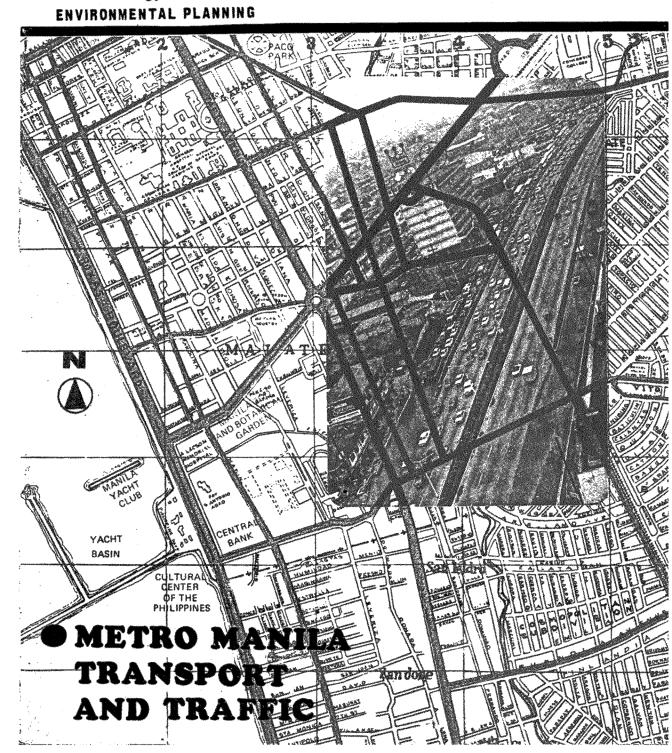
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• VOLUME X NUMBER 2 APRIL 1979 •



(Vol. X, No. 2, April 1979)

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The *Philippine Planning Journal* is published in October and April by the Institute of Environmental Planning, University of the Philippines. Views and opinions expressed in signed articles are those of the authors and do not necessarily reflect those of the institute. All communications should be addressed to the *Managing Editor*, Philippine Planning Journal, Institute of Environmental Planning, University of the Philippines, Diliman, Quezon City, Philippines 3004.

Annual Subscription Rate: Domestic, ₱12.00; Foreign, \$8.00. Single copies: Domestic, ₱6.00/copy; Foreign, \$4.00/copy. Back issues: Domestic, ₱8.00/copy; Foreign, \$6.00/copy.

PHOTO CREDITS

Materials for the Cover courtesy of PPDO/MPWTC and Freeman Fox and Associates.

Frontispiece, courtesy of P.G. Pak-Poy and Associates—Metro Manila Transport Engineering and Management (TEAM) Project. Also photos appearing on pp. 4, 9, 15, 19, 23, and 29.

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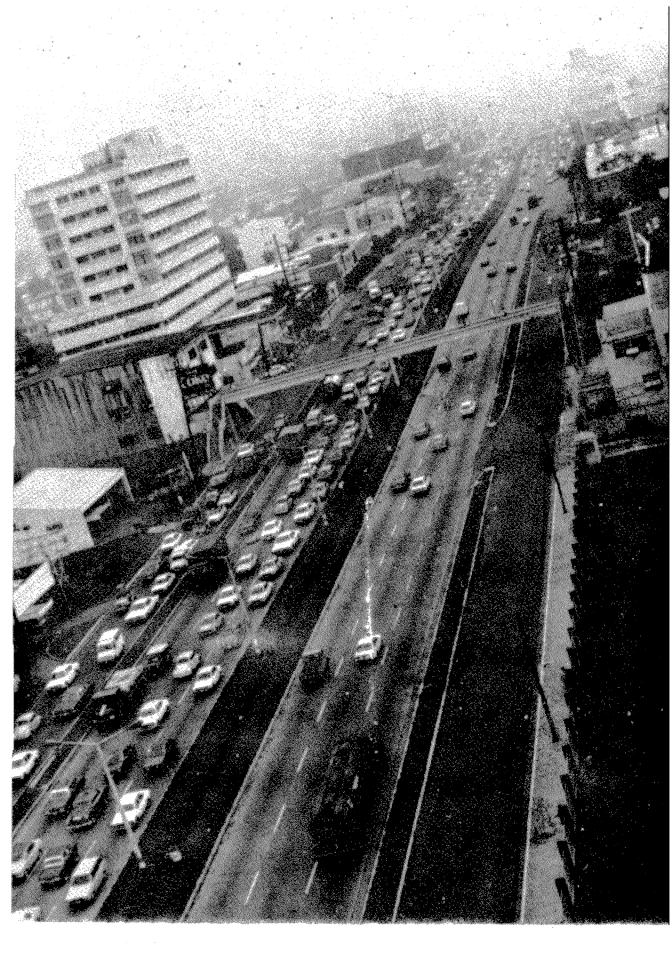
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IMPROVING MASS TRANSPORTATION IN METROPOLITAN MANILA: SOME SHORT-RANGE NON-CAPITAL INTENSIVE TECHNIQUES

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Introduction

The crisis in urban transportation is experienced worldwide. From the small villages of Europe to the sprawling metropolis of the West, from the crowded centers of the rich nations to the congested primate cities of the developing countries, urban mobility has become unsafe, costly, inconvenient and time consuming. With a growing urban population and an increasing ownership and use of automobiles, cities have become congested and polluted, adding much to the deterioration of urban mass transportation.

Solutions to the transportation crisis are varied. Experiments of different countries ranged from intensifying the use of existing transport facilities to adding and applying new and computerized transport technology; from short-range drives to discourage the use of private automobiles to long-range integration of land use and transportation system; and from the modest park-and-ride systems to an ambitious and costly Bay Area Rapid Transit (BART) system.

Generally, the response of most urban centers in the United States, Canada and Europe to the current urban transportation crisis has been to shift transport policies, from the traditional motor-oriented transport system to one that favors mass transit through the provision of funds for major investments in mass transit systems, the downgrading or reduction of highway programs; or through "discouragement" programs that aim to limit the use of the private automobile. Trends indicate that the transport policy-making processes in these urban centers will evolve into a program of comprehensive restraint characterized by high investments, comprehensive traffic control programs, comprehensive land use controls, and restricted use of highways.¹

In Metropolitan Manila, as with most of the primate cities of the developing countries, no shift in transport policy has yet occurred. Thus, urban mass transportation continues to deteriorate. The crisis is aggravated by sudden and massive rural-urban migration and an obvious lack of funds.

Solutions continue to be elusive and proposals to come to grips with the transport problems have either been short-lived, crisisoriented and ad hoc in approach, or general, broad and long-range. Most of the ad hoc strategies adopted have failed. On the other hand, long-range solutions have been barely initiated and are yet to be realized. These include regional planning through the establishment of growth poles and growth centers; urban design through a policy of selective decentralization; land use controls through more integrated zoning and subdivision regulations; the use of new technology such as monorails; or expensive technology, such as underground rail rapid transit or subways.

For purposes of establishing growth poles and growth centers, the country was divided into thirteen (13) regions each with a designated regional capital. This regional

Paper prepared in 1977 as part of major report of the author as a UP-UNDP Fellow on Urban Transportation Planning at the University of British Columbia, Vancouver, Canada.

¹Frank Colcord, Jr., Urban Transportation: Decision-Making (Springfield, Virginia: National Technical Information Service (NTIS), 1947), p. 58.

capital serves as the focus of the region. It is also a counter-magnet to the attraction of Metro-Manila. It is assumed that the development of these regional growth centers will discourage the population from migrating to the primate city. At the same time, development will be equitably redistributed throughout the country. A number of towns in the immediate vicinity of Metro-Manila were also designated as growth centers to decentralize development and to reduce population shifts.

The policy of selective decentralization involved the slow "relocation" of major traffic generators within the metropolitan core. These included major industries especially those that are pollutive, commercial establishments, and major universities. Feasibility studies are currently being conducted to determine the effects of such movements on the Central Business District. At the same time, zoning and subdivision regulations are being updated (they used to be carbon copies of US regulations) and attempts are being made to implement them on a metropolitan scale.

The Ministry of Public Works, Transportation and Communications (MPWTC) is working on the detailed planning stages for constructing the first subway line in Metro-Manila in preference to monorails and other mass-transit systems.

While these long-range strategies are undoubtedly important and cannot be overlooked or even postponed, the present situation also calls for remedial, actionoriented strategies and techniques which must be implemented now to alleviate the present crisis, to help avert an even more serious crisis in the future, and to make the future transportation problems more manageable. Since other urban services also make their demands on the limited resources of Metro Manila, these short-range, action-oriented strategies should not require intensive capitalization.

This paper attempts to review and analyze these short-range, action-oriented and noncapital intensive urban mass transit techniques in an effort to assess how these might apply and help solve the transportation crisis in Metropolitan Manila. The paper will present and examine Metro-Manila's transportation system, its problem areas, especially where such strategies might apply; identify and classify these techniques, which may be broadly divided into those strategies that modify the supply of mass transit, and those that modify transit demand; review various case studies, where such techniques have been experimented and/or applied; and through careful analysis, recommend such strategies and techniques (and their changes or modifications) which may be applicable to the mass transit problems of Metropolitan Manila.

Metro Manila and Its Transportation System

The Socio-Economic-Political Environment

Metropolitan Manila is the primate city of the Philippines—an archipelago of some 7,100 islands and 43 million Filipinos (1975). Being a primate city, Metro-Manila is the center of all commercial, industrial, social, educational, cultural, political and administrative activities of the country. Within Metro-Manila are 90 of the country's first 100 leading corporations, one-half of which are within the City of Manila proper.

All but one of the main banks have their head offices in Metro-Manila; all of the major newspapers, most of the radio stations and all of the six commercial television stations in the country are based in the area.²

Metro-Manila also accounts for about 50 percent of the national gross value added. Full one-third of all manufacturing establishments in the Philippines are concentrated in the area. The region also employs 40 percent of the country's non-agricultural labor force, and pays more than one-half of the total manufacturing payroll.³ Out of its labor force of 1.20 million about 1.07 million (88%) are employed, 26 percent of which are in the service sector. The average annual family income in 1971 was P7,785, which is more than twice the national average of P3,736.⁴

In sharp contrast to its wealth, commerce and vitality, one-fifth of the population of Metro-Manila live in slums and squatter

²See Aprodicio Laquian, *The City in Nation-Building* (Manila: School of Public Administration, University of the Philippines, 1966).

³*Ibid*, p. 46. ⁴Philippine Census, 1971,

settlements; and one-third of them reside in the central or core city, Tondo, which recently became the site for an international competition for *Habitat '76*, and is the largest squatter settlement, with a population of over 175,000 residents or 27,000 families. It has a density of over 2,000 persons per hectare, or about 810 persons per acre.⁵ Urban renewal and housing, therefore, are two of the more pressing concerns of the metropolis.

in 1974, the Metropolitan Manila Government was incorporated into a Metropolitan Manila Commission under the governorship of the First Lady. The Metro Manila Commission includes four cities and thirteen municipalities under its jurisdiction. It occupies an area of 630 sq. km. and embraces a 25-km. radius from the central business district. The population was estimated at 7 million in 1976,6 represented about 50 percent of the total national urban population, and is equivalent to 10.5 percent of the country's total. The population is increasing at an annual rate of 5.0 percent (2.5% is due to immigration alone), compared with the nation's annual average rate of 3.1 percent. The average density is 11,240 persons per sq. km. in 1975, and is increasing at an annual rate of 2.5 percent.

In comparison, the Greater Vancouver Regional District (GVRD) covers a total of thirteen (13) cities and municipalities, with an estimated population of 1.2 million in 1975, and a density of only 460 persons per sq. km.⁷

The Metropolitan Manila Commission (MMC) promises to make the city a more livable place. In the last two years, while awaiting a comprehensive plan being prepared by the Human Settlements Commission (HSC), it has embarked on an action program by creating task-forces for each of the "metropolitan" services, which include power, water, drainage and sewerage, garbage disposal, transportation and traffic, and planning. Acting on previous studies and proposals, the MMC has implemented action projects. The task force on traffic has devoted most of its efforts to traffic alone (the movement of vehicles on the road), and not necessarily on urban mass transit (the movement of people and goods).

Though growth poles and growth centers have been designated to act as countermagnets to Metro-Manila's growth, the metropolis will continue to play the role as the Philippine's primate city, and will continue to influence the development of the other cities and urban centers of the country.

The Transportation System

1. The Road Network

As early as 1577, only six years after its founding in 1571, Manila already had a plan for a small fort built by Governor Francisco de Sande. This fort eventually grew and became "Intramuros," the walled City of Manila, during the Spanish times. Little is known of what plans were prepared during the 300 years of Spanish colonization, but it is assumed that the City continued to grow and spill out of the fortress and into the countryside. In 1905, Daniel Burnham, the father of the "City Beautiful" movement, prepared the "Plan of Proposed Improvements" for Manila. Of its street system, he wrote:

The aim of the proposed sireet system of Manila is in brief, to leave the old city streets untouched except for the creation of a few indispensable new arteries upon which work should be begun immediately. The old wall (of Intramuros), left undisturbed except for the street opening through the angle bastions, should have a setting formed by a sunken garden replacing the unsanitary moats. In the outer part of the town, a rectangular street system insures sunlight on all sides of the houses, provides especially ample streets in the lines of heaviest traffic toward the town center and by means of radial and diagonal arteries makes every section of town readily accessible from every other. In considering this street system, we should bear in mind that the presence of water very near the surface places almost prohibitive difficulties in the way of depressed or underground connections of any sort. So that short of a recourse to expensive and objectionable track ele-

⁵"Tondo Foreshore", in the *Philippines Quarterly*, Vol. 8, No. 2(June, 1976), pp. 59-63.

⁶Imelda Marcos, "Manila-Challenge to the Visionary", in the *Philippines Quarterly*, Vol. 8, No. 1 (January, 1976), p. 22.

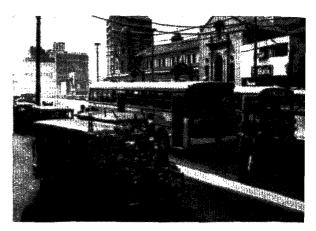
⁷Greater Vancouver Regional District, *The Livable Region*, 1976.

vation, there is only one way to provide for ample traffic, viz., by sufficient arteries.⁸

Burnham's plans of wide avenues, instead of "track elevations" or elevated highways, and "underground connections" or subways, were of course, short of visionary. Unfortunately, only a part of Burnham's plan was implemented. Even if it was fully implemented, the plan covered only about a tenth of the present Metro-Manila area. During World War II, Manila was heavily damaged and practically leveled to the ground, though "the general outlines of Burnham's innovations survived that conflict as partial basis for post-war Philippine urban development."⁹

"Partial basis" is an appropriate description of what happened to planning after the war. In 1945, the National Planning Commission (NPC) prepared a "Major Thoroughfares Plan for Metropolitan Manila" which was revised in 1954. Though laid out in the spirit of Burnham's wide avenues, these plans have largely been inefficient and ineffectual. The NPC could only "be consulted as an advisory body, but it had no control over the actual implementation of the Plan."10 The present transportation network therefore, evolved dimly out of Burnham's grandiose plans, as well as what the 13 municipalities and four cities decided to build, oftentimes independently of each other, after the War.

In September 1973, the Overseas Technical Cooperation Agency of Japan prepared an "Urban Transportation Study for Metropolitan Manila Area."¹¹ The study was the first of a number of serious attempts at planning the transportation system of the Metropolitan area with foreign assistance.



The Philippines' most important modes of public transport—the bus and the jeepney.

Their plans, however, invariably proposed extensive use of elevated highways over existing ones, and even over and along rivers and "esteros" or canals. Criticized primarily in terms of costs and aesthetics, these plans have not been implemented, and may have been quietly and promptly shelved.

Recent proposals to improve the road network, and urban transportation in the metropolis come from the Ministry of Public Works, Transportation and Communications (MPWTC). Building on the existing network composed of nine (9) radial and three (3) circumferential major arteries, mostly with four to eight lanes, they propose to expand the network to 10 radial avenues converging on the central business district, and six (6) circumferential arteries, fanning out of the central business district.

A two-rail subway, out of a total of three, is being proposed to run from the northeast, through the central business district, and southwards, up to the vicinity of the International Airport. Other proposals have included the setting up of a monorail system, but the financial and other problems supposedly favor the construction of subways. Detailed planning of these and other proposals are on-going.

In 1976, another foreign consulting firm was commissioned by the MPWTC to prepare a Transportation cum Land Use Study for Metropolitan Manila.

