing passenger demand.

TABLE 2.1
TRAFFIC MANAGEMENT MEASURES IN METRO MANILA

Year	Engineering and Management Measures	Related Events
1976		Traffic Control Center established Transport Training Center established
1977	Start of TEAM Project Phase I(up to 1982)	Toll Regulatory Board created
1980	Implementation of TEAM Phase I Geometric improvement of intersection Pavement markings Bus waiting shed	
1982	TEAM Project Phase II (up to 1987)	
1983	Yellow Box	
1985	Implementation of TEAM Phase II Pedestrian barrier	
1986	One-way System in Makati	MMC reorganized
1989	TEAM Phase III (up to 1995) Pedestrian overpass Bus stop separator	TCC renamed as TEC TEC transferred to DOTC MMLTCC created
1990	Pook Batayan EDSA Bus Lane Bicutan Traffic Discipline Project Toll fee hours on Expressway	MMA created DOTC Action Center created
1991	Reversible Lane	Local Government Code enacted
1992	Implementation of TEAM Phase III Battery Back-up for Signals Provincial Bus Ban	
1993	Domestic Road One-way System Bus Stop Segregation Scheme	TEC transferred to DPWH TTC re-organized as NCTS MMLTCC reaffirmed
1994	Tulong Daan 2000 New Truck Ban	MMLTCC rationalized
1995	Odd/Even Number TEAM Phase IV signed	MMDA created MMLTCC abolished Signal Ticketing System introduced
1996	Color Coding Scheme (UVVRP)	
1997	TEAM Phase IV implementation Underpass and elevated walkway	Signal System transferred to MMDA TRAFIMM organized

2.2 Traffic Engineering and Management (TEAM) Project

The most comprehensive traffic management project undertaken in the Philippines is the Metro Manila Traffic Engineering and Management Project (TEAM). The project was started in 1977 with financial assistance from the IBRD. Phase I, II and III of the project were implemented from 1976 to 1995. Phase IV was planned and its contract signed in 1995. However, the contract procedure was questioned by Congress and the implementation has been delayed since then. Outline of each phase and the traffic management measures that were adopted are described below and summarized in Table 2.2.

Phase I (Study and design 1977 – 1980; Implementation 1980 - 1982)

Phase I of the TEAM project introduced an area traffic control (ATC) system in Metro Manila. Traffic signals were installed in 112 intersections (this was later increased to 134). Ten units of closed circuit television cameras were also put up and a Traffic Control Center, with a central computer system, was established. Phase I included geometric improvements of intersections, construction of bus waiting sheds, the application of pavement markings and the installation of traffic signs. The IBRD provided a $5.8 million loan for the project.

The effects of Phase I were evaluated. A report entitled "An Evaluation of Phase I Traffic Signal System in Metro Manila" was prepared by the project consultant for the then Ministry of Public Works and Highways in November 1983. According to the report, the signal system reduced travel time by 17%, travel speed increased by 10%, and accident rate decreased by 27%. Annual savings of fuel and travel time was calculated at P35 million and P36 million at the 1983 price levels, respectively.

Phase II (Study and design 1982 - 1985, implementation 1985 - 1987)

Phase II of the TEAM Project was partly financed by the Overseas Economic Cooperation Fund (OECF) of Japan with a 3.86 billion yen loan. The project expanded the ATC system with the addition of 173 computerized signals and four closed circuit television cameras. A driver information system was introduced and two changeable message signs were installed to disseminate information on traffic and road conditions to motorists. As in Phase I, geometric improvements of intersections to be signalized were undertaken and pavement markings and more traffic signs were installed.

An evaluation of Phase II by the project consultant was undertaken. A report entitled "An Evaluation of Phase I and II Traffic Signal System of Metro Manila - Final Report" was prepared by the U.P. Engineering Research and Development Foundation, Inc. in 1989 for the Traffic Engineering Center which was then under the Department of Transportation and Communications.

Phase III (Study and design 1989 ~ 1992, implementation 1992 ~ 1994)

Phase III further expanded the signal system with 127 more signals and four color television cameras. Signal control function was also enhanced. An air pollution monitoring station was established to monitor air quality at four locations in Metro

Manila. Like the previous two phases, geometric improvements were also undertaken at intersections to be signalized. Additional traffic engineering works included construction of pedestrian overpasses, pavement markings and traffic signs. The project was financed by the OECF through the provision of 4.61 billion yen.

The project consultant evaluated the project and a report entitled "Metro Manila Traffic Engineering and Management Project Phase III Evaluation Report" was prepared in September 1994. Annual economic benefit was estimated at P313.6 million and P110.0 million at the 1994 prices levels for time saved and fuel saved, respectively.

TABLE 2.2
SUMMARY OF ATC SYSTEM

Equipment	Phase I	Phase II	Phase III	Total
Center System	Computer System Wall Map Communication Equip. Control Console CCTV System Air Conditioning Generator Center Building	Driver Information Control Console	Work Station	
Sub-Station	-	2	1	3
Local Controller	134	170	131	435
Vehicle Detector	412	538	336	1,286
CCTV Camera	10	4	5	19
Changeable message sign	-	2	5	7
Communication Cable Length	55	131	150	336
Air Pollution Monitoring Station	-	-	4	4
Radio Base Station	1	4	-	5

Phase IV (1995 - 2000)

With the signal system getting outmoded TEAM Phase IV was designed to improve the system earlier set up by the preceding TEAM phases. Phase IV was planned in 1993 - 1994. The basic design of the existing signal system was developed in the late 70's and no significant change was made to system functions except the introduction of a driver's information system during Phase II. The central computer of the existing signal system was installed 16 years ago in 1981. The model has since gone out of production and its capacity and speed is very much inferior to today's computers with similar applications. Other equipment also had become dilapidated. Overall, system functions were limited and signal operation was inefficient. Recent developments on signal control technology has not been incorporated into the system

In 1995, the contract for Phase IV was signed between the DPWH and an Australian company. However, questions on contract selection arose and congressional hearings were held from January to June 1997. Although the hearings were completed no resolution was made on the investigation. A Notice of Proceed was issued only in September 1997 and the project only officially started that year. Construction time was set for 30 calendar months, and a total of 419 signals were to be installed.

Phase IV includes the replacement of existing local controllers and the installation of a new central equipment wherein all new local controllers will be connected to. Contract amount was P570 million with P84 million being the local currency portion. The rest being the foreign currency portion. The contract amount was denominated in foreign currency with the exchange rate fixed at US$1.0 = P25.0

Although the contract was done way back, the Traffic Engineering Center (TEC) only recently started work on signal design with its in-house staff. According to the TEC, it planned to do 30 designs every month. This meant taking them a year to complete the entire design work.

Phase IV is expected to face several technical, financial and project management difficulties. First, the quantities used in the contract are mere provisional figures and the actual work amount could very much be different pending completion of the design work. Second, the contract assumed existing equipment to be functioning well and that other facilities, like underground conduits were re-usable for the additional cable installations. Experience with previous TEAM projects, show that this assumptions were often unrealistic. Placing the responsibility of such an undertaking on the TEC, which lacked financial and technical capabilities, plus the fact that there was no maintenance contract was in a way detrimental. There was also a clause that entitled compensation for the contractor for the delays not attributable to it. This conflicts stem from the fact that the contract was entered into without the benefit of a detailed design.

Not only that, the TEC building in Sta. Mesa is affected by the MRT Line 2, which runs along the south side of R. Magsaysay Boulevard near the Nagtahan intersection. The TEC building must be cut about 6 meters from the existing wall facing Magsaysay Boulevard. The details of the building modification plan and a re-layout scheme of the existing equipment in the control center are yet to be worked out.

Operation

The signal system operates 24 hours a day, seven days a week and 365 days a year without let up. The control center is manned from 6:30 A.M. to 9:00 P.M. with a three- group shift: A regular duty (8:00 AM – 5:00 PM), An AM shift (6:30 AM – 2:30 PM) and a PM shift (1:00 PM – 9:00 PM). A modified staffing schedule is done for saturdays, sundays and holidays. Operators basically do the following tasks: 1) control desk operation, 2) computer operation and 3) traffic engineering and monitoring. System monitoring and operation of changeable message signs can be done through the control desk. Accessing the central computer is either done through system typewriter, character display, and graphic display. Minor adjustments of the signal timing parameters, drop-off and pick up of on-line signal controls, and other system operations are done through computer operations. Phasing modification and other major signal operation changes, is applied after the proposed change is discussed jointly by the Planning and Design Divisions of the TEC. Traffic engineering and monitoring is made through wall maps and a closed circuit television system.

System operation is either automatically or manually logged. Logs are kept for signal timing change, system save, maintenance record, manual control and queue length monitoring.

Despite criticisms from experts and even from the general public, manual control of signal is a common practice and is one of the causes of unnecessary delays. APPENDIX C graphically shows the difference in delay between short and long signal cycles.

Although the TEC has issued guidelines on Traffic Signal Manual Operations several years back it is not strictly being adhered to. The manual stipulates that enforcers are allowed to resort to manual control only when traffic condition is abnormal. And they can only do this with prior permission from the control center operator. Signal controllers are equipped with telephones directly connected to the control center for communication between the center and site. The control mode switch on the control panel, which selects either automatic or manual controls, is normally disabled to prevent unauthorized manual control. But generally, these are often disregarded by traffic enforcer and hand signaling is commonly done to control traffic at intersections.

The transfer of the signal system to the MMDA, per a memorandum of agreement signed between the Secretary of DPWH and the Chairman of MMDA on August 15, 1995, also transferred responsibility of operation and system maintenance to the MMDA. This transfer however was delayed until February 1997 due to administrative foul-ups. Personnel of the Operation and Maintenance Division of the TEC was also transferred to the MMDA.

Maintenance

Following the transfer to the MMDA, responsibility for the maintenance fell on the authority's Traffic Signal and Operation Division. Previously, a maintenance contractor under contract with Traffic Engineering Center, undertook the maintenance of the signal system. The last maintenance contract expired on December 31, 1996. No maintenance work has been done since then. As a result, the system has started to deteriorate as indicated by an increased in busted bulbs, poor coordination between adjacent signals and inoperative terminal equipment. The updating of signal timing parameter and other adjustment works necessary to adapt to the change in the traffic demand are also not properly undertaken due to budgetary constraints and qualified staff. Even before the termination of the maintenance contract, the system was poorly maintained. Table 2.3 shows the number of malfunctioned equipment as of September 1996.

Recently, actions have been taken to restore and repair the damage. The TEC has already purchased signal bulbs to replace busted ones. Replacement work is, however, hampered by the limited number of boom trucks, which are used for the bulb replacement operation. Out of three boom trucks, the TEC has two are damaged and need repair. The MMDA conducted a bidding for spare parts of circuit boards used in the local controller. It is hoped that once the spare parts are delivered, some of the defective signal controllers will be fixed.

TABLE 2.3
STATUS OF MAJOR SYSTEM COMPONENTS

	Normal	Malfunctioned	Total	Rate
Local controller	424	21	445	4.7%
Vehicle detector	1,064	101	1,165	8.7%
CCTV camera	16	3	19	15.8%
Changeable message sign	1	6	7	85.7%
Portable radio	31	21	52	40.4%

One major maintenance dilemma is that most of the damages to equipment and communication cable are caused not by the normal wear and tear but by other road excavation work like road repair, telephone cable installation, water supply work, sewerage work, the LRT/MRT projects, etc. Contractors of these works pay little attention to the existing facilities and inadvertently damage the terminal equipment or cut the communications cable. Once an accident occurs, the restoration process is slow as the contractor is not capable of repairing the damage either technically and financially. Efforts have been made by the TEC to restore the damaged equipment but only on a limited extent because of the presence of many equipment and facilities that still require repair work.

2.3 Traffic Management on Expressways

Metropolitan Manila has two expressways. The North Luzon Expressway (NLE) and South Luzon Expressway (SLE). The NLE stretches from Balintawak in Quezon City to the north, reaching Sta. Ines in Angeles City. It has a total length of 83.218 km. It has 12 toll plazas with a total of 90 booths for toll collection. The SLE starts at Nichols in Pasay City and wounds towards the south, ending in Calamba, Laguna. Its total length is 42.878 km. It has 12 toll plazas with a total of 102 booths. The expressways were constructed and managed by Construction & Development Corporation of the Philippines (CDCP) later renamed the Philippine National Construction Corporation (PNCC).

2.3.1 Traffic Condition on the Expressways

Traffic Volume

The traffic in the NLE and the SLE are classified into five (5) groups:

Class 1: Cars, Jeepneys, pick-ups, and vans
Class 2: 2-axle trucks, tourist bus, school bus, class 1 with 2 axle vehicle, class 1 of the height of 7 ft. or above
Class 3: 3-axle trucks
Class 4: Public utility buses
Class 5: 4 and up axle trucks

In 1995, a total of 45 million vehicles used the NLE while a total of 83 million used the SLE. The daily average is calculated at 124,808 and 228,445 for the NLE and the SLE, respectively. As expected from the topographic location of these expressways, the sections with the highest volume are the end section closest to the center of Metro Manila for both expressways. The Balintawak - Valenzuela section -- the busiest

section on the NLE – has a daily average of 91,000 vehicles. On the SLE, the most congested section is between Nichols/C5 and Bicutan with a daily traffic volume of 165,000 vehicles.

Peak Hours/Congestion

Congestion is frequently observed at entry and exit toll plazas. Generally, the entry toll plazas in the direction toward the center and the exit toll plaza at the other end experience the congestion in the morning, while the entry and exit plazas in the opposite direction have heavy traffic in the afternoon. Peak hours and congestion locations are summarized below.

Congestion is a daily occurrence at the toll plazas located near the end of the toll ways. It becomes worse when the capacity is reduced by an accident or stalled vehicle. Despite the serious volume of congestion, a detailed and qualitative data on traffic congestion is ironically not available. If such data can be obtained, the huge losses from traffic congestion could be calculated.

TABLE 2.4
CONGESTION ON EXPRESSWAY

North Luzon Expressway

Time	Entry Toll Plaza	Exit Toll Plaza
6:00-7:00	All	Balintawak Valenzuela
7:00-8:00	All	Balintawak Valenzuela
8:00-9:00	Meycauayan Valenzuela	Balintawak
16:30-17:00	Balintawak Valenzuela	All
17:00-18:00	Balintawak Valenzuela	All
18:00-19:00	Balintawak Valenzuela	Meycauayan Valenzuela
19:00-20:30	Balintawak	Valenzuela

South Luzon Expressway

Time	Entry Toll Plaza	Exit Toll Plaza
6:00-7:00	All	Nichols Alabang
7:00-8:00	All	Nichols Alabang
8:00-9:00	Bicutan Sucat Alabang	Nichols
16:30-17:00	Nichols	All
17:00-18:00	Nichols	All
18:00-19:00	Nichols	All
19:00-20:30	Nichols	Bicutan Sucat Alabang

Traffic Violations and Assistance to Motorists

PNCC patrol personnel are deputized by the MMDA and the LTO to enforce traffic regulations in the expressways. For the six-month period from January 1, 1996 to June 30, 1996, the Traffic Security and Safety Operations group of the PNCC apprehended traffic violators. They also assisted motorists with mechanical troubles (shown in Table 2.5).

A Traffic Violation Receipt (TVR) is issued for violations of traffic regulations while a Temporary Operator's Permit (TOP) is issued for vehicles with defective conditions. Republic Act 4136, known as the Land Transportation and Traffic Code, stipulates road traffic rules and requirements for motor vehicles registration. Republic Act 2000, called the Limited Access Highway Act, lays down guidelines on access to limited highways.

TABLE 2.5
NUMBER OF APPREHENDED VIOLATORS

	NLE	SLE	Total
TVRs issued	1,671	2,453	4,124
TOPs issued	3,695	6,490	10,185
Apprehension as per RA 4136			
Illegal parking	984	2,120	3,104
Loading/unloading/obstruction	1,167	3,159	4,326
Defective/no lights	1,071	4,533	5,604
Slow moving vehicles	550	1,275	1,825
Reckless driving	462	828	1,290
No emergency warning device	646	878	1,524
Others	1,510	2,670	4,180
Apprehension as per RA 2000			
Pedestrians/vendors	1244	1,723	2,967
Motorcycles/bicycles	75	26	101
Stray animals	228	9	237

Notes: TVR: Traffic violation receipt issued by MMDA
TOP: Temporary operation permit issued by LTO

It should be noted that the number of TOPs is higher than the number of violations of traffic regulations for which TVR is issued. This imbalance could be attributed to lack of a vehicle inspection system in the country. For example, vehicles with defective lights or other defects are caught only on expressways and other major roadways.

Traffic Accidents

Number of accidents January 1 to June 30, 1996 is summarized in Table 2.6. A total of 4,968 accidents (2,217 on the NLE and 2,751 on the SLE) occurred on the expressways. This is equivalent to an average of 27 accidents a day. Total fatalities was 93, while injuries totaled 1,608.

TABLE 2.6
NUMBER OF ACCIDENTS ON EXPRESSWAYS

	NLE	SLE	Total
Number of accidents	2,217	2,751	4,968
Without injuries	1,473	1,963	3,436
with injuries	676	763	1,439
with fatalities	41	9	50
with injuries and fatalities	27	16	43
Number of cars involved	3,803	5,048	8,851

The NLE has fewer accidents compared to the SLE, but its number of fatalities is higher than the SLE. In the number of vehicles involved in the accidents, about 30% involved single cars, indicating inappropriate handling of vehicles by drivers.

Driver errors was 46.1%. This was followed by reckless driving with 21.9% and mechanical troubles with 18.3%. This three accounts for 86.3% of all accidents. This indicates that driver technique and driving skills are comparatively adequate and that most accidents could be avoided with proper maintenance of vehicles.

Towing Services

The whole stretches of the North and South Luzon expressways, from Balintawak to Sta. Ines and Magallanes to Prenza, Calamba, Laguna, respectively, are tow-away zones. Inclusive periods is from 6:00 P.M. to 5:00 A.M. Stranded vehicles are immediately towed away to avoid disturbing traffic flow. A grace period of one hour is allowed for motorists to move their vehicles from (5:01 AM to 6:00 PM) at the stretches between Burol Overpass and San Fernando Interchange in the North Luzon Expressway. The same holds true for Susana Heights Overpass to Prenza, Calamba, Laguna in the South Luzon Expressway. Stalled vehicles however should be parked on the emergency shoulder and not pose a threat to the safety of other motorists.

Wreckers or towing service is provided for a fee. Upon finding a stalled vehicle, a PNCC patrol relays towing requests to one of the several accredited towing companies. Actual service is provided by the responding company. The standard rates for towing service are set by the PNCC and must be posted on both sides of the tow truck.

The number of vehicles towed by PNCC-accredited towing companies from January 1, 1996 to June 30, 1996 is shown below.

TABLE 2.7
NUMBER OF VEHICLES TOWED

Type	NLE	SLE	Total
Light	2,098	4,501	6,599
Heavy	2,395	3,242	5,637
Extra heavy	2,181	1,951	4,132
Total	6,674	9,694	16,368

Over 16,000 vehicles were towed for the six-month period. The 91 vehicle per day average is a very high figure again indicating poor conditions of a large number of vehicles.

2.3.2 Expressway Management

Management Organization of the PNCC

The Philippine National Construction Corporation (PNCC) is a government controlled corporation managing both the North and South Luzon expressways. The Traffic Security and Safety Department (TSSD) of the PNCC undertakes the task of managing traffic on the expressways. The organizational chart of the department is shown in Figure 5.6.1. The TSSD is divided into two divisions, the North Luzon Expressway Division (NLED) and the South Luzon Expressway Division (SLED), each covering North Luzon Expressway and South Luzon Expressway, respectively.

The number of staff in the TSSD is summarized in Table 2.8. The tasks assigned to each staff at each position is described in detail in one of the Security Service Manual.

TABLE 2.8
NUMBER OF TSSD PERSONNEL

Personnel	NLE	SLE	Total
TSSD Head	1	1	2
Senior Security Supervisor	2	2	4
Security Supervisor	5	3	8
Company Guard			
Patrol crew	72	70	142
Motorcycle rider	13	18	31
Traffic control unit	26	31	57
Stationary/fixed post	57	67	124
Traffic aide		38	38
Investigator	1	1	2
Traffic Accident Analyst	1	1	2
Researcher/coordinator	1	1	2
Armorer/custodian	1	1	2
Clerk/typist	2	2	4
Agency Guard	13	29	42
Total	195	265	460

Note: Agency guard is a security guard from a contracted security agency to augment stationary/fixed post assignment

Motor Vehicles

To carry out its traffic management tasks, the PNCC has vehicles and a communications facility. The table below shows the number of motor vehicles and motorcycles used by the TSSD.

TABLE 2.9
NUMBER OF SERVICES FOR TRAFFIC MANAGEMENT

	NLE		SLE		Total	
Motor vehicles	14	(12)	19	(12)	33	(24)
Motor cycles	16	(9)	24	(11)	40	(20)
Total	30	(21)	43	(33)	73	(44)

The figures without parenthesis are the total number, while the figures in parenthesis show the number of units that are less than five years old. As the table indicates, the vehicles and motorcycles are relatively new. But considering that these vehicles operate at high speeds the need for regular replacement is a must.

Radio Networks

PNCC has two radio networks, one each for the North Luzon Expressway and the South Luzon Expressway. It uses VHF and UHF bands. Base stations are set up at fixed locations (e.g. the PNCC office, toll office, field office, etc). Patrol vehicles, service vehicles and motorcycles are provided with mobile units. Hand carried units are used regularly by PNCC personnel. The number of radio units are shown in Table 2.10.

TABLE 2.10
NUMBER OF RADIO EQUIPMENT

	NLE	SLE		Total
	VHF	UHF	VHF	
Base station	15	6	20	41
Mobile	19	9	17	45
Portable	13	28	2	43
Total	47	43	39	129

The figures do not include non-operational units. In addition the PNCC has 30 units of trunked two-way radios used by key personnel. These are sometimes installed on motorcycle or vehicles.

Call Boxes

Communication tools are an essential requirement for motorists on the expressway. This is particularly true for those needing assistance, as there is virtually no other means of outside communication. In 1990, the PNCC installed call boxes which used a wireless system along strategic points on the expressway. But they were soon vandalized. In 1994, the call box system was rehabilitated. Currently, 12 units of call boxes are existing along the NLE while 6 units have been put up along the SLE.

Patrolling

For patrolling, the NLE and the SLE are both divided into two zones. Each zone is further divided into several sub-zones. Patrolling is conducted by either a patrol car with two crews, or a patrol motorcycle. Each patrol unit is assigned to a sub-zone and is requested to stay within the sub-zone. In case of emergencies the patrol units of neighboring sub-zones may be called in to provide assistance.

The Traffic Patrol Manual defines the purpose of patrol as follows:

- Deterrence to violations
- Deterrence to unsafe driving
- Observation of traffic conditions

- Road intelligence
- Provision of services to motorists
- Handling of emergencies

Guidelines for patrolling and procedural applications are described in the Security Service Manual. The manual provides procedures for abandoned, stalled, or bogged down vehicles. It also provides action-guidelines for inclement weather, flooding, carnapping, robberies, vehicles on fire, etc. Procedures for apprehending traffic violators and accident investigation are also stipulated in the manual.

Traffic Management Manual

The PNCC has a set of manuals on expressway management collectively called the Security Service Manual. They are list in Table 2.11. The manuals are comprehensive and they detail the objectives, policies, and procedures and carry supplemental information for other activities. They also outline the tasks which the patrol units and other TSSD personnel carry out during their daily work.

TABLE 2.11
LIST OF SECURITY SERVICE MANUALS

Reference/ Code	Title
06-0001	Laws governing expressway operation
06-0002	Scope of operation
06-0003	Manpower
06-0004	Zoning and patrol cars requirement
06-0005	Work schedule and assignments
06-0006	Traffic patrol
06-0007	Patrolling
06-0008	Gasoline assignment
06-0009	Procedures in special traffic situation
06-0010	Pledges and acknowledgment of liabilities
06-0011	Motorist assistance
06-0012	Wrecker services & towing rates
06-0013	Deputation
06-0014	Qualification, requirement for LTC & MMC deputation
06-0015	Traffic accident investigation in general
06-0016	Handling traffic accident investigations
06-0017	Traffic and crowd management at the accident scene
06-0018	Theft prevention in traffic accidents
06-0019	Radio communication
06-0020	Discipline
06-0021	General orders & codes affecting security personnel
06-0022	Accidental discharge of firearms
06-0023	Damage to patrol cars

2.3.3 Problems and Issues

Traffic Congestion

The biggest problem that the NLE and SLE is facing is the worsening traffic congestion. With the rapid increase in car ownership and the expansion of the metropolitan area, the demand far exceeds the expressway's capacity. Heavy congestion is observed daily in the morning at the Valenzuela - Balintawak section of the NLE and the Alabang - Nichols section of the SLE. All entry toll plazas are also heavily congested. A long queue often forms at the Balintawak and Nichols Exit Toll

Plaza. In the afternoon, the flow reverses and congestion is repeated. During accidents, the situation worsens.