2. Urban Transit Demand

The population and activity patterns of Metro-Manila generate some 8.5 million trips

⁸Charles Moore, *Daniel Burnham—Architect* and *Planner of Cities*, Vol. 1 and II, (Boston: Houghton Mifflin Company, 1921) p. 187.

⁹Thomas Hines, *Burnham of Chicago—Architect and Planner* (New York: Oxford University Press, 1974), p. 215.

¹⁰Aprodicio Laquian, "Manila", in William Robson and D.E. Regan eds., *Great Cities of the World: Their Government, Politics and Planning,* Vol. 2 (London: George Allen and Unwin Ltd. 1972) p. 621.

¹¹Overseas Technical Cooperation Agency, *Urban Transportation Study for Metro Manila Area*, (Manila: DPWTC, 1973).

a day (excluding walking trips), about 1.7 million vehicle trips a day, and some 700,000 person trips to and from the surrounding areas outside the metropolis.¹²

Modal split in 1974 revealed that out of 8.3 million person trips, 67.9 percent or 5,654,000 person trips were made by mass transit, i.e., by jeepney, bus and taxi, making 739,475 vehicle trips representing 43.4 percent of total vehicle trips (see Table 1 below). As with most cities that are fast becoming motorized, 40.8 percent of vehicle trips were made by the private automobile in Manila.

Table I — Modal Split in Metropolitan Manila 1974

	Person trips		Vehicle trips	
	No.	%	No.	%
Jeepneys	3,839,000	46.1	479,875	28.2
Buses	1,364,000	16.4	34,100	2.0
Taxi	451,000	5.4	225,500	13.2
Private cars	2,091,000	25.1	697,000	40.8
Trucks, etc.	579,000	7.0	272,000	15.8
	8,324,000	100.0	1,708,475	100.0

Source: Terms of Reference, Metro-Manila Transportation cum Land Use Study, June 1974.

The land use pattern of Metro-Manila aggravates the crisis in urban mobility. Growing in a traditional concentric pattern. the population exhibits marked variations in number, growth and density within the area. as shown in Table 2. The concentration of specific land uses which are major traffic attractors and generators, also adds to the transportation problems. Most of the commercial establishments are located in the core area. The squatters and slum dwellers. who are potentially captive transit riders, are in the core area. About two-thirds of all movié houses, now numbering almost a hundred, with seating capacities of over 2.000 each, are also within the core area. Ten to twelve universities, four of which are in the middle of the central business district itself, having a combined population of over 200,000 students, are all located

¹²Department of Public Works, Transportation and Communications, "Terms of Reference Metro-Manila Transportation cum Land Use Study" (Manila: DPWTC, 1974).

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within or immediately within the vicinity of the core area. In a study done by a Japanese transport team in 1972, it was found out that trips to school (1,060,000 trips) outnumber trips to work (1,046,000 trips).¹³

Table 2 — Population and Density Pattern, Metro-Manila

	% of Area	% of Metro Population	Density (p/km ²)
Core (City of Manila)	4.5	30.0	34.75
Inner Ring (urban- ized subdivisions)	39.0	48.5	6.25
Outer Ring (urban- ized area)	56.5	21.5	1.90

Sources: Terms of Reference, Metro-Manila Transportation cum Land Use Study, June 1974.

To add to all these, there are large-scale urban developments, both proposed and in progress, within the core area. These new developments, in the absence of a comprehensive plan, are being constructed without previously considering their effects on the demand for urban mobility. Among these projects are: an urban renewal program of the Tondo squatter area which is being carried out under a policy of on-site redevelopment or nonrelocation, which means that more than 175,000 residents will remain in a the core area; a 4,000 hectare reclamation project along the Manila Bay, which will be a mixed commercial-residential-recreational city-within-a-city development, scheduled for completion in the 1980's; and the international airport, which is being renovated to accommodate the increasing number of tourists. (Although plans for its transfer have been proposed, the airport might stay by default since no available and feasible alternative site has been found.)

Urban mobility in the Metro-Manila area will continue to deteriorate what with an already congested and crowded core area, together with a rapidly increasing population base, and the rush of uncoordinated large-scale urban developments.

3. Urban Travel Supply

To cope with the travel demand in Metro-Manila, residents rely on the following for mobility:

a) A fleet of 2,600 buses of 50 to 60 seating capacity, and around 400 minibuses of

¹³OTCA, op. cit., p. 84.

20 to 25 seating capacity, in 1975. The system is operated by 76 private bus operators on more than 400 routes, with individual owners openly competing on the same routes;

b) A para-transit system consisting of 17,000 jeepneys or Public Utility Jeeps (PUJ) of 10 to 14 pasengers; about 3,000 autocalesas (smaller jeepneys with 6 to 8 seating capacity); and around 8,000 taxicabs. These are likewise operated by many operators, which may be private individuals, corporations or cooperatives, all competing along the same routes. In 1960, jeepneys were operating on more than 2,000 franchised routes within the metropolitan area.¹⁴

Jeepneys were originally US Army surplus jeeps, which were converted for urban transport services at the end of the War in 1945.15 Since then, they have become "permanent fixtures," and have evolved into a lavishly decorated and locally manufactured Manila jeepney which has ultimately become one of Metro-Manila's major "attractions." Each jeepney accommodated two passengers in front, and from six to twelve passengers at the back along two upholstered seats or benches placed along each side of the vehicle. The jeepney is an ideal vehicle for the hot and humid climate of Metro-Manila since the sides of the vehicle are open. A canvas or plastic sheet may be unrolled over the sides in case of rain.

The competition along the routes is completely open-ended. The service is completely demand-responsive, having no fixed schedules. It is a thriving business. In 1975, an estimated 45,000 drivers, 6,000 to 7,000 owners, around 1,000 mechanics and several hundred body-building enterprises were involved in the jeepney transport system. The industry affects the livelihood of nearly 350,000 residents directly;¹⁶

c) About 200,000 private cars, in 1975 (this includes cars owned by institutions, the government, and delivery cars and trucks);

d) A newly operated commuter train system, managed by the Philippine National Railways (PNR), carrying a negligible number of only about 15,000 passengers per day in 1975. (Until this time, the trains were relegated to inter-provincial and regional travel.)

The public transportation system of buses and jeepneys is essentially an aggregate of a vast number of individual enterprises, operating in direct, often fierce, competition with one another along the same route, for the same fare. Fares are very minimal. This has contributed much to greater mobility. The minimum amount is now 45 centavos for the first five kilometers and an additional 8.5 centavos for each kilometer thereafter.

Other urban transportation modes in Metro-Manila are the tricycle and the "caretela." Tricycles are motorized bicycles or motorcycles with sidecars seating two passengers. They are used for very short trips, such as intra-subdivision travel. The "caretela," a horse-drawn carriage, which was once popular during the Spanish times, has now been confined for use in the chinatown district, although it occasionally wanders into the central business district.

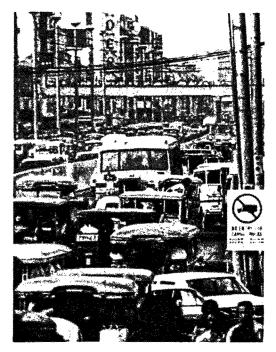
Supplying mobility to Metro-Manila's 7.0 million residents has become a dilemma: on one hand, the combined capacity of all public vehicles-about 431,000 seats is not enough to meet the 8.5 million person trips per day, especially during the rush hours; on the other hand, there are not enough vehicles to meet the travel demand, the roads are too few and too narrow to accommodate the increasing number of vehicles. Thus, we have a situation where there are too many people and too few vehicles, yet too narrow and constricted roads for so many vehicles. Solutions lie somewhere between providing more roads and transport infrastructure, providing more and better public vehicles, and reducing the population and travel demand.

The free-wheeling free enterprise system that characterizes the mass transit operations in Metro-Manila also creates problems. With so many operators, free transfers are virtually impossible to initiate. This works against commuters whose trips are not covered by one route. Flerce competition for the same passenger and fare also creates offensive driving habits among

¹⁴Setty Pendakur, "Impact of Transport Modernization", a paper presented to the Transportation Research Board (Washington, D.C.: January 1971), mimeographed.

¹⁵Sigurd Grava, "The Jeepneys of Manila", in *Traffic Quarterly*, (October, 1972), pp. 470-485. ¹⁶Pendakur, p. 18.

drivers, which only serve to encourage fast driving and disregard and violation of elementary traffic rules, thus neglecting the safety and convenience of passengers, and hindering traffic flow and further prolonging travel times.



Travel time in buses and jeepneys in Manila is among the slowest in the world—10 to 20 kilometers an hour.

The most obvious, glaring and readily perceptible defect of the present transit system in Metro-Manila is the fact that there are virtually no rider information and rider education programs. The only way to find out which route a bus or jeepney is taking is to be familiar with the system, by experience. There are no published bus or jeepney routes of any kind. There are no schedules, and even if there was one, the traffic congestion and delays will render them useless and totally unreliable. Headways, however, are short (only about 5 minutes at the most, during the rush hours) but buses and jeepneys are almost always loaded and crowded at these times.

Passenger convenience such as waiting sheds and designated bus and jeepney stops are more of an exception than a general rule. In a city where the rainy season lasts for more than four months, and where the

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temperature in the scorching sun averages in the high 80's, covered waiting sheds are not sufficient in number. Bus and jeepney designated stops become useless. In a system where every passenger counts, and means greater income and profit for both driver and operator, buses and jeepneys operate like taxicabs-they can load and unload just about any place along a route. again adding to delays and traffic chaos.

What is needed is a complete overhaul of the management and the provision of transit supply, as well as the enforcement of strict controls and proper planning of transit demand.

4. The Urban Transit Agencies

To handle the enumerable mass transit problems, a number of agencies and organizations have been created, both permanent departments and ad hoc committees. They include the following:

- A. Government Ministries/Agencies
 - 1. Ministry of Public Works, Transportation and Communications (MPWTC)
 - 2. Ministry of Public Highways (MPH) 3. Board of Transportation (BOT)

 - Public Service Commission (PSC)
 - 5. Land Transportation Commission (LTC)
 - 6. Ministry of Human Settlements (MHS)
 - 7. Metro-Manila Commission (MMC)
 - 8. Philippine National Railways (PNR)
 - 9. All Engineering Departments of cities and municipalities of Metro Manila
- B. Ad Hoc Committees
 - 1. Metro-Manila Management Study and Implementing Committee (MMSIC), created by the Secretary of the DPWTC in 1974.
 - 2. Transportation Management Advisory Group (TMAG), created by the President, Letter of Instruction No. 225, November 15, 1974.
 - 3. Inter-Agency Technical Committee on Transportation Planning (IACTP), created by the President, Memorandum Order No. 473. December 5. 1974.
 - 4. Inter-Agency Committee to Evaluate and Recommend Mass Transit Modes for Metro-Manila, created by the President, Memorandum Order No. 503, April 2, 1975.
 - 5. Metro-Manila Transit Corporation, created by the Presidential Decree No. 492, June 27, 1974.

Although some of the agencies and departments listed above are indirectly concerned with mass transportation, it is clear that nobody seems to be in charge of mass transit in Metro-Manila. There are also no explicit urban mass transit policies to guide the various agencies and departments in planning and implementing even segments of the mass transport system.

The failure to control or contain transit demand, and the failure to provide an adequate and safe transit system, are aggravated by the failure to properly manage the entire mass transit itself.

In terms of organizational strategy, it will be noted that the approach to transportation planning, promotion, regulation and implementation has been very fragmented, largely uncoordinated and unintegrated. At the same time, the approach to immediate transit problems has been piece-meal, and at most, on an ad hoc basis. Although the studies of the different ad hoc committees are not readily available, the author is fairly familiar with some of the significant proposals which were actually experimented on. They include staggering of work hours; use of the Pasig River, which winds through the metropolitan area, as a transit mode; and assigning exclusive bus lanes.

For some reasons, these strategies, although full of promise and potential, failed. Work hours, for example, were staggered, but for only 30-minute to one-hour intervals. In a city where a one-hour home-to-work journey time is the rule, work hours should be staggered for at least two-hour intervals to have any appreciable effect. Employees within each agency or department were also free to choose their work hours, thus half of the staff would come in early, and the other nalf would come in later. The early employees would wait for the late employees before they could start working. In the afernoon, the late employees stop working when the early employees go home. Staggering of work hours to be successful, should therefore be done on a department or government wide basis, carefully considering other criteria such as locational factors, employee population, commuting patterns of employees, and degree of coordination with other agencies and departments.

The use of Pasig River as a transit mode also promised a lot of potential. Unfortunately, this was done by a private organization, which did not, or could not properly relate to an already uncoordinated land transit system, especially at the terminals along the river. Worse, hardly anyone knew anything about it; marketing was practically nil. The operators had to abandon the system. With proper planning however, it is worth reviving.

With streets that are narrow, assigning, exclusive lanes for buses and jeepneys is impractical. On the other hand, too many buses and jeepneys which are free to load and unload anywhere, have practically preempted the right-most lanes. In practice, the public vehicles' "intrusion" into the left lanes when overtaking vehicles that load and unload on the right lanes causes more problems. Along heavily travelled transit routes. it might be better to "pedestrianize" the entire route or portions of it, or assign it exclusively for transit use, or both, by restricting the road to two transit lanes, while widening the pedestrian sidewalks, and exluding all private cars.

To summarize, the urban mass transit crisis in Metropolitan Manila can be traced





Pedestrianized Plaza Miranda Quiapo, Manila

to the combination of the following: 1) the failure to plan and implement a comprehensive and integrated land use and transportation plan; 2) the failure to prepare and develop explicit urban mass transit policies to guide public and private agencies in coordinating the formulation and implementation of transportation and transit-related plans and programs; and 3) the failure to properly implement, manage and enforce the most elementary rules of traffic to ensure the efficient, safe, and free flow of vehicles, people and goods.

To arrive at an integrated, pragmatic, and economical approach that will consider the different inter-related factors affecting both transit supply and transit demand, shortterm and long-term solutions covering traffic management, physical infrastructure requirements, public information and education programs, and urban mass transit policies should be considered. As stated earlier, this paper will focus on the short-range, action-oriented, non-capital intensive strategies. A review of such strategies, which have been experimented on and applied in various countries, will be covered next.

Alternative Transport Strategies

Low-cost, short-range, and action-oriented transportation alternatives are available as options to expensive rapid rail systems. While they may not, by themselves solve the crisis in urban transportation, their consideration should be a pre-condition to any decision to build the high cost option of subways or rapid rail transit systems. These

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techniques or strategies have been tested, tried and in most cases applied in cities of various countries with varying degrees of success, and failure. It is the purpose of this section to review the nature and potentials of such strategies. In most cases, the primary objective of the strategies is to reduce the volume of traffic in order to achieve a more efficient flow or movement of a greater number of people and goods.

These strategies may be broadly divided into two groups: 1) demand modification techniques or those that modify transport demand and 2) supply modification techniques, or those that tend to modify or influence transportation supply.

Demand Modification Techniques

A. *Traffic Restrictions*—These include methods of preventing vehicles, by physical obstruction or fiscal measures, from going where they would otherwise go. They strike directly at the freedom of the motorists.

1. Total or Partial Closure of Roads— Other than not building roads altogether, the next best thing to do in order to control traffic is to either partially or totally close the road. This may involve the use of bollards, gates or other barriers, or large plant boxes. These physical obstructions may be placed on both ends of a street, to exclude all motorized traffic, or only at one end, to discourage through traffic, and achieve a *culde-sac* effect. Traffic is then channeled away from areas that require privacy and quiet, and into selected main arteries where it is better accommodated and regulated.

2. Restriction of Motorized Traffic by Area, by Vehicle and/or Time of Day

Traffic may also be restricted not only along a road, but also within a specified area, such as historical and scenic places. Restricting traffic in certain areas during special gatherings such as parades, festivals and similar occasions is already commonly practised.

Legal restrictions are also already being enforced to prohibit certain types of vehicles —"No Entry Except Buses," and freight trucks above certain specified weight limits —from entering an area or street. In Istanbul, "dolmus" buses are not allowed to operate within the city center; and in Lagos, "kia-kia" buses are also banned from the central

business district.¹⁷ Vehicles, especially private cars, may also be restricted during specific times of the day—"No Entry—6-9 A.M."—from entering designated streets that tend to be easily congested.

Most of these restrictions are already being enforced, and designating additional restricted areas should not meet adverse public resistance. Though less restrictive, and therefore, more acceptable, than placing permanent bollards and large plant boxes, legal restrictions have the disadvantage in that they are only effective when properly obeyed, or otherwise, extensively policed and monitored.

B. *Traffic Restraint*—These strategies do not directly curtail traffic, but are merely intended to influence, without directing, motorists' choices by making driving more difficult and more costly. The main objective is to persuade people to make less use of private motor vehicles, especially during the rush hours, in the inner and other congested areas of the city.

The economic justification of these strategies, often expressed in the context of "road pricing," has adequately been set by various authors.¹⁸ The argument hinges on the conclusion that higher charges for the use of congested roads could produce gains in economic efficiency. The logic is that since decisions to use motor vehicles do not carry responsibility for all system costs, i.e., vehicle operating costs (including value of time), road wear and tear, accident costs, direct environmental and other external costs, some vehicle journeys are therefore made which would not otherwise be made if the costs were directly chargeable to them. The economic efficiency of the system would therefore be improved by the exclusion of vehicle journeys whose value is less than the incremental system cost. In principle, this could be achieved by charging an appropriate price or by other selective means of traffic limitation, such as those outlined below.

1. Use of Tolls-Until the present time, the collection of road tolls is popular, especially in the United States although tolls are most often limited to major expressways and skyways or bridges. Their collection is also justified primarily by the need to enable these special infrastructures to be economically viable and pay for themselves. The idea, however, could be transferred to regular urban roads, and the toll fees used not only to finance the transport infrastructure, but also to influence travel demand. At the same time, toll fees could also be used as an effective measure to initiate peak/off-peak differential pricing.¹⁹ Such an idea, however, has not really become acceptable yet. On the contrary, in some areas such as the tolloates at the Lion's Gate Bridge in Vancouver, the collection of toll fees had to be stopped due to pressure from motorists.20

The biggest drawback of urban tollgates, however, is the number of gates that might be needed, and the consequent cost of operation. The Smeed Report in London simply stated that "for ordinary roads in urban areas, they (tollgates) are costly and inefficient, and impede the flow of traffic, and even with modern refinements, we do not regard them as practicable."21 Nevertheless, Thomson argues that "the presumption that large toll collection areas would be needed is, however, not convincing. Consequently, although some road widening would probably be necessary in order to accommodate the booths, the additional area required would not necessarily be so large as to rule out the possibility of toligates altogether."22

²²*lbid.,* Thomson, p. 50.

¹⁷Michael J.Thomson, *Methods of Traffic Limitation in Urban Area* (OECD Working Paper No. 3, 1972), p. 22.

¹⁸See Ian G. Heggie, *Transport Engineering Economics* (McGraw-Hill: London, 1972), Michael Beesley, *Urban Transportation: Studies in Economic Policies* (Butterworth: London, 1973); and A.A. Walters, *The Economics of Road User Charges*, World Bank Staff Occasional Paper No. 5 (Baltimore, Maryland: John Hopkins Press, 1970).

¹⁹William Vickrey, "The Use of Tolls in Controlling Urban Traffic Congestion", in Andrew Hammer, ed., *Out of Cars Into Transit*, Research Monograph No. 65 (Georgia State University: Atlanta, 1976).

²⁰From a class lecture in Planning 533, Winter Term, University of British Columbia, 1977.

²¹Ministry of Transport, *Road Pricing: The Economic and Technical Possibilities* (Report of the Panel under the chairmanship of R.J. Smeed, London, 1964), p. 17.

2. Area Licensing—A variation of tollgates is area licensing. In this scheme, an area such as the central business district is defined and motorists must secure daily, monthly, or even yearly licenses, and display them in the windshield of their cars, when entering the restricted zone during restricted hours.

In Singapore, where such a scheme seems to be enjoying some measure of success, the hours of restriction are limited to the morning peak, i.e., from 7:30 a.m. to 9:30 a.m. only. ²³ Restriction over the full working day suffers from a serious disadvantage in that shoppers and people transacting business in the area are affected to the same extent of work commuters, who constitute the majority of urban traffic. At the same time, it is felt that evening peak hour restriction may not be necessary if motorists have already been induced not to drive into the zone by the morning peak restriction.

Restrictions may apply to all vehicles, though exemptions may be granted to all public vehicles, private buses, emergency vehicles, police and military vehicles, and goods vehicles. As in Singapore, private vehicles with four or more occupants may also be exempted, "to encourage car pools... (and to) lessen criticisms that the scheme favors wealthy motorists and discriminates against the less well-off motorists."²⁴

Area licensing schemes have the advantage of controlling all cars entering the specified area regardless of whether the cars are parked or not; of regulating unnecessary through traffic; and of selective control of various categories of motor vehicles. There are, however, disadvantages, such as difficulties of enforcement and administrative problems. It is for these reasons that in a study²⁵ by the British Ministry of Transport in 1967, they were doubtful about the prospects of enforcing a daily license system. However, subsequent experience in the experiment in Singapore should provide valuable lessons as to whether daily license can work, at least in the context of developing countries.

3. Vehicle Metering-Vehicle metering is the sophisticated and mechanized form of area or daily licensing, and has become closely associated with "road pricing" and "congestion pricing." Meters may be distinguished as either on or off-vehicle. Onvehicle meters, as proposed by Vickrev. would involve "equipping all cars with an electronic identifier. These blocks would be scanned by road-side equipment at a fairly dense network of cordon points, making a record of the identity of the car; these records would then be taken to a central processing plant once a month and the records assembled on electronic digital computers and bills sent out."26

For off-vehicle meters, an identification unit fitted to the vehicle would enable the identity of the vehicle to be recorded by road side equipment where the vehicle passes over a pricing point. This information is then stored and processed by computer and an account is presented to the vehicle owner every month, in much the same way as for telephones.

Meters may be designed for either continuous or point pricing. The continuous meter is switched on automatically when the vehicle crosses a loop entering a pricing zone, and continues to run until it is switched off when the vehicle passes out of the zone. The point meter simply registers one unit everytime the vehicle passes over a loop, i.e., a pricing point.

No city seems to have applied any form of vehicle metering. The obvious difficulty is of course, the technical complexity of installing and operating the meters, not to mention the political as well as practical difficulties of fitting all cars with such devices. But given its successful technical performance, vehicle metering offers a powerful and sophisticated means of traffic restraint.

4. Parking Charges—Parking charges or taxes have been proposed by many as a

²³Organization for Economic Co-operation and Development, *Better Towns with Less Traffic* (OECD, 1975), p. 107.

²⁴*ibid.*, p. 107.

²⁵Minister of Transport, *Better Use of Town Roads* (London, 1967), p. 23.

²⁶William S. Vickrey, "Pricing in Urban and Suburban Transport", in George M. Smerk, ed., *Readings in Urban Transportation* (Bloomington, Indiana: Indiana University Press, 1968), p. 126.

means of implementing marginal cost pricing on road facilities.27 But research has shown that they are not as effective as they are thought to be. A study that examined previous experience with parking price changes to determine the likely impact of a parking tax on travel patterns, found, with reasonable consistency, that "the demand for parking for work trips on an area-wide basis is impact of parking tax on traffic conditions, therefore, has been slight, almost negligible for any area-wide parking policy tested. Part of the reason for this insensitivity in traffic conditions is that through traffic, which can account for up to 60 percent of central business district trips, is not affected by a parking tax.29

Considering the 40 percent central business district trip-ends, studies on the effects of parking taxes are vague in their conclusions. In a survey in London to study possible mode shifts, 72 percent of auto travelers indicated that for work trips, they would shift to transit if faced with the in-ability to park.³⁰ But when a parking strike in Pittsburgh, Pennsylvania occurred, which came closest to creating the "impossible" parking conditions posed in the London survey, the overwhelming shifts to public transportation indicated by the London respondents did not occur.³¹

On the positive side, parking taxes are relatively easy to implement and administer, and much of the mechanism for administering a parking tax are already existing, at least, when compared to other forms of road pricing. And though it may not be a panacea for road congestion, as with all strategies when implemented alone, it can have a significant role to play in conjunction with other pricing measures, so concludes the Smeed Report.³²

Moreover, the numerous types of parking facilities present considerable practical difficulties in the implementation of a parking charge policy. Clearly, it is only in on-street parking areas and in municipal or city parking facilities that parking charges can be installed with relative ease. Private commercial parking facilities, i.e., privately owned but open to the public on a commercial basis, can also be controlled; but formidable difficulties are raised in charging semiprivate car parks, i.e., privately owned but available on a non-commercial basis to restricted sections of the public, e.g., customers, visitors, employees, etc.; and virtually impossible on private parking spaces attached to residential property.

5. Vehicle Registration and Import Taxes —The imposition of car registration fees and import taxes, though mainly used to raise revenue and relieve balance of payments, can be effective measures to control the number of car ownerships, and therefore of subsequent car traffic volumes. Money raised through car registrations and import taxes may then be used to cross-subsidize mass transit.

In Colombia, the tax on cars reaches 200 to 300 percent depending on the model. The capital city, Bogota, is perhaps the only city in the world with a population of over two million and with no serious traffic problems. In Burma, the import tax is far higher, a modest car retails at L5000; and in Rangon, a city of 1.8 million residents, there are no traffic problems.³³ While the imposition of stiff vehicle import taxes serves to limit the number of private cars, alternative modes must be improved, as a compensation for those who are opted out.

6. Fuel Tax—With the increasing cost of fuel, the use of fuel taxes on gasoline and diesel oil for motor vehicles could be expected to influence the annual mileage of vehicles, the number and the type of vehicles owned. The main objection against fuel taxes, however, is that, as with vehicle regis-

²⁷See Gabriel Roth, *Paying for Roads: The Economics of Traffic Congestion* (Penguin Books, Hammondsworth, England, 1967), and A.A. Walters, *The Economics of Road User Charges*, World Bank Occasional Paper No.5 (Johns Hopkins, 1968).

²⁸Damian Kulash, *Parking Taxes for Congestion Relief: A Survey of Related Experience* (The I'rban Institute, Washington, D.C. 1974), p.v.

²⁹ı*pid.*, p. 46.

³⁰Michael J. Thomson, Some Characteristics of Motorists in Central London (Greater London Paper No. 13, The London School of Economics and Political Science, 1968).

³¹*Ibid.*, Kulash, p. 48.

³²Ibid.,Thomson, Methods of Traffic Limitation, p. 68.

³³Ibid., Smeed Report, p. 4.

tration fees and import taxes, they penalize everyone, and everywhere, i.e., in urban as well as rural roads, and all motorists at all times.

Despite this drawback, high fuel taxes could discourage unnecessary trips, and the use of large cars with high fuel consumptions.

C. Incentives—Two incentives schemes have been used to influence travel demand with relative success, at least, in some cities: the staggering of work hours, and subsidized and free transit fares.

1. Staggering of Work Hours-One characteristic of urban travel demand is that the majority of the trips are journeys to work. With the institutionalization of business hours, this has resulted in the very familiar problem of the morning and evening peak hours, overloading transport facilities during the peak periods, and making them highly underutilized during the off-peak. One obvious solution, therefore, is to distribute journeys to work by staggering work hours. or allowing flexible working hours, or "flexitime." A recent survey of flexible working hours indicates that this relatively new approach to work schedule in the United States (now also widely practiced in Europe and Asia) has won the approval of workers. reduced absenteeism and increased productivity. Of the 59 flexible-hour plans studied, none had reverted to rigid work schedules.34

Under one plan, the employee chooses his own hours, within the range established by the employer, and adheres to them each day. Thus all workers might be required to be present from 10 a.m., but may start as early as 7 a.m., and leave as late as 6 p.m. Another system would permit day-to-day variation in the schedule of individual workers, as long as a specified number of hours are worked per week. Of another 40 forms studied, using this "flexitime" plan, 18 reported increased productivity, none a decrease in productivity, 34 firms reported a decrease in tardiness, and 22, a decline in absenteeism.³⁵ "Flexitime" might present some problems of enforcement at the start, but this should not alter its effectiveness. If enforced agency-wide, and metropolitan-wide, it could effectively redistribute traffic movements not only temporarily, but also spatially, and "flatten" the "sharp" morning and evening peak periods, and facilitate the movements of people and goods.

2. Subsidized Fares—The case for and against subsidies in mass transit has been argued by a number of authors.³⁶ In any case, most public transit systems of the world are subsidized, one way or the other. There are social reasons for subsidizing mass transit—to help the poor, the aged and the young (though often contested in its feasibility); and economic reasons—to encourage motorists to take the transit service and to persuade transit riders who are potential motorists, to stay on public transit (also highly debated).

Whatever the reasons, subsidies in public transit may be used to lower fares or to improve quality. While the poor simply want lower fares, the potential motorists want higher quality. This may lead to confusion over the real purpose of subsidy, and conflict over the way in which it should be used. In any case, the effects of subsidized fares as a tool for traffic limitation or attracting motorists to take mass transit, seem to be limited. A study of 20 German and American cities by Baum revealed that fare reductions lead to a substantial increase in passenger demand, but that the extra demand arises mainly from non-work journeys by nonmotorists.37 This may show that the influence of subsidized fares on travel demand is not very significant. Subsidies might best be used to improve mass transit

³⁴"Hours of Work When Workers Can Choose", a Study financed by the Business and Professional Women's Foundation, reported in the New York Times, July 7, 1975.

^{'35}Ibid.

³⁶See George M. Smerk, "Subsidized for Urban Mass Transportation", in George M. Smerk, ed, *Readings in Urban Transportation* (Bloomington, Indiana: Indiana University Press, 1968): J.R. Mayer, et.al., *The Urban Transportation Problem* (Cambridge, Mass,: Harvard University Press, 1965); and Michael Beesley, *Urban Transportation: Studies in Economic Policy* (Butterworth: London, 1973).

³⁷H.J. Baum "Some Aspects of Fares—Free Public Transport", *Journal of Transport Economics and Policy* (January 1973).

service, or to attain other non-economic objectives, such as social equity in urban transportation.

3. Free Public Transportation—This is an extreme form of subsidized fares, and at least one author saw it as a way out of traffic jams.³⁸ Experience on free transit, however, is vague in their effectiveness.

"A net benefit seems to have been produced by free transit in a 105-square block area in downtown Seattle. This service, which has been carrying 12,000 daily riders, has reduced the number of cars on the streets by 7% and is credited with increasing retail sales by an estimated \$7 million over a 12 month period."³⁹

On the other hand, the free-fare experiment conducted in Rome lead Baum to conclude that:

"A transfer from private to public transport can be achieved more efficiently by improvements in the quality of public transport; the isolated introduction of free transit seems unable to relieve towns of traffic congestion."⁴⁰

As with most strategies to solve the transit problems, the effectiveness of a freefare system could depend primarily on certain peculiar characteristics of an area. Obviously, any one strategy, when implemented in isolation, cannot be expected to solve the whole urban transport crisis. But the fact that free-fares policy has been successful in some cases shows that, given the right conditions, it can be used effectively to influence travel demand.

Supply Modification Techniques

A. Traffic Management and Engineering Systems—These are direct restraints, which do not necessarily make the movement of motor traffic easier or faster. In fact, they encourage just the opposite. In so doing, they improve conditions for pedestrians, cyclists, bus passengers, residents and shoppers. They also tend to reduce noise, pollution, and accidents. 1. Traffic Channelization—In conjunction with partial or total road closures, this may include route restrictions of certain vehicles along certain times of the day, and designating one-way systems, which can make it difficult and tedious, without making it impossible, to drive through residential and other environmentally sensitive areas. But while traffic channelization and oneway streets improve things for pedestrians, they encourage longer motor trips and possibly make congestion worse. They should therefore be implemented in conjunction with other traffic limitation strategies.

2. Urban Goods Movement Restrictions -The restrictions on the movement of freight and other urban goods delivery traffic can significantly provide additional roadway capacity which may be made available in congested times and places. These restrictions may include, 1) time of day restrictions, i.e., during rush hours, 2) reduction of total number of delivery trucks needed in the urban area, and 3) parking and movement restrictions. The effectiveness of this scheme, however, will depend largely on the volume of freight traffic. In cities where the number or volume of urban freight delivery trucks is numerous or significant, schemes for removal, reduction or redirection of urban goods traffic may play a very important role.