Another factor exacerbating congestion is the inadequate geometric design of the expressway's interchanges, or its entry and exit plazas. All of the interchanges are small and do not have enough space capacity. Most of the interchanges are directly connected to other streets without the benefit of buffering zones. If there is a service road along the expressway, the intersection just outside of interchange often experiences chaotic conditions as vehicles from more than four approaches intermingle there.

Although minor improvement works have been implemented to alleviate congestion, the effects are very limited as they are made within the existing right-of-way.

Information Collection/Gathering

Traffic congestion and incidents like flooding, stalled cars, accidents, etc. are the vital signs the expressway traffic management body is on the lookout for. Currently, much of the traffic management activities depend on the information collected by the patrol units. When the expressways are congested the information collection by patrol car becomes inefficient as the patrol cars themselves can get stranded in the congestion. Drivers needing assistance have no means of contacting the traffic management body or phoning outside, unless they have cellular phones. They have to wait until a patrol car locates them, which takes more time if the expressway is congested.

As a consequent of insufficient information collection, traffic congestion data are not quickly gathered by the PNCC. In money terms, losses are estimated to be huge, but there are no data to support estimates. If the losses can be properly calculated, it could easily justify improvement projects which require substantial investments.

Information Dissemination

Road users on the NLE and the SLE are virtually kept oblivious to traffic condition on the expressways. They notice congestion only when they are stranded in it. If they were informed of the traffic condition, beforehand, they could have taken alternative routes or cancelled the trip. Even if one is already trapped in traffic anxieties could be relieved if one is at least told the cause of congestion and its severity.

In other countries, driver information systems on expressways regularly provide road users with info on traffic conditions at the downstream sections. Estimates of travel time are even provided. Such information are highly useful to motorists and will help lessen congestion.

2.3.4 Future Directions

Traffic Information Systems

The PNCC has a plan to establish a Traffic Operation Center where traffic condition information will be collected and all traffic management activities will be supervised. As the construction of new expressways requires time to complete, existing facilities must be fully utilized. Expressway information systems, or expressway surveillance

and control systems, are standard fare on many expressways in the developed and the developing countries. In this system, traffic information is collected by vehicle detectors, video cameras, emergency telephones and other devices. The collected information will be processed and an up-to-the-minute expressway condition will be displayed to the expressway operator. If an incident occurs, it is detected without delay and necessary countermeasures quickly taken. Information can also be disseminated to road users through other means such as changeable message signs, commercial radio, highway radios, telephone answering machines and even the Internet. Introduction of such systems to the expressways in Metro Manila is urgently required.

New Expressways

The fundamental problem of the existing congestion on the expressways is the imbalance between demand and capacity. To solve the problem, either the demand must be contained or the capacity increased. When the on-going Skyway project along the SLE is completed the capacity will be doubled and congestion will be relieved. However, not all the problems will be solved. First, the Skyway is being constructed only between Bicutan and Buendia. The section between Bicutan and Nichols will be improved by Skyway, but congestion at other sections will remain. Second, the entry and exit points of the Skyway are directly connected to roads with relatively smaller reserve capacities. This design will make the entry and exit points into perennial bottlenecks, like the expressways in Bangkok, Thailand. More expressways, not only along the NLE and the SLE, but also within Metro Manila (and forming a network) are needed.

2.4 Traffic Laws and Regulations

Republic Act No. 4136 entitled "An act to compile the laws relative to land transportation and traffic rules, to create a land transportation commission and for other purposes" contain clauses pertaining to traffic rules and regulations. APPENDIX A shows the table of contents of the RA No. 4136.

R.A. No. 4136, not only defines traffic rules but also provides clauses on registration and vehicle operation. Enacted more than 30 years ago in 1964, R.A. 4136 already suffers from obsolescence. Thus, there are sections which are not adequate or not applicable anymore. Also, there are items which a traffic code should deal on but are not mentioned in any of its provisions. Examples are: the right- of-way rule (section 42) and signals on starting, stopping or turning (section 43). There are no clauses on traffic signs, pavement markings, and traffic signals. Terms such as "through highway" or "stop intersection" are antiquated and are not commonly used today.

There were moves to create a new Philippine Traffic Code in Congress. House Bill No. 7116 was introduced but the bill has yet to be enacted. Aside from this proposed bill, the MMDA is drafting an omnibus code entitled "The Metropolitan Manila Transport and Traffic Code." This is said to be similar to the proposed Philippine Traffic Code. The table of contents of the proposed code is presented in APPENDIX B.

To complement the inadequacies of Republic Act No. 4136, ordinances and resolutions on traffic rules and their enforcement were issued by relevant agencies,

i.e., the LGUs, MMA, and the MMLTCC, a transport coordinating council. The council was abolished when the MMDA was created. Random creation of new rules by various agencies has engendered chronic confusion.

The Local Government Code of 1991, vested the LGUs with the function of traffic management within their jurisdiction. Responsibility for metro-wide traffic management fell on the shoulders of the MMDA. The traffic code being prepared by the MMDA will consolidate existing traffic rules and eradicate confusion. The code is to be implemented soon but no schedule has been set. Promulgation of such code however should be done on a national scope.

Amount of fines to be imposed are originally stipulated in R.A. 4136. Revisions are contained in Department Order No. 93-693, entitled Revised Schedule of Administrative Fees and Charges of the Land Transportation Office (LTO), dated November 13, 1992

There are other regulations created by other agencies related to traffic management. Table 2.12 summarizes these laws and orders. The table shows Republic Acts, Executive Orders and Presidential Decrees. There are numerous Ministry Orders and regulations and orders issued by local government units.

TABLE 2.12
LAWS AND REGULATIONS RELATED TO TRAFFIC MANAGEMENT

No.	Title	Date
RA No. 4136	An act to compile the laws relative to land transportation and traffic rules, to create a Land Transportation Commission and for other purposes	1964
PD No. 1265	Creating the Metropolitan Manila Traffic Management Authority	December, 1977
PD No. 824	(creation of Metropolitan Manila Commission)	
PD No. 1274	(amendment to PD No. 824)	
MO No. 345	(creation of MMLTCC)	July 25, 1989
PD No. 1605	(authority of enforcement to MMC)	
EO No. 392	(creation of Metropolitan Manila Authority)	January 9, 1990
MO No. 397	(reconstitution of MMLTCC)	January 9, 1991
RA No. 6975	An Act Establishing the Philippine National Police Under a Reorganized Department of the Interior and Local Government and for Other Purposes	December 13 , 1990
RA No. 7160	An act providing for a local government code of 1991	October 10, 1991
	Rules and regulations implementing the local government code of 1991	
DO 93-693	Revised Schedule of Administrative Fees and Charges of the Land Transportation Office (LTO)	November 13, 1992
MO No. 176	(reaffirmation of MMLTCC)	October 19, 1993
EO No. 170	Rationalizing and harmonizing traffic and transportation management powers and functions of agencies in Metropolitan Manila and for other purposes	April 20, 1994
RA No. 7924	An act creating the metropolitan Manila Development Authority, defining its powers and functions, providing funding therefor and for other purposes	March 1, 1995

2.5 Organizations and Institutions

There are various government and non-government agencies involved in traffic management in Metro Manila, these are:

(a) Metropolitan Manila Development Authority (MMDA)
(b) Local Government Units (LGUs)
(c) Department of Transportation and Communications (DOTC)
(d) Department of Public Works and Highways (DPWH)
(e) Philippine National Police (PNP)
(f) National Center for Transportation Studies (NCTS)
(g) Department of Education, Culture and Sports (DECS)
(h) Government owned or controlled corporations (GOCCs)
(i) Non-Governmental Organizations

Table 2.13 is a matrix showing the responsibilities of these agencies. Similar matrices have been prepared several times in the past by different studies. The responsibilities shown in the table are expressed in a broad sense and there is no clear definition or delineation between primary and secondary responsibilities. A brief description of each agency is listed in the table is presented below.

The Metro Manila Land Transportation Coordinating Council (MMLTCC) was established on April 29, 1994 by virtue of Executive Order No. 170. MMLTCC was the highest policy making body on all matters pertaining to traffic management in the metropolitan area. MMLTCC's powers and functions include (1) reviewing all existing laws, policies, programs, rules, and regulations on land transportation to devise appropriate policies and measures to improve transport and traffic in Metro Manila, (2) identifying and resolving problems arising out of existing laws, (3) using funds from traffic fines imposed by the MMA for the operation needs of the Council and policy implementation, (4) calling upon any government instrumentality or utility company for assistance in the discharge of its duties, and (5) encouraging private section participation. The MMLTCC was abolished upon the creation of the Metropolitan Manila Development Authority in March 1995.

TABLE 2.13

MATRIX OF AGENCY RESPONSIBILITIES

Agency	Engineering	Enforcement	Education	Transport	Environment
Metro Manila Development Authority					
• Traffic & Transport Management Center	○	⊙	○	○	○
Local Government Units	○	○		○	○
Department of Transportation and Communications					
• Transport Planning Service				⊙	
• Action Center		○	○		
• Land Transportation Office (LTO)		⊙		○	⊙
• Land Transportation Franchising & Regulatory Board (LTFRB)		○		○	
Department of Public Works and Highways					
• National Capital Region	○				
• Urban Road Project Office	○				
• Traffic Engineering Center	⊙	○	○		
• Toll Regulatory Board	○			○	
Philippine National Police		⊙			
National Center for Transportation Studies – University of the Philippines	○		⊙	○	○
Department of Education, Culture and Sports			○		
Department of Environment and Natural Resources					○
Government owned or controlled company	○	○			
Non-Governmental Organizations	○	○	○	○	○

Legend: ⊙ Primary responsibility

○ Secondary responsibility

(1) Metropolitan Manila Development Authority

The Metropolitan Manila Development Authority (MMDA) was created by Republic Act No. 7924, which took effect on March 1, 1995. The Act treated the Metropolitan Manila area as "a special development and administrative region subject to the direct supervision of the President." Unlike its predecessor, the Metropolitan Manila Authority (MMA), which was more of a coordinative body working with the various constituent cities and municipalities comprising the metropolitan area, the MMDA was given power and authority to implement development projects. In its rationale bestowing more power to the body, R.A. 7924 stated that this was to make "certain basic services affecting or involving Metro Manila as metro-wide services more efficiently and effectively planned, supervised and coordinated by a development authority."

As a consequent, the MMDA's authority concerning traffic management has now more heft and teeth compared with its previous character. Section 3. of R.A. 7924, specifies the scope of the MMDA's role in this aspect to wit: "Transport and traffic management, which includes the formulation, coordination and monitoring of policies, standards, programs and projects to rationalize existing transport operations, infrastructure requirements, and the use of thoroughfares; promotion of safe and convenient movement of persons and goods; provision for the mass transport system and the institution of a system to regulate road users; administration and implementation of all traffic enforcement operations, traffic engineering services and traffic education programs, including the institution of a single ticketing system in Metropolitan Manila."

Traffic management powers that lie beyond the boundary of cities and municipalities are, thus, administered by the MMDA. While the local government units within Metro Manila were still given responsibility for traffic management within their respective city or municipality, traffic management along major thoroughfares like EDSA, the C-5, etc., went to the MMDA.

The Act further states that the MMDA "shall set policies concerning traffic in Metro Manila, and shall coordinate and regulate the implementation of all programs and projects concerning traffic management, especially those pertaining to enforcement, engineering and education." All other government agencies and offices "shall extend assistance and cooperation, including -- but not limited to -- assignment of personnel."

The MMDA was also given the power to "install and administer a single ticketing system, including the fixing, imposition and collection of fines and penalties for all kinds of violation of traffic rules and regulations, whether moving or non moving in nature, and the confiscation, suspension and revocation of drivers' licenses in the enforcement of such traffic law and regulations" (the provision of RA 4136 and PD 1605 to the contrary notwithstanding).

To carry out these tasks, the MMDA was allowed to deputize members of the PNP, traffic enforcers of LGUs, duly licensed security guards, and members of non-government organizations. These groups were bestowed with a certain authority subject to conditions and requirements imposed by the MMDA.

Even though it had functions other than traffic management, the MMDA became an embodiment of the Metro Manila Traffic Authority, a long advocated, but yet unrealized plan, to put up a single clearing house on metropolitan traffic management.

Figure 2.4.1 presents the organization chart of the MMDA and Figure 2.4.2 is the organization of the Traffic & Transport Management Center (TTMC) its traffic management arm. The functions of the TTMC are as follows:

1) Planning, programming and evaluation of traffic management.
2) Operation and maintenance of signal system.
3) Traffic control by traffic enforcers deployed at critical intersection.
4) Administration of traffic citation ticketing system and operation of redemption centers.
5) Coordination with other government and non-governmental agencies regarding to traffic management.

Among the six service departments comprising the MMDA, the Traffic Enforcement Service (TES) is the largest. It has four divisions and a manpower complement of about 2,500 personnel. This manpower corps comprises mobile, motorcycle and bicycle troops. A workforce of about 150 manages the redemption centers. There are 23 redemption centers in Metro Manila. The Administrative Service has a staff of about a 100. The Training and Education Service has 20 personnel which handle seminars for traffic enforcers and traffic aides and volunteers. The division also provides seminars for repeated traffic code violators. The Planning and Engineering Service has a workforce of a 100, handling traffic engineering (e.g. traffic signs etc.).

The bulk of the MMDA's traffic enforcers are former metro aides previously handling work as the MMA's clean brigade. When garbage collection and street sweeping were given back to the local government units, those engaged in these works were converted into traffic enforcers following a simple screening and training regimen. However, doubts about their qualifications still remain.

The MMDA has a plan to increase its traffic workforce to 6,000 or 7,000. New recruitment methods have become a little stringent. Candidates must at least have finished second year college. Height requirements (5'7" for males, 5'4" for females) have been instituted.

For equipment and resources, the MMDA currently has 30 units of service vehicles and a 100-unit motorcycle fleet. Eighty of these units were donated by a Japanese private organization. It also has 150 units of hand-held radios of which half are used for traffic management. With mobility a premium in its role as traffic vanguard, the MMDA needs an additional 200 units of motorcycles (preferably the smaller type which can handle better maneuverability inside traffic jams).

(2) Local Government Units

The study area in this aspect consists of Metro Manila and its adjacent areas. There are two categories of Local Government Units (LGU's) in the study are. Metro Manila has ten cities: Caloocan, Las Piñas, Makati, Manila, Mandaluyong, Marikina, Muntinlupa, Pasay, Pasig and Quezon. It has seven municipalities: Malabon, Navotas, Parañaque, Pateros, San Juan Taguig, and Valenzuela. The LGU's contiguous to Metro Manila include six municipalities of Laguna Province, twelve municipalities of Rizal Province, sixteen municipalities of Bulacan Province, and twelve municipalities and two cities of Cavite Province.

Republic Act No. 7160, commonly called the Local Government Code of 1991, assigned to the LGUs the responsibility of the funding, construction and maintenance of infrastructure projects which included the construction of "municipal roads and bridges and the collateral improvements such constructions will entail, like the placement of "traffic signals and road signs;" and "other similar facilities." For cities this responsibility included the funding and construction of "adequate communications and transportation facilities." The construction and improvement of provincial roads and bridges fell on the provincial government.

As said earlier, in Metro Manila, metro-wide measures fall under the ambit of the MMDA. The traffic citation ticket administered by each city and municipality was abolished and integrated into the MMDA's single ticketing system.

(3) Department of Transportation and Communications

The *Department of Transportation and Communications* (DOTC) is a national agency committed to the maintenance and expansion of a viable, efficient, and dependable transportation and communications systems as effective instruments for national recovery and economic progress. The DOTC exercises general supervision over all its sectoral offices, which include the Land Transportation Office (LTO), and the Land Transportation Franchising and Regulatory Board (LTFRB).

The Department's *Transportation Planning Service* provides technical assistance in the preparation of integrated plans, programs and budgets for the projects of the DOTC relative to overall developmental goals and objectives of the government. It has four divisions: road transportation, railway transportation, water transportation and air transportation.

As per Department Order No. 96-957 dated July 15, 1996, the DOTC Public Assistance Center was renamed the *DOTC Action Center*. The Action Center has the following functions: (1) traffic education, (2) law enforcement operations in coordination with the MMDA, (3) disaster response and relief operations (which also cover transport strikes and other mass action contingencies), (4) special field operations to assist priority projects and major programs of the department (e.g. LRT Project, Eagle Watch, Task Force Lily, etc.), and (5) public assistance and processing of complaints to expedite immediate resolution.

The DOTC Action Center is directly under the Office of the Secretary. It has four sections with a total personnel complement of 64. The Center has ten (10) units of vehicles, of which six units are operational. Two of the units were sent to Pampanga for lahar related operations. The center also has eight UHF radios, four trunk and four VHF radios. A Government Emergency Telephone System (GTES), a nationwide radio network, is also operated by the center.

The Department's Public Education Team conducted a total of 137 lectures from January 1 to December 31, 1995. Total number of participants was 4,569. Of this number 2,316 were public utility drivers and 910 came from government offices. Other participants came from civic organizations, volunteers, private companies and traffic agencies.

The Land Transportation Office (LTO) was created in 1964 by virtue of R.A. 4136. The LTO is mandated to undertake the following tasks: (1) motor vehicle registration, (2) driver's and conductor's licenses and permits, (3) traffic law enforcement, (4) collection of fees and penalties and (5) information services among the LTO, other government agencies, and the private sector.

The LTO is the fourth largest revenue generating government agency. Its income for 1995 was more than P3 billion. For 1996, its revenue was P 3.3 billion.

Vehicle registration is computerized in the LTO Central Office. An ambitious computerization plan involving the 70 provinces and 62 cities has been sanctioned by the National Economic Development Authority (NEDA) and is awaiting approval by the President. The project will be finished in 18 to 24 months at an estimated cost of $55 million.

The LTO has four vehicle inspection centers; two are in Metro Manila (located in East Avenue and Domestic Avenue), one is in Lipa City, Batangas, and the other one in San Fernando, Pampanga. Equipment being used in the four centers were donated by the Japan International Cooperation Agency (JICA). There is a plan to expand the inspection center through the built, own and operate (BOO) scheme. At present, only vehicles for hire have to pass the standards. The LTO plans to expand this to include other vehicle categories in the future.

The Philippines has about eight million licensed drivers. Computerization of the registration system was started in 1986. At that time, it was the most advanced system in Southeast Asia. The current centralized system will be upgraded to a network system in 6 to 18 months.

LTO's law enforcement section has 57 enforcers and 11 motor vehicles. Its enforcers only apprehend violators from among the franchise system, i.e. buses, jeepneys, taxis, etc. Apprehended drivers are relieved of their licenses and are issued a citation ticket. The licenses are redeemed at LTO offices after a prescribed fine is paid.

The Land Transportation Franchising and Regulatory Board (LTFRB) was created by virtue of Executive Order No. 202 issued on June 19, 1987. It has been mandated to rationalize, regulate and supervise all motorized land-based public transportation

services in the country. The functions of the LTFRB include: (1) to prescribe and regulate the routes of public transportation services, (2) to issue, amend, revise, suspend or cancel Certificates of Public Conveyance, which authorizes operation of public land transportation services, and (3) to determine, prescribe and approve, and periodically review and adjust reasonable fares, rates and other related charges.

A plan merging the LTFRB with the LTO is in the drawing board. The new agency will be called the National Land Transportation Authority.

(4) Department of Public Works and Highways (DPWH)

The Department of Public Works and Highways (DPWH) is the nation's engineering and construction arm. Its mandate is to plan, design, construct, operate, and maintain infrastructure facilities which include highways, bridges, flood control systems, etc. The DPWH is also tasked with developing and implementing codes, standards and guidelines to ensure the safety of all public and private structures in the country and assure efficiency and proper quality in the construction of public works.

DPWH-National Capital Region (NCR). A DPWH regional office, is responsible for the construction and maintenance of roads, bridges, flood control and drainage systems in the National Capital Region.

Urban Road Project Office (URPO). One of the vital project management offices (PMO's) of the DPWH. It implements foreign-assisted infrastructure projects in the country.

Traffic Engineering Center (TEC). The TEC is one of the project management offices of the DPWH. It was created in 1976 to undertake the World Bank sponsored Metro Manila Traffic Engineering and Management (TEAM) Project. The TEAM Project Phase I installed 113 computer-controlled signals, established a traffic control center and implemented traffic management measures. The TEAM Project was expanded to cover a total of 341 intersections during its Phase II and Phase III components. The latter two were funded by the Overseas Economic Cooperation Fund of Japan.

Toll Regulatory Board (TRB). The Board was established in 1977 by virtue of Presidential Decree 1112 under the National Economic and Development Authority. Among the TRB's powers and duties are: (1) to enter into contract for construction, operation and maintenance of toll facilities, (2) to determine and decide the kind, type and nature of public interest, (3) to issue, modify and promulgate toll rates, and (4) to grant authority to operate a toll facility and issue toll operation certificates. In 1990 the TRB was transferred to the DPWH with the Public Works Secretary becoming its chairman.

(5) Philippine National Police (PNP)

Philippine National Police (PNP). The PNP was established by Republic Act No. 6975 known as Department of the Interior and Local Government Act of 1990. The PNP is tasked with the effective delivery of law enforcement services to the citizenry through the establishment of a highly efficient and competent police force that is national in

scope and civilian in character. The merger of the Integrated National Police and the erstwhile Philippine Constabulary constitutes its current ranks.

Aside from its national office in Metro Manila, the PNP has regional offices, provincial offices, district offices, city and municipal offices. In Metro Manila, it has the PNP National Capital Region which is divided into five district offices (Central, Northern, Eastern, Western, and Southern Police Districts). Each of these districts has their own Traffic Management Command. The PNP-NCR handles enforcement in EDSA, while the district offices are responsible for the enforcement of traffic regulations in the five districts.

In the case of Central Police District, which has jurisdiction over Quezon City, the District Traffic Management Command consists of four sections, to wit: Education, Engineering and Plans, Enforcement and Administrative. Below are the number of personnel in each section:

Administrative	21
Education	1
Engineering and Plans	3
Enforcement:	598 (214 policemen and 384 civilian traffic enforcers)

In the Enforcement Section there are eight officers, 70 motorcycle policemen, and 35 investigators. The Traffic Management Command has six vehicles and 50 motorcycles.

The civilian complement are workers of the Quezon City government. They are hired by the city on a contractual basis. Although they are administratively under the city government, the district police is in charge of their supervision. There are no set qualifications in the hiring of civilian traffic enforcers. As incentive they receive a minimum wage and provided minimal allowance.

Unlike before when the police was under the supervision of the LGUs, current recruitment for the PNP is done centrally by the PNP. Recruits for traffic duty has never been high. Traffic enforcement is not a popular assignment for new cops mainly due to harsh working conditions (i.e. heat, pollution etc). Although the traffic citation system has traditionally been incentive laden for traffic cops, the job still attracts few qualified applicants.

(6) National Center for Transportation Studies

The Transport Training Center (TTC) is a predecessor of the National Center for Transportation Studies. It was created in 1976 as a special unit attached to the University of the Philippines. Its creation was made possible by a Japanese government assistance. The TTC has the goal of upgrading the skills and capabilities of transport-related government personnel through extensive training in traffic engineering, planning, and management.

In 1992, the TTC was restructured and *the National Center for Transportation Studies (NCTS)* was established through a bilateral agreement between the Government of the Philippines, through the University of the Philippines, and the Government of Japan,

through the Japan International Cooperation Agency. At the same time, the NCTS was integrated into UP system as one of its regular units. The NCTS conducts research in the various fields of transportation and offers graduate courses in a master's program. The main activities of the NCTS are (1) graduate programs, (2) research, (3) regular training programs, (4) conducting international training courses, (5) holding seminars, and (6) extension services.

(7) Government Owned or Controlled Company

The Philippine National Construction Corporation (PNCC) is one of the government owned or controlled corporations. Among the large shareholders of the PNCC are the Government Service Insurance System, the Philippine National Bank and the Philippine Export & Foreign Loan Guarantee Corporation. The PNCC has three divisions: (1) Tollways Group (2) Construction Group (3) Realty Management Group. The Tollways Group is in charge of the management of the North and South Luzon expressways which was constructed by the Construction and Development Corporation of the Philippines (CDCP), the PNCC's predecessor. The CDCP was then granted a franchise to operate, construct and maintain toll facilities as per Presidential Decree No. 1113.

(8) Non-Governmental Organizations

Philippine Motor Association (PMA). The PMA is a non-governmental organization dedicated at promoting services and the benefits of motoring to Filipino motorists. The organization's objectives are:

- To promote and maintain an association of individuals with a common interest in land vehicles.
- To help vehicle owners secure the enactment of proper laws, ordinances and regulations for the advancement, promotion and protection of the interest of motor vehicles as well as those governing the use and licensing of such vehicles.
- To promote and encourage the construction and maintenance of good roads and to protect the motorists and the public in the use and enjoyment thereof.
- To promote and encourage the development of a spirit of cooperation and courtesy among users of roads and highways.
- To promote touring, and to cooperate with other civic movements.
- To promote and practice safety for the prevention of accidents on the highways and in the operation of motor vehicles.
- To maintain the rights and privileges of all persons who own or are interested in automobiles and other motor vehicles.

Members of the PMA enjoy the following privileges: (1) 24-hour roadside towing services, (2) Free motor vehicle registration services, (3) Auto care services and mobile car clinic, (4) International driving permits, (5) International reciprocity agreement, (6)

Driving lessons, (7) Ambulance services, (8) Insurance, (9) Security assistance, and (10) Accident assistance.

Currently, the PMA has more than 10,000 members. Membership has been increasing every year. Membership campaigns are not conducted as the rapid expansion of the organization makes it difficult to deliver services to members. The PMA has seven units of tow trucks and two ambulances. Its annual membership due is P500. A general meeting is held once a year. Seminars on traffic safety, proper driving manner and car maintenance are regularly held.

In 1993, the PMA issued a 10-point action plan to help solve traffic problems in Metro Manila. The action plan, according to the PMA, was disregarded by government traffic enforcement agencies. The plan is attached as APPENDIX D. Experts still deem it applicable.

Metro Manila has several bus operators and jeepney operators associations. Some of the biggest are the *Integrated Metropolitan Bus Operators Association (IMBOA) the Federation of Jeepney Operators and Drivers Association of the Philippines (FEJODAP*), and the *Pinagkaisang Samahan ng Tsuper at Operators Nationwide (PISTON)*, which means unified coalition of drivers and operators nationwide. These groups actively express their concern and opinion on government policies affecting the registration and operation of public transport. Common issues they react to include fuel price increases, introduction of new transport systems (like the FX taxi), and granting of franchise.

(9) Presidential Task Force on Traffic Improvement and Management (TRAFIMM)

Presidential Task Force on Traffic Improvement and Management (TRAFIMM). It is an inter-agency coordinative body coordinating work among government agencies as well as private sectors. It is headed by the Secretary of the DOTC and was established in August 1997. TRAFIMM is similar to MMLTCC or the Metropolitan Manila Land Transportation Coordinating Council, which was first established in 1989 and later rationalized in April 1994 with the issuance of Executive Order 170. MMLTCC was dissolved upon the creation of the MMDA.

Under the chairman of TRAFIMM, a traffic action group (TAG) was formed to implement various measures to help improve traffic conditions in Metro Manila. Members of the TAG included the MMDA, DOTC, DILG/PNP, DND/AFP, DPWH, DENR, DECS/CHED, media, and various NGOs (e.g. PMA, MAPA, etc.) TAG members are divided into three groups: traffic engineering, traffic enforcement and traffic education. Each group identifies the problems in its respective field and works out an action plans which are then classified into short term (3-6 months), medium term (one year) and long term, (more than one year).

2.6 Traffic Enforcement

Although the MMDA has the authority for traffic management it deputizes the Philippine National Police, Local Government Units and other traffic related agencies in the implementation of traffic enforcement and management.

The MMDA has pegged a total of 432 intersections as the sites where traffic enforcers are most needed. Due to limited personnel and resources only half of them are actually manned by enforcers.

At certain intersections, a traffic cop, an MMDA traffic enforcer, a local government enforcer and civilian volunteer are sometimes on hand. In such a gathering, the highest-ranking police officer takes command and the other enforcers will be under his control.

Since there are no guidelines, or a manual, on how to control or direct traffic at intersections discretion is often left with the traffic enforcers and manual operation of signals are often resorted to. This practice has resulted in longer cycle time, and random discretion on right-of-way causing longer queues. No scientific approach is adopted and there is no coordination between adjacent intersections.

2.6.1 Traffic Citation Ticket System

With the creation of the MMDA, a single ticketing system administered by the MMDA was introduced. This move abolished ticketing systems set up by the LGU's. To implement the ticketing system, the MMDA deputized traffic cops, the DOTC's Action Center and volunteers from the local governments. When a traffic enforcer apprehends a violator, his driver's license is confiscated and a traffic violation receipt (TVR) is issued. APPENDIX E shows an example of a TVR. The violator is requested to redeem the license at one of the 23 MMDA redemption centers in Metro Manila. They are given seven days to do this. The apprehending enforcer is also requested to report and surrender the license to the redemption center. The number of apprehensions and settlements are shown in Table 2.14.

For frequent violators (i.e. three violations), participation in the seminar is required. At the fourth violation, the driver's license may be suspended. But since the licensing and ticketing system are not computerized tracing repeat violators is cumbersome if not impossible.

TABLE 2.14
TRAFFIC APPREHENSIONS AND SETTLEMENTS OF TVRS

Year	TVR issued	TVR settled	Percent Settled
1990	513,440	332,896	64.8 %
1991	327,085	121,638	37.2 %
1992	356,626	74,290	20.8 %
1993	396,339	156,325	39.4 %
1994	293,334	126,644	43.2 %
1995	684,380	520,897	76.1 %
1996*	525,422	435,011	82.8 %

* Up to August 15
Source: MMDA

A high settlement rate in 1995 and 1996 was attained. It is noted that a large number of driver's licenses are not redeemed and the reasons are unclear.

The fine collected from the traffic violators is shared by the MMDA (75%), the agency of the traffic enforcer (5% ~ 20%) and apprehending enforcer (20% ~ 5%). The last portion is an incentive for the traffic enforcer.

2.7 Existing Plans/Projects

TRAFIMM Projects

TRAFIMM works as a coordinating body among the government agencies and NGO's. It held a workshop in September 1997 in which the traffic problems in Metro Manila were identified and solutions to issues were prepared as action plans. APPENDIX F lists the action plans identified by TRAFIMM.

MMDA Projects

Since the MMDA assumed an amalgam of tasks, it is determined to take the lead in implementing projects that are designed to mitigate the traffic problem in Metropolitan Manila. The Traffic and Transport Management Office of the MMDA has launched an ambitious plan comprising various traffic engineering, transport planning, enforcement and education projects. APPENDIX G lists the MMDA's current plans and programs. Many of the projects are already listed in the TRAFIMM action plan.

TEC Projects

The Traffic Engineering Center (TEC) of the DPWH, is a lead agency in traffic engineering, particularly on projects which require modification or adjustments on the signal system. The TEC's current projects are listed in APPENDIX H.

The existing computerized signal system covers Muntinlupa in the south, Valenzuela in the north and Marikina in the east. All signals are connected to the control center in the TEC building in Santa Mesa. Except for signals at peripheral locations, which are operated as isolated signals, interconnection is done through the TEC owned communications cable. The signal system is to be expanded and new signals are planned in the municipalities of the study area as shown in Table 2.15. Signalization is often more effective if implemented together with traffic management measures like geometric improvements of intersections or traffic regulations.

TABLE 2.15
SIGNALIZATION PLAN IN ADJACENT MUNICIPALITIES

Municipality/Province	No. of Locations	Warranted for Signalization	Traffic Management Plan	Remarks
Binan, Laguna	1	1		Plan approved
Carmona, Cavite	1			
Cavite	10	8		Plan approved
Calamba, Laguna	5	1	4	Plan approved
Los Baños, Laguna	2	2		Plan approved
Pulilan, Bulacan	3	3		Preliminary design
San Pablo City, Laguna	4	1	3	Plan approved

PNCC Projects

PNCC plans to put up a traffic management system on the Skyway. The first section from Bicutan to Magallanes Interchange has recently been completed and the second stage is soon to follow. The planned traffic management system will be constructed in three stages. Stage 1 consists of the conventional toll collection system and communication facility between toll plazas. In Stage 2, an electronic toll collection system using in-vehicle tags will be introduced. Finally, a driver information system, which provides drivers with current traffic conditions and other traffic-related information on a real-time basis, will be constructed in Stage 3. The project is, however, being finalized.

3. ASSESSMENT OF CRITICAL CORRIDORS/AREAS

Traffic conditions in the study area reveal various traffic management problems. Congestion is common not only in the central business districts but also along secondary roads and suburban roads. In the following sections, traffic conditions in the critical corridors are underscored and problems regarding traffic management are assessed. These corridors and areas are listed below and are shown in Figure 3.1.

TABLE 3.1
ASSESSMENT OF CORRIDORS AND AREAS

Type	Road/Area	Location
CBD	• Binondo/Quiapo • Ermita/Malate • Makati	Manila Manila Makati
Major corridor	• EDSA • Roxas Boulevard • Quezon Avenue	Pasay, Makati, Mandaluyong, Quezon, Caloocan Pasay, Manila Quezon
LRT corridor	• Taft Avenue • Magsaysay/Aurora Blvd.	Manila, Pasay Manila, Sun Juan , Quezon
Secondary road	• E. Rodriguez • Chino Roces Ave. (Pasong Tamo)	Quezon Makati
Suburban areas	• Commonwealth Avenue • Alabang-Zapote Road	Quezon Muntinlupa, Las Piñas
Expressway	• South Superhighway	Makati, Pasay, Parañaque, Muntinlupa, Laguna

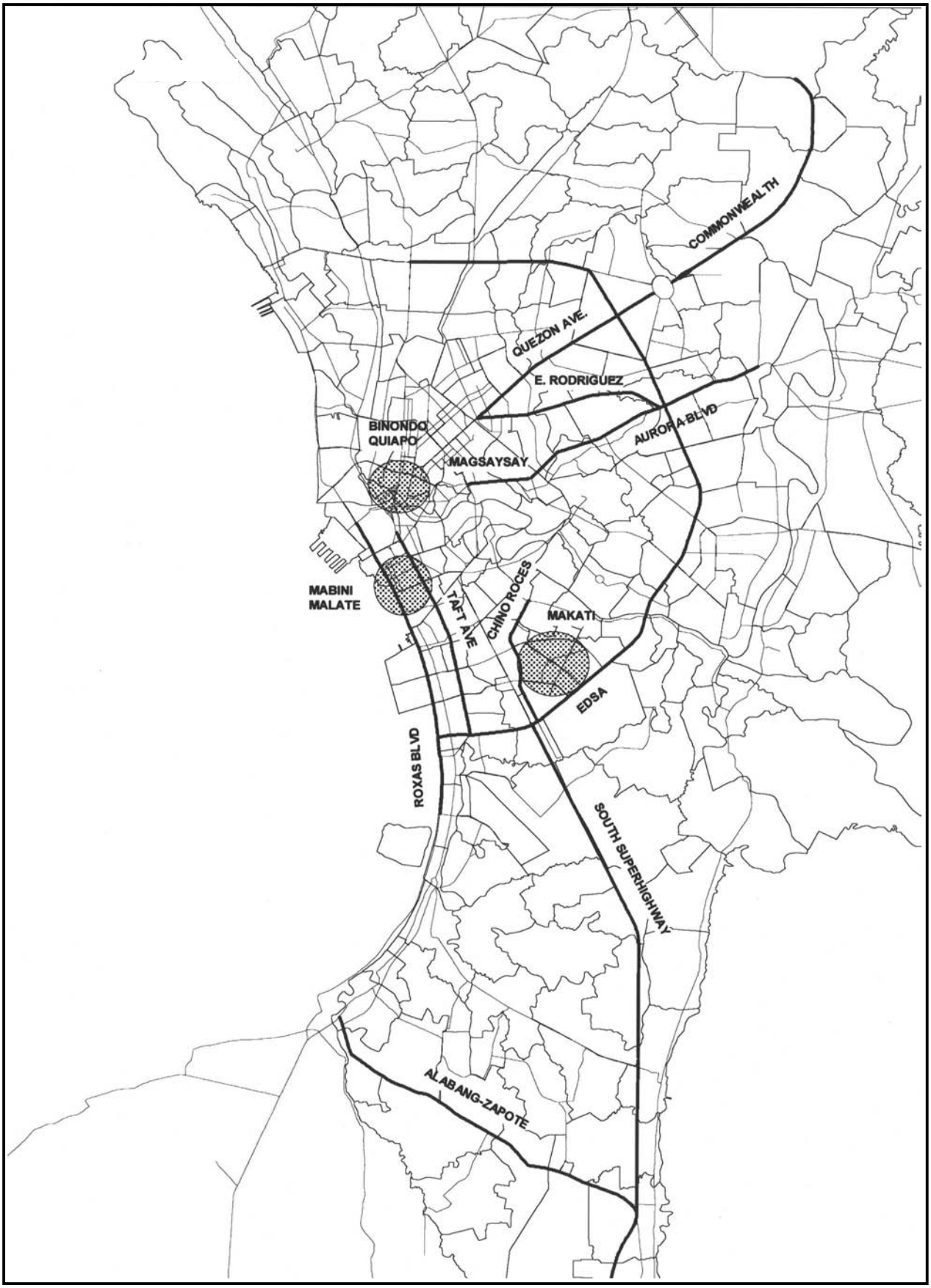
3.1 CBD

The development of Manila started in Intramuros, a fort town built during the Spanish colonial period. Until the 1970s, the center of business in Metro Manila was the city of Manila, particularly the districts of Binondo, Quiapo, Ermita, and Malate. During the onset of the 1980s the business center gradually shifted to the newly developed district of Makati.

Binondo and Quiapo

The Binondo and Quiapo areas are located north of the Pasig River. They are approximately at the geographic center of the circumferential road network which stretches outward towards the outer suburbs of Metro Manila. These two areas are the oldest commercial districts in the entire metropolitan area. They are still dotted with retail and wholesale shops and small business establishments. Quiapo Church, in the heart of Quiapo, is one of the most popular churches in the Philippines. It not only attracts worshippers but is peopled with hawkers, that have encamped in its premises to sell various goods.

FIGURE 3.1
Assessment of Corridors and Areas



There are three major streets in the area. C. M. Recto Street transverses the east-west direction. Rizal Avenue and Quezon Boulevard transverse the north-south direction. Except for this three, the other roads in the areas are narrow and the network dense and irregular. Because of the non-availability of parking spaces, vehicles commonly park on road shoulders compounding the atmosphere of congestion in the area and leaving little room for vehicles to travel through the narrow streets. Crawling cars is a common sight. The elevated tracks of LRT Line 1 runs along Rizal Avenue and Carriedo. The buildings along the three major streets are so designed that part of the ground floor is used as a pedestrian sidewalk. Other smaller streets don't have pedestrian sidewalks.

The three major streets are also major jeepney routes. Further limiting the capacity of the already narrow streets are the ever-constant loading and unloading activities of the jeepneys plying them. Compounding this are the loading and unloading activities of delivery vans.

The absolute imbalance between traffic demand, road capacity, and lack of parking spaces provide a dilemma for implementing traffic management measures in the area. Average travel speed remains very low, although the one-way scheme has been adopted in all the streets, except the major ones, and pedestrian barriers have been set up.

Recently, the separator along Quezon Boulevard, which segregates the through-traffic lanes (three lanes) from the lanes for jeepneys and local traffic (two lanes) was removed. The removal work is in a state of incompletion. Some lamp poles are still standing in the open lanes posing a traffic hazard. The separators were effective in preventing jeepneys from disrupting the flow of the through traffic. Now the fusion of the two separate lanes and the penchant of the jeepneys to disrupt the flow in the through traffic have further reduced travel time.

Although intersections along the major roads are already signalized, over saturation during peak hours and the ensuing long queues that block the intersections, render the signals ineffective.

In addition, the lane markings are fading and traffic signs are being blotted out by an over-abundance of non-traffic signs and advertisements. Parking prohibition is not clearly indicated.

Worsening the dilemma is the fact that since the area is a built-up one, there is virtually no room left for improving intersection geometry, like the creation of additional lanes or putting up turning bays.

Most of the buildings in the locale are old although some are newly built. The demolition of old edifices and construction of new and larger buildings would create additional traffic demand and add to the gravity of the congestion. Construction of

off-street parking facilities and strict enforcement of no-parking measures are clearly needed. If these reforms will not be instituted, traditional commercial and other economic activities in the area will be gravely affected by the worsening traffic congestion.

Ermita and Malate

Ermita and Malate are located south of Rizal Park, facing Manila Bay. The area is peppered with entertainment establishments, tourism sites, restaurants, nightspots, airline offices and travel agencies. Various hotels, from five-star to budget class, are scattered in the vicinity. Some government offices are located north of the area.

The area forms a grid road network involving Roxas Boulevard. T. M. Kalaw Avenue, Taft Avenue and President Quirino Avenue. Parking is prohibited along Roxas Boulevard, Taft Avenue, and President Quirino Avenue. Parking is only allowed along the side of the service road of Roxas Boulevard and T. M. Kalaw Street. Parking restrictions in nearby streets are not strictly enforced. Several side streets have been converted into off-street parking areas. But in spite of this, congestion in the area is on acceptable levels at the moment. Again, congestion is basically caused by the ubiquitous loading and unloading by jeepneys. As is common in the metropolis, sidewalks are narrow and often strewn with various obstacles. Though the area is a tourist belt its narrow sidewalks lessen the place's attractiveness.

One-way streets have been widely introduced in the area helping ease congestion. Mabini and Del Pilar streets are both one-way, mainly serving as major jeepney routes. Some sections of other streets have been made one-way, like sections of Padre Faura, and San Andres streets.

Critical intersections and other intersections are already signalized but it has been observed that signal cycle is quite long even at the intersections of major streets.

Because of its relatively moderate traffic demand the traffic situation is currently not severe and not as grave as in other metropolitan locations. But new buildings which are cropping up, like the one at the former Pistang Filipino site, will increase demand and undoubtedly foster chronic congestion in the area. Construction of off-street parking facilities and the gradual removal of on-street parking is needed. And because of its tourism features, widening of the sidewalks will make walking in the area more pleasant and attractive.

Makati

The Makati Central Business District (CBD) is located six kilometers southeast of Manila City. Makati was developed as a suburban residential district in the 1950s but has emerged into a primary business center. Many large companies, domestic and foreign alike, have their headquarters here. The CBD is delineated by EDSA, Arnaiz

Avenue (formerly Pasay Road), Senator Gil Puyat Avenue (formerly Buendia Avenue) and Chino Roces Avenue (formerly Pasong Tamo Avenue). Ayala Center with its plush hotels, high-end department stores, retail shops, restaurants, supermarkets, a church and parks, sits at the center of the area. The mixture of residential condominiums and office buildings is a common feature especially in Salcedo and Legaspi villages. Two low-story high-class residential villages are also found in the area. Access to the Makati CBD from other points is limited to a few streets, namely Arnaiz Avenue, Ayala Avenue Sen. Puyat Avenue, Makati Avenue and Kamagong Street.

Ayala Avenue, the primary thoroughfare that runs through the CBD, is one of the few well-designed and well maintained avenues in the country. Its median is strewn with flowers and plants. Its wide sidewalks also have flowerbeds and trees and feature a pedestrian barrier with decorative designs. Paseo de Roxas and sections of Makati Avenue also have wide sidewalks of similar design. Arnaiz Avenue, on the other hand, has narrow sidewalks. There are even points where the space meant for a sidewalk have been eradicated. The spaces in front of the shops in its south portion are used as parking spaces. Walking along this portion is not only unpleasant but also dangerous as pedestrians are forced to walk on road shoulders due to the parked cars.

Congestion in the CBD is a regular occurrence. One of the factors is the heavy use of passenger cars by employees working in the area and by shoppers. Congestion is severe during morning and afternoon peak hours along the access roads leading to the CBD and on the smaller streets within the area. At night and on weekends the congestion is caused by the shopping and leisure traffic.

A one-way flow system is strictly enforced in almost all the streets in the office areas of the CBD where the morning and afternoon commuting traffic demand is extremely high. An alternate one-way system has been adopted for Arnaiz Avenue. In the morning, the avenue is one-way westbound from EDSA to Makati Avenue. In the afternoon, it is one-way eastbound, at the same portion. For the rest of the day, it reverts back to two-way.

Makati employs yellow-shirted traffic aides who work with the help of traffic cops and the MMDA traffic enforcers. On-street parking spaces are also managed by the Makati traffic aides. Illegally parked vehicles are immediately towed away and are released only after the payment of a P500 fine and a P500 towing fee.

Recently, Makati has installed various traffic management facilities. Pedestrian underpasses equipped with escalators have been constructed in the Ayala Avenue – Makati Avenue intersection. Another two are currently being constructed at the Ayala Avenue – Paseo de Roxas and the Ayala Avenue – Herrera Street intersections. These modern underpasses eliminate at-grade pedestrian crossings and greatly

enhance the capacity and safety of the intersections. Another project that has been constructed is an elevated pedestrian walkway system. It acts as a second-level sidewalk along sections of Makati Avenue and De la Rosa Street.

A vehicle underpass is also being constructed at the Ayala Avenue – Herrera Street intersection. A vehicle overpass has been constructed at the EDSA – Ayala Avenue intersection. This is used by vehicles turning left from Ayala to EDSA. These facilities are expected to substantially decongest the intersections in the CBD. However, their overall effect is expected to be moderate, considering the severity of traffic congestion and the many bottlenecks in the CBD area.

An off-street bus and jeepney terminal, which could be a model for the metropolis, is located at the corner of Makati and Arnaiz avenues. The operation of the terminal by private personnel of the Ayala Corporation is well organized. Bus parking and passenger queues are well organized. Traffic signs and pavement markings are well displayed. On-street parking space is marked with white paint. Red painting on curves indicate no parking zones. These measures are being practiced even though they were not included in the Manual on Pavement Markings prepared by the former Ministry of Public Works and Highways in 1980.

For vehicle parking, the CBD has several vehicle parking buildings. New buildings are also equipped with large-sized parking facilities. On-street parking lots are allowed along most of the streets, except the major ones. But in spite of this, parking space remains insufficient, especially during peak demands.

Because development in the CBD is still continuing, traffic demand will continue to grow. If its present growth rate continue, the area will undoubtedly suffer from a dearth of road capacity and parking spaces. Removal of on-street parking and the elimination of pedestrian crossings and their replacement with underpasses and elevated walkways will help alleviate the situation, but the CBD's road capacity won't be able to serve the ever increasing traffic demand. In effect, this will be the CBD's critical mass. When this happens absolute shortage of road capacity will cause horrendous traffic jams. The result will greatly limit the business, commercial, and corporate activities inherent in the area. Introduction of drastic measures is thus highly recommended.

3.2 Major Corridors

EDSA

Epifaño de los Santos Avenue, commonly known as EDSA, is technically called C-4 because it is the fourth circumferential road built in Metro Manila. It stretches from its intersection with Roxas Boulevard, in the south, to its intersection with Rizal Avenue, in Monumento, in the north. From Monumento onwards, the avenue drastically becomes narrow and its name correspondingly changes to Samson Road. As it continues onwards it becomes San Miguel Street, which extends towards Radial Road No. 10. Widening of this road is planned but no timeframe has been set.

EDSA used to have a separator island and is divided into three center lanes and two outer lanes. The separator was intended to segregate fast moving vehicles from slow moving ones, like buses. The separator island was gradually removed at most sections to obtain additional lanes. Before the construction for the tracks of LRT Line No. 3, EDSA had six lanes per direction.