3. Creative Use of Planned Congestion— This technique recognizes the fact that congestion does occur, and therefore, if it cannot be avoided, it is best to organize traffic flow so that congestion is concentrated on roads that are not bus routes, or in places where motorists can be obliged to queue where they only get in one another's way.⁴¹

Planned congestion, such as the Bitterne Traffic Scheme in Southampton ⁴² looks at bottlenecks not as problem areas, but as control points. There may be difficulties in enforcing this strategy, especially where alternative routes are limited, and where

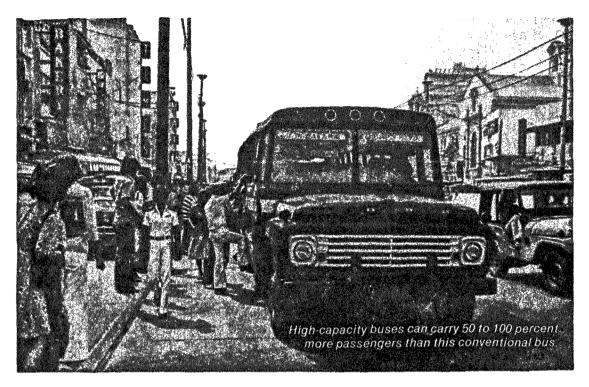
³⁸L. Leslie Waters, "Free Transit: A Way Out of Traffic Jams", in George M. Smerk, ed., *Readings in Urban Transportation* (Bloomington, Indiana: Indiana University Press, 1968).

³⁹American Transit Association, *Passenger Transport* (August 1974), p. 4.

⁴⁰¹bid., Baum

⁴¹Michael J. Thomson, *Modern Transport Economics* (Penguin Books: England, 1974), p. 155.

⁴²Bursledon Road, Bitterne Road, Northern A3024 Traffic Management of Bus Pricing Scheme, Project Description, Southampton City Council, 1970.



overly excessive queuing occurs, but congestion, no doubt, can exercise an important restraining influence on the volume of traffic.

4. Restrictions on Parking Space-Parking controls may be broken down into two types. 1) by pricing (as discussed earlier), and 2) by restrictions on supply. Supply restrictions may be done by placing limits on the supply of commercial and private parking facilities, and by banning parking on various public facilities. Thus, parking may be prohibited along major arteries, or heavily travelled routes; along an entire public transit route, especially where road widths are relatively narrow; or on-street parking may be restricted only along bus stops, as is the case in the City of Vancouver. Alternatively, time limits may be placed for parking durations, which may discriminate against commuters in favor of shoppers and callers, but will have the advantage of accommodating a larger turn-over of cars.

Another technique is to simply put limits on the number of commercial and private parking allowable. In some cases, parking may not be provided at all. In a study conducted in Great Britain, 83 percent of London motorists will theoretically take alternative modes, i.e., public transport, taxi, walk or ride the bicycle, if it were impossible to find a parking place in the town center.⁴³ Setting new and lower limits to commercial and private parking spaces may require revisions of parking requirements in zoning and subdivision regulations. If this is done then revisions should be done on a metropolitan-wide basis; otherwise, the flow of traffic that requires parking may only transfer from one area to another, and only serve to shift congestion.

B. Improvement of Transit Services—These strategies are perhaps the most important, especially when placed in the context of developing countries, where the primary mode of urban mobility is through some form of mass transit, and where the need for improvements of existing services and facilities is required.

1. Use of High-Capacity Buses—The ubiquitous "coca-cola red" double-decker buses of London are obviously not used merely as a tourist attraction, but to carry more passengers, reduce the number of

⁴³Ibid., Thomson, Some Characteristics.

public vehicles on the road, and encourage overall traffic and economic efficiency. The use of articulated buses in other parts of Europe serves the same purposes.

The use of high capacity buses could carry from 50 to 100 percent more seated pasengers than conventional transit vehicles. With this added cabacity, it seems like-Iv that the most effective use of these buses would be on routes where headways are short and crowding is severe. The loading area can hold pasengers prior to payment of fares, thus buses move away from curbs more quickly. The increased driver productivity can improve the economics of transit operations by cutting the extra costs assoclated with serving heavy peak-hour demands; and improved passenger comfort and increased vehicle reliability are also likely to be realized from the use of such vehicles.44

However, high capacity buses may not be able to operate on some streets, and in fact, may be relegated only to service major arteries, and perhaps, even only during peak periods. But while not radically solving the problem of transit supply, the use of high capacity buses does offer some advantages, and few, if any, serious drawbacks.

2. Bus Priorities and Exclusive Bus Lanes —Other than rapid transit or subways, and light rapid rail transit systems, a third alternative to accommodate inceasing demand and dwindling supply is a rapid bus system. In a survey of 21 low-cost alternatives for improving urban movements, the application of bus ways, in all forms, was found to be among the most promising of the low-cost techniques involved.⁴⁵

Bus ways have the following operational characteristics:

- Only buses, and in some special cases, taxi, car-pools and emergency vehicles, may use the facility when it is in operation. Prohibition against general use of such lanes is strictly enforced;
- 2. Bus ways are primarily oriented towards relief of congestion, exclusive bus lanes are designed to effectively circumvent congestion delays, and frequently these facilities are in operation only during

peak hours. In some cases, twenty-four hour operation reflects more extensive round-the-clock congestion experienced in that particular environment; and

 The bus ways facility is usually designed to provide the bus rider with a transportation advantage over commuting by automobile.

Bus ways can be implemented on all types of existing roadways, or they may be a separate, especially constructed and dedicated roadway, adjacent to or in the median of a freeway, as in the 11-mile Shirley Highway express bus lanes in Washington, D.C.⁴⁶ Power lines and abandoned railway rights-of-way may also be payed and used as bus ways. Additionally, in interacting with the traffic, bus lanes can operate "With Flow" or with the normal flow of traffic, or "contra-flow," against the flow of traffic. In a separate lane. "Contra-flow" lanes seem to be more successful due to their "intrinsic self enforcing nature which keeps the lane exclusive and uncongested."47

The advantages of bus ways are numerous. Peak hour passenger volumes as high as 25,000 have been observed on a limited access bus way lane. In contrast, 2,600 persons per hour is the normal maximum passenger volume expected on a mixed traffic, limited access highway lane with few or no buses.48 Bus ways also have the potential of saving substantial time during peak periods. They are inexpensive, and if existing roadways are utilized, they can be made operable in a matter of weeks. Bus ways can also be applied to almost any existing street type, design, configuration, and should have no problem in seeking the approval, and even patronage of motorists.

The use of exclusive bus ways, either reserved lanes or reserved streets, is spreading. In Europe, reserved lanes and streets have been experimented and operated with success in Dublin, Copenhagen, London, Manchester, Paris, Amsterdam and others.⁴⁹

⁴⁴*Ibid.*, Pratt, p. 44. ⁴⁵*Ibid.*

⁴⁶U.S. Department of Transportation, *Preferential Treatment for High-Occupancy Vehicles* (Department of Transportation, 1974).

⁴⁷ Ibid., Pratt, p. 10.

⁴⁸Ibid.

⁴⁹European Conference of Ministers of Transport, *Promotion of Urban Public Transportation* (ECMET, 1973).

In the context of developing countries, the application of bus ways may yet become the answer to the dilemma between the rising cost of rapid rail or light rail transit systems, on one hand, and the worsening urban transit crisis, on the other.

3. Rider Education and Information Systems-This strategy may sound obvious, but rider education and information systems in most developing countries are practically nil. Such services could include information on bus routes and schedules; pamphlets on how to use the buses and other transit systems, as provided in most cities in Europe; a regular publication on transit affairs, such as the Buzzer of the British Columbia Hydro Transit Company. These information services can make mass transit more attractive and easier to use. Knowledge of routes and schedules could make trips not only more convenient, but could avoid the unnecessary trips of passengers boarding the wrong bus. In cities with heavy tourist traffic, a multi-lingual instruction on how to use the transit system can also increase patronage, and a regular transit flyer will not only keep passengers informed of the latest policies and programs of the transit agency, but could also be a form for passenger complaints and suggestions, and a vehicle to elicit public participation in transit planning.

4. Provision of Rider Conveniences— Again, as with rider education and information, rider conveniences can be a powerful tool in attracting more patronage and for keeping captive riders intact. In most developing countries, such conveniences unfortunately, are the exception, making transit trips so inconvenient and frustrating that even the poorest captive rider dreams of buying and driving a motor car someday.

Rider conveniences could include properly designated bus stops, preferably with information on routes and schedules; waiting sheds sheltered against rain and wind, and well-illuminated at night; and such minor improvements as signal bells for stopping, easy steps for boarding and alighting, designation of entrance and exit for vehicles, courteous drivers and conductors, clean buses, padded seats, and many others.

Though undoubtedly very minor, these improvements could go a long way in making transit trips more pleasant, convenient, and attractive. C. Provision of Cycle Paths and Pedestrian Facilities—Cycling and walking are probably the two most neglected (or taken for granted) options for urban mobility. Current trends, however, indicate that, largely due to the rising cost of motor fuel and the rising popularity of active recreation and exercise, cycling and walking are staging a come-back.

1. Cycle Paths—In an article in Scientific American, the superior technology of the bicycle is described as follows:

"The bicycle has evolved so that it is the optimum design ergonomically. It uses the right muscles (those of the thighs, the most powerful in the body), in the right motion (a smooth rotary action of the feet), at the right speed (sixty to eighty revolutions per minute). Such a design must transmit power efficiently (by means of ball bearings and the bush-rollers chain); it must minimize rolling resistance (by means of the pneumatic tyre), and it must be the minimum weight in order to reduce the effort of pedalling uphill."⁵⁰

Indeed, the bicycle is not only technologically superior, it is also the most energy efficient. Compared with other modes of transport, the bicycle could theoretically carry 100 passenger-miles/U.S. gallon, while most cars with two occupants could only make 35 passenger-miles/U.S. gallon, and a helicopter, the most energy inefficient, 7.5 passenger-mile/U.S. gallon.⁵¹

The advantages of the bicycle over all mechanized form of transport cannot be underestimated. It is cheap for the individual user, easy to use for groups such as school children, young people and those of low income, and quicker. and more convenient than other modes for many short-distance urban trips. And "since the bicycle makes little demand on materials or energy resources, contributes little or no pollution, makes a positive contribution to health, and causes little death and injury, it can be regarded as the most benevolent of machines."⁵²

The provision of facilities for bicycles does not require expensive infrastructure;

⁵⁰S.S. Wilson, "Bicycle Technology", Scientific American 228 (March 1973), p. 82-83.

⁵¹Terence Bendixson, *Instead of Cars* (Templesmith: London, 1934), p. 34. ⁵²*Ibid.*, Wilson, p. 84.

they can be provided incrementally, but quickly. All it requires is the construction of bicycle lanes, the designation of bicycle paths, with proper signs, the provision of bicycle ramps at street curbs, and bicycle racks.

The popularity of the use of bicycles, and the provision of bicycle paths is spreading in most U.S. and European cities, as well as in Asia. Of course, cycling is *the* mode of transportation in Communist China.

2. Pedestrian Malls—"Streets are for People" could very well be the motto for the 70's. Cities have not only experimented in closing, even on a part-time basis, major streets from motor traffic—such as the Ginza in Tokyo, the famous plazas in Rome and Fifth and Madison Avenues in New York —but have actually permanently "pedestrianized" roads.⁵³

This "pedestrianization" can take various forms:

1. Shopping arcades for the exclusive use of shoppers and pedestrians are already common. They may be covered, exemplified in early designs by a famous shopping center in Milan, or open, as multi-level pedestrian streets, such as Schulstrasse in Stuttgart and the new Robson Square in Vancouver.

2. Streets closed to motor traffic, redesigned, repaved, and landscaped for exclusive use of pedestrians and cyclists, such as Bar Street in Southampton, the famous Plazza Navona in Rome, Albion Street in Leeds, and Sparks Street in Ottawa, to mention a few.

3. Streets that are redesigned and landscaped by widening the sidewalks and narrowing the street pavement for exclusive use of buses and trams, and taxi, such as Granville Mall in Vancouver, and Nicollet Mall in Minneapolis in U.S.A.

The "pedestrianization" of streets may be created to serve a variety of complementary objectives. It can serve to alleviate congestion, facilitate access for shoppers, reduce air-pollution and noise, and to enhance the attractiveness of historic buildings and streets. The reaction of pedestrians and motorist alike has been encouraging, as

⁵³Organization for Economic Cooperation and Development, *Streets for People* (OECD, 1974).

shown in at least one survey conducted in London⁵⁴ where an ovewhelming majority of those interviewed favored that pedestrianization scheme.

Such reactions, no doubt, are typical to the increasing number of "pedestrianized" streets all over the world's cities. This, together with cycle paths, should enable "leg power" to play a more important role in improving urban mobility.

D. Encouragement of Para-Transit—Another neglected option in urban mobility is para-transit. This form of transportation has been defined as "those forms of intra-urban passenger transportation which are available to the public, are distinct from conventional transit (scheduled bus and rail), and can operate over the highway and street system.⁵⁵

Indeed, urban transportation may be viewed as a continuum that ranges from the private car, to the conventional transit services. Para-transit modes occupy the middle range, and are composed of: 1) hireand-drive services, such as the daily and short-term rental cars, 2) hail or phone services, such as the taxi, dial-a-ride, and jitney services; and 3) pre-arranged ride sharing services, such as car pools and the subscription bus.

The potential of these modes lies primarily in their shared-ride characteristics, and thus, of increasing vehicle occupancy and consequently, of reducing the vehicles on the road. In the U.S., a study showed that "there could be a 25 percent reduction in the number of cars used for the work trip if average load factors were increased from 1.5 to 2".⁵⁶

1. *Hire-and-Drive Services*—The use of rental cars, especially in the U.S. is quite popular for business and recreation trips. A variety of special services are currently being offered by the daily rental car companies; clubs for special services, such as the Hertz Number One Club; daily, weekly

⁵⁴Ibid., p. 102.

⁵⁵Donald F. Kirby, et. al., *Para-Transit: Neglected Options for Urban Mobility*, (The Urban Institute: Washington, D.C. 1974) p. 9.

⁵⁶*ibid.*, U.S. DOT, 1974 National Transport Report, p. v-17.



The jeepney, ubiquitous on Manila's streets, is a unique Filipino creation.

and monthly rates; check-out and check-in at different locations; different vehicle sizes and types, and so on. The behavior of the daily rental car and the private automobile, however, is essentially the same, and therefore, prospects for improving urban mobility by reducing traffic is minimal, if not, nil. There seems to be "little potential for increased vehicle occupancy since rental cars are currently used by businessmen and tourists with diverse travel patterns.⁵⁷

2. Shared-Ride Taxis-The taxi is probably the most familiar form of para-transit mode. Taxi-cabs serve professional and managerial workers, area residents and nonresidents of all income ranges, and in particular, the economically inactive (housewives, students, and the unemployed, retired or incapacitated) who have no private automobile alternative. The biggest potential of taxicabs in terms of reducing urban traffic and improving mobility, is in sharing passenger rides, i.e., additional riders may be taken on after the original hiring by the first party. In most major cities, however, shared-ride services are specifically prohibited by local ordinance.58

However, a new fare structure could be designed which would distinguish between direct route taxi service and the shared-ride service, and encourage sharing. This will have the effect of not only possibly lowering taxi fares, but also of increasing taxi capacity and availability, without necessarily adding more taxicabs on the roads.

Shared-ride taxi may take the form of a jitney service, in which case they may be hailed in the streets, with signboards informing potential ride-sharers of the general direction of route the taxi is going (mainly determined by the first or initial passenger); or may be "hailed" by phone, (dial-a-cab?), in which case it becomes a variation of diala-ride services. Examples of shared-ride taxis that can be halled in the streets may be found in Teheran, while those that are called by phone may be found in Davenport in Iowa and Hicksville in New York, which "seem to demonstrate the versatility of demand-responsive transportation systems and the ability of these systems to adapt to different economic, social, cultural and political environments."59

⁵⁹Kenneth W. Heathington, et.al., *Shared-Ride Taxi Systems: An Analysis in Summary* (DOT, Urban Mass Transportation Administration, 1973), p. 20.

⁵⁷Ibid., p. 25. ⁵⁸Ibid., Kirby, p. 57.

3. Dial-a-Ride Services-This transport mode is a shared-ride vehicle which provides door-to-door service on demand to a number of travelers with different origins and destinations, and is "hailed" by telephone. Diala-ride services have been experimented in Haddonfield, New Jersey; Davenport, Iowa; and in Batavia, New York, in the U.S.A.; in Regina, Saskatchewan, in Canada; and in Emmen, Netherlands, among others. Experience with this mode has been limited and mixed, and serious doubts have been raised as to their financial viability.60 Nevertheless, this mode might work best in providing shared-ride service to special groups such as the elderly, the handicapped, and other similar minority groups.