Sidewalks along EDSA are generally narrow except in some locations. Where there are pedestrian overpass, the bridge structure of the overpass occupies most of the sidewalk space with its opening wide enough only for one person to go through.

The land contiguous to the avenue varies from commercial, residential, military and industrial. There are several vacant lots along it and several large commercial centers, like Shaw, Cubao and Monumento. Through traffic defines most of the traffic on EDSA. Before, a small volume of traffic was allowed direct access to roadside facilities. Since many points along EDSA have been transformed into commercial and shopping destinations (e.g. North EDSA, Ortigas and Shaw) friction between the avenue's through traffic and the local one has increased. This has resulted in slower travel time.

Jeepneys are not allowed along EDSA except in some sections like the ones from Taft Avenue to the South Superhighway, Sen. Gil Puyat to Guadalupe and SM North to Monumento. All intersecting points with other arterial roads are used as inter-modal terminals. Large pedestrian traffic exists around these terminals. Perpendicular points like Taft, Arnaiz, Ayala, Gil Puyat, Shaw, Ortigas, Santolan, Aurora, Kamias, East Avenue, Quezon Avenue, North Avenue, Roosevelt, Balintawak and Monumento have either a jeepney or a bus stops, or both, near the intersections.

Except for the expressways, EDSA used to carry the largest vehicular volume among Metro Manila's thoroughfares, especially in the Guadalupe area. Data of its traffic volume count show about 160,000 vehicles in 14 hours in both directions between Senator Gil Puyat Avenue and Guadalupe. Many buses ply this route and the peak hour bus volume reaches more than 500 buses in one direction. Total daily bus traffic

is more than 6,000 buses per direction a day. Its outer two lanes are designated as bus lanes and are thus reserved for buses. General traffic is required to stay in the inner four lanes except during turning at intersections and getting access to roadside facilities. This separation is generally observed mainly because bus volume virtually leaves no room for other vehicles to use the outer lanes.

Fly-overs or underpasses have been constructed at intersections with the South Superhighway, Senator Gil Puyat Avenue, Kalayaan Street, Shaw Boulevard. Ortigas Avenue, Santolan Road, P. Tuazon Street, Aurora Boulevard, Kamias Road, and East Avenue. All of these intersections previously were bottlenecks before construction was implemented. Another fly-over is being constructed at the Arnaiz Avenue – Ayala Avenue section. An underground pass was constructed beneath it which connects Pioneer Street and Boni Avenue. Another set of flyovers are planned at the EDSA – North Avenue section, and the EDSA – Quezon Avenue section.

Although pedestrian overpasses have been constructed in several locations, all of these are not close to major intersections. Pedestrians, crossing at-grade, greatly reduces traffic capacity because of the longer required pedestrian green time and the expanse of the avenue. The avenue's large traffic volume is a potential pedestrian hazard.

Bottlenecks constantly occur at intersections with arterial jeepney or bus terminals. This is common at the Ayala Avenue and Quezon Avenue intersections Congestion is also high near Taft Avenue, the South Superhighway, and the bus terminals in front of Megamall and North Avenue.

Although bus bays are provided in some areas like the front of Shoe Mart Makati and Megamall bus volume is so large that bus bays cannot accommodate all buses thereby limiting its usefulness. A bus stop segregation scheme was introduced several years back to alleviate the congestion created by the buses loading and unloading in bus stops. Buses were divided into two groups classified by their points of destination. Each group was required to load or unload only at the designated bus stops. The scheme was modified in 1997. The modification divided the buses into three groups and employed a color-coding system. Instead of stopping at all the 22 bus stops, the buses were allowed no more than 10 bus stops. The move made bus trips faster.

The avenues has a total of 21 signal lights. Except for a few, the traffic lights are commonly operated manually by traffic enforcers during heavy traffic. A longer cycle time usually ensues in the intersections. Often longer than the optimum. Other than the resulting delay long cycle time also causes the emission of more pollutants from idling vehicles.

Construction of the line for the MRT Line No.3, which runs for most of the length of EDSA is on-going. Construction activities occupy the middle portion of avenue leaving only from three to five lanes for traffic. Minimum traffic management and safety devices have been adopted and installed at the working sites (i.e. fences, safety cones, warning lights, etc.) Despite the lane disruptions brought on by the work, lane markings have not been modified. New lane lines must immediately be drawn.

Roxas Boulevard

Roxas Boulevard runs along the coastal line from its intersection with MIA Road, in the south, to its intersection with Burgos Street, in the north. The boulevard connects with the Coastal Road and serves as a major access route to Manila from Parañaque and Las Piñas and the province of Cavite. The road features four lanes for each direction and has a wide median decorated with plants. A service road, separated by a green belt, runs on the east side of Roxas Boulevard. The service road provides access to the buildings along the boulevard and is commonly used as parking space. The wide space lined with coconut palms on the sea side of the boulevard, has been narrowed to provide more lanes for vehicular traffic.

Roxas Boulevard is one of the well-maintained streets in Metro Manila. The asphalt pavement has minimal potholes and its pavement are clearly marked. Street lighting is provided on both sides of the street.

Fly-overs were constructed at intersections with Senator Gil Puyat Avenue and EDSA. Its common bottlenecks are at the intersections with President Quirino Avenue, MIA Road and at Baclaran Church. A large left turn traffic at the MIA Road intersection constantly occurs, often forming three lines, even though the exit provides only three lanes thereby clogging it. The queue of southbound traffic starting at Baclaran often extends beyond the Gil Puyat flyover, during the afternoon peak hours.

A large pedestrian volume exacerbates traffic in the Baclaran portion of the boulevard. It is used as an on-street bus terminal and during Wednesdays people troop to the Baclaran Church to hear mass causing congestion through pedestrian crossing and increased volume of parked cars near the church. Baclaran is also a hawkers' market were cheap goods are sold. A pedestrian bridge is clearly required in the area. The MMDA has plans to transform Baclaran into a pedestrian mall.

Roxas Boulevard has 12 traffic signals and one pedestrian signal that is located in front of Rizal Park. The Libertad and Baclaran intersections have been closed and their signals shut off. Left turn movement from Roxas to Vito Cruz has been banned to help ease the congestion at this intersection.

Quezon Avenue

Quezon Avenue starts at the Quezon Memorial Circle, located at the northeast part of Metro Manila, and runs in a southwest direction towards downtown Manila. It is one of the ten radial roads in the metropolis. The avenue is an eight-lane divided road that sports a wide

median. Left turn bays are provided at intersections were left turns are allowed. The land running along the avenue's length is mostly commercial with a smattering of restaurants, automobile dealerships, banks, hospitals, small offices and nightclubs.

Quezon Avenue is a major jeepney route. Its outer two lanes is often exclusively occupied by jeepneys during peak hours. The general traffic is confined to its two inner lanes. Because of the jeepneys loading and unloading and their constant lane swervings, the avenue's capacity has been made smaller than its theoretical figure.

Bottlenecks regularly occur at its intersections with EDSA, West Avenue and South Avenue, Roosevelt Avenue, and at the Araneta Avenue. All these are major intersections. It has heavy left turns from EDSA and Roosevelt. It has been observed that at these intersections left-turning vehicles occupy more lanes than the designated pavement marking, clogging traffic. Left turns to Araneta Avenue has been banned to reduce the number of signal phases. Vehicles here are required to make a right to Araneta Avenue and then execute a U-turn, back towards the intersection.

The EDSA intersection has good pavement markings but there are no markings in the Welcome Rotonda area. Parking is strictly prohibited along the route. Observance of this regulation is probably being helped by the large number of jeepneys plying the route.

Traffic signals along the avenue between EDSA and Scout Chuatoco Street were installed as training equipment of the Transport Training Center, now called the National Center for Transportation Studies, of the University of the Philippines. The signals were later reconnected to the signal system of the TEC-DPWH and is now operated from by the Center like other signals.

3.3 LRT Corridors

Taft Avenue

Taft Avenue runs in a north-south direction, starting from P. Burgos Street leading to EDSA. The structure of the avenue and its corresponding traffic flow varies between its north and south sides with Vito Cruz Street acting as the point of change. The road is relatively wide at its northern section and has six to eight lanes. From Vito Cruz to EDSA, it dramatically drops to four lanes. The elevated line of the LRT Line 1 runs the whole length of the avenue using its entire center. Concrete islands are found beneath the LRT tracks except at intersection to prevent vehicles from crossing at mid-block. Pedestrian barriers have been installed for the same purpose. Pavement markings have already faded.

Hospitals, schools and commercial establishments dot its northern section while its southern portion is peppered with residential areas coupled with mixed-use areas. There is a market at Libertad and a commercial area at the south end.

Because of its wider lanes, traffic flow is relatively smooth at its northern section. The banning of left turns at most of the intersections in this section also contributes to the smoother flow here. In Libertad market vendors occupy the sidewalks. Pedestrians and waiting passengers spill onto the roadway leaving only one lane for vehicular traffic. Due to these and the ubiquitous jeepneys, traffic in the southern section is slow and congested.

A bus terminal is located at the south end of Gil Puyat Avenue. There is another at the northern portion President Quirino Avenue. Ingress and igress of buses into these terminals regularly block traffic flow though serious congestion is not inflicted. On the other hand, jeepney stops near major intersections like EDSA and Gil Puyat Avenue cause more congestion.

Protected left turns, indicated by a green left-turn signal are provided only at President Quirino, Vito Cruz, Gil Puyat and EDSA intersections. The flow however is made slow by the existence of the concrete LRT columns. Left turns are banned at other intersections along Taft Avenue.

Magsaysay/Aurora Boulevard

Magsaysay Boulevard starts from the Nagtahan intersection and ends at V. Mapa Street. From thereon the road becomes Aurora Boulevard, which crosses EDSA at Cubao and leads to Katipunan Avenue. Construction of the line for the LRT Line 2 has been started in this area.

Magsaysay Bouleavard is an eight-lane road, in both directions, with a median with plants. Aurora Boulevard has the same number of lanes from V. Mapa to the San Juan River. From the San Juan River and its merger with E. Rodriguez Avenue, it narrows down to a four-lane road without a median. From EDSA to Katipunan Road, Aurora again becomes an eight-lane avenue. A pedestrian barrier has been installed along its median. Pavement markings along the stretch are still visible. Sidewalks are narrow along the entire route except at Cubao where parts of the ground floor of commercial buildings are used as sidewalks.

Several schools and colleges are situated along Magsaysay Avenue. A shopping mall sits at the corner of Araneta Avenue. The Araneta Center in Cubao, which occupies the southeast corner of the EDSA-Aurora Boulevard intersection, is one of the largest commercial and shopping centers in Metro Manila.

Double-deck fly-overs were built along the Nagtahan – Alfonso Street section and along the Legarda Street - Nagtahan intersection, which is a five-leg intersection. Before they were built congestion was heavy in these areas. There is another fly-over at its merging point with E. Rodriguez. In Cubao, EDSA passes under Aurora Boulevard. A fly-over was also constructed at the Katipunan intersection (which is part of C5).

Magsaysay and Aurora boulevards are one of the busiest jeepney routes in Metro Manila connecting Quezon City and Marikina with Manila. Bus bays are provided near the old National Statistics Office and in front of the SM Centerpoint mall. These bus bays have reduced jeepney disruptions to the through traffic.

The EDSA-Aurora Boulevard intersection is a major transfer point between the buses lines along EDSA, and jeepneys plying Aurora. Pedestrian volume crossing Aurora or EDSA is extremely high. Sidewalks and corner islands are not large enough and jaywalking is rampant. The west approach, where Aurora and E. Rodriguez merges, is relatively wide. This factor often transforms the through traffic, the left turn traffic, and the waiting jeepneys, into one chaotic mixed.

Albeit the construction of Nagtahan fly-over somewhat reduced the severity of congestion at that area, it still remains as one of the bottlenecks along the entire route. Part of this is that the westbound side near the foot of the Legarda fly-over, is so narrow and bent that queues always exist in the site. Intersections with major roads like V. Mapa, Araneta and EDSA are regular bottlenecks. Sometimes the eastbound queue at the Aurora intersection extends beyond V. Mapa Street. There it blocks left turning vehicles emerging from Aurora to V. Mapa. As elsewhere, jeepneys are a major congesting factor along the route. Two outer lanes were once designated as jeepney lanes but the effects of the move has not been determined.

Like most other intersections with a high left turn volume, vehicles waiting to turn left occupy more lanes than they are supposed to do, creating the common through traffic block. This phenomenon is common at the V. Mapa and Aurora sections.

The LRT line that will run through the route occupies the center portion of the boulevard. At the section of existing medians, construction of the columns have not affected road capacity. But at the narrower four-lane sections, like the portion between San Juan River and Cubao -- sections where medians are non existent -- the existing four lanes will be reduced, greatly limiting capacity.

Another potential problem is the putative congestion at future LRT stations. Although, it is beyond the scope of this Technical Report on Traffic Management to forecast the effects of LRT Line 2 on future traffic patterns it is presumed that the itinerant jeepneys will still operate along the route as was the experience in Taft and Rizal avenues. Their loading and unloading practices near an LRT station will most certainly exacerbate congestion, unless bus or jeepney bays are constructed.

3.4 Secondary Roads

E. Rodriguez Avenue

E. Rodriguez Avenue, in Quezon City, is a four-lane undivided road that runs from Cubao to the Welcome Rotonda. The road is wider at the Quezon Institute,Tomas Morato and Don Egea portions. It merges with Aurora Boulevard at Cubao, where an underpass has been constructed. Sidewalks are narrow along the route.

Schools and hospitals and small shops abound along the avenue. Large commercial establishments, like car dealerships and supermarkets that were built in recent years are also located along its length. Behind these are residential areas.

The avenue complements both Aurora Boulevard and Quezon Avenue providing an alternative route for the traffic in the east-west direction. Part of the avenue is also used as an alternative route in the north-south traffic direction. Tomas Morato Avenue, E. Rodriguez Avenue, Hemady, Gilmore and D. Rodriguez streets form this route. This grid results in a heavy left turn volume at the Tomas Morato intersection.

Bottlenecks commonly occur at both ends of the road and at the Araneta Avenue intersection. Jeepney terminals at both ends of the boulevard have limited road capacity and maintained congestion. Volume is highest at the Araneta intersection with long queues regularly forming in all approaches. Except for these kinks it could be said that traffic along E. Rodriguez Boulevard is relatively smooth.

Left turns are allowed at all intersections except at locations where crossing leads to a one-way exit. Surprisingly, unlike its nearby boulevards, left turn traffic causes only minor disturbances to the through traffic.

There are ten traffic signals along the route excluding two at both ends. Signal operation is not critical except at Araneta and Tomas Morato where traffic is heavy. Signal operation could be improved by adjusting the timing parameters.

Chino Roces Avenue (formerly Pasong Tamo Avenue)

The Chino Roces Avenue, formerly Pasong Tamo Avenue, in Makati, runs parallel to the South Expressway, between EDSA and Gil Puyat Avenue. It changes direction at the north-east and ends at the J. P. Rizal intersection. The section south of Arnaiz Avenue is relatively wide and has four lanes. The rest of the road is narrow. Here vehicles often file single line. But at other intersections, two lines are formed. There is no median and sidewalks are narrow along the whole stretch.

The road passes under the EDSA overpass and is connected with it only through a side road. But only westbound movements from EDSA to Chino Roces Avenue and from Chino Roces to EDSA eastbound are possible. Because of these limited movements, traffic volume between these two roads is small.

The south section is dotted with offices and factories while shops and several offices dominate the area between Arnaiz and Gil Puyat avenues. North of Gil Puyat Avenue sits a residential area mixed with a plethora of small shops. Makati Cinema Square, a commercial complex, stands at the corner of Arnaiz Avenue.

Chino Roces Avenue, Arnaiz Avenue, Estacion Street and Don Bosco Street, form a one-way counter-clockwise loop. Although the number of conflicting movements has been reduced by a one-way system that begins at the Arnaiz intersection, the intersection is still one of the two heavily congested intersections in the area. Since the intersection is the start and end-points of the one-way system, vehicle movement is rendered irregular and the intersection is often blocked. Other bottlenecks occur at the Gil Puyat intersection, where a left to Chino Roces has been banned.

Chino Roces Avenue is heavily used by jeepneys. The north and south portions of its intersection with Arnaiz Avenue have been transformed into an on-street jeepney terminal. Heavy jeepney loading and unloading is a common practice near Gil Puyat and Kalayaan and in front of the Makati Cinema Square causing constant congestion. Occasional congestion also happens near De La Rosa Street and between Vito Cruz and Kamagong streets.

A total of five signals are used along the route. The intersection with Herrera Street may warrant a signal. There is no signal at the intersection with JP Rizal as through traffic along it is prohibited and its westbound traffic is required to make a right turn at the intersection. Signal at the Arnaiz and Gil Puyat intersections are often operated manually.

3.5 Suburban Roads

Commonwealth Avenue

Commonwealth Avenue, a vital thoroughfare, is the only arterial road that connects the huge residential area in the northeast part of Metro Manila with the center of the metropolitan area. It starts from the Quezon City Elliptical Circle and leads northeast towards Batasan, where Congress is located, and then ends at Fairview subdivision. The University of the Philippines has its campus near the Elliptical Circle. The land along Commonwealth is mostly residential although two shopping malls have already been constructed in the area. A commercial complex is located at the Don Antonio area.

Commonwealth Avenue is a six- to eight-lane divided road with a wide median. A fly-over has been constructed at the Tandang Sora intersection. Although its right-of-way is listed at 50 meters, only its center portion is concretized and used. Delineation of right-of-way is not clearly marked and sidewalks are provided only at some sections. The bare space between the road and the boundary of the right-of-way has been sequestered by the ever increasing roadside shops and have been transformed into parking spaces, stock yards for the hardware shops, and work shops. A big public market is located near Constitution Hill (running north and south). Concreting for an additional lane was done at the sections north of Don Antonio.

Commonwealth has a big bus and jeepney volume. The lack of sidewalks, the obstacles beside the avenue, and the public market have forced passengers to wait for buses and jeepneys on the road itself. This substantially limited its capacity. Because of this, bottlenecks occur not at the intersections but at the loading and unloading zones like Constitution Hill. A jeepney terminal with barriers in front of the Ever-Gotesco shopping mall has been effective in rationalizing loading and unloading. Several bus bays along the route are not properly used.

Pedestrian overpasses have been constructed in several locations. But pedestrian crossing is common where no such facilities exist. For crossing pedestrians, the wide road is compounded by the speedy traffic of the avenue.

In the morning, traffic is heavy going into Metro Manila and is correspondingly heavy in the opposite direction in the evening. Bottlenecks are at the Don Antonio intersection and at the loading and unloading zones near Congressional Hill (the north and south portions). Swerving by buses and jeepneys constantly occur in this area. Aggravating the irregular lateral movement of these vehicles is the lack of pavement marking in most of the route except at signalized intersections. Here the pavement markings were applied at the same time the signals were installed three to four years ago.

A reversible lane option is resorted to between Don Antonio and University Avenue during the morning rush hour. But the practice is applied only occasionally. Safety cones are placed to designate the counter flow lane.

MMDA and Quezon City traffic enforcers man the major intersections. They however only focus in controlling right-of-way movements at intersections and ignore the disorderly loading and unloading practices of the buses and jeepneys which is the major cause of congestion in the avenue.

A civic traffic endeavor called "Tulong Daan 2000" was once launched by the Quezon City government, the Traffic Engineering Center, the PNP Central Police District Command, Rotary Club and other government and non-government organizations. The project's aim was to improve traffic conditions by coupling traffic management measures with discipline among road users.

Commonwealth Avenue holds a high potential for becoming a model avenue in Metro Manila. It offers so much room work on. There is only a need to pave the entire width of the road and its sidewalks developed with bus and jeepney bays, waiting sheds, and planted with trees and flowerbeds.

Alabang-Zapote Road

The Alabang-Zapote Road runs in an east-west direction connecting the municipalities of Muntinlupa and Las Piñas. It runs between the South Superhighway at Alabang interchange and Quirino Avenue in Zapote. It is a four-lane undivided road with a narrow sidewalk. Beside the route are residential and industrial areas interspersed with vacant lots. Commercial establishments have steadily increased. Residents of sub-division in the vicinity usually take connecting streets to get to Alabang – Zapote Road. Then they either take the South Superhighway in the east or Quirino Avenue in the west.

Aguilar Road is the only small road that runs in a north-south direction and connects Alabang – Zapote Road with Dr. Santos Avenue, another major road running in an east-west direction located north of the Alabang – Zapote Road. Although there are several subdivision roads that leads either to the expressway or Quirino Avenue, these roads are exclusively used by subdivision residents and are closed to the public. Because of this Manila-bound traffic has to traverse Alabang – Zapote Road to get at either of the two roads at its end points. Other vehicles use Aguilar Road.

A fly-over has been constructed at Zapote. It links Alabang – Zapote Road with the Coastal Road. The flyover has increased the west bound traffic.

Traffic demand is increasing due to commercial development and population growth in the areas along the route. Congestion has become a daily occurrence especially at intersections like Marcos Alvarez.

The road sports pavement markings although markings in some sections are fading and are barely visible. Reflectorized center are found along the center line in some sections. Three locations have traffic signals (Alvarez and Aguilar roads, and Quirino Avenue). Albeit the three are operated in an isolated mode they are often operated manually by the enforcers.

The two main causes of congestion in the Alabang - Zapote Road are the left turn movements at intersections and indiscriminate loading and unloading by jeepneys and buses. At the Marcos Alvarez intersection, the large volume of through traffic and a heavy left turn to Alvarez constantly over-saturates the area. The situation worsens when impatient drivers occupy the opposite lane reducing its capacity. These drivers totally disregard the median yellow marking which prohibits crossing into the opposite direction. Violators do this with impunity because the practice is tolerated and condoned by traffic enforcers.

A bus and jeepney bay is provided in front of SM South Mall. A pedestrian overpass is provided near the bay. Even as these facilities alleviate congestion, the vehicles entering and leaving the mall's parking lot, causes minor congestion.

3.6 Superhighways

South Luzon Expressway (SLE)

There are only three toll roadways in the metropolitan area, the South Luzon Expressway (SLE), North Luzon Expressway (NLE) and the Coastal Road Tollway. The SLE starts at the Magallanes Interchange in EDSA and runs in a southerly direction. It has interchanges in Bicutan, Sucat, Alabang, etc.

The SLE used to have three lanes for each direction with paved shoulders for emergency use between the Magallanes and Bicutan interchanges, and two lanes for each direction the rest of the entire stretch. As the construction of the Skyway started, the median was removed to make way for the support columns of the elevated expressway which runs above the SLE. Because heavy traffic demand exceeds its capacity shoulders of the SLE has been turned into another lane obliterating the space reserved for emergency use.

Most of the SLE's interchanges are poorly designed. Exit lanes are short and after the exit gate, they are immediately connected to the road at short distances. Existence of service roads on both sides of expressway at Bicutan, Sucat and Alabang only worsens the problem. Smooth traffic movement is disrupted at the interchanges where loading and unloading of bus passengers are practiced. Traffic congestion outside of the expressway quickly affects its exit points and causes a queue on the SLE. This in turn causes congestion in the expressway.

The Philippine National Construction Corporation (PNCC) which manages the SLE has a set of manuals for traffic management. But the SLE lacks traffic management facilities standard in expressways in other countries. A wireless emergency telephone system was once installed but was soon stolen or vandalized. Although congestion is common there is no information system to inform drivers about traffic condition up-road. Although some subdivisions have manual display systems and radio programs broadcast traffic situations in major metropolitan roadways, including the SLE, they are often not accurate.

The dilapidated condition of the pavement on the SLE is another major problem. Large potholes and cracks which pose serious traffic hazards are found everywhere. Repair work is done only through asphalt patching. This has created another problem -- the uneven surface of the SLE which causes discomfort to road users.

To control over-tonnage vehicles, the SLE has two weighing stations, one located near the Villamor Toll Gate and the other, near the other end of the superhighway. But the two stations seemingly are not operational.

Once the construction of the Skyway is completed the new expressway will be turned over to the PNCC which will operate both the new and existing expressways. The Skyway project includes rehabilitation of the existing expressway as part of its scope of work.

The Skyway's columns have reduced the SLE's lanes to 2.5 lanes southbound and to three lanes northbound (between Villamor to Bicutan). At night, construction areas are cordoned off with warning lights. Safety measures are however not sufficient. For example, early warning signs are not properly placed when the road changes its width or when there are obstructions on the road. These are part of the bigger problem which stems from a lack of a comprehensive traffic management plan during the construction phase. Roles and tasks of the various traffic management organizations have not been clearly defined. The contractor was asked to pay an amount to the MMDA for traffic management measures the body planned to implement. The contractor was asked to prepare its own traffic plan and obtain approval for it. The plan is yet to be submitted although the work started in 1996.

3.7 Summary of Assessment

The various traffic management problems identified and assessed in the major areas and corridors in the study area are summarized below. The problems can be classified into three groups:

1.) Problems on imbalance between demand and supply.
2.) Problems related to road and road facilities.
3.) Problems related to operation.

Table 3.7.1 summarizes the traffic management problems of the areas and routes in the study area.

3.7.1 Over-saturated Condition

There is a fundamental problem of imbalance between demand and supply. Traffic demand in Metro Manila simply exceeds network capacity and this results into heavy and chronic congestion in several points. As the capacity of intersections is often smaller than the mid-block sections, long queues often happen at critical intersections with heavy volumes. A case in point are: Coastal Road – MIA Road, Ortigas – E. Rodriguez, and McArthur Highway in Monumento. In the past, construction of fly-overs in over-saturated intersections improved conditions by separating conflicting movements. There are still intersections where fly-overs are effective in decongesting traffic.

Some primary arterial roads are too narrow and thus are not suited to be primary arterial roads. Their capacity is simply too small to accommodate demand. The problem is aggravated by the perennial loading and unloading practice of the jeepneys since most primary arterial roads are also major jeepney routes. J. P. Rizal Avenue, in Makati City, and Quirino Highway, in Quezon City, are examples of narrow primary arterial roads.

3.7.2 Poorly Maintained Signal System

A signal system requires good maintenance for its to efficiently perform it function of controlling and regulating traffic flow. Maintenance refers to both hardware maintenance and software or database maintenance. Hardware maintenance, which consists of periodical check-up and repair of damaged or malfunctioned component, is essential to keep the signal system in good working condition.

Today, advanced local controllers are capable of automatically adjusting signal timing and adapting current traffic conditions. This capability is powerful but there is a limit. Manual adjustment is still needed when there is a change in traffic pattern caused by the introduction of new regulations, such as no left turns or the imposition of one-way systems. If signal is not properly tuned, green time is wasted and delay is incurred.

If communication between control center and local controller is interrupted, signal coordination between two adjacent signals can no longer be maintained. In road networks where signal intervals are short, offset is critical in maintaining smooth flow. Wrong offset causes huge and unnecessary losses to road users.

Signal bulb is a consumable item and has a short operational life. Therefore, bulbs must be replaced either periodically or as soon as failure is noticed. A “lamp off”

condition is not only hazardous but also degrades the signal operation. Drivers will be confused and trust on the system will be lost in signal if busted lamps are not replaced for long duration.

Maintenance of the existing signal system has been neglected since January 1997. In September, MMDA started to restore and maintain the signal system with the assistance of the TEC. Results are yet to be assessed as many signals are still poorly maintained.

3.7.3 Faded Pavement Markings

Pavement markings in Metro Manila are fading except in some streets such as Roxas Boulevard. The TEAM projects included the painting of pavement markings, new lane lines, turning signs, pedestrian crossings, etc. during their implementation period. After completion, Phase III, renewal of pavement marking has not been undertaken by any agency (DPWH, LGU, and MMDA). Ideally, pavement markings must be re-applied every year (if thermo-plastic material is used) and repainted every three months (if cold paint is used).

Lane lines are effective in streamlining traffic flow. Stop lines and pedestrian crossing markings are one of the safety devices placed at intersection and mid-block sections. The turn arrow marking at the approach of intersection, often ignored by drivers and traffic enforcers, designates lane use and segregates the flow of vehicles going in different directions. Lack of these marking causes traffic confusion and create undisciplined chaos.

3.7.4 Narrow Sidewalks

Most of the sidewalks in Metro Manila are narrow. Wide sidewalks such as the one along Ayala Avenue are exceptions. The Design Guidelines, Criteria and Standards for Public Works and Highways stipulates 1.5 meter as the standard width. The Urban Road Project Office (URPO) pegs it at 2.5 meter. One reason for this narrowness is that detailed design for new roads is done before actual acquisition of land is finalized. Modifications are made to fit into the actual land acquired. Sidewalks are further narrowed to provide additional lanes, or hold bus/jeepney bays.

Sidewalks often hold various obstacles, e.g.: poles, ad signs, open ditches, damaged manhole covers, parked cars, vendors, garbage mounds, etc. Pedestrian traffic flow is not only made difficult but is literally made obsolete by these obstacles. At terminals and shopping centers, narrow sidewalks force pedestrians to spill over onto the roadway. Sidewalk should have the standard width of 4.0 to 5.5 meters.

3.7.5 Loading/Unloading of Buses and Jeepneys

In Metro Manila, mobility of people heavily depends on public transport. Of the total traffic volume of 17.4 million trips a day, in Metro Manila, 40.9 % were made by jeepneys, and 14.1 % by buses. The heavy use of buses and jeepneys indicates the magnitude of the jeepney and bus transport operations and the horde of passengers they load and unload at bus and jeepney stops. On congested streets where service level is C (or worse) the loading and unloading activities of jeepneys severely restricted the movement of other vehicles. Bus and jeepney bays have proven

effective in lessening the negative effects of stopping buses and jeepneys. But the inherent narrowness of sidewalks makes it difficult to construct additional bus and jeepney bays.

The undisciplined behavior of bus and jeepney drivers worsens the situation. They often do not pull themselves close to the curve, instead allowing passengers to board or alight in mid-street. After doing this, they then swerve to the left disturbing through traffic. These drivers also have a notorious penchant for stopping at intersection exits forcing tailing vehicles to stop in the intersection. These behavior commonly cause or start a congestion.

However, culpability also resides with passengers. Passengers often wait on roadways or at corners of intersections to get on buses or jeepneys. But unlike public utility drivers, passenger discipline holds some promise. Passengers are now starting to form queues at on-street terminals (e.g. Kamagong near South Superhighway). Boarding is orderly and smooth. If this practice becomes common and widespread, and if driver behavior improves, jeepney efficiency would substantially be enhanced and the age-old problem of jeepney loading and unloading will be reduced.

3.7.6 Blocking of Intersections

One of the reasons of frequent and heavy congestion in Metro Manila is that a small congestion spreads rapidly in the neighboring area because of intersection blocking. Although yellow boxes have been present for many years, drivers ignore the markings and proceed into intersection even if the exit is already congested. There are some traffic enforcers who try to correct blocking but most of the time, they do not know what to do. In worse case, a traffic enforcer tries to stop the incoming flow, while another enforcer encourages the same flow to proceed.

Prevention of intersection blocking requires cooperation between drivers and traffic enforcers. Moreover, traffic enforcers must organize a team in which team members work in a coordinated way under the instruction of a commander. For drivers they must, or should be made, to understand that blocking practices only worsens and brings no benefit to anyone including them.

3.7.7 Running to Opposite Side

Impatient drivers move out of long lines to the opposite side to bypass the waiting queue is often observed at bottlenecks. This practice is similarly onerous as intersection blocking. Vehicles that take up the lane in the opposite direction limit the discharge flow in the opposite direction delaying resolution of the congestion. Traffic enforcers do not try to contain this bad practice and instead allow those on the opposite side to overtake the queuing vehicles. Malpractice is encouraged and honest drivers are disregarded. Though undisciplined drivers are major contributors to traffic congestion no serious initiative has been taken by traffic enforcers to address the problem.

3.7.8 Manual Operation of Signal

Manual operation of signal has often been criticized in past reports. Reasons for criticisms are summarized below:

- Inefficient
- Inconsistent
- Long cycle time
- No coordination with other signals

It is observed that under manual control, green time is kept on as long as there are vehicles still running through. Signal is changed only when a sufficient gap in the flow is observed. The practice works against an efficient operation of signal system. Simple calculation shows that to maximize the number of vehicles passing an intersection, green time must be terminated as soon as the flow falls below the saturation rate.

Splits vary from cycle to cycle under manual operation and enforcers handle operations differently. As a result, congestion or queue lengths become unpredictable and varies everyday. The consistent operation of a signal creates a favorable predictable situation and traffic condition along several alternative routes will automatically attain equilibrium over time.

Total delay becomes larger if cycle time is made longer. The illustration in APPENDIX C shows the difference in total delay for short and long cycle time lengths. Traffic enforcers should be made to understand this principle.

Traffic enforcers only see the traffic condition of the immediate vicinity of the intersection they are in. They don't know how long the queue is or what the traffic condition is at the next intersection. Optimum operation of an intersection, which cannot be achieved by manual operation, does not equate to optimum operation for the entire road network.

4. IDENTIFICATION AND ASSESSEMNT 0F PROBLEMS/ISSUES

4.1 Organization/Institution Aspects

4.1.1 Lack of Initiative

Since the 1970s, the necessity of creating a single body responsible for traffic management in Metro Manila has repeatedly been emphasized. In certain ways, this goal was realized with the creation of the Metropolitan Manila Development Authority (MMDA) in March 1995. The MMDA is tasked with administering traffic management measures beyond the boundaries of cities and municipalities. Local government units are, on the other hand, still responsible for the traffic management within a city or a municipality.

MMDA thus plays a central and active role in the planning and implementation of traffic management measures in Metro Manila. It is also required to act as a strong coordinator among various government agencies involved in traffic management. It has to do this, since traffic management cannot be implemented alone by the MMDA. In reality, the MMDA is not making full use of the power and authority bestowed on it as central traffic manager. Since the launching of its UVVRP scheme in June 1996, the authority has not implemented any major traffic measure. This may be attributed to lack of manpower, budgetary constraints, and an organizational restructuring.

To help streamline and expedite the implementation of traffic management measures, the Presidential Task Force on Traffic Improvement and Management (TRAFIMM) was established in August 1997 with the Secretary of the DOTC acting as chairman and the MMDA as secretariat. TRAFIMM compiled a list of recommendations in September 1997, which consists of action programs related to engineering, enforcement and education. It is premature to review the accomplishments of the task force at this moment. Regardless of the result of such programs, however, efforts must be sustained to solve the ever-growing traffic problem.

4.1.2 Manpower Limitations

The MMDA lacks personnel who are well versed in traffic engineering and traffic management. Though its Traffic Operation Center is manned by 2,500 traffic enforcers most of them were former metro aides handling clean up work. Although they were oriented on traffic violation procedures they were not inculcated with proper guidelines as to how to guide and control traffic at critical points. A lack of the basics on traffic flow often makes them resort to manual operation of the signals. Ignorant of the techniques of cycle time, they simply believe that manual operation is better than automatic methods.

Other government agencies handling traffic management have similar manpower problems. Experienced and qualified traffic engineers are always scarce.

4.2 Engineering/Technological Aspects

4.2.1 Lack of Scientific Approach

Many measures that were implemented in the past were not well studied. A common denominator was that most schemes were not well planned and the positive and negative effects not fully analyzed. Measures were not evaluated objectively by comparing the before and after conditions. This practice results in frequent changes in the rules and guidelines creating confusion. Evaluation is not a difficult task for a traffic engineer if necessary data is available. There are a number of software tools that can simulate or estimate the effects of proposed traffic schemes.

4.2.2 Lack of Qualified Personnel

The planning, programming, implementation and evaluation of traffic management require personnel with knowledge and experience in traffic engineering, traffic codes and related subjects. The NCTS offers a regular training program twice a year and more than 1,300 personnel from both public and private organizations have completed its program since 1978. However, they are spread all over the country and some of them are not involved in traffic management anymore. The MMDA has a large manpower corps in the Traffic Operation Center but most of them are traffic enforcers deployed at intersections. The DOTC staffers at the Transportation Planning Service are mostly planners. Traffic Management measures are often applied without thorough design by traffic engineers and once implemented no review is made.

4.2.3 Deteriorating Signal System

The basic design of the existing signal system dates back to the late 1970s. It was constructed over a 15-year period since 1980. The hardware and system functions are not sophisticated compared with today's standard. The central computer system is so obsolete that repair is daunting if it breaks down. Procurement of spare parts is a problem as they are already out of production.

Periodic review and updating of signal operation, signal phasing and timing parameter modifications are required as traffic pattern and regulations constantly change. Systematic work by qualified engineer is required for this job. At the moment, the MMDA does not seem to be showing initiative to update the signal operation. Inefficient operation of signal is extremely high at many signalized intersections.

Lack of efficient maintenance system, which must be supported by qualified personnel, and adequate funds, have contributed to the deteriorating signal system. There is no maintenance contract. The previous contract expired in December 1996. Busted bulbs are common indicating a dearth of bulb replacement work.

4.2.4 Lack of Traffic Information Database

Effective measures against congestion can be prepared only if traffic condition data such as location, severity, time, and duration of congestion are available. The implementation of major transportation projects require traffic diversion plans to minimize the impact of lane closures and other restrictions. A good traffic management plan during construction cannot be prepared unless road capacity, traffic volume, and other necessary data are available.

The Traffic Engineering Center regularly conducts intersection turning movement counts. All signalized intersections plus potential locations for signalization are included in the survey. The survey data are now inputted into personal computer and data files are kept in floppy disks. Data are, however, not organized into database. Knowledge of data structure is required to manipulate and utilize data. Establishment of volume count database is required.

The Philippine Road Classification Study (PRCS) funded by the Asian Development Bank developed three databases consisting of road inventory, geographic information and traffic count on a national level. A road inventory survey was conducted as one of the surveys of the MMUTIS project. A total of 331 roads in Metro Manila and 116 roads located outside Metro Manila were surveyed. Surveyed items included width, pavement and side friction data. This database must be accessed by other organizations including private sector for planning and administration.

Real time traffic information is required in order to grasp the true traffic situation and impose countermeasures. Traffic information includes location and severity of congestion; location and type of incident, such as accident and stalled car; location and duration of on-going or planned construction work; location and duration of events, etc. This information can be collected either through the traffic monitoring equipment such as vehicle detector and closed circuit television cameras, through radio and telephone communication from traffic enforcers, the general public, or through coordination between agencies concerned. Non-availability of this information exacerbates traffic congestion as vehicles unknowingly proceed to congested sites. An advance information system reduces congestion.

4.3 Enforcement Aspect

4.3.1 Complexity of the Legal System

Basic traffic rules are laid out in Republic Act 4136, enacted in 1964. As mentioned earlier, some clauses in R.A. 4136 are not suited to today's congested and diversified traffic environment. To complement R.A. 4136, various traffic codes and ordinances were issued by the Metro Manila Commission and Metro Manila Authority. After the passage of the Local Government Code of 1991, the local government units started to enact their own regulations. These developments have resulted in a plethora of overlapping provisions and contradictory requirements. In addition, coverage has not been sufficient and regulations not well defined. This condition of incompleteness has resulted in state of confusion among drivers and traffic enforcers alike.

A case in point are the fines for traffic violations. R.A. 4136 originally stipulates and lays down the amount of penalties for the violation of a specific traffic rule. DOTC's Department Order 93-693 issued on November 13, 1992 is also valid and in effect regarding penalties. The local government units have come up with their own versions on rules and penalties. On illegal parking, the DOTC Department Order imposes a P150 penalty while Makati City imposes P500.

The MMDA recognizes the necessity of a unified traffic code and is preparing the Metropolitan Manila Transport and Traffic Code. Table of contents of the code is included in APPENDIX B. The move is commendable as it will rationalize the confusion and simplify traffic rules. But the institution of such a code should be established on a national scope.

4.3.2 Poor Quality of Traffic Enforcers

Actual traffic enforcement in Metro Manila is carried out by the traffic police, the MMDA traffic enforcers and traffic aides hired by the LGUs. The latter two groups are deputized by the traffic police to enforce traffic rules. Commonly, these groups are not well trained. By itself, the quality of traffic cops is influenced by the recruitment culture in the PNP. New recruits undertake a general training and regimen for crime fighting, however, there is no special training for those who eventually end up as traffic cops.

Because MMDA traffic enforcers were former metro aides, many of them only know how to fill out traffic violation receipts. Ideally, a minimal orientation on traffic engineering should be required for enforcers handling traffic management in metropolitan cities.

LGUs, on the other hand, hire traffic aides on a contractual basis. Their remuneration is low and no qualification is set for applicants.

4.3.3 Lack of Guideline for Traffic Enforcers

Compounding the poor quality of traffic enforcers, traffic management operation by traffic enforcers is not efficient since no guidelines exist to help them control traffic flow. Traffic cops, MMDA traffic crews, and LGU traffic aides are often assigned to the same intersection. The traffic cop is supposed to be in charge and supervise work of the latter two personnel. But in reality, tasking is not organized and this collection of enforcers often works individually, acting on their own individual intuitions. Actual traffic management thus regularly differs due to variations in enforcement.

A guideline must be prepared in order to make the traffic management operation at critical intersection more efficient. This guideline should have two parts. Part one should touch on the basic concept of traffic management. Part two should provide operational procedures that are specific for each intersection. The creation of a team with a leader and with members coordinating with him is also necessary. The guideline should indicate the position of each member of the traffic enforcement team and what his specific task is.

4.3.4 No Legal Bases for Pavement Markings and Traffic Signs

Various kinds of traffic signs and pavement markings are applied in the road network not only in Metro Manila but also in other parts of the country. Though there are manuals on traffic signs and pavement markings prepared by the Traffic Engineering Center, there is no law granting legal basis to these signs and markings. In addition, the manuals were prepared in late 70‘s and has not been updated to cope with today’s more complicated traffic conditions. The Traffic Engineering Center once attempted to revise the manuals but no new version was issued.

4.4 Education/Social Aspects

4.4.1 Lack of Education for Drivers

Driver’s licensing in the Philippines is administered by the Land Transportation Office (LTO). A person who intends to obtain a driver’s license must take and pass an examination at the LTO. The examination consists of a written test, psycho-physical test and a driving skill test. The written test is a multiple choice tests of traffic rules and can be easily answered. Those who forego enrolment in driving schools don’t receive orientation on traffic rules, regulations, and road courtesy.

There are about 20 driving schools in Metro Manila accredited by the LTO. These driving schools are required to provide prospective drivers with classroom training in addition to teaching driving technique. However, their emphasis is more on driving skills rather than traffic rules. In addition, percentage of applicants for driving schools is less than 10% due to the high tuition the schools charge.

Because of this, most drivers in the Philippines are not literate on current traffic rules and road courtesy. Drivers commonly don’t stop when they see pedestrians about to cross a street. Instead, they honk their horn and proceed without giving way.

Driver education programs have been launched in the past. The TRAFIMM project recommended the following reforms: mandatory re-testing of drivers renewing drivers license, issuance and publication of necessary regulations, seminars for violators, media campaign on traffic discipline, etc. Effects of such programs are not immediately visible and sustained efforts are required to have positive impacts on the behavior of drivers.

4.4.2 Lack of Education for Students

Currently, traffic safety education program is not incorporated in the school curriculum at all levels from pre-school to university. According to the 1996 Philippine Statistical Yearbook, students (primary, secondary and tertiary) comprise 28.8 % of the population in the National Capital Region. They are exposed to risks on their way to and from schools and even during after-school activities. Unless taught by adults, children are ignorant about the perils of road hazards. Safety education in school would be effective because children and students learn more easily than adults. Teaching basic traffic rules at school won’t require much capital outlay. It can be started if the agencies concerned are determined to promote safety for students.

4.4.3 Undisciplined Behavior of Drivers

Undisciplined drivers are a major cause of traffic congestion. Observation of traffic flow in Metro Manila reveals three notorious behaviors of drivers: blocking of intersection, illegal counter flow, and sudden and forcible lane change by bus and jeepney drivers. These behaviors contribute to the creation and expansion of traffic congestion.

Impatient drivers proceed into intersections even if the exit side is already packed with vehicles. Vehicles stop and deliberately block other intersection movements. Although there is a regulation prohibiting blocking of intersections, and yellow box markings are provided at some intersections, they have not proven effective in alleviating the problem.

It seems a habit of Filipino drivers to cross the centerline and occupy the lane of the opposite traffic whenever congestion occurs. The result is that queues are formed in both directions and the two opposing flows block each other out, discharge rate turned nil. Traffic enforcers often tolerate this onerous practice.

Exacerbating this condition is the fact that bus and jeepney drivers are paid on a commission basis. For remunerative reasons, drivers try to carry as many passengers as possible and ply the route as many times as possible to maximize income. Because of this and coupled with ignorance of road safety and courtesy, bus and jeepney drivers make sudden lane changes near bus and jeepney stops causing congestion. Vehicles behind them are forced to slow down to give way to the lane trespasser.

5. IMPROVEMENT DIRECTIONS

5.1 Traffic Management Policy Direction

Traffic management in the study area confronts the issues and problems described in the preceding chapters. These issues were in existence long before. Proposals and recommendations were made, some were implemented successfully while others were not as successful. Despite these efforts, traffic congestion has worsened mainly due to rapid economic growth and the widening gap between demand and capacity of existing road networks. A new approach is clearly required. New policies should be instituted and their emphasis should be on the following:

- From demand responsive to demand management.
- Introduction of market mechanism.
- Internalization of external cost.
- Use of information technology.

5.1.1 From Demand Responsive to Demand Management

Congestion is worsening because of the widening gap between the rapidly increasing vehicle volume and the slow expansion of road networks. In the past, traffic demand was considered a given and the measures suited to handle the demand was selected. This approach has lost currency under present traffic conditions in Metro Manila. Since network capacity will never catch up with demand, demand must be contained in one way or another. There are physical, regulatory and financial measures to manage demand. These measures work to reduce the size of demand, or disperse demand over time or space, or change transportation mode. Different types of vehicles, private cars, buses, taxis, etc. can be treated in different ways. Measures giving priority or favor to one type over other types of vehicle are used. But whatever measures are taken, fairness and transparency should be factored in and the benefits must be tangible.

The first attempt at this approach was the institution of the odd/even scheme. Implemented in December 1995 it restricted vehicles from major streets during morning and evening peak hours depending on the last digit of their plate numbers. The scheme evolved into the Unified Vehicle Volume Reduction Program (UVVRP) in June 1996 and more stringent features were added. The scheme is still in effect.

A MMUTIS study on the control of vehicle use revealed that about 70% of the respondents were affected by the UVVRP, 33% negatively and 37% favorably. In spite of the fact that one-third of respondents experience the inconvenience, 90% of the respondents support the UVVRP scheme. Acceptance of the scheme by the majority is considered a sign that people are recognizing the seriousness of the traffic problem and acknowledge the need for containing demand.

5.1.2 Introduction of Market Mechanism

In a heavily congested road network like Metro Manila's, demand will always exceed capacity. To help ensure that traffic conditions remain at acceptable levels, demand must be contained. The UVVRP is one such tool of containment though it is applied uniformly to all vehicles except public transport and other exempted vehicles. All vehicles are treated equally regardless of type or their purpose on the road. But the UVVRP does not utilize a market mechanism to help in the containment. It should be noted that some road users are willing to pay additional costs to be allowed to use their vehicles during peak hours.

One way of using market mechanism is to charge a certain fee for the use of a congested road during peak hours. An area is designated restricted and a fee is charged for those entering it at a certain time. Only vehicles willing to pay the fee will be allowed entry resulting in reduction of volume within the area. Demand size will depend on charge rate. If the fee is high, there will be less demand and vice versa, like the demand supply relationship of other goods. In this scheme, market mechanism plays a role of setting the level of demand.

5.1.3 Internalization of External Cost

Traffic congestion carries a high cost in terms of the following variables: longer travel time, road maintenance, pollution, noise, and the increased risk of traffic accidents. Motorists shoulder this cost by enduring longer travel time and consuming more fuel. However, road users don't shoulder the cost that comes about when they cause the delay of other vehicles. They also have no share in the cost shouldered by the community in road maintenance. The cost of pollution is even graver.

These factors underscore the need for a mechanism in which road users will be required to shoulder external costs. This way they might realize the true cost of vehicle use. This mechanism should be more congestion specific rather than merely increasing the cost on car ownership and vehicle operation. This is the reason why policies like higher taxes on vehicle and fuel, and registration fees are not enough. Levying a congestion fee will internalize total external costs. The level of congestion can be determined by the amount of the congestion fees. The higher the fee, the lesser the congestion.