4. Jitney Services—Jitneys are usually large automobiles or small vans, and service is limited to relatively fixed routes (with occasional variations). They are not formally scheduled, and they are hailed on the streets by potential passengers. In the U.S., the jitneys were regulated out of existence by as early as the 1920's.⁶¹ At present, only two U.S. citles—Atlantic City and San Francisco —continue to maintain jitney operations of a significant size on a fully legal basis, aithough a number of smaller jitney services operate illegally elsewhere.

While unpopular in the U.S., jitneys flourish in other cities, particularly in Latin America, the Middle East and Asian cities. Examples are the *carros por puestos* in Caracas, Venezuela; *peseros* in Mexico City; *dolmus* in Istanbul, Turkey; and the jeepney of Manila. The advantages of jitneys, other than their shared-ride characteristic, are, they are completely demand-responsive; have guaranteed seats; and tend to have shorter headways.

The popularity of jitney services in the developing countries may imply that this form of para-transit service is more attuned to the socio-economic characteristics of these cities, and should therefore not be over-looked when planning for improvements in their mass transit systems. 5. Pre-Arranged Ride-Sharing Services— This is a form of service in which a number of travelers make an agreement to travel together on a regular basis. The two most common forms are car-pooling and the subscription bus. Others include companysponsored van pools, company-operated bus services, privately owned and operated bus services, services provided by neighborhood cooperatives, and specialized school bus services with part-time or volunteer drivers.

The relative success of pre-arranged ridesharing services⁶² would suggest that the true potential of this form of para-transit is yet to be realized. What is needed is a more effective marketing system of matching riders through match-boards computer matching, and information on the availability of alternative car pools; and disseminating a wide range of incentives such as low-cost close-in parking, toll-free rides, priority access to expressways, use of exclusive lanes, etc.

E. Changes in Government Regulations— All transport services are subject to government regulations, but when such regulations have become static and obsolete, their review and possible revision (if not abolition) must become a pre-requisite to any program for improvement of urban mobility. Regulations that need some review include taxi regulations, vehicle road-worthiness regulations, and the licensing of drivers.

1. Taxi Regulations Studies—Studies seem to indicate that the limitations or restrictions of the number of taxicabs and entry controls are antiquated, and should therefore be relaxed, if not totally abolished. Other than the relaxation of entry and number controls, a new fare structure may also be designed which will reflect variations in the costs of taxicab operation between peak and off-peak hours. At the same time, taxicabs may also be allowed to display destination signs to facilitate ride-sharing.

2. Vehicle Regulations—To the extent that the purpose of limiting traffic also means limiting noise, pollution, and danger

⁶⁰D.M. Medville, *Diai-a-Ride Demonstration in Haddonfield: Planning and Initial Operation* (Highway Research Board, 1973).

⁶¹R.N. Farmer, "Whatever Happened to the Jitney?" Traffic Quarterly 19 (April 1965).

⁶²L.W. Pratsch, *Carpool and Buspool Matching Guide* (U.S. DOT, Federal Highway Administration, 1973).

caused by traffic, this can be partly achieved by the prohibition in urban areas, at least, of vehicles that fail to meet rigorous environmental standards. This should help make urban streets and corridors cleaner, quieter, and safer—characteristics which could make for a more attractive and pleasant environment for the pedestrians, the bus passengers, and the motorists. Undoubtedly, pleasant surroundings can contribute, even if only indirectly, to ease traffic flow, by avoiding potential hostilities, distrust and dislike, especially between the pedestrians and bus riders, and the motorists.

3. Driver Licensing—Again, to the extent that traffic limitation also means making streets safe and allowing a continuous flow of traffic, motorists who are not qualified to drive must be prohibited from driving. Two groups can be identified: 1) those who are too young, too oid, handicapped or otherwise physically unfit to drive; and 2) those who lack sufficient ability to drive, and lack the knowledge of elementary road signs and symbols and road courtesy.

What this simply means is that government agencies involved should strictly enforce regulations regarding the granting of driver's licenses. This may not be a problem in most developed countries where proper licensing is strictly followed, but in the developing countries, where it is customary to "buy" driver's licenses, there are far too many "drivers" on the road who either are not totally proficient in driving or otherwise. are not sufficiently familiar with road signs, symbols and courtesies, and consequently, disregard even the most elementary forms of safe and courteous driving. Such "drivers" do not only add to the frustrations of pedestrians, bus riders and motorists, but also definitely contribute to traffic congestion, delays, and accidents.

These are the various urban transportation strategies that may be implemented in order to improve urban mobility. The innovative strategies have all been studied, most have been experimented or tested, and some have actually been applied. Other strategies are not really new, or innovative—they simply need to be enforced and strengthened.

Some of these strategies are almed at the motorists, others at pedestrians and cyclists, and still others, at transit riders. Other strategies are directed towards traffic engineers and planners, as well as policy-makers. Some techniques are meant to hinder and prohibit, others merely to discourage or dissuade, while others are intended to encourage and persuade.

The common goal of all these strategies is to improve urban mobility, so that more people and more goods (not necessarily more vehicles) can move or travel into, within, and out of the city or metropolis, with relatively faster speed, more convenience, greater safety, and lesser costs.

All the techniques discussed above are action-oriented, many do not require extensive capitalization, and all can be implemented within a short period of time. It should be noted, however, that the crisis in urban transportation is a complex one, and no strategy or technique, when implemented alone, can be expected to solve the problems. A careful combination of strategies is required.

What combinations, and what adaptations are required to make these strategies suitable and practicable in Metro Manila will be discussed in the last section of this paper.

Low-Cost Options to Improve Transport in Metro-Manila

A cursory look at available data on Metro-Manila's traffic and transit conditions will show that almost all of the lów-cost options described above can be applied. While some of these strategies have failed in some cities, they succeeded in others. Given the socioeconomic, physical and political conditions in Metro-Manila, they might work here as well. The reverse could also be true. The point is that they are worth re-considering, testing and applyng. The following could form a program to improve Metro-Manila's urban transportation through low-cost options:

1. Road Closures and Restrictions— This can be applied in any city, especially in areas where the main road pattern is gridiron, as in Metro-Manila's urbanized areas. In the middle and low income residential areas, where car ownership is low, roads may be closed to create a *cul-de-sac* effect, and may be opened only to emergency vehicles such as fire trucks and ambulances. This measure will not only serve to re-channel through traffic, but also discourage through traffic altogether. It also provides much

needed space for the pedestrians to walk, and for the children to play. In these areas, the majority of travelers walk and the majority of residents are children. The closing of such minor roads for their use, seems only appropriate.

In historic and shopping areas, they may be completely cordoned off from motorized traffic, allowing only delivery trucks or they may be partially closed during rush hours and other times of the day.

2. Road Pricing—Though the use of vehicle metering may not be advisable for developing countries at present due to their technical difficulties and cost considerations (they are no longer used anywhere else, except for limited experiments), various road pricing techniques can now be implemented. Differential peak/off-peak pricing, (if the problem of determining how much and where can be hurdled) can easily be implemented in Metro-Manila since most public transit vehicles have conductors or conductresses to collect and inspectors to inspect fares.

Toll booths may not be practical, as most roads are narrow, but the use of daily license, as shown by the experiment in Singapore, is worth considering. Higher parking charges is also worth considering although this might not be as effective as daily licenses, since there are a number of through-trips as well as chauffered trips.

3. Incentives—Staggering of work hours will definitely help in spreading peak hour loads, and since school trips add considerably to peak loads, school hours should also be staggered, in consonance with work hours. All staggering of work hours should be done metropolitan-wide, and government-wide, to be effective. And considering the high levels of congestion, hours might best be staggered at two-hour intervals.

Subsidized and free fares, as experimented elsewhere, might not be advisable for Metro-Manila. Subsidies, if funds are available, might best be used to improve the quality of service, rather than to lower fares. Additionally, "other pressing calls on public finance and the very high cost of even a small subsidy per passenger, most of whom are not from the poorest groups, argue against subsidy"⁶³ in the developing countries.

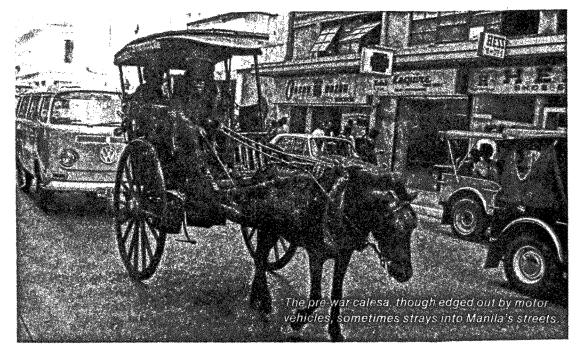
4. Traffic Engineering and Management— Metro-Manila has been seriously considering high-cost options such as subways, elevated highways, monoralls and more recently, a light rail transit system, without seriously improving traffic engineering and management techniques. This may be due to the fact that different agencies, with different funding sources, almost independently of each other, control, and are responsible for different areas of urban transportation. Yet, simple devices such as installing more and better signs and signals, channelization of traffic route, designation of one-way streets, prohibition of parking by vehicle type, area and/or time of day, restriction of urban goods movement during peak hours, and others, have significant potentials which are yet untapped. Most of these traffic engineering techniques are already being used, but they are yet to be fully utilized, and integrated with other strategies.

The high cost of fuel may have checked the use of cars for unnecessary trips while the imposition of vehicle registration fees and high import taxes of vehicles may have served to lower the rate of car ownership. These fees should continue to be enforced, even raised further to control and restrain future car ownership and use. Rationing of fuel, for example, could encourage motorists to plan their trips more wisely.

5. Bus Priority Schemes—As shown by most experiments, this strategy promises the best potential. "Contra-flow" bus lanes could be designated along major arteries; and in areas with narrow streets, the entire street should be reserved for the exclusive use of buses and other mass transit services. In this case, the pavement might be limited to two lanes, for two-way bus traffic; and the sidewalks should be widened, so the entire street could service the greatest number of pedestrians, cyclists, shoppers and other mass transit riders.

The use of high-capacity buses is also appropriate in Metro-Manila's traffic and transit conditions, because headways tend to be short, especially during the rush hours,

⁶³World Bank, Sector Policy Papers, Urban Transport (World Bank 1975), p. 10.



and crowding of people is severe, throughout most of the day.

6. Rider Conveniences and Information Services—These are absolutely necessary, not only to make transit rides more pleasant and comfortable, but also to encourage captive riders and potential motorists to continue taking the transit services, rather than walk, or sacrifice earnings to buy a car. These improvements might even persuade some motorists to shift to mass transit. At the same time, since the improvement of transit services might entail some fare increases (though this must be avoided, if possible), public opposition can be minimized by matching these increases with improvements in services.

7. Cyclists and Pedestrians—In Metro Manila, the majority of the people do not and will continue not to own cars in the future. The only other alternative, therefore, is to walk or use the bicycle. Surprisingly, however, there are no cycle paths anywhere, even in the public parks; and some sidewalks, especially those in major arteries, have been demolished to widen the roads. Undoubtedly, there are plans to rebuild the sidewalks in the future, when the space becomes available, but this clearly shows the wanton disregard of pedestrians, in favor of motorists. Metro-Manila should embark on a program to "pedestrianize" some streets; widen sidewalks, rather than roads; and designate and construct cycle paths. It is time that non-motorized traffic get its share of better urban mobility.

8. Para-transit-Surprisingly, there have been (and still are) some plans to remove the jeepneys of Manila, on grounds that they occupy more space per passenger than buses. Nothing, however, is said about private cars, which obviously occupy more space per passenger than leepneys. Neither is there anything said of the fact that, as the modal split shows (see Table 1), 46.1 percent of person trips in 1974 were made by jeepneys. Clearly, the jeepneys should not be removed. What is needed is the proper assignment of roles for jeepneys and buses. For example, the buses, with bigger capacities, may be used for long-haul trips, with fewer stops; and the jeepneys may be assigned to short-haul trips.

Taxi regulations and operations are carbon-copies of their Western counterparts. There are restrictions as to entry and numbers and to shared rides. However, the potentials of shared-ride taxi in Metro Manila should not be underestimated. In 1970, there were 7,000 taxicabs, or almost one-half the number of jeepneys, which was around 17,000. Considering that jeepneys carry the bulk of person trips, the taxi, if allowed to be shared and to accommodate more passengers, could achieve significant results. If taxi capacity is doubled, through ride-sharing, from 5.4 percent of person trips in 1974 (see Table 1), to 10.8 percent taxis have the potential of carrying almost twothirds of what buses carry, at 16.4 percent of person trips.

Encouraging pre-arranged ride-sharing services, such as company and school buses, will greatly improve urban transportation. At present, some very large firms in the suburbs operate company buses for commuting employees. Given more incentives, this practice should cover all large firms; even the smaller ones can form cooperatives. Traditionally, exclusive schools operate their own school buses. It is only a matter of transfering this practice to the public schools, where it is more needed. With certain adjustments in time schedules, company buses can also serve the schools, and vice-versa. Adjustments in routes may service both employees and students at the same time.

Rental cars, while probably increasing due to a rise in tourist traffic, will not have a very significant impact at present, since they are used primarily as private cars; dial-a-ride services are too expensive to be worth considering at this time.

9. Changes in Government Regulations— As earlier stated, relaxing taxi regulations can only result in expanding taxi services, making the taxi more available, with sharedride option, and fares cheaper for the passengers, while at the same time, earning more revenue for the driver and operator.

Vehicles need to be regulated more closely, with regard to proper maintenance, and pollution emissions. Additionally, drivers' licenses must not be granted indiscriminately, to ensure that only qualified drivers are allowed behind wheels. This may require asking all holders of driver's licenses, who must renew them annually on their birthdates, to take mandatory written exams, and even practical exams, where necessary.

These low-cost options of improving urban mobility seem only appropriate, especially when placed in the economic context of Metro-Manila. Serious consideration and application should therefore become a prerequisite or a pre-condition to any decision to opt for the high-cost options of either subways or light rail transit systems.

Two other recommendations need to be mentioned: 1) coordination and integration of mass transit management; and 2) reorganization of land uses, and integration with transportation plans.

The coordination and integration of the public and private agencies that are currently involved in the planning, funding and implementation of mass transit projects, cannot be overlooked. These strategies, or any strategy for that matter, can only succeed, and be effective, if the entire urban mass transportation system is viewed as an integrated whole, and managed as such. The creation of another ad hoc committee to oversee such an integration is hardly the answer: what is needed is a permanent body, such as a Metro-Manila Transit Authority. Such a body should have the responsibility of formulating policies that will guide and bring into sharper focus, all programs and projects of both private agencies that directly bear on public transportation. At the same time, such an agency must redirect present policies to focus more on the efficient movement of more people and goods, rather than merely on the movement of more vehicles.

While all of the above strategies are shortrange (though they need to be implemented and monitored on a continuous basis), the long-range strategies cannot be overlooked or even postponed. One such strategy is the reorganization of existing and conflicting land uses, and the integration of land use and transportation plans. The transfer of large universities out of the central business district and the core area, is one such move. The encouragement of mixed land uses, and the location of residences closer to places of work or vice-versa, is another. Land uses determine the level of transportation system and transportation determines land uses. Both must be considered and consciously planned together, and simultaneously, through time. In Metro-Manila, this requires greater coordination and integration, or a merger, of certain functions of the Ministry of Public Works, Transportation and Communications, and the Ministry of Human Settlements.

BUS AND JEEPNEY OPERATIONS IN METRO MANILA: PROBLEMS AND SOLUTIONS

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introduction

The bus and jeepney system is the principal mode of transport in Metro Manila. According to MMETROPLAN the system caters to more than one-half of all trips in the area. The bus and the jeepney both operate on a fixed route, usually with designated stops along busy sections. Together, they offer the travelling public a variety of services and a wide range of vehicle sizes, from a seating capacity of 8 up to 75. Statistics compiled by the Committee on Bus Reorgnization (COBRE) indicate that as of March 1979, there were about 2500 buses operating and between 22,000 to 27,000 authorized jeepneys in Metro Manila.

The industry is beset by many problems, perhaps the most serious of which is the financial situation of the bus operators. This paper analyzes some of these problems and presents ways of solving them.

Criteria for the Provision of Public Transport Service

The provision of public transport service in the Philippines comes largely from the private sector. It is therefore not surprising that commercial viability is still the main guiding principle in route applications. One applies to operate a route because he expects profit from it. The fact that the service satisfies a particular demand may be thought of as a secondary objective.

On the surface, the criterion appears to meet the social objective of public transport operation as profitability is clearly an indication of the presence of demand on the route. However, it fails to reflect under provision or indeed lack of service for some members of the community. In fact, it is advantageous for the operators to keep the supply of services low in order to maintain a high load factor even during off-peak periods. Operators tend also to avoid low density areas and areas generating low public transport demand.

It is clear that commercial viability should not be the sole criterion in the provision of public transport service. The demands of passengers for maximum convenience, comfort, reliability, frequency and low fares should also be taken into consideration. It is then the role of the government to strike a balance between the two to ensure that resources are efficiently and effectively managed. The ultimate criterion is to have a service that provides social benefits greater than total costs. Social benefits are usually measured in terms of savings in walking times, waiting times and in-vehicle times while total costs refer to the investment necessary to effect service improvements.

Status of the Bus and Jeepney Operation

The bus and jeepney system had been examined by MMETROPLAN. Their conclu-

¹Metro Manila Transport, Land Use and Development Planning Project (1977), *Final Report*, Vol. 1, 2 and 3.

sion was that the system was orrering a service which was generally good relative to the fares being charged. The route coverage was comprehensive and left few areas with a distance of more than 400 meters from a bus or jeepney route. Waiting times, which are functions of service frequency and reliability and bus loading were not generally long. Although operating speeds were not high. reflecting the traffic conditions in the area, they were not very low either. In fact, there were not many parts of the road network where speeds fell below 15 kph. MMETRO-PLAN found that there was no significant difference between the speeds of buses and those of ieepnevs.

On commercial viability, the findings of the Board of Transportation (BOT) were that the bus industry was in a sorry financial state.² According to the BOT, 70 percent of the present bus fleet were more than five years old and only two percent were new units. Moreover, present operators were reluctant to make new investments, claiming no incentives in an industry where they were losing or getting a low rate of return. The operators claimed losses in 1977 and estimated even more losses for 1978.

While bus operation seems unprofitable (as claimed by the bus companies) this does not appear to be the case with respect to the jeepney operation. A proof of this is the recent action of a group of jeepney drivers (members of the Pasang Masda Nationwide Drivers Organization) seeking from the Supreme Court the suspension of the implementation of higher fares for jeepneys, as contained in the BOT's order of 22 March 1979.

The better financial position of the jeepney compared with the bus has been attributed by MMETROPLAN to, among others, the differences in trip lengths of passengers carried while operating under the same fare structure. The average trip lengths on the jeepneys and on the buses have been estimated at 3.8 km. and 7 km., respectively. This means that, with a fare structure of P0.45 for the first 5 km. and P0.085 per km. thereafter, the average revenue per passengerkm. on the jeepney is 34 per cent higher than that on the bus. Although the operating cost per passenger-km. of the jeepney is also higher than that of the bus, the difference is small as per findings of MMETROPLAN, so on the whole the jeepney does enjoy some financial advantage over the bus within the existing fare structure.

The claims of losses of bus companies have been disputed by the Commission on Audit (COA) which presented their own findings showing that these companies earned an average profit of 29 per cent in 1977. COA's findings, in turn, were questioned on the grounds of being "hypothetical estimates based on questionable methods and hit-and-miss assumptions." The BOT decided the issue by approving new fare rates in March 1979 which represented an increase of approximately 40 per cent for buses and jeepneys.

It is difficult to carry out independent checks on the financial position of operators in the absence of additional statistics such as vehicle-kilometrage operated and number of passengers carried. Some deductions may however, be possible using MMETRO-PLAN's 1976 estimates of bus operating costs and the fare structure prevailing at the time. MMETROPLAN put bus operating cost at P2.12 per km. including depreciation and interest, assuming a bus operating speed of 15 kph. Relating this cost to the fare rate of about P0.065 per km., one obtained an average loading per bus of 33. Considering the widespread claim of a shortage in public transport services, it would be difficult to believe that the average bus loading at the time was only 33 passengers. A higher bus loading would indicate of course, a profitable operation. Though simplified, the procedure provides a quick means of checking the commercial viability of operating a route. Decision-making hinges on the acceptability of the value of operating cost. which could be agreed upon with the operators, and the bus loading which could be periodically measured.

Various ways of improving profitability while maintaining an acceptable level of service are presented below.

Measures to increase Profitability

Fares.—In the face of increasing operating cost, the natural tendency of operators is to increase fares. This certainly has been

 $^{^{2}\}text{Board}$ of Transportation (1979), Order, 22 March.

the case during the past two years when bus and jeepney fares have gone up in 1976 and 1979 by approximately 25 per cent and 80 percent respectively. (These percentages have been calculated based on MMETRO-PLAN's estimates of an average passenger trip length of 7 km. for buses and 3.8 km. for jeepneys).

Obviously, revenue has to rise to meet increased operating costs but this should not be attained, whenever possible, by increasing fares. Adoption of this policy will cause real hardship to the poor. In fact, MMETROPLAN concluded that many poor people in Manila could not afford to ride on public transport and this conclusion was even made prior to the fare increases in April 1977 and March 1979.

Increasing fares should be considered as the last resort in maintaining a profitable public transport operation. Operators should first try other measures such as improved operational efficiency and network improvement. Some of these measures are discussed in the succeeding sections.

Routing and Service Frequency. Many of Metro Manila's routes may be already considered obsolete. New routes had been merely added to the old ones with minimum or no adjustments. Operators should continually examine their networks and make changes in route configuration and/or service frequency in order to adopt them to the changing travel patterns. The objective here is to increase revenue through higher patronage and/or to reduce cost through route rationalization.

Different Service Standards. Operators should look for diversity in services offered. The example set by Metro Manila Transit Corporation (MMTC) may be emulated, where in addition to the ordinary service at least two other types are presently being operated, namely, the "No Standing" bus and the "Love" bus. The "No Standing" bus has the same body design as the ordinary bus but. as the name implies, allows no standing passengers. It is two-man operated and charges a flat fare of ₱1.50. The "love" bus is air-conditioned and also accommodates seating passengers only. It is one-man operated and charges a flat fare of P2.50. The advantage of this scheme is that operators are able to charge higher fares corresponding to higher levels of service, and as per MMTC's experience there is a considerable demand for these types of service. Consequently, revenue is improved without necessarily raising fares on ordinary buses which the majority of the traveling public rely upon.

Introduction of Double-Deck Buses. The double-deck bus is believed to be the most promising of higher capacity vehicles for possible introduction on Metro Manila's roads. Although dismissed by one operator as being "too British," it offers several advantages both to the operators and to the rest of the community.

The major advantage is its higher carry-Ing capacity which gives the operator a lower operating cost per passenger-kilometer than the ordinary bus. It is particularly adapted to varying levels of demand, say between the peak and the off-peak periods. Units need not be kept idle during periods of low demand since its lower operating cost per seat-kilometer allows it to maintain a viable operation with lower load factor.

The double-decker* also provides benefit to non-bus users in the form of less congestion as it is more economical in the use of road space than the ordinary bus.

Role of Government

As previously pointed out, the provision of public transport service cannot be left solely to market forces, for there are also other objectives. The government must ensure that all members of the community have reasonable opportunities for mobility and at the same time prevent the extravagant use of scarce resources, notably energy.

Two areas which the government should be concerned with are presented in this paper. For other aspects of transport regulation, the readers are referred to a study³ made by the Transport Policy Formu-

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^{*}A master's degree student of the Institute of Environmental Planning, University of the Philippines, is presently undertaking a thesis on the feasibility of introducing double-deck buses in Metro Manila. The results of this study should be of interest to the operators and government alike.

³Inter-Agency Technical Committee on Transport Planning (1978), A Study on Transport Regulation.

lation Study Team of the Inter-Agency Technical Committee on Transport Planning and the work of the Committee on Bus Reorganization.

Optimum Network Determination. This is one area in which the government should take an active role. The output should include route configuration, size of vehicle that should be operated per route and service frequency. The Public Transit Improvement Project, which is being carried out at present under the auspices of the COBRE, is concerned mainly with bus network development. It ought to be extended to cover all forms of public transport so that the uncoordinated use of different types of vehicles which characterizes operation in Metro Manila may be minimized.if not eliminated. At present, it is fairly common to observe leepneys, mini buses and buses operating on the same route. On some routes, lower-capacity vehicles predominate although these routes may be better served by higher-capacity vehicles.

The proposed scheme involves the coordinated allocation of various public transport vehicles between different routes. As in the hierarchical classification of roads, public transport routes likewise may be classified into: (1) bus routes; (2) minibus routes; (3) jeepney routes and even (4) tricy-cle routes. Overlaps cannot be avoided but care should be exercised to ensure that they are minimized.

The above principle has in fact been applied by COBRE to the route along Epifanio de los Santos Avenue, whereby minibuses plying the route will be gradually relocated and replaced by standard large buses. As reported by the technical secretariat to the committee, substantial community savings will be obtained from such a scheme.⁴

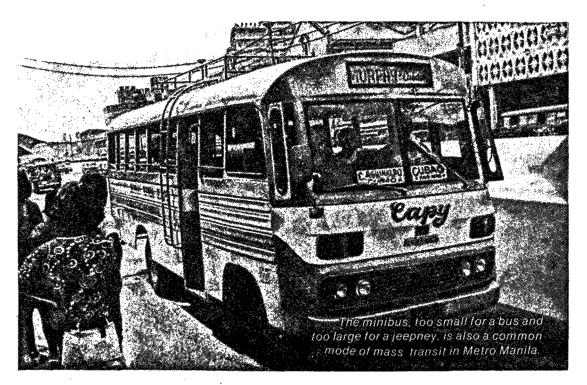
Once routes have been identified they will then be allocated among the operators concerned and franchises issued. The network should be examined regularly to consider new developments such as changes

⁴Committee on Bus Reorganization (1978), OPLAN: EDSA Minibuses, A plan presented to and approved by the Committee on 20 April. in travel patterns and introduction of new modes of transport.

Public Transport Priority. The above proposal may help to improve the financial situation of operators while providing an acceptable level of service. Other schemes are also available besides simply acceding to fare increases or granting of financial assistance. One such measure is public transport priority.

This category includes measures such as "bus and jeepney only" streets, busways, priority for turning movements, priority at traffic signals and exemptions from oneway streets. A scheme first tried along Magsaysay Blvd, involves the reservation of one or more lanes for the exclusive use of buses and leepnevs during the peak periods. This scheme called "Bus and Jeepney Only" lanes is being extended along Taft Ave., España and other major thoroughfares through the Traffic Engineering and Management Project of the Ministry of Public Highways. More ambitious measures are usually made parts of traffic management schemes. One system worth trying (in fact, partly implemented in the last traffic efficiency zone experiment) involves the regulation of the flow of traffic along major routes in such a way that overall, a satisfactory level of service is achieved. Flow regulation may be achieved by metering traffic entering from the side roads thru the use of traffic signals. Signals may be linked to give main road progression. Buses and leepneys will be given priority by providing them with exclusive entry points, thus avoiding delay at the metered side roads.

In 1973, such a scheme was installed on a 51/2 km. stretch of Bitterne Road, a main radial route of Southampton, England. Side road traffic was metered in order to keep traffic demand at the critical intersection 5-7 per cent below maximum practical capacity. Before-and-after studies showed that bus journey times were improved by eight per cent on average while cars experienced little change in overall travel time as the longer entry times were being balanced by smaller delays on the main route. The Southampton scheme was a ploneering one and was extended by Nottingham, England into a zone and collar control system,



Planning Tool

This paper has underlined the importance of determining an optimum public transport network for Metro Manila. Yet, this task is complicated since numerous factors need to be considered including walking times, waiting times, in-vehicle times, bus loading and fares. For an area as big as Metro Manila, it is quite difficult to obtain the best combination of route configuration, service frequencies and fare structure without the aid of a sophisticated tool, such as the one described below.

To help attain the objectives of the Public Transit Improvement Project, the Technical Secretariat of COBRE has acquired a computer package which could be useful also to public transport operators. Code-named "PTAS," the program is designed to assist users in the testing and evaluation of alternative networks. The package may be applied in several ways, depending on the imagination of the user, but one of its main applications is the selection of a most profitable and/or socially beneficial public transport network. The package is composed of several sub-programs designed to perform different functions, as follows:

1) Network building-creates a computer-

ized description of the public transport network. Its inputs are link data which describe the physical network and line data which describe all routes. This subprogram carries out checks for network coding errors and writes data sets describing the network for use by other_ sub-programs.

2) Path finding—this reads the network description output of the previous subprogram and creates a data set of "shortest" paths between all or selected zones in the system. The criterion used in determining the shortest interzonal path is a measure called "generalized cost" which is the weighted sum of the actual money cost (fare) and the component times spent in various phases (walking, waiting, in-vehicle, etc.) of the journey. This sub-program also calculates an interzonal outpefnocket cost matrix which

terzonal out-of-pocket cost matrix which is useful in assessing the financial viability of a network.

3) Assignment—this reads a trip matrix and assigns its elements to the corresponding interzonal shortest paths specified by the sub-programs. Its print-out includes mode to mode transfer summary, non-public transport link volumes, detailed passenger volumes for each line and/or link in the network and number of passengers boarding on and alighting from each mode. The output enables the performance of each route as well as the system as a whole to be evaluated.

The package has a number of important features. The more significant ones are:

- The computer representation of networks is as close to reality as is presently possible. The aspect of transfer and waiting times is properly handled. Express buses or limited stop services can be coded.
- 2) Factors influencing trip-making are considered by the program by assigning weights to components such as walking time, waiting time, in-vehicle time and fares. It is therefore possible to test various policy options so long as one of these factors is involved.
- 3) The program handles up to 8 modes with any mixture of public and nonpublic transit modes. This would be very useful, especially where a hierarchical system of public transport were to be developed. Park and ride systems may also be tested with the program.
- Any form of fare-distance function may be represented unlike in other packages.

Summary

The paper has presented some solutions to problems concerning the provision of public transport in Metro Manila. It is argued that fare increases should be the last resort in trying to maintain a profitable business. Alternative measures have been presented including network improvement, and introduction of multi-level services and doubledeck buses.

The role of government and some of its policy implications have been defined in the paper. It is suggested that the government can help solve the financial plight of the operators through the application of public transport priorities, better coordination between various forms of public transport, and the determination of an optimum network.

Finally, a computer tool has been described. It is claimed to be useful to bus operators and the government alike in testing various strategies involving fares, network details and other factors.

Let us consider the traffic experiment first. I would say that the traffic experiment which lasted up to November, 1978 was a success. It is so in view of the fact that it succeeded in aetting the attention of the government to the worsening traffic situation in Metro Manila. It should be noted that no less than the President himself took cognizance of the problem by taking a direct hand in providing solutions to it. For instance, he issued a decree which bans the entry of cargo trucks in the main streets at certain hours of the day. He conferred at Malacañang with the various government agencies involved in traffic. Furthermore. he appropriated the sum of three million pesos for the repair of traffic lights, and the hiring of additional traffic aides to supplement what then was existing. Likewise, some significant findings came out of the experiment. It was found out, for instance, that 500 traffic aides were insufficient to man the crossings of our streets. Hence, the need for additional policemen and traffic aides.

It was also established that we need more traffic lights and that some of the existing ones already needed repair. The traffic experiment, therefore, was a success because it brought to light the defects, the inadequacies of the present experiment on traffic being undertaken by the Traffic Management Authority.

Yet, I believe that we cannot completely solve our traffic problem simply by adding more policemen and traffic lights. This will have to continue considering the fact that we have very limited infrastructures. I will surely agree with you when you say that the streets of Greater Manila are not wide. I will also agree with you on the need for elevated highways to traverse a particular section and more bridges across the Pasig River. Just as I will agree with you on the need to build overpasses at several intersections.

THE METRO MANILA TRANSPORT PROBLEMS AND THE TRAFFIC EXPERIMENTS*

Atty. Jose Crisanto, Jr. General Manager Metro Manila Transit Corporation

We now proceed to the transportation problem. In 1974, the President came to realize the existence of a transportation crisis. In response to that, he created the Metro Manila Transit Corporation. The original plan was just to acquire 200 buses. With the passing of years, though, it expanded so that at present the corporation has already a fleet of 700 buses and 250 taxicabs. When we started operation in 1975. when curfew hours were still observed, our buses were able to run at least 300 kms, a day. When curfew was lifted and traffic began to be heavier and heavier, our buses could run only for about 230 kms. a day. You will notice, therefore, that transportation goes hand in hand with traffic. One is useless without the other. Hence, it is not enough that we increase the number of public conveyances. What is important is to make these public utilities run and carry passengers. One time, the First Lady expressed to me her desire to secure more buses. I told her in the vernacular. "Ma'am, may I say something before I comment on this additional purchase. And I hope not to be misinterpreted as hardheaded when I question your suggestion. If you would ask me to buy 200 buses, I will buy that number of buses. And if you would ask me to buy 500 or more buses, I will do it, Ma'am. When that time comes, I could guarantee that there will be no more passengers waiting in the bus stops. All of them will be inside our buses waiting in a traffic jam".