5.1.4 Use of Information Technology

Recent innovations in information technology have made the transmission of data, whether in figure or in image, easy and inexpensive. In traffic management information technology could be harnessed to help alleviate congestion. Information technology can do this in two ways:

- Traffic demand replacement
- Intelligent Transportation System

Traffic demand itself is being greatly affected by information technology. A yet to be quantifiable demand has partly been replaced by the onset of the telephone, the fax

machine, videoconference system, and the personal computer. Some people and goods no longer need to move around. Delivery of letters is being replaced by the fax machine and the e-mail. Meetings can be held through a teleconference system. Information technology is slowly rendering physical distance obsolete.

The Intelligent Transportation System (ITS) is an advanced transportation system equipped with state-of-the-art information technology. Efficiency, amenity, safety and the environment traffic conditions will be greatly enhanced by an ITS in which road and vehicles are integrated into an information system. Vehicles are made into thinking cars with the aid of computers and other devices. Information is exchanged between roadside and vehicle for the optimum operation of a road network. Research and development projects of ITS-related technology are being undertaken in the developed countries and some of the fruits of the development have already been implemented not only in the developed countries but also in the developing countries.

An intelligent transportation system is being utilized in other areas like the advanced navigation system, electronic toll collection system, safe driving, traffic management optimization, efficient road maintenance, support of public transport, efficient commercial vehicle operation, support for pedestrian, and support of emergency vehicle operations.

As the world is moving in this direction the Philippines should also start to make steps towards this goal. Although relatively primitive, the Philippines has made some steps in this regard. It has instituted the traffic information dissemination system and often utilizes commercial broadcasting. The new Skyway intends to introduce an electronic toll collection system. More emphasis must be given in this area.

5.2 Review of Traffic Management Measures

Traffic management measures refer to tools used to control and regulate traffic demand and flow. As shown in Table 5.1A & 5.1B, there are various measures each with a different objective. It should be noted that relationship between measure and objective is not necessarily clear-cut as indicated in the table.

Traffic congestion occurs when demand exceeds capacity. The severity of congestion is more than proportional to the gap between demand and capacity. A small excess demand, if maintained, accumulates to a heavy congestion. Thus, traffic congestion can be mitigated by either reducing the demand or increasing the capacity. Another approach to the congestion problem is the promotion of public transportation which is more efficient in terms of road space. This section presents the general review of these measures.

TABLE 5.1A
TRAFFIC MANAGEMENT MEASURES AND OBJECTIVES

	Ownership Control	Demand Control	Public Transport	Network Distribution	Capacity Increase	Traffic Safety	Clean Air
Additional tax	○	○					
Off-street parking requirement	○	○					
Quota system	○	○					
Vehicle inspection	○					○	○
High-occupancy vehicle		○					
Road pricing		○					
Truck ban on certain routes and areas		○					
Plate number scheme		○					
Tricycle ban on certain routes and areas					○		
Staggered working hours		○					
Parking provision within building					○		
Restrict on-street parking					○		
Priority lane provision in some area			○				
Bus priority signal			○				
Bus/jeepney terminal			○				
Waiting shed			○				
Bus location system			○				
Segregated bus stop			○				
Traffic signal					○	○	○
Arterial signal coordination					○	○	○
ATC system					○	○	○
Turning restriction				○	○		
One-way street scheme				○	○		
Reversible lane in some area					○	○	
Geometric improvement of intersection					○	○	
Fly-over					○	○	○
Bus/jeepney bay					○		
Pavement markings					○	○	
Street lighting						○	
Traffic signs					○	○	
Traffic control devices						○	

TABLE 5.1B
TRAFFIC MANAGEMENT MEASURES AND OBJECTIVES

	Ownership Control	Demand Control	Public Transport	Network Distribution	Capacity Increase	Traffic Safety	Clean Air
Navigator system				○		○	
Roadside radio				○			
Changeable message sign				○			
Broadcasting				○			
Incident disposal					○	○	
Driver education					○	○	
School curriculum						○	
Public education						○	
Law enforcement					○	○	
Pedestrian barrier						○	
Pedestrian overpass					○	○	

5.2.1 Capacity Enhancement Measures

Table 5.2 shows the measures to increase physically or effectively the capacity of road or that at intersection. A brief description of each measure and its applicability to the study area is given below.

TABLE 5.2
CAPACITY ENHANCEMENT MEASURES

Category	Measure	Remarks
Physical	• New road • Fly-over • Road widening • Turning bay • Pedestrian overpass • Bus/jeepney bay	Intersection intersection
Traffic Regulation	• One-way • Turning movement restriction • Reversible lane • Parking restriction	Intersection
Signal	• Intelligent signal	Intersection
Information	• Traffic/road information • Route guidance	
Vehicle segregation	• High/low speed vehicles • Bus/jeepney lane	
Roadside friction	• Pedestrian barrier • Bus stop segregation • Removal of sidewalk vendor	
Guidance	• Guidance signs • Pavement markings • Traffic signs	

Physical Method

Physical measures range from the construction of new roads to the provision of bays for turning vehicles. Construction of new roads requires the acquisition of right-of-way. Because this usually takes it is not considered a traffic management measure.

Several fly-overs were constructed in Metro Manila over the past ten years. Most of the intersections with large bottlenecks have already been provided with flyovers. And there are still locations where a fly-over has proven effective in reducing congestion. These locations are presented in Technical Report No. 6 on Urban Road Development in Metro Manila.

In the Metro Manila TEAM Projects, the geometry of intersections to be signalized was reviewed and various geometric improvements were implemented. These included widening the existing right-of-way, the provision or demolition of corner islands, creation of turning bays, construction or demolition of medians, etc. Thess actions left little room for further improvement at intersections already signalized. However, when new traffic measures are instituted, modifications may be required to the new requirements.

Traffic Regulations

Traffic regulations, particularly the one-way system and turning restrictions have proven effective in improving capacity along streets and intersections. Signal coordination is easier and effective in one-way street. The number of signal phases can be reduced if some movements are eliminated. But some requisites should be met for these to work effectively.

It should be noted that both the one-way scheme and turning restrictions are aimed at simplifying the street and intersection flow by eliminating movement in some directions. Ironically, the one-way scheme has resulted in longer trips for those whose movements were restricted. The application must therefore be evaluated carefully by comparing the merits and demerits of the measure. It has been observed that the measure has been often used without maximum assessment of overall effects. Even as it solved the original problem, it spawned congestion in other locations.

The reversible lane system assigns different lanes to the two opposing directions at different periods in a day, depending on the proportion of traffic demand (e.g. peak commuting traffic). The system proved effective if the ratio of the demand varied in a day and a particular road had enough lanes to offer maneuverability. The capacity of the mid-block section tends to increase with the scheme but the traffic flow at the start and end points must be properly managed. If the bottleneck is not the mid block section, the measure works in shortening queues. But for the individual vehicle, however, the travel time would remain the same or could even be worse. In Metro Manila, reversible lanes have been adopted along several routes like Ortigas Avenue and Commonwealth Avenue. Unauthorized reversible lanes also occur in some locations where impatient drivers occupy opposite lanes to bypass long traffic lines. In such case, the reversible lane works negatively as it hampers the smooth flow of the opposing traffic.

On street parking occupies a space equivalent to one or more lanes. To utilize the capacity of a street to the full extent, no parking measures must be strictly be applied. Enforcement of no parking is sometimes very difficult since there are always illegally parked cars if the demand for the parking space is much higher than the actual parking space. In Metro Manila, such situations occur in several congested locations.

Signals

The capacity of a street is limited not by its sectional dimension but by the capacity of the intersection along where several conflicting movements must share the same space. Traffic signal is to control movements at intersections. If the operation of a signal is not properly adjusted to the traffic demand, green time will be wasted and the capacity, which can be expressed in terms of the total number of vehicles that can pass the intersection during a given time, will be reduced. Today's advanced signal can adjust its timing on a real-time basis to adapt to the changing demand. Two facts must be pointed out, however. First, there is a limit on the additional capacity a good signal can offer. The improvement is achieved only by eliminating misusing green time. The capacity can not be more than the limit determined by such factors as intersection geometry, composition of vehicles, etc.

Secondly, in a road network where signals are close to each other, flexibility of the signal timing adjustments is reduced due to resulting constraints on signal coordination. Signals are interrelated and the optimum operation of a signal does not produce the optimum situation on a network level.

This goes to show that the improvement attained by the signal system is marginal and a dramatic reduction cannot be expected. Metro Manila is congested to the point that even the most advanced signal system cannot eliminate the congestion. But it should be remembered that the existing signal system in Metro Manila is outmoded. The central computer system is outdated and manual operation of signals by traffic enforcers is very rampant.

Traffic Information

Another decongesting measure is the diversion of vehicles away from congested areas. But efficient diversion techniques can only be achieved through the provision of information to motorists. The state of traffic must be relayed to motorists. If information on congestion is learned beforehand (e.g. accidents, construction work going on, etc.) motorists can take other routes or delay their trips. In Metro Manila, a traffic information system is becoming more important as its congestion worsens. Also discipline can relatively be attained if motorists are informed of actual causes of congestion.

There are various ways of relaying road information to motorists. The most direct is the changeable message sign installed beside highways. Electronic signboards, using large characters or graphic presentation, update motorists on conditions upload. Drivers can change routes if their original route is congested. Spot reports from commercial broadcasters on traffic conditions are a popular media in Metro Manila. However, its effectiveness is limited as volume and reliability of information is

sometimes not sufficient. Other methods such as roadside broadcasting facility, telephone answering machines, the Internet, etc. must be developed.
A route guidance device is an on-vehicle device that shows a vehicle's route towards its destination. However, the device isn't of much help as it only aids drivers to pick the right route by indicating which street to take and where to make turns.

Vehicle Segregation

The interaction between fast- and slow-moving vehicles often reduces the flow pace in a thoroughfare. Mixing different types of vehicles like passenger cars, buses and jeepneys, trucks etc. generally deters smooth flow. Groupings of same-type vehicles are therefore effective in maintaining a homogeneous flow. Lane markings and separators are tools used to achieve this purpose. EDSA used to have a separator segregating high and low speed vehicles. They were gradually removed to provide additional lane.

Roadside Friction

Many roadside facilities and activities limit road capacity. Factors such as: lack of sidewalks, pedestrians walking on roadsides, parked cars, loading and unloading practices, parking maneuvers, obstacles placed on roadsides, illegally erected poles for ad signs, etc., contribute to capacity reduction. Unpaved road edges, deteriorated pavements, and potholes also disturb flow and limit speed. Addressing these problems is effective in attaining smooth flow. If the above-mentioned factors are addressed substantial improvements could be achieved in Metro Manila for they are causes of roadside friction.

Guide Signs and Markings

Maintaining smooth flow is a simple but effective way in attaining capacity. Any disturbance reduces capacity. Guide signs, lane lines, pavement markings, and traffic signs help in this purpose. Guide signs act as route signposts, while lane lines and pavement markings help streamline traffic flow. Traffic signs are meant to notify motorists of existing regulations in particular locations. Guide signs are implements normally used by agencies handling road maintenance, i.e. DPWH, MMDA, etc. Lane lines and pavement markings were extensively installed during the TEAM projects. It is not, however, clear as to what agency is responsible for the upkeep of these signs. They require re-application at least once a year.

5.2.2 Traffic Demand Restriction Measures

Traffic demand restrictions can be achieved in two ways: restrictions on ownership of vehicles and restriction on vehicle use. Control of parking and regulation of parking lots also helps control vehicle use. Table 5.3 summarizes the traffic demand restriction measures.

TABLE 5.3
TRAFFIC DEMAND RESTRICTION MEASURES

Type	Ownership	Usage	Parking
Physical		• Pedestrian mall • Zone system • Limited parking space	
Regulation	• Quota system • Parking space certificate	• Restricted area • Number plate system • High occupancy vehicle • No parking • Staggered or flexible office hours	• Operating hours • Maximum parking time • Priority • Enforcement of no parking regulation • Increase in penalty for illegal parking
Financial	• Tax on purchase, registration and annual renewal	• Tax on fuel • Tax on parts • Road/congestion pricing	• Levy on parking fee • Flexible parking fee • High parking cost

Physical Measures

Physical methods literally ban or restrict vehicle use in certain areas. Pedestrian malls, whether temporary or permanent, helps limit vehicles use. The MMDA has a pedestrian zone project for Redemptorist, Baclaran area and Escolta, in Manila. A zone system controls entry into a zone through a limited number of access points. It also removes through-traffic which uses a zone to reach another zone. This requires implementation of physical measures. But in Metro Manila they are not readily implemented.

Parking space availability is also a factor which affect vehicle use. However, in Metro Manila where alternative transportation is not readily available people still use their cars even with the scarcity of parking spaces.

Regulatory Measures

Traffic demand restriction through regulation can be applied to car ownership, car usage and parking. The regulations related to car ownership are the quota system and parking space certificate. The quota system, which is applied in Singapore, limits annual car sales to keep vehicle population under control. Parking space certificates are applied in Japan, Korea and Taiwan. This requires prospective car owners to prove that they have an off-street parking space for the vehicle being purchased. This is intended to reduce on-street parking.

A variety of measures regulating car usage have been applied in Metro Manila. In certain restricted areas only vehicles with certain stickers are allowed access. But this has been done only on a limited scale as it is too restrictive. Another is the odd/even and the unified vehicle volume reduction schemes.

The plate number-based system has proven effective in reducing traffic demand. But it has its own shortcomings. Wealthy people who own more than one vehicle can skip coverage and it grants exemptions to certain types of vehicles like buses, jeepneys and emergency vehicles. This complicated the scheme. In a city like Metro Manila where the increase in the volume of registered vehicles is rapid the scheme's earlier effectiveness will soon be negated.

The high occupancy vehicles system (HOV) provides preferential treatment to vehicles with several passengers. HOV lanes, which is popular on the freeways in USA, is an inspirations of the local version. The odd-even project exempted HOV motorists from restrictions. The unified vehicular volume reduction scheme, currently in force, however does not grant exemptions to HOV motorists. Enforcement is a bit dicey in the HOV system because the number of riders must be checked by enforcers. In Jakarta, Indonesia, children called jockeys are seen standing near restricted zones offering themselves as dummy passengers.

No parking regulations, if strictly enforced, also helps discourage vehicle use. However, reasonable alternative means of transportation must be available for the regulation to be followed.

Financial Measures

Financial measures can be applied to discourage car ownership and car use. High acquisition costs can have a negative impact on car ownership. Annual registration costs also affects vehicles growth. High fuel costs reduce the use of vehicles in general and thus is not effective in determining congestion at specific locations. Road pricing, which will be described later in detail, has been contemplated for many locations. Theoretically, high parking fees can curtail vehicle use but in Metro Manila, where most car owners are affluent, this will be of less help.

5.3 Expanded Demand Management

Demand management measures must be seriously considered because of the worsening traffic condition, coupled with the fast growth rate of car ownership and the slow pace of road network expansion in the study area. A traffic impact study and a congestion-charging scheme are possible alternatives in this department.

5.3.1 Traffic Impact Study

The pace of economic growth in the country has resulted in large-scale developments in many parts of Metro Manila. Shopping centers, sub-division, office buildings, hotels, hospitals, industrial parks, etc. were examples of such large-scale development.

As an example, the sprouting of shopping centers in Metro Manila have attracted a huge number of shoppers, virtually arriving either public transport or private car. Traffic congestion around the shopping centers is a common phenomenon now at such locations as SM Mega Mall, SM North, Harrison Plaza, Ayala Center, etc. Efforts have been exerted to attain some rationalization, i.e. the creation of jeepney bays etc. But the inability to include traffic management in the development of these areas is now proving daunting to in the attempt to manage traffic in these areas.

A traffic impact analysis is used to determine whether the road network in the area of a proposed major development will be able to handle additional traffic that the development will generate. If the road network cannot accommodate the additional traffic, an impact analysis should determine the types and extent of improvements needed or how traffic should be controlled.

The study should be made mandatory requisite in getting permits for large-scale developments. Some private developers are aware of the necessity and usefulness of the traffic impact study and conduct the study to make their development project more efficient and trouble free. The proposal is to officially incorporate the process into the development program. The process will provide consensus among the government, the developer, and the community as to the impact and what measures to take.

A traffic impact study is aimed at gaining a rational traffic environment by studying and evaluating how new development project, which will induce a large-scale traffic demand, will impact on the traffic in the project site. The study implements measures for improvement. Mitigation of potential traffic problems, better accessibility for users, lesser disturbance to the through traffic, and deeper understanding of the traffic by the developer are among the expected benefits of the traffic impact study.

The study has two goals: to rationalize the existing traffic and transportation system, and to improve the efficiency of that system. Under each category are specific items that should be achieved.

Rationalization of traffic and transportation system:

- Systematic expansion of arterial and distributor road networks.
- Adjustment of interest among those in the transportation business.
- Improvement of the transportation system in the neighborhood.

Improvement of traffic facilities:

- Improvement of existing inefficient traffic facilities.
- Restructuring of transportation system including putting emphasis on public transportation.
- Implementation of demand management suited to the specific traffic demand.

Countermeasures to be implemented to improve the traffic environment will include, but not be limited to, the following:

- Geometric improvement of roads and intersection.
- Improvement of entrances and exits.
- Improvement of public transportation.
- Improvement of facilities for pedestrians.
- Improvement of parking facilities.

Review of a traffic impact study will be undertaken by an evaluation committee composed of the MMDA, LGUs, the DPWH, the DOTC, and other experts on traffic

and urban planning. The evaluation of traffic impact will be made objectively based on the following information to be prepared by the study:

- Outline of the development project.
- Current land use and traffic conditions in the surrounding area.
- Traffic demand forecast in the surrounding area.
- Impact on the traffic environment by the proposed project and identification of problems.
- Other problems caused by the project and intended countermeasures.
- Benefits and effects of countermeasures.

Understanding traffic impact is crucial as the pace of large-scale development is increasing in Metro Manila. Countermeasures can be implemented more effectively with less cost if the impact is analyzed and potential problems are addressed in beforehand.

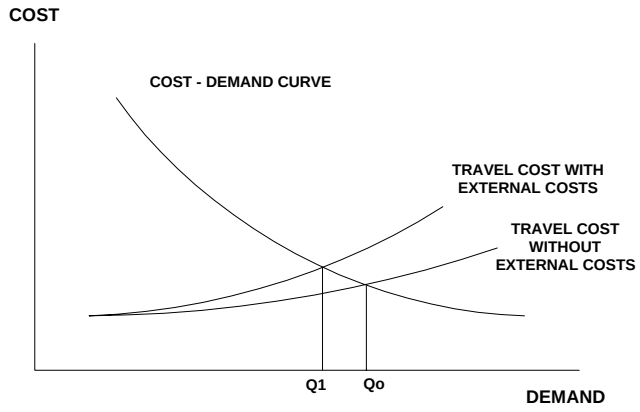
5.3.2 Congestion Charging

The relationship between cost and demand is inversely proportional. If cost is high there is less demand, if cost is low there is more demand. This rule also applies to the traffic demand and travel cost as shown by the Cost-Demand curve in Figure 5.1. More demand is generated if travel cost is low and vice versa. On the other hand, the cost incurred by each vehicle user becomes gradually higher as traffic volume increases because of slower travel speed at higher traffic volume as shown in the Travel Cost Without External Cost in the figure. The actual traffic volume Q_0 will be determined as the cross point of two curves.

The vehicle operating cost incurred by the vehicle user consists of vehicle operating cost (VOC) and time cost (TC) of persons on the vehicle. However, there are other costs that each vehicle inflicts to other vehicles and society as a whole. Addition of a new vehicles make travel time of other vehicles longer and causes more pollution to be emitted. Road maintenance cost becomes larger and the cost of traffic management increases as the volume increases. These costs are external to the added vehicle because it does not pay the said additional cost.

As shown in Figure 5.1, if a mechanism exist wherein the external cost can be chargeable to the vehicle user, the cost of vehicle will become higher as outlined in the Travel Cost With External Cost curve. The resultant traffic volume Q_1 will be the cross point with Cost-Demand Curve, which is lower than the original traffic volume. The mechanism works to internalize the external costs that a vehicle creates. The amount of traffic volume reduction depends on such factors as amount of charge and the willingness to pay by road users. Other factors like restriction area, time of restriction, etc. also affect the operation of the scheme.

FIGURE 5.1
COST-DEMAND RELATIONSHIP



Congestion charging incorporates the mechanism of internalization and obligates road users to pay the true cost their vehicle generates. Congestion charging is a very useful and effective tool for the following reasons:

- It makes the use of private vehicles less attractive by imposing additional cost on them.
- It promotes the use of a mass transit system as public transport will become more reliable and faster because of less congestion.
- It introduces market mechanisms and removing less important vehicles attains decongestion.
- It brings in revenue that can be used for transportation infrastructure development, traffic management, and other road, traffic and transportation improvement projects.

The objectives of congestion charging are to reduce the congestion in the target area by imposing appropriate charges on the road users. Its more specific goals are:

- To use the existing road network more effectively.
- To eliminate unnecessary trips.
- To internalize the external costs incurred by society and the environment.
- To encourage use of public transport.
- To secure fund sources for traffic management and transportation infrastructure projects.

Congestion charging is similar to the unified vehicle volume reduction program (UVVRP), which restricts use of vehicles based on plate numbers. Both schemes are intended to reduce volume. But congestion charging allows vehicles to enter a restricted area if they pay a certain fee. UVVRP, on the other hand, treats all vehicles equally and flatly denies use except those exempted regardless of their need or urgency.

Congestion charging is being done in several parts of the world, in Singapore and in three Norwegian cities (Bergen, Oslo and Trondheim) to name a few. Among them, the Singapore system is the largest in terms of restricted areas and the number of vehicles affected. Singapore introduced an area licensing system using manual methods in 1975. The system is being converted to an electronic area licensing system and full operation of the new system started in April 1998.

There are many issues to be addressed in devising a congestion charging system. Table 5.4 summarizes the issues to be considered and the factors related to each issue.

TABLE 5.4
ISSUES OF CONGESTION CHARGING

Issue	Factor
Restricted area	• Road network • Congestion • Traffic volume (before and after) • Expected revenue • Availability of alternative transportation
Restricted time	• Congestion • Traffic volume (before and after) • Expected revenue
Vehicle to be charged	• Public transport • Motor cycle • Exemption
Charging rate	• Vehicle type • Willingness and sensitivity • Parking fee • Fixed vs. flexible
Charging method	• Manual, electronic or mixed
Payment	• Pre-payment, post-payment, stored money, or mixed
Operating body	• Government vs. BOT
Revenue	• Expected amount of revenue • Initial investment cost • Operation and maintenance cost • General use vs. transportation infrastructure
Enforcement	• Detection and apprehension method • Prevention of fraud • Penalty and fine

It is important that restrictive measures like congestion charging should be implemented together with other measures that will enhance the attractiveness of

public transport, e.g.: construction of bus and jeepney terminals, free shuttle bus services to the terminals, etc. Congestion revenues must be transparently used for the improvement of transportation system so that road users will be convinced that their money is being used meaningfully.

Since implementation may face the objections from road users if the scheme is poorly implemented, a strong organization is needed to act as lead agency supported by other agencies involved in traffic management. The MMDA is supposed to play this role and strengthening its planning capability is highly required for the successful implementation of the said proposal.

5.4 Strengthening Overall Traffic Management Capabilities

5.4.1 National Traffic Code

The existing laws and regulations governing traffic and traffic violations is at the most fragmented and sometimes contradictory. Overlapping is common and some areas are not covered by existing laws. It is strongly suggested that a National Traffic Code which will consolidate all existing laws and implementing guidelines be created. The essence of such a code must be used in driver education and traffic safety education in schools. The Metropolitan Manila Transport and Traffic Code being prepared by the MMDA must be upgraded into a national traffic code.

Guidelines for pavement markings and traffic signs were prepared during the TEAM Project Phase I. Since then the guidelines have been used not only by subsequent phases of the TEAM Project but also by other projects which also included application of pavement markings. The guidelines are, however, not followed by all projects. Variations of pedestrian crossing markings are seen all over Metro Manila. In addition, they are not consistent with the Vienna Conventions on Road Traffic and Road Signs and Signals (1968). In conjunction with the update of national traffic code, these guidelines should be modified and copies of the guidelines should be distributed to local government units, the traffic police and other agencies concerned.