Really, the problem cannot be solved simply through the acquisition of more buses or jeepneys. Now, I would like to make it clear. I do not have anything against the jeepneys. Neither do I have anything against the tricycles, the buses, the carabao and other modes of transportation for that matter. I do not tell you that we get rid of any of them. For mountain trails we could use the carabao. For narrow streets or lanes the tricycle. For streets that are wider, the jeepney. And for main thoroughfares, let's use buses and if necessary, the trailer.

I think it's about time that we rationalize the transportation system not only in Metro Manila but also nationwide. People in the transport business like myself have problems: increase in the price of oil, in spare parts, and the consequent hike in transportation fares. The need to rationalize the transportation system becomes more imperative in view of the fact that the agents of the law could not effectively police all the public conveyances in Metro Manila and the rest of the country for that matter. It is my suggestion that if we cannot put them in their places through police action, let us try to control them through economics. The formula runs this way.

If you are going a short distance, do not take the bus. Take a jeepney because it will cost you less. But if you are going quite a distance, take a bus and not a jeepney for the latter is more expensive. And if you are in a coat and tie, by all means, take a taxicab. My idea which I have already voiced out with the National Economic and Development

^{*}Excerpts from the third lecture in the Public Lecture Series sponsored by the U.P. Institute of Environmental Planning, U.P. Planning and Development Research Foundation, Inc., and the Philippine Institute of Environmental Planners, 8th December 1978.

Authority is this: Let us assume that there has been an increase in transportation fare from 61/2 centavos/ 1 km. to 8 centavos/1 km. If you'll take a jeep, for the first 3 kilometers, you should be charged 25 centavos. That makes it cheaper than what you are paying at present which is 45 centavos for 5 kilometers. So, the initial cost will be 25 centavos for the first 3 kilometer ride; another 3 kilometers ride would cost you 25¢ or a total of P.50, another 3, P.75 and another 3 would cost you a peso. In buses, however, make it in such a way that the minimum fare will be P.50, for the first 6 kilometers and cheaper as the distance lengthens. By then, jeepneys will no longer resort to cutting trips because they'll charge by stages of 3 kilometers. They won't race with buses in the main thoroughfares anymore. Drivers, therefore, will be able to classify their passengers and thereby, make travel time faster.

I often say that if we have four riders here who would pay P.45 each for a ride of 2 or 3 blocks, I would suggest that they should not deprive the man in coat and tie of a ride in the taxicab. The latter has an important business and is ready to spend money. But would they prefer to ride in a jeepney in favor of the taxicab when the latter would cost them less? If it would cost them P1.00 going to their destination, it's still cheaper by taxicab because they will pay P.25 each only. On the other hand, it would cost them P.45 each to cover the same distance by jeepney. But if taxis are allowed to charge P1.00 at flagdown, the taxi rider will look for the taxicab, the jeepney rider for the jeepney and the bus rider for the bus. And in the event the lightrail system comes into reality, I do hope you will avail of it. For it will be cheaper since it could carry more passengers which would enable it to generate more income.

We now come to the problem of carrying passengers from one place to another. I also believe that a common terminal for provincial buses should be constructed in Metro Manila, although not within the heart of the City. Once the construction is completed, the entry of provincial buses in the city proper should be prohibited. I'm sure the bus operators and drivers will feel happy about it for they will no longer fight it out with the city traffic. When this is realized, the BOT will have to readjust the certificates of public convenience. So that when you arrive in such a terminal you just decide where to go. If you want to go to Pasay, for instance, you proceed to Lane 1, to Caloocan, Lane 2 and so forth and so on. And if you want to take a taxicab, you just go down to the groundfloor. This idea of building bus terminals could help a lot in the rationalization of transportation in Metro Manila. Likewise, it will help unclog city streets of traffic.

Aside from big terminals, I would also suggest that we build pocket terminals within the city. This way, a jeepney or a bus will not just load and unload passengers in a narrow highway. They need not be multimillion peso edifices. If there will be invitations to owners of private lands to convert their property into public terminals, they will do so. They could then build stalls around the terminals where they could derive income.

Let us now go to the major ideas. The creation of a Ministry of Transportation will not improve the present problems. My feeling is that the creation of such an agency per se will not achieve what we have failed to achieve now. Because, a similar agency will powerless over the Board of be Transportation. If the Ministry lays down a policy and the BOT does not agree to that, the former cannot do anything about it. The BOT people could say that they cannot be dictated upon in solving the traffic problem. So in the event a Ministry of Transportation is created, the accompanying legislations or measures should be enacted to make it solid and viable.

Another thing I'd like to point out is, that insofar as solving transportation problems is concerned, it is the technical people who are in a position to do so. Lawyers cannot solve such problems. Public necessity should not be decided by legal arguments. The transportation problem is a highly technical problem the solutions to which requires the use of sophisticated technology and inputs from technical persons.

Lastly, the government should now realize the need to subsidize the present transportation system. The idea of a subsidized masstransportation will be coming sooner or later, for the simple reason that mass-transit is for the poor, the aged, the students. Hence, the government should be prepared for that eventuality.

TRAFFIC CONTROL DEVICES: THE EFFECT OF THEIR USE AND MISUSE ON ROAD SAFETY

Desmond M. Dent Traffic Consultant, Traffic Engineering and Management Project Ministry of Public Highways

Introduction

Of all the warm blooded species residing on this planet, the human being is the most difficult to convince that he should change his habits. You well know that if children are taught the correct way to behave when they are young, they follow this path in later life. When an adult has been behaving in a particular way for a long period of time, it is difficult to convince him to change this habit. The best method of changing behavior is to convince the person that it is in his best interest to do so, but if this type of approach fails, a more direct approach is necessary: to introduce the concept of a penalty.

Traffic management authorities thus have two methods to use to influence the behavior of drivers: One is *advice* and the other is *enforcement*. Due to the frailty of human nature, it is necessary to resort to the latter at times, unfortunately far too often.

Logical approach to device installation

In designing traffic control systems and in selecting the correct traffic control devices, a wealth of engineering knowledge and experience is now available to assist the designer. However, in all cases, care must be exercised to ensure that each device when viewed by the motorist or pedestrian must be:—

- (1) clearly visible,
- (2) easily read or understood, and
- (3) is correctly chosen for the particular situation.

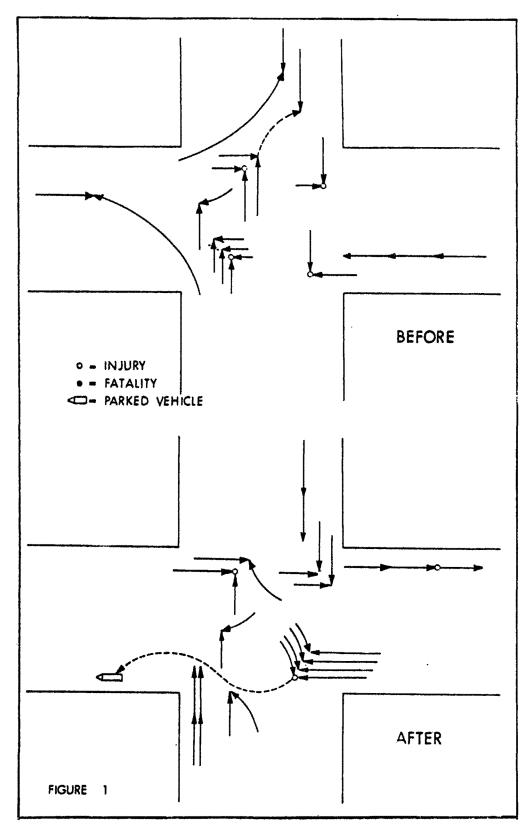
More will be said concerning the first two items later, but it is the third that I would draw your attention to at the moment. How many times have you seen signs indicating "Workmen Ahead"—"Slow"—"Danger," only to find when you reach the danger spot that there is nothing dangerous and there are no persons working. It necessarily follows that drivers will tend to disregard these signs if they are used incorrectly.

Another demonstration of item (3) is the traffic signal that causes unnecessary delays late at night when the traffic demand is very small. Drivers can see that there is no opposing traffic, but are forced to stop for up to 40 seconds at a red light. Usually, unless a policeman is seen nearby, most drivers will move across the intersection on the red light.

The examples illustrate the point that if the behaviour of drivers is to be influenced, the control device must appear to be sensible, and if this cannot be fully achieved the element of fear of being fined must be used. A combination of both factors usually suffices for about 95 percent of the community.

Communication with drivers

The saying that "Caesar's wife means many things to many people" helps to explain the driver communication problem. How many times have you received directions from a friend on how to go to a certain place. After following the instructions



carefully you become lost. Although the instructions were clear, they lacked some essential details that the person giving the instructions felt were too obvious to include. The same problem can be identified in the use of road signs.

Signs such as "DANGER SLOW DOWN" are rather meaningless unless accompanied by a specific speed limit sign (and preferably a policeman hiding around the next corner).

Road designers normally pay considerable attention to using unambiguous signs and these are normally chosen from a special sign manual. Any signs that are non-standard or erected by well meaning people should only be permitted if approved by the appropriate authority and are appropriate for the particular situation.

If we are to influence the behavior of the driver, the message that he receives should be concise, positive, easily recognizable, logical, and familiar to him.

Sign standards and visibility

The Philippine Government, being a signatory to the Vienna Convention in 1968 adopted the international system of road signs, and a manual has been published by the Ministry of Public Highways. All signs erected should be in accordance with this manual. Drivers can thus associate color with the meaning of a sign—for example red for regulatory and mandatory signs and blue for informative signs—such as direction signs.

Signs are normally manufactured from a reflective material so that the signs appear the same by day as they do at night. Letter sizes on signs should also be selected from appropriate manuals which give recommendations concerning the size of the sign related to the speed of vehicles on the adjacent roadway.

Pavement markings

Pavement markings are also important devices that can influence the behaviour of motorists. They are used to direct vehicles to stop at a correct position at an intersection, and where lanes are allocated for specific movements, arrows are used to provide a clear definition of the movements permitted from a particular lane. Reflecting glass beads are normally included with the road paint so that the lines are visible at night and more importantly in rainy weather. Markings must therefore be uniform and in accordance with a standard manual if compliance by drivers and pedestrians is to be expected.

Street lighting

This plays an important role in the recognition of control devices and improving road safety. This particularly applies to Manila where the pedestrian accident rate is very high. The provision of adequate street lighting unfortunately is in conflict with measures to conserve energy and therefore difficult decisions will have to be made. A compromise solution has been recommended by the TEAM Project, which involves the lighting of pedestrian crossings and intersections only, and deletion of plans to illuminate complete lengths of roadway. It is considered that this is the most cost effective solution for the present circumstances.

One important aspect of street lighting is that the addition of extra poles around an intersection should not create an additional daytime hazard. Care must be taken therefore to ensure that the poles are correctly placed and that the number is kept to an absolute minimum.

Intersection improvements

The most common method of improving the safety and efficiency of an intersection is to provide islands to correctly channel the opposing traffic flows: Normally, if the volumes and accidents warrant, traffic signals are installed. Line marking, particularly stop lines and pedestrian crossing lanes are associated with the intersection treatment. Newly installed islands must be correctly delineated with reflectorized paint and hazard markers.

Traffic signals

This is a most complex subject and I will deal briefly with it in this paper. The salient points I wish to make are:—

- (1) The signals must be clearly visible from all approaches.
- (2) The phasing movements and cycle

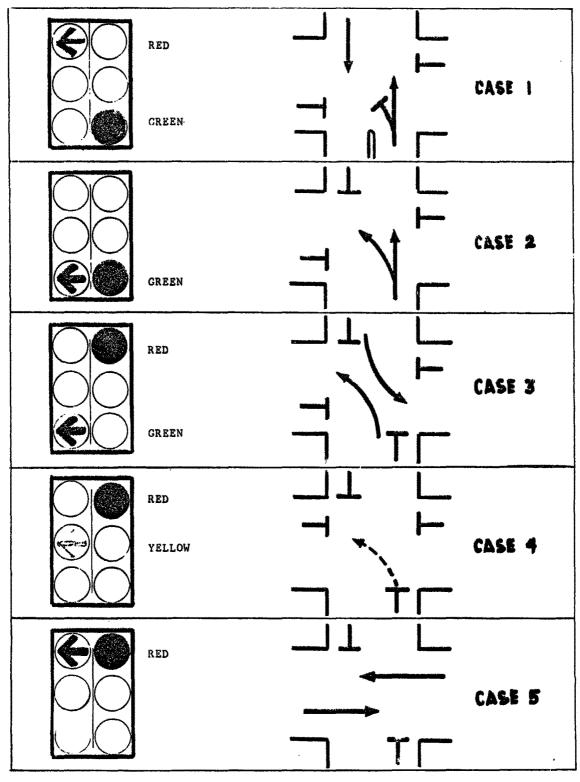


FIGURE 2

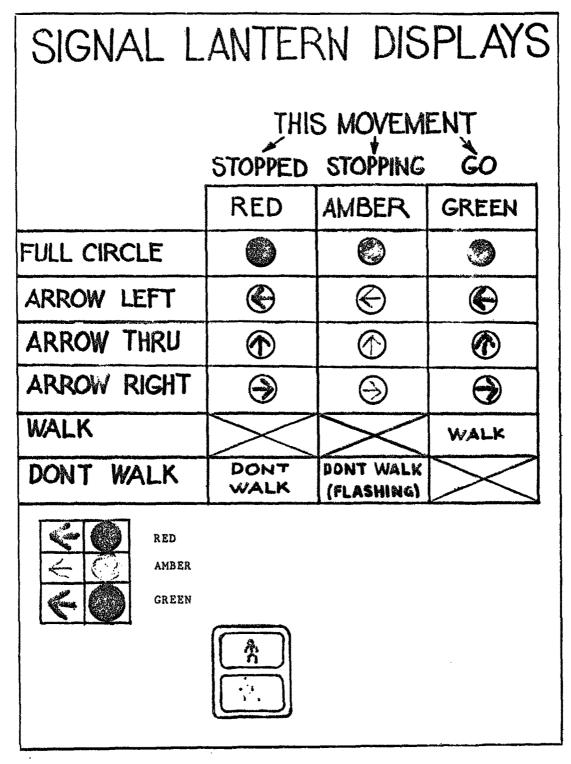


FIGURE 3

times must be appropriate for the traffic volumes.

- (3) The signals must be regularly maintained.
- (4) There must be enforcement of compliance with signal indications.

Signals are usually installed to improve traffic flow and safety. However, contrary to popular belief, the number of accidents usually increases after signals are installed. This applies particularly to high speed wide roads mainly at night.

However, it should be pointed out, that although the total number of accidents increases, the type of accident changes from right angle accidents (severe casualties) to right turning and rear accidents (light casualties). See Fig. 1. Therefore from the point of view of injuries to people, the traffic signals are performing a useful task.

One of the current problems in Manila is lack of compliance with traffic signal indications. The timing plans in most of the signals are inadequate for both peak hour traffic and off peak traffic. Coupled with the burned out bulbs and lack of maintenance, the effectiveness of the traffic signals is not good. These problems are related to the subjects mentioned in the introduction, namely visibility and public acceptance.

The TEAM Project will be providing solutions to the above deficiencies-namely:-

- (1) New signals will be installed with two lanterns per approach, placed on posts and cantilever poles at each intersection.
- (2) Traffic plan controllers will be changed several times each day to ensure that the current timing plan is the most appropriate one for the traffic volumes.
- (3) Arrow-signals will be more extensively used. (Figs. 2 and 3)
- (4) Comprehensive maintenance will be introduced.
- (5) Legislation will be improved to assist the enforcement officers in their task of detecting and apprehending signal violators.
- (6) Public education programs will be undertaken to ensure adequate understanding by the general public of the new systems.