5.4.2 Human Resource Development

Although its manpower corps is large, the MMDA does not have enough number of competent engineers and personnel to support traffic management activities. Thus its character as a single traffic authority is not effectively utilized. Hiring capable traffic engineers and using external talents like consultants, when necessary, are urgently required to strengthen its ability of managing traffic.

The Traffic Engineering Center is also suffers from a lack of competent personnel. Brain drain is a common phenomenon in government technical offices because of low pay and poor career incentives. Several experienced engineers have already left the TEC. Maintenance of the system, which is critical for any computer-based system, must be supported by competent staff.

Since the Local Government Code was enacted in 1991, the LGUs became responsible for the traffic management in their respective jurisdictions. Most LGUs, however, do not have traffic engineer since traffic management is relatively a common field to them. Traffic is often guided by intuition by traffic enforcers.

It might be difficult to recruit good traffic engineers into government organizations because of low pay, but salary should not be the only come-ons. If suitably motivated, engineers will work hard to solve the challenging problem of traffic congestion.

5.4.3 Road Numbering System

Roads in the Philippines are usually identified by names. Names of famous people, countries, or simply sequential numbers are assigned to roads. A road numbering system, which is adopted in many countries, is yet to be established.

For local traffic managers, however, the practice of identifying roads by name has the following drawbacks:

- The official and true name of a road is not clear.
- Common names, such as Rizal, Mabini, Quirino, are used at many locations. Similar names are also used, for example E. Rodriguez and D. Rodriguez, G. Tuazon and P. Tuazon.
- Some roads have two or more names. For example, EDSA is also called C-4 and Highway 54, South Avenue and Timog Avenue are the same.
- Official names are not often used. Aurora Boulevard in Pasay City (its official name) is commonly called Tramo.
- Names of some streets are obscure. For example, Taft Avenue becomes Mexico Road south of EDSA.
- Names are too long for easy recall. This leads to the different ways of abbreviation.
- Start and end points are not clearly defined.

These practices create confusion. Contributing to the confusion is the fact that name of roads are often changed for political reasons. For example Don Mariano Marcos Avenue (an example of a long name) was changed to Commonwealth Avenue; Imelda Avenue to Kalayaan; Buendia to Senator Gil Puyat; Pasay Road to Antonio S. Arnaiz; to name a few.

It is basic in road administration that road identification should be unambiguous and specific locations along roads can be pinpointed by kilometer posts. Today, many data related to road and road traffic are processed by computer. These data include road classification and road inventory which provide a database for road construction, maintenance, traffic count, accident record, and other purposes. The lack of a consistent and a concise naming system will mean a different set of data uses and different names with no unified naming system.

In order to eliminate the confusion and enhance the efficiency of road administration, introduction of road numbering system is indispensable. Ideally, the system must be applied to all levels of road, from national road to barangay roads. The first stage may start with the national roads administered by the Department of Public Works and Highways.

Under the road numbering system, all roads will be assigned with a number and they must be identified by the combination of type of road and number, i.e., National Road No.1, or Provincial Road No. 2. Starting and ending points of a road must be defined. A road numbering system can be inputted to a geographic information system (GIS) and graphical output of the GIS as well as tabular data, can be distributed to any organization who can benefit from the system.

A road numbering system can be used for many applications. It accrues benefits to both road administrator and road user. For the administrator, reference to a specific road and a specific location can be uniformly made without confusion and misunderstanding. Road numbers can be employed in a data, a plan, and any report prepared or maintained by offices from the national to the municipal levels for planning, construction and maintenance of road and its associated facilities.

For road users, a road numbering system also eliminates confusion about road networks. Guide signs can be installed at roadsides, the sign can be legible and easily understood by road users. Following road numbers instead of proper names is definitely easier. Road maps also become highly legible in a road-numbering system.

5.4.4 Discipline Building

It is often said that the lack of discipline is one of the causes of traffic congestion in the study area. Observation of traffic congestion reveals this to be true. Bus and jeepney do not load and unload passenger properly. Passengers on the other hand wait for buses or jeepneys on the roadways and at the corner of intersections. Vehicles enter stop intersections without stopping. Left turning vehicles ignore arrow markings on the pavement guiding direction of movement and often cut in from the outer lane to the left-turn lane ahead of waiting queues. This behavior highly contributes to the traffic mess and congestion. Traffic enforcers do not know how to control these offenses and tend to apprehend violators who cause less disturbances to traffic flow.

The action plans prepared by the MMDA and TRAFIMM lists these problems and proposed “strict enforcement” as a countermeasure. However, past experiences show that efforts in this regard are often shortlived and chaos immediately return back to the streets. One reason why such measures are not sustained and discipline is not attained is the lack of guidelines for traffic enforcers. Enforcement mainly depends on the discretion of traffic enforcers.

A discipline-building campaign is recommended. The campaign is intended to demonstrate how discipline can be fostered and carried out at two or three model intersections in each police district. Model intersections should be in intersections with heavy blocking or blocking of through traffic by left turning traffic. A guideline should be developed jointly by the traffic police, the MMDA traffic enforcer and

traffic aides for each model intersection. The guideline will define the composition of enforcement teams and their specific tasks, and show the location of each personnel on the intersection plan. Each team member should be deployed at specific locations to perform the assigned task.

Necessary preparation must be made before the campaign starts. Yellow box, lane lines and turning arrow markings must be applied if necessary. Signs identifying the model intersection will be set up at appropriate locations before the intersection. Flyers to be given to drivers should be printed. The flyer will illustrate how undisciplined behavior worsens the traffic and calls for courtesy. The first one-week of the campaign will be devoted solely to driver education. Offenders will be warned and given the flyers without apprehension. Starting from the second week, violators will be apprehended. The campaign must continue for three months under which the guideline will be reviewed and progress evaluated periodically.

5.4.5 Early Implementation of TEAM Project Phase IV

The existing signal system urgently requires rehabilitation and upgrading to strengthen its function and efficiency. A contract was awarded to an Australian company in December 1994 for this purpose but following controversies and subsequent congressional hearings, no physical progress has been made as of March 1998.

The details of the project such as scope of work and construction schedule were not disclosed to the MMUTIS study team. The project is supposed to improve the functions of the signal system. As the new system cannot replace the existing system in a short time, a program of gradual modification of the existing system must be prepared to minimize the disruption of signal operation during the transfer. Besides, the existing TEC building is affected by the construction of LRT Line No. 2, which runs along Magsaysay Blvd., and modification to the building is necessary. Considering the present conditions, implementation of TEAM Project Phase IV is required. But the design and process cannot be reviewed by the MMUTIS study team due to lack of information.

APPENDICES

APPENDIX A

REPUBLIC ACT NO. 4136

AN ACT COMPILING ALL LAWS RELATIVE TO LAND TRANSPORTATION AND TRAFFIC RULES, AND CREATING A LAND TRANSPORTATION COMMISSION AND FOR OTHER PURPOSES.

CHAPTER 1 PRELIMINARY PROVISIONS, ARTICLES

CHAPTER II REGISTRATION OF MOTOR VEHICLES

APPENDIX A

CHAPTER III OPERATION OF MOTOR VEHICLES

Article 1	License to Drive Motor Vehicles
Section 19	Duty to procure license.
Section 20	License for enlisted men operating government motor vehicles
Section 21	Operation of motor vehicles by tourists
Section 22	Drivers license, fees, examination
Section 23	Issuance of driver's license
Section 24	Use of driver's license and badge
Section 25	Driver's records
Section 26	Renewal of license
Section 27	Suspension, revocation of driver's license
Section 28	Driver's bond
Section 29	Confiscation of driver's licenses.
Section 30	Student-driver's permit
Article II	Illegal Use of Licenses, Plate Numbers etc.
Section 31	Imitation and false representations
Article III	Passengers and Freight
Section 32	Exceeding registered capacity
Section 33	Passenger or freight capacity marked on vehicle
Article IV	Accessories of Motor Vehicles
Section 34	(a) Tires of motor vehicles, (b) Brakes, (c) Headlights, (d) Taillights, (e) Stop Lights, (f) Motorcycle and other vehicle lights, (g) Light when parked or disabled, (h) Windshield wiper (I) Use of red flag (j) Mufflers

CHAPTER IV TRAFFIC RULES

Article I	Speed Limit and Keeping to the Right
Section 35	Speed restrictions
Section 36	Speed limits uniform throughout the Philippines
Section 37	Driving on right side of highway
Section 38	Classification of highways
Article II	Overtaking and Passing a Vehicle, and Turning at Intersections
Section 39	Overtaking vehicle
Section 40	Driver to give way to overtaking vehicle

APPENDIX A

APPENDIX B

Office of the President
METROPOLIAN MANILA DEVELOPMENT AUTHORITY
Republic of the Philippines
Makati City, Metro Manila

Regulation No._____

"THE METROPOLITAN MANILA TRANSPORT AND TRAFFIC CODE"

Preliminary Provisions

Definition of Terms

Installation and Operation of Traffic Control Items

APPENDIX B

Driving on Right and Overtaking

Section 27 Keeping far Right as Practicable
Section 28 Overtaking
Section 29 Use of Center and Left Lanes of a Three-lane Thoroughfare
Section 30 Passing Vehicles
Section 31 Giving way to overtaking vehicles
Section 32 Drivers Not to Obstruct Traffic
Section 33 Driving in Lanes on Thoroughfares
Section 34 Driving Through Roundabout of Rotundas
Section 35 Keeping Right of Double Yellow Lines
Section 36 Following Too Closely
Section 37 Driving on Divided Road
Section 38 Approaching Crest or Curve
Section 39 Bus and PUJ Lanes

Giving Way

Section 40 Meaning of "Give Way"
Section 41 Giving Way at Intersections
Section 42 Giving Way During Turns
Section 43 Movements To or From Parked Vehicles
Section 44 Action on Approach of Emergency Vehicles
Section 45 Entering or Leaving a Road
Section 46 No Blocking Rule or No Entry to choked Intersections
Section 47 Roundabouts or rotundas

Pedestrian

Section 48 Pedestrian Crossing
Section 49 Duties of Pedestrians
Section 50 Restriction on Pedestrians
Section 51 Pedestrians on Thoroughfare

Turning, Starting and Stopping

Section 52 Right Turns
Section 53 Left Turns
Section 54 Turn and Stop Signals
Section 55 Use of Signaling Devices
Section 56 U-turns

APPENDIX B

Railway Level Crossing

Section 57 Stopping Level Crossings

Speed Restrictions

Section 58 Speed Limits

Stopping and Parking Vehicles

Section 59 Vehicles not to be in Certain Places
Section 60 Methods of Parking
Section 61 Method of Parking in Parking Areas
Section 62 Prohibited Parking Places
Section 63 Parking, etc. Near Crest of Curve

Lights, Warning Signs, equipment etc.

Section 64 Lights on Moving Motor Vehicles
Section 65 Dimming of Headlights
Section 66 Lights on stationary Motor vehicles
Section 67 Portable Warning Signs for Disabled Vehicles
Section 68 Lights and other Equipment on Bicycles
Section 69 Lights on Animal-Drawn Vehicles
Section 70 Fog Lamps
Section 71 Lights on Towed Vehicles
Section 72 Spot Lamps
Section 73 Flashing Warning signs

Bicycles, Tricycles, and Animals

Section 74 Riding bicycles or tricycles
Section 75 Towing of Bicycles, etc.
Section 76 Riding more than two Abreast
Section 77 Leading Animals

CARELESS AND DANGEROUS DRIVING UNDER THE INFLUENCE OF LIQUOR OR DRUGS

Section 78 Scope
Section 79 Careless Driving

Section 80 Reckless and Dangerous Driving
Section 81 Driving under the Influence of Liquor or Drugs
Section 82 Driving a Motor Vehicle While Under the Influence of Liquor or Other Incapacitating Drugs

Expressways

Section 83 Use of Expressways
Section 84 Fly-over and interchanges in Metro Manila

Miscellaneous

Section 85 Leaving Motor Vehicles Unattended
Section 86 Driving Backwards
Section 87 Driving on Footways and Reservations
Section 88 Passengers on Motorcycles
Section 89 Safety Helmets for Motorcycles
Section 90 Riding in Trailers
Section 91 Opening Doors and Alighting from Vehicles
Section 92 Putting Glass, etc. on Roads
Section 93 Diggings, constructions, etc. on Roads
Section 94 Securing of Loads
Section 95 Obstructing Roads
Section 96 Towed Vehicles, Trailers etc.
Section 97 Processions
Section 98 Use of Horns, etc.
Section 99 Permits for Vehicles Carrying Explosives or Dangerous Substances
Section 100 Learners to Direct "L" Sign
Section 101 Duties of Drivers after Accidents
Section 102 Production of driver's license

Penalties

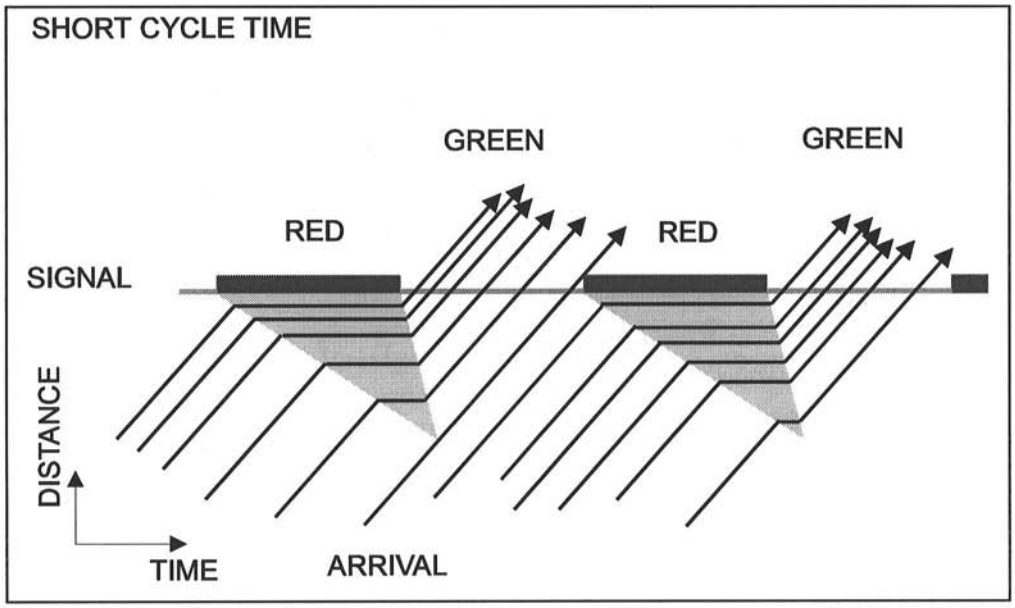
Section 103 Schedule
Section 104 Punishment for Other Offenses

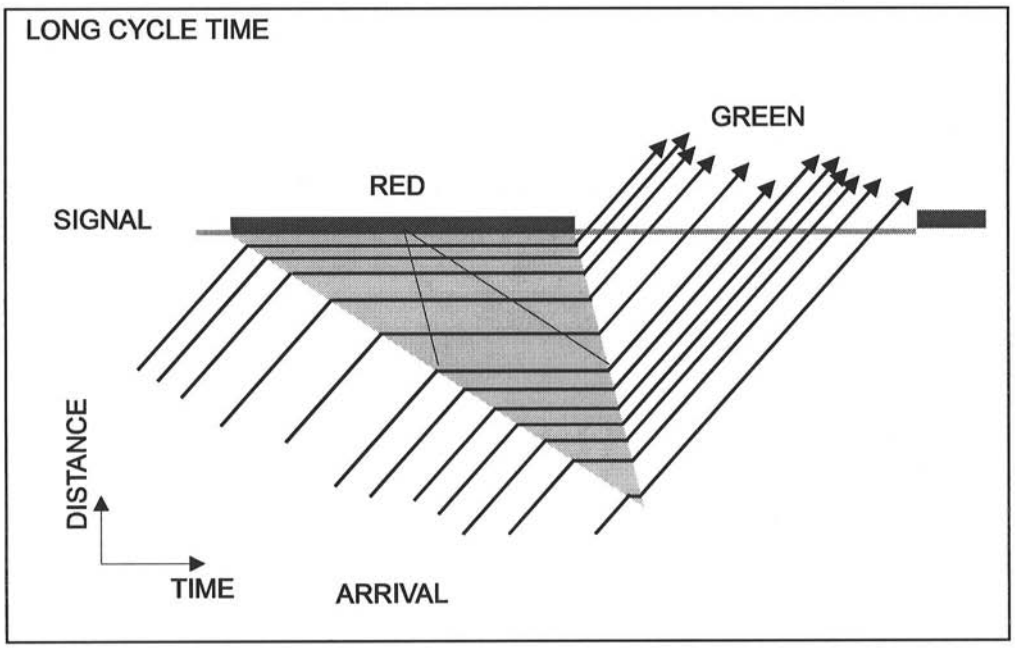
Final Provisions

Section 105 Enforcement
Section 106 Payment of Fines
Section 107 Repealing Clause
Section 108 Affectivity

APPENDIX C

Comparison of Delay





Long cycle time cause twice as long total delay as short cycle time under the same traffic volume and signal split.

APPENDIX D

PMA's Ten-Point Program for Traffic Management

Point One Consolidate into a single "Metro Manila Road User's Handbook," which is revised and issued yearly, all the traffic laws, rules, regulations, and guidelines, applicable to Metro Manila as the basis for all traffic enforcement activity involving motorists, commuters, pedestrians and other Metro Manila road users.

Point two Ensure that traffic enforcers are trained, disciplined and are worthy as government representatives in daily contract with the citizenry for this purpose, requiring that they take and pass a simple standard traffic management course and subsequently placing them under a unified performance-oriented monitoring and evaluation system.

Point three Revalidate all driver's licenses and all certificates of vehicle registration at the time they fall due, requiring drivers to take and pass a test for thorough knowledge of the consolidated traffic rules and regulations for drivers, and for vehicles to take and pass a rigid test for mechanical, signaling and environmental road worthiness.

Point four Clear the road network of obstructions (such as basketball courts, car repair shops, squatters and sidewalk vendors) and strictly regulate repairs and diggings on the same by utility companies and other private repairs.

Point five Streamline the traffic adjudication process by providing a firm but non-threatening network (e.g. north, south, east, west) of 24-hour, 365-days-a-year traffic courts, where traffic violations are promptly settled within the hour, and where payment of fines is made as convenient and easy as using any ATM machine.

Point six Mobilize civic energy and institutionalize private sector and non-governmental organization participation in appropriate areas of traffic management.

Point seven Undertake traffic education and information as a vital function in its own right, negotiating and sustaining its inclusion in formal school and multi-media programming.

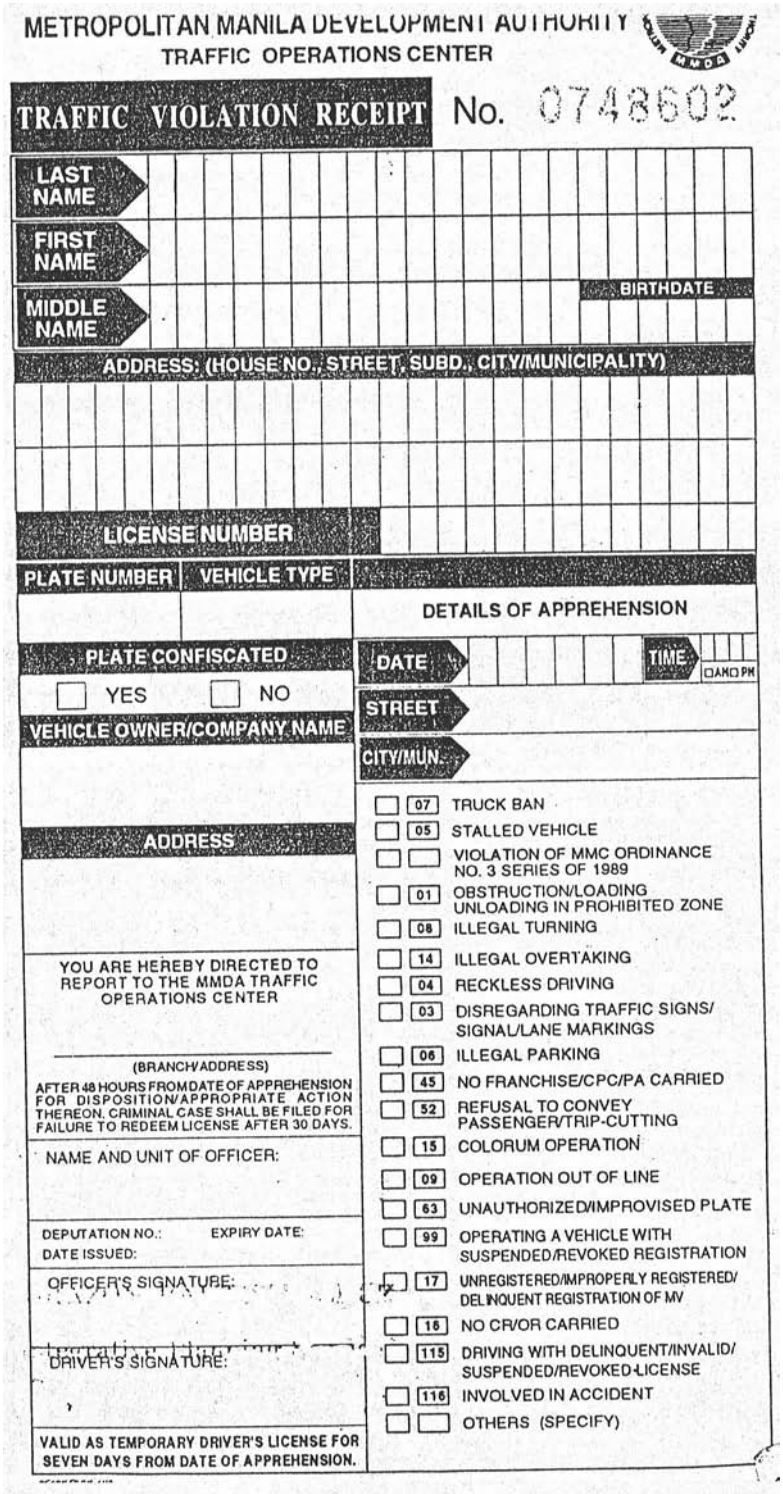
Point eight Fast track the shift to a mass transit system with the LRT as the main backbone and high-capacity buses as secondary backbone, discouraging half-empty private cars and all jeepneys from designated high traffic areas.

Point nine Complete the basic network of the Metro Manila road network immediately constructing the missing links of C-3, beginning the construction of C-5 and C-6 and negotiating the integration of subdivision and private roads into the network.

Point ten Create a single Metro Manila Traffic Authority that will manage traffic throughout the metropolis, empowered to issue a consistent, rationalized set of traffic guidelines and regulations pursuant to law, etc.

APPENDIX E

Traffic Violation Receipt



METROPOLITAN MANILA DEVELOPMENT AUTHORITY
TRAFFIC OPERATIONS CENTER

TRAFFIC VIOLATION RECEIPT No. 0748602

LAST NAME
FIRST NAME
MIDDLE NAME
BIRTHDATE
ADDRESS: (HOUSE NO., STREET, SUBD., CITY/MUNICIPALITY)
LICENSE NUMBER
PLATE NUMBER | VEHICLE TYPE
PLATE CONFISCATED
☐ YES ☐ NO
VEHICLE OWNER/COMPANY NAME
ADDRESS

YOU ARE HEREBY DIRECTED TO REPORT TO THE MMDA TRAFFIC OPERATIONS CENTER

(BRANCH/ADDRESS)

AFTER 48 HOURS FROM DATE OF APPREHENSION FOR DISPOSITION/APPROPRIATE ACTION THEREON. CRIMINAL CASE SHALL BE FILED FOR FAILURE TO REDEEM LICENSE AFTER 30 DAYS.

NAME AND UNIT OF OFFICER:

DEPUTATION NO.: EXPIRY DATE:
DATE ISSUED:

OFFICER'S SIGNATURE:

DRIVER'S SIGNATURE:

VALID AS TEMPORARY DRIVER'S LICENSE FOR SEVEN DAYS FROM DATE OF APPREHENSION.

DETAILS OF APPREHENSION

DATE TIME ☐AM ☐PM
STREET
CITY/MUN.

- ☐ 07 TRUCK BAN
- ☐ 05 STALLED VEHICLE
- ☐ ☐ VIOLATION OF MMC ORDINANCE NO. 3 SERIES OF 1989
- ☐ 01 OBSTRUCTION/LOADING UNLOADING IN PROHIBITED ZONE
- ☐ 08 ILLEGAL TURNING
- ☐ 14 ILLEGAL OVERTAKING
- ☐ 04 RECKLESS DRIVING
- ☐ 03 DISREGARDING TRAFFIC SIGNS/ SIGNAL/LANE MARKINGS
- ☐ 06 ILLEGAL PARKING
- ☐ 45 NO FRANCHISE/CPC/PA CARRIED
- ☐ 52 REFUSAL TO CONVEY PASSENGER/TRIP-CUTTING
- ☐ 15 COLORUM OPERATION
- ☐ 09 OPERATION OUT OF LINE
- ☐ 63 UNAUTHORIZED/IMPROVISED PLATE
- ☐ 99 OPERATING A VEHICLE WITH SUSPENDED/REVOKED REGISTRATION
- ☐ 17 UNREGISTERED/IMPROPERLY REGISTERED/ DELINQUENT REGISTRATION OF MV
- ☐ 16 NO CR/OR CARRIED
- ☐ 115 DRIVING WITH DELINQUENT/INVALID/ SUSPENDED/REVOKED LICENSE
- ☐ 116 INVOLVED IN ACCIDENT
- ☐ ☐ OTHERS (SPECIFY)

LIST OF TRAFIMM PROJECTS

EDUCATION

Problems/Issues	Recommendations	Lead Agency	Remarks/Funding Requirements
1. Indiscriminate violation of traffic rules and regulations among drivers, particularly PU drivers.	– Mandatory re-testing of drivers renewing drivers license.	LTO	
	– Issuance and publication of necessary regulation.	LTO / NGO	
	– Publication of instructional materials (including traffic rules & traffic signs) • instructional materials for drivers renewing drivers license • manuscript ready	LTO / MMDA	Target: 105,000 copies @ P20.00 Traffic Officers: 5,000 copies Drivers: 100,000 copies Funding Requirement: P2.1 million
	– Driver education – seminar for apprehended drivers (on-going)	LTO / MMDA	
	– Tri-media campaign on traffic discipline for road users (drivers, pedestrians and commuters) (medium term)	LTO / MMDA	
	Utilize existing TEC TV tie-up with Channels 2 & 7 for regular airing (daily M-F 5:00-5:30 P.M.) of traffic rules and regulations (tag lines). To furnish tag lines for airing starting Monday, September.	MMDA/ PNP-LGU	

2. Pedestrians and commuters occupying the roadway while waiting for rides.	Drive against "Jaywalking" and clearing roadways of obstructions.	MMDA/ PNP-LGU	
3. Untrained traffic enforcers	Training of traffic law enforcers – Starting 3rd week of September.	PNP-TMG, MMDA, LTO, DOTC, PMA, DILG	

ENFORCEMENT

Problems/Issues	Recommendations	Lead Agency	Remark/Funding Requirements
1. Indiscriminate loading / unloading of PU vehicles	Strict enforcement	MMDA / PNP	
2. Lax enforcement of loading / unloading activities at EDSA / Aurora, EDSA / Shaw Blvd. and EDSA / Guadalupe	Reinvigorate enforcement efforts done by the different enforcement units in coordination with the local enforcers.	MMDA / PNP	
3. Operation of tricycles/vendors, slow moving vehicles in major thoroughfares (national roads, expressways and highways).	Strict enforcement	MMDA/PNP/ LGU	
4. Presence of ambulant vendors on sidewalks and roadways.	Direct all police stations in Metro Manila to work hand in hand in the clearing of sidewalk vendors and obstruction of major thoroughfares.	PNP	
5. Pedestrians and commuters waiting for rides on roadways.	Strict enforcement of "Jaywalking" and clearing roadways of obstructions.	PNP	

6. Illegal (on-street) parking caused by the absence or lack of parking area.	Strict enforcement	MMDA/PNP/ LGU	
7. Proliferation of "out-ofline" and "column" operations of public transport services.	Drive against "colorum" and "out-of-line" operation ASAP.	LTO	
8. Poor traffic movement direction all intersections along EDSA.	Automatic operation of traffic signal lights.	MMDA / TEC	
9. Vehicle congestion during department store promotional sales.	Deployment of effective and adequate traffic enforcers in the area.	MMDA / PNP	

ENGINEERING

Problems/Issues	Recommendations	Lead Agency	Remark/Funding Requirements
1. Insufficient road capacity vs. Rapid increase in number of private vehicles.	Inventory of all roads in NCR priority to be given to EDSA, C5 and Ra and refer to proper agency for immediate action.	DPWH-NCR, LGU, MWSS	
Lack of parallel roads/secondary streets to be used for traffic diversion.			
Lack or absence of sidewalks			
2. Presence of ambulant vendors in sidewalks and roadways.	Driver against roadway obstructions.	PNP	
3. Poor traffic management during road closures.	Strict enforcement of road works traffic management guidelines and impose sanctions on violators.	MMDA / PNP	

4. Indiscriminate loading / unloading of PU vehicles.	Identification of authorized loading / unloading zones. Re-design bus stop and markings consistent with bus and bus stop color coding of MMDA (along EDSA).	DPWH-NCR, LGUs	
5. Unattended leaks (MWSS water pipes) and uncoordinated diggings.	Immediate restoration / report to concerned LGUs.	MMDA / LGUs	
Delayed repair of damaged roads (potholes) which cause reduction in speed of vehicular traffic	Immediate restoration / report to DPWH	DPWH / LGU	
6. Unauthorized manual operation of traffic signals particularly by untrained traffic enforcers / aides causing very long cycle times.	Immediate repair of defective traffic signal lights. Fine tuning / adjustment of traffic signals. Strict implementation of guidelines for manual operation of traffic signals	TEC / DPWH / MMDA	
7. Lack / absence / improper location of, presence of non-standard, illmaintained / obscure, obsolete and confusing traffic signs.	Inventory of traffic signage's and lane markings. Provide lane markings, traffic signs where necessary	TEC / MMDA	
8. Flash floods .	Assignment of stand-by pumps during rainy season. Cleaning and declogging of drainage laterals.	MMDA / LGUs, PNCC	

List of MMDA Projects

Traffic Engineering Program / Project

Program / Project	Objective	Activity Description	Target Output	Time Frame	Budget Requirement
Road works traffic management standards	To institutionalize and integrate road works traffic management schemes.	Establish and enforce road work traffic management standard	Publication of standards for road works traffic management & safety	End of March 1997	P 100T
TF-IRREX support programs	To facilitate implementation and accelerate completion of construction of road, rail & expressway projects	Synchronization of timetable of construction of flagship projects in Metro Manila & implementation of traffic engineering and management plan for TF-IRREX projects.	Road signs and traffic safety devices installed at rerouting areas and work site Central database monitoring system for implementation of transport infrastructure project established	1997 and continuing	P 70 million to be turned over to MMDA from other agencies (235 personnel)
One-way system	To reduce traffic conflicts and increase road capacity	Identification & operation of street pairs that can be designated one-way.	7 areas to include Manila, Makati, Callocan, Pasay, Quezon, San Juan, Mandaluyong	6 months & continuing	P 3.5M for road signs
Pedestrian zone project	To promote alternative mode of movement	Designation of areas with heavy pedestrian congestion as no vehicle zone.	2 areas (Redemptorist Road and Escolta)	3 months	P 100T for road signs
Route improvement measures	To provide technical studies for traffic measures	Conduction continuing studies and analysis of intersection management preparatory to the implementation of route	Study report	8 month and continuing	P 20T supplies & materials

		improvement measures.			
Traffic signal operation and maintenance	To integrate traffic signal operation & maintenance as part of the traffic management functions of MMDA	Transfer of management and operation of the traffic signals in Metro Manila from the DPWH to the MMDA including the technical personnel of the TEAM-PMO.	444 signalized intersections, one control center and the three (3) sub-stations	End January 1997	P 15 Million P 55 Million
Road signs and lane marking program	To enhance road safety and efficiency and upgrade quality of roads	Installation of traffic signs and traffic safety devices and application of lane and pavement markings.	Yellow lane and boxes, pedestrian lanes in schools and identified high-risk areas	1997	P 5 Million
Pedestrian Facilities	To eliminate conflict points for pedestrians and vehicle	Construction of pedestrian overpasses and provision of roofing and rehabilitation of waiting sheds.	3 pedestrian overpasses, roofing for 3 overpasses, 40 waiting sheds	1997	P 36. 910 Million

Transport Planning, Operation and Management

Program / Project	Objective	Activity Description	Target Output	Time Frame	Budget Requirement
Selective rerouting of PUJ's	To rationalize use of road space	Conduct of a continuing study on route measured capacity for public transport and evaluation of results to determine and implement measure consistent with policies on hierarchy of service.	Study report	8 months and continuing	None
Alternative mode of transport	To promote other means of public transport modes	Revival of the riverine transport & Pasig River & introduction of shuttling system.	1 riverine transport line and 5 shuttle service routes	1997	None

Vehicle restraint policy	To reduce volume of vehicles on the road	Strict implementation of the Unified Vehicular Volume Reduction Program.	15% to 20% reduction in volume of vehicles	On-going and continuing	None
Review of franchising system for all land transport common carriers including pedicabs and tricycles	To establish guideline in the issuance of franchise to public transport	Undertake joint study and evaluation of existing franchise and corresponding routes issued by the LTFRB and the local government units and pending result, the LTFRB and LGU's to suspend granting of subject franchises.	Manual on issuance of franchise	8 months and continuing	P 20,000.00 for printing manual
Integrated planning activities with the traffic and transport agencies	To insure that agency plans are integrated into the overall traffic and transport master plan for Metro Manila	Joint planning session for road infrastructure and transport programs in Metro Manila. MMDA to as cleaning house of major infra project on road, transport and flood control as part of the requirements of the NEDA.	Traffic & transport master plan	On-going and continuing	C/o MMUTIS
Mass Transit system & priority measures for public utility vehicles with more efficient occupancy	To promote usage of public transport	Provision of traffic management assistance to LRT / MRT projects and study and implement priority measures for PUV's having greater capacity.	5 rail project to include 3 additional LRT / MRT, PNR South and North rail and people mover system	5 years	Over P 10 Billion (BOT and OCEF-funded)
Central inter modal terminal	To integrate public transport terminal system	Provision of public transport terminal complexes to serve as transfer points for inter-city and provincial transport system.	Pilot multi-modal central terminal in the south	1997	P 1 million (MMDA) balance through private sector

Traffic Enforcement Operations

Program / Project	Objective	Activity Description	Target Output	Time Frame	Budget Requirement
Anti-colorum campaign	To regulate illegal public transport operations	Intensify the drive against colorum vehicles and establish database linkage with LTO / LTFRB for effective control and monitoring.	Apprehension of an estimated 60,000 colorum vehicles	12 months	None
Bus segregation scheme	To decongested loading and unloading area	Strict enforcement of existing bus stop segregation scheme along EDSA. Study other areas for expansion of the scheme.	100 apprehensions per day	On-going	None
Close door policy (PUBs)	To promote safety and prevent accident / injuries	Strict enforcement of the closed door policy whereby PUB's are prohibited from opening its door outside of designated loading / unloading areas.	100 apprehensions per day	On-going	None
Campaign against moving and non-moving violations	To enforce MMDA orders / regulations and RA 4136 and other traffic rules and regulation	Strict implementation of traffic and transport rules and regulation (including UVVRP and Express Lane).	100,000 per month	On-going	None
Towing and impounding operation	To clear all roads and thoroughfares to ensure smooth traffic flow	Continuing operation against illegal parking and stalled vehicles.	300 per day	On-going	None
Standards for accreditation of towing trucks	To ensure that accredited tow trucks conform with required standards	Strict implementation of policies regulation the standards and operation of towing services.	Conformance of all credited tow trucks with the prescribed standards / policies	12 months	None

Turn-over of towing operation to concerned LGU's AOR	To ensure smooth transition of towing operation to LGU's	Adoption and operationalization of MOA between MMDA and LGU's for the latter to take-over towing operation within their respective AOR's.	17 LGU's	Within 12 month	None
Traffic deployment project	To rationalize deployment of traffic personnel	Increase manpower support by tapping of other government personnel to manage traffic (e.g. military personnel and barangay officials, civic organizations and NGO's).	4,500 traffic enforcers	12 months	None
Standards of traffic enforcers / NGO's and LGU's	To upgrade the hiring / deputation standards for traffic enforcers and deputized agents	Formulation and implementation of qualification standards for traffic enforcers and deputized personnel.	4,500 highly qualified traffic officers	12 month	None
Continuing removal of illegal obstruction	To promote pedestrianization & improve accessibility	Expand operation for the removal of sidewalk vendors and illegal obstructions.	8 areas to include; Baclaran, Cubao, Q-Mart, Balintawak, Mangahan, Divisoria, Munoz, Pasay	Continuing	P 4 Million to purchase of required cargo vehicles
Additional incentives program for traffic enforcers	To uplift the morale and economic status of traffic enforcers	Through the support of private sector, MMDA to initiate arrangements for sponsorship of insurance coverage, traffic enforcement tools, free meals, free transportation, free movie passes, etc. For traffic	4,500 motivated traffic enforcers	6 months	None

		enforcers. These will be in addition to the 25% incentive.			
Anti-intersection blocking & anti-illegal counter flow	To promote safety and prevent gridlock	Intensify drive against intersection blocking and illegal counter flow.	50 apprehension per day	On-going	None
Suspension / revocation of driver's licenses	To impose stiffer penalties for dangerous / intentional violations	Implementation of the provision governing the suspension / revocation of drivers licenses.	100 apprehension per day	Continuing	None

Traffic Education

Program / Project	Objective	Activity Description	Target Output	Time Frame	Budget Requirement
Upgrading of quality of drivers in coordination with the LTO	To improve proficiency and behavioral attitudes of drivers	To revalidated drivers licenses at the time of renewal requiring all drivers to take and pass a thorough knowledge of traffic rules and regulations including traffic signs and other.	300,000 public utility drivers	3 years	None
Active participation of school on traffic concerns	To enhance traffic safety & efficiency in school zones	For school authorities to adopt / implement traffic and parking management system in their school including carpooling. Conduct of schoolroom orientation-seminar to elementary students.	School at U-Belt and K-Belt	12 month	None
Continuing seminar-workshops for traffic enforcers	To upgrade enforcement proficiency	Expansion and improvement of the on-going training of traffic enforcers to include traffic management units of LGU's and NGO's	4,500 traffic enforcers	12 months & continuing	P 300 T

Traffic Administration and Adjudication

Program / Project	Objective	Activity Description	Target Output	Time Frame	Budget Requirement
Creation of pre-adjudication unit	To be able to settle contested apprehensions / administrative complaints against traffic enforcers	Acceptance and disposition of cases	1 unit	1997	None
Traffic enforcers inspection / monitoring	To establish check and balance mechanism to discourage malpractice among traffic personnel	Activation and intensification of the activities of the TOC Inspectorate Group	Weekly report	1997	None
Transfer of management of the redemption of Traffic Violation Receipts (TVR's)	To be able to establish an effective and efficient TRVR management system and incentive system	Turn-over of the management and operation of Redemption Centers to the Treasury Operations services (OAMF) including the re-assignment of personnel currently under the OC Data Control Division comprising of 300 personnel.	Streamlined collection system	1997	None
Administrative support	To provide the Center and efficient administrative support in the form of adequate personnel and supplies and materials requirements	- Personnel administration - Supplies and TVR distribution - General services	Report, annual budget profile, supplies, personnel and equipment inventory	1997	P 88,813,200.00 for personal services P 67,810,000.00 for maintenance and other operating expenses

TASK FORCE ON TRAFFIC IMPROVEMENT AND MANAGEMENT
COMMITTEE ON ENGINEERING
ACTION PLAN II
OCTOBER 1, 1997 – DECEMBER 31, 1997

Problems and Issues	Recommendation	Duration (Target)	Responsible Agency	Actions/Remarks
Jupiter/Buendia	Opening of Jupiter Uniflow Makati and Paseo de Roxas	Sept. –Dec.	TEC/URPO/MMDA	1. Prepare traffic rerouting plan. 2. Coordinate with MMURTRIP for the traffic analysis. 3. Discussion with concerned agency
Nichols Interchange	Improvement of the interchange and installation of traffic signals	Sept.-March	TEC/CITRA	1. Prepare the traffic improvement plan and signal design. 2. Coordinate with MMURTRIP for the traffic analysis
South Superhighway/Zobel Roxas Intersection	Removal of left turning flow	Oct.-Dec.	TEC/MMDA	To prepare the traffic analysis and proper road signs in the area
UST	To convert the Exit location into the Entrance location	Oct.-Dec.	TEC/MMDA	To request UST to convert the Exit located in Dapitan to Entrance from 6:00 am to 9:00 am.
A.H. Lacson	Widening	Oct.-Dec.	TEC	Excavation permit approved can start work anytime this month.
Commonwealth Avenue	Proposed opening of Intersection	Oct.-Dec	TEC	Request for excavation permit.
Tuazon-Katipunan	Proposed left turning from Airport to Roxas Blvd.	Oct.-Dec	TEC, NPD	Analysis of the proposed opening.
Roxas Blvd.-Airport Road		Oct.-Dec	TEC, NPD	Analysis of the proposed additional Phasing

Signal Timing Tuning Projects

Problems and Issues	Recommendation	Duration (Target)	Responsible Agency	Actions/Remarks
Pres. Quirino Avenue	Fine tuning	Oct.-Dec.		
Ortigas Avenue	Fine tuning	Oct.-Dec.		
A. Rodriguez	Fine tuning	Oct.-Dec.		
EDSA	Fine tuning	Oct.-Dec.		
Quezon Avenue	Fine tuning	Oct.-Dec.		

Signal System Facility Restoration Projects

Problems and Issues	Recommendation	Duration (Target)	Responsible Agency	Actions/Remarks
Taft Ave./Buendia	Loop detector		Second Metro Manila Engg. District NCR	Not operational No action undertaken by SMMED
Along Pasay Road	Loop detector		Second Metro Manila Engg. District NCR	No operational No action undertaken by SMMED
Domestic/Airport Road	Communication cable and conduit		MIAA	No action undertaken by MIAA
Mia/Roxas/Coastal Road	Traffic signal cable, conduit, power cable and communication cable		PEA/PATI	No action undertaken by PEA
EDSA/Ayala/Pasay Road	Traffic signal, CCTV camera		URPO-DPWH	Temporary operational-for permanent restoration upon completion of project (URPO). No approved signal plan for permanent signal and detector installation
Coastal Road/Talaba	Traffic signal facilities		URPO-DPWH	Pulled-out by URPO Intersection permanently closed URPO has not yet delivered the Facilities to TEC
Kalayaan/EDSA	Communication cable, conduit power cable and loop detector		URPO-DPWH	No action undertaken URPO-DPWH

Problems and Issues	Recommendation	Duration (Target)	Responsible Agency	Actions/Remarks
Quezon Ave./In front of Wildlife	Power cable		URPO-DPWH (Eusebio Const.)	Funds for electrical works sub-allotted by URPO but the civil work portion was not completed by RPO Contractor
Along Ortigas Ave. from Meralco to E. Rodriguez	Overall equipment and changeable message sign		URPO-DPWH (Eusebio Const.)	Funds for electrical works sub-allotted by URPO but the civil work portion was not completed by RPO Contractor
Along Katipunan a) Katipunan/Ateneo b) Katipunan/Mirriam c) Katipunan/Gonzales d) Katipunan/Aurora e) Katipunan/C.P. Garcia f) Katipunan/Shuster	 Overall equipment Overall equipment Overall equipment Overall equipment Changeable message sign Communication cable Lope detectors		URPO-DPWH (William Uy)	No action undertaken by URPO
EDSA/Shaw Blvd.	Signal & Communication cables, signal post & lantern, loop detectors & cabinet, CCTV		URPO-DPWH (China Road Construction)	No action undertaken by URPO submitted relocation plan not yet confirmed URPO
Shaw Blvd./Sheridan	Loop detector & communication cable		URPO-DPWH (China Road Construction)	No action undertaken by URPO
Shaw Blvd./Pioneer	Communication		URPO-DPWH (China Road Construction)	No action undertaken by URPO
Along Elliptical a) Elliptical/Kalyaan b) Elliptical/East Avenue c) Elliptical/Quezon Avenue d) Elliptical/North Avenue e) Elliptical/Visayas f) Elliptical/Commonwealth	 Traffic signal and communication cables, signal, post and lantern, loop detectors, power cable, communication cable and conduit		URPO-DPWH (Eusebio Const.)	Funds for electrical works sub-allotted by URPO but the civil work portion was not completed by RPO Contractor
EDSA/B. Serrano	Signal cable, PE pipe and terminal block		URPO-DPWH (Toledo Const. & Consuelo Const.)	No action undertaken by URPO-DPWH
Along A. Bonifacio From Blumentritt to 7th Avenue	Loop detector, communication cable and power cable		URPO-DPWH	Funds for restoration sub-allotted to TEC-DPWH TEC-DPWH is processing the documents for restoration

Problems and Issues	Recommendation	Duration (Target)	Responsible Agency	Actions/Remarks
Ortigas Avenue E. Rodriguez	Detector and communication cable		First Metro Manila Eng'g District	No action undertaken by FMMED
Along EDSA a) EDSA/C. Jose b) EDSA/Tramo c) EDSA/New York d) EDSA/west e) EDSA/Quezon Avenue f) EDSA/White Plains	Loop detector and communication cable Loop detector and communication cable Traffic signal, power cable, communication cable and loop detector Loop power cable Ultrasonic detector, power cable and communication cable Traffic signal facilities		DOTC/Sumimoto	No coordination made by the contractor to TEC prior to the removal and excavation hence the damage.
Commonwealth/INC	Overall facilities		QCED-DPWH (Toledo Const.)	No action undertaken by Quezon City Engineering District
Along Tayuman PLDT to San Lazaro	Communication & detector cable detector, pole, handhole, PE pipe		NMED-DPWH (Toledo Const.)	No action undertaken by NMED
Balintawak Bridge	Communication facilities CCTV camera, changeable message sign, power cable		TEC-DPWH (Persan Const.)	No action undertaken by TEC-DPWH
Balintawak (EDSA)	Fiber optic cable, communication cable		ICC/Bayan Tel.	No action undertaken by Bayan Tel
Dimasalang /Ma. Clara	PE pipe (conduit), signal cable		MWSS-NMED-DPWH	No action undertaken by MWSS, NMED-DPWH
Andalucia/Alvarez	PE pipe (conduit), signal cable handhole		Manila City Engineers Office	No action undertaken by Manila City Engineers Office
Rizal Avenue/7th Ave.	Handhole		BSA	Handhole covered not yet restored
Along South Superhighway	Changeable message sign, loop detector, communication cable and power cable.		TRB/CITRA	No action undertaken by TRB/CITRA
Along MIA Road	Traffic signal, changeable message sign, communication cable, loop detector handhole		MMDA/Selectra	No action undertaken MMDA

Problems and Issues	Recommendation	Duration (Target)	Responsible Agency	Actions/Remarks
Along Roxas Blvd. from MIA to Redemptorist	Traffic Signal, handholes		MMDA	No action undertaken by MMDA
Along Gil Puyat Avenue from EDSA to Roxas Blvd.	Traffic signal maintenance, handhole		MMDA/City of Makati	No action undertaken by MMDA
R. Magsaysay/V.Mapa	Vehicle loop detector		PLDT/Miescor	No action undertaken by PLDT
España/Blumentritt	Loop detector		PLDT/Miescor	No action undertaken by PLDT
Sumulong Hi-way/Shoe Avenue	Traffic signal cables		Marikina City Engineers Office	No action undertaken by MCEO
Dagupan/Moriones	Loop detector		PLDT/Miescor	No action undertaken by PLDT
Marcos Hi-way-Sumulong	Traffic signal			
Busted Bulb	Replacement		TEC/MMDA	Repair of two (2) boom truck