Accidents

A brief mention of accidents at intersections has already been made, but I would like to draw your attention to the TEAM system of accident analysis. Accident spot maps of Metro Manila have been compiled for 1977 and 1978 and a priority order of solutions to problems has been established based on the data gathered from the accident spot maps. Corrective measures relating to specific intersections have been programmed by the TEAM Project and this will be a continuing process of improvement.

Conclusions

It cannot be denied that we are faced with severe road traffic problems in Metro Manila. The solution involves the methodical analysis of all aspects of the problem and finding individual answers to each problem. The TEAM Project is solving the engineering problems but the human problems require urgent attention, as well.

The objectives of influencing the behaviour of drivers and pedestrians to be more safety conscious and law abiding should be high on the priority of all agencies involved with traffic improvement. Some of the methods that may assist this process are expounded in this paper. It is important that the public be educated to accept that higher levels of enforcement and more traffic control devices are for the common good. It is commonplace in other countries for the public to expect very severe penalties and high levels of enforcement for offences that are known to cause severe road accidents resulting in injuries and death-such as dangerous driving and driving under the influence of liquor.

High on the list of priorities should be a comprehensive program of road safety education in schools, preferably operated by an independent authority and assisted by the police.

As we know, the vehicular and pedestrian accident rate in Manila is at least double that for North American and European cities and thus a concentrated and combined effort is necessary to reduce this road trauma.

THE PROPOSED COMPUTERIZED SIGNAL SYSTEM FOR QUEZON AVENUE

Esteban Q. Cases, Jr. Transport Training Center University of the Philippines

The Transport Training Center (TTC), in cooperation with the Ministry of Public Highways (MPH) will establish a new computer controlled signal system along Quezon Avenue. This is part of the Japan International Cooperation Agency (JICA) Assistance Program. The objective of this system is to coordinate the signals in the area and to have the flexibility to accommodate the fluctuation of traffic.

Before we proceed any further, let us first know what coordination means. Two intersections are said to be coordinated if the vehicles which are allowed to pass the first intersection on green are able to clear the downstream intersection without stopping (i.e. the same vehicles will be able to meet green light at the second intersection). With this scheme, the delay (which is simply the difference between the time of departure and time of arrival of vehicles) at the second intersection is reduced enormously. This can happen only when the time interval between the beginning of green indications of both signals is equal to the travel time between the two intersections. This time interval is technically called the "offset". To maintain the time relationship between the two, a common cycle length must be adopted and a single controller must be used for both. If the coordination system is expanded to include other signalized intersections in a road, we have what is called a "coordinated line control system".

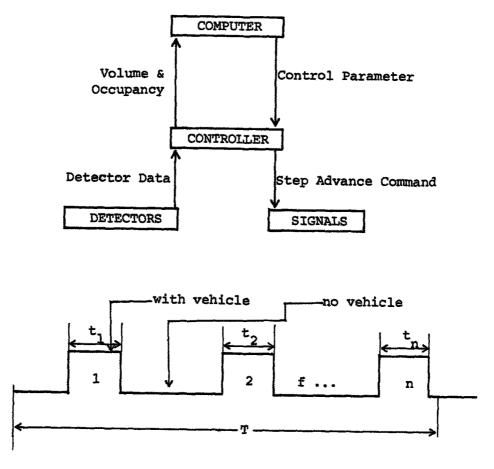
What the TTC and the MPH will introduce in Manila is one of the most sophisticated forms of control system and has been adopted in many major cities of the world. This is called the *Area Traffic Control System.* It is simply described as a series or branches of line controlled signalized intersections. The system has central controllers which regulate the signals in the area. Owing to rapid progress in electronics, electronic computers have been introduced into the central controller and are made to handle complex calculations to give logical judgments in a short time.

IMPULSES IN DETECTOR

The TTC System consists of four major components, namely: a computer, a central controller, detectors and signals.

The detectors send traffic data to the central controller, which the latter uses in computing for volume and (time) occupancy. The controller then sends analyzed data to the computer which decides on the appropriate strategy—whether to lengthen or shorten the cycle length, whether to change the split or offset, whether to change phase, etc. The computer then sends back to the central controller the appropriate control parameters and the latter uses these in regulating the traffic signals step by step.

The data provided by the detectors consist of pulses which show whether vehicles are present under the detectors or not. The central controller measures the number and duration of pulses in certain time intervals. The number of pulses represents the traffic volume during the same interval (En)/T while the ratio of the sum of durations of all pulses





to the interval is called occupancy (Eti%)/T. Occupancy is a measure of congestion; occupancy of about 20 percent means the street is already congested, hence green light must be provided.

The TTC Traffic Control System includes a fail-safe mechanism. When the computer malfunctions, the central controller takes over the operation of the system. It has a logic or program which is relatively simpler compared to that of the computer to select adequate control parameters. When the central controller likewise bogs down, the control is transferred to the local controllers which automatically operate the signals on some predetermined timing plan. The local controllers that will be installed are multidial, meaning they are capable of operating on three programs—for morning peak, afternoon peak and off-peak hour operations.

ized intersections, namely-Banawe, Scout Chuatoco, Roosevelt, Delta Circle, Scout Borromeo and EDSA. Either sonar or underaround magnetic detectors will be installed at the approaches of these intersections to gather the necessary data needed by the computer to decide on the appropriate control parameters to be adopted-cycle length, offset, splits, etc. From these same data, the computer can decide whether to adopt a two directional coordinated control program, or traffic responsive control program, etc. Two-way coordination will be flows used when from both directions-Welcome and UP are heavy. For this program, the traffic signals for different signals will either be simultaneous or alternate. But in cases where flow from only one direction is heavy and critical, the one-way

The Control Area includes seven signal-

coordination will be adopted. The system will be traffic responsive. Control parameters like cycle length, splits, offset, etc. will vary from time to time depending on the needs as reflected by the information gathered by the detectors.

Aside from detectors, traffic conditions at various intersections will be monitored to the TTC Control Center by CCTV cameras. This will give the people at the center the upto date visual information of the flow conditions at intersections and some selected midblock points along Quezon Avenue.

For the point in front of the Sto. Domingo Church, the center will install a pedestrianactuated traffic signal. This is operated with a push of a button. If a pedestrian pushes the button, the central controller sends the indication and timing to the signal controller to turn into pedestrian-green. Otherwise, the traffic signal always displays car-green indications.

Various geometric improvements are being done at Quezon Avenue in preparation for the computerized signalization. The number of lanes in midblocks is increased from three to four. This will improve the capacity of the road. For intersection approaches, more lanes are constructed to increase their saturation flow capability. For the sake of efficiency, the whole project area will be properly marked (painted) with pedestrian lanes, left turn, right turn or through lanes, speed limit, etc.

The most radical geometric improvement that will be done is the removal of the rotondas at Delta and EDSA. These will be converted to ordinary channelized and signalized intersections, to reduce their areas of conflict, making them easier to handle.

Another geometric improvement that is of major importance is the provision of more but shorter left-turn lanes. This is done to allow more left-turning vehicles to pass in a much shorter time. This will, in the process, provide more green time to the more important through stream.

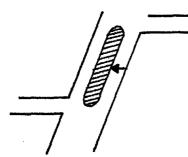
In connection with and to provide the basis for the Quezon Avenue Project, various studies have been done such as surveys on traffic volume, saturation flow, waiting queue, general characteristics and pedestrian crossing.

Traffic Volume Survey I was conducted to determine the volume characteristics for

a day. Surveys were conducted from 6 a.m. to 9 p.m. of Wednesday. The vehicles were classified into passenger cars, jeepney, bus, truck, etc. Turning movements at various intersections were noted—left, right, U and through. This was conducted with the use of manual tally counters.

Traffic Volume Survey II made use of four automatic counters installed at the midblock of *Tuason* and *Banawe*, and between *Roces* and *Delta Circle*. Its purpose is to know the volume variation in a week. It was conducted from 6 a.m. to 9 p.m., continuously for 1 week.

Saturation Flow Study was conducted in all signalized intersections in the control area. This study was extended as per request of MPH to include the intersections of C.M. Recto-J.A. Santos, EDSA-New York, España-Forbes, Taft-Buendia, Taft-Herran, Taft-UN and Magsavsav-Pureza, The aim of this study is to determine the saturation flow rate or the maximum number of vehicles that can flow during a time interval assuming there is a queue and a 100 percent green time. This information is needed because the required green time per stream is proportional to the ratio of flow (volume) to the saturation flow of that stream. The result of this study will help us establish the Philippine standard for saturation flow and passenger car unit (pcu) equivalent. At present, saturation flow for the whole width of the road is already computed, however, in establishing a standard, the saturation flow rate per lane or per unit effective width of the road is more important. It is here where the difficulty lies because even though the approaches are properly marked with lane separators, the vehicles don't stick to their lanes. Some vehicles transfer from lane to lane and some even straddle two lanes. The actual number of columns of cars varies during the surveys: sometimes three lanes, sometimes four and sometimes even five. For intersections without lane markings the problem is bigger. Furthermore, there is no definite column of vehicles. The left-turning traffic sometimes moves in single file and sometimes in double file and sometimes through traffic encroaches into left-turn lanes. Because of these, the effective width (actual width used by vehicles) of the road is hard to establish, making the saturation flow rate harder to standardize.



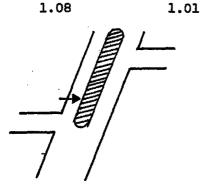
Rate of Walking (m/sec):

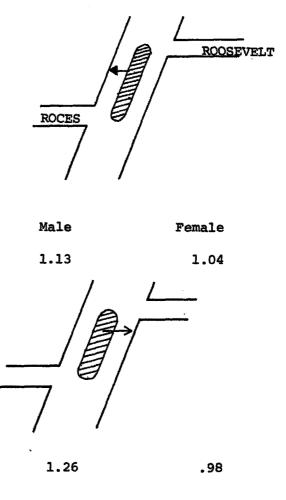
Male

1.19

Female

.87





The waiting queue observation was done with a memo-motion camera at intersections of Banawe, Roosevelt and Roces, the three foremost bottlenecks of Quezon Avenue. This was conducted to know the waiting queue density and to study the change of waiting queue length. This information will help determine the number and length of lanes needed and the required cycle time to ease this queue.

Pedestrian Crossing Survey was conducted at various points namely: a) in front of Sto. Domingo Church b) between Roosevelt and Roces, and c) in Rotonda Circle. For b and c, the surveys were conducted from 7 a.m. to 7 p.m. on a week day; and in a at the same time on a week day and Sunday. This study was conducted to determine pedestrian volume variation. With the use of a memo-motion camera, the normal route of pedestrians across Quezon Avenue at b is traced and the walking speed computed. These are necessary in proper location of pedestrian crosswalk and in computing for the minimum time for the pedestrian green. Shown above is the result of the computation at b.

In the United States, by way of comparison, the minimum green time to allow the pedestrian to clear the intersection is based on a walking speed of 1.5 m/sec.

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PLANNING NEWS

Public Lecture Series Concluded

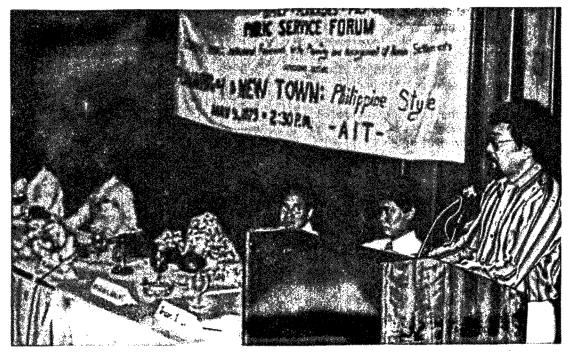
A lecture on "New Towns Planning: Philippine Style" on May 9, 1979 by Nathaniel Von Einsiedel, Deputy General Manager of Human Settlements Development Corporation, concluded the public service forum series jointly sponsored by the Institute of Environmental Planning, the U.P. Planning and Development Research Foundation Inc., and the Philippine Institute of Environmental Planners.

The series of seven public lectures which started with the inaugural lecture on "Human Settlements as a National Policy" on October 14, 1978 by Dr. Onofre D. Corpuz, was designed to create public awareness of the realities, problems, emerging patterns, challenges and opportunities present in environmental planning in the country today.

The other topics and lecturers in the series that developed the general theme "Institutional Framework for the Planning and Management of Human Settlements" include the following:

"Towards a National Urban Land Policy"— Atty. Asteya M. Santiago; "Metro-Manila Transportation Problem and the Traffic Experiment"—General Manager Jose Crisanto, Jr. of Metro Manila Transit Corporation; "Approaches to Rural Resettlement Planning"—Deputy Minister Benjamin Labayen of the Ministry of Agrarian Reform; "Meeting the Needs for Housing"—General Manager Florencio Orendain of the National Home Mortgage Finance Corporation; and "Meeting the Needs for Water"—National Resource Expert Carlos Borromeo. of the Ministry of Human Settlements.

Each lecture was followed by reactions from invited discussants who were acknowledged experts in their respective fields and a general open forum. All lectures were held at the Institute of Environmental Planning except for the concluding part which was held at the U.P. Asian Institute of Tourism.



Arch. Nathaniel von Einsiedel of the Human Settlements Development Corporation delivers the concluding lecture at AIT.

PLANNING NEWS

Revised MURP Curriculum Takes Effect

The revised curriculum under the Master in Urban and Regional Planning takes effect in June of schoolyear 1979-1980.

The rationale behind the latest revision of the MURP Program, according to UPIEP Dean Leandro A. Viloria, stems from the need to strengthen the preparation of planners in the light of two major developments. One is the institution of human settlements planning and management as a new and emerging discipline following the creation of the Ministry of Human Settlements. The other is the recognition and regulation of environmental planning as a distinct profession with the enactment of P.D. 1308.

As approved by the Curriculum Committee of the University, the revised curriculum will institute four areas of specialization: urban planning, regional planning, estate planning and management, and public works planning and development.

The other features of the new curriculum, as explained by Dr. Benjamin V. Cariño, Director of Graduate Studies include the following:

- 1. It increases the number of unit requirements as follows: Plan A—from 36 to 39;Plan B—from 42 to 45.
- 2. It expands the core courses with the elevation of Planning Law to the status of a core course, thereby increasing the core courses from 18 to 21 units.
- 3. It replaces or subsumes the old areas of concentration under the new ones, e.g., transportation under urban planning, regional location theory under regional planning, housing under estate planning and management, and infrastructure support under public works planning and development.
- 4. It sets up a comprehensive workshop as an integrating course for the various areas of specialization. This replaces the old internship program.

All other aspects of the present curriculum remain unchanged including the degree title and the duration of the program. Students enrolled in the old curriculum are enjoined to shift to the new one. Dr. Cariño assures that all subjects taken under the old curriculum can be credited towards the new.

This latest curricular revision is the second major change in the graduate program of the IEP. When the institute was established in 1965, it offered the Master in Environmental Planning degree under a trimestral calendar. The MEP was aspectual in its approach and offered no areas of specialization.

In 1975, the MEP was changed into the current Master in Urban and Regional Planning. The MURP was a major departure in that it offered common core courses and four different areas of specialization. It also split options by allowing students to pursue a thesis or a non-thesis program, which could be completed in two years following the regular semestral calendar, thereby abolishing the trimestral calendar.

IEP Faculty Hold Confab

Following the approval recently by the Curriculum Committee of the proposed revision of the MURP Program, a two-day conference of the IEF faculty was held on 30-31 March 1979 to map out strategies for its full implementation beginning next school year. The venue of the conference was Covelandia in Kawit, Cavite.

The main purpose of the conference was to discuss possible changes in the core courses as well as the contents of new courses under the revised curriculum. Other matters were also taken up such as the admission requirements and the administration of the comprehensive examinations.

Earlier, the faculty had been divided into work teams. Each team was to prepare the course outlines for each of the courses under one area of specialization. The outlines were expected to include course description, course objectives, list of topics and proposed references. Accordingly, five such teams were created as follows: Core Course—Dean L.A. Viloria, Prof. D.A. Endriga, Prof. M. Tekie; Urban Planning—Prof. T.C. Firmalino, Prof. J.U. Nierras, Prof. L.S. Velmonte; Regional Planning—Prof. G.S. Calabia, Prof. C.D. Turiñgan, Ms. L.P. Buenvenida; Estate Planning—Prof. B.V. Cariño, Prof. Y.M. Exconde, Prof. Z.A. Manalo;

MURP 27 Receive Master's Degree in Planning

The U.P. Institute of Environmental Planning graduated 27 students under the Master in Urban and Regional Planning Program on April 22, 1979.

Senen R. Ricasio is the lone graduate under the thesis program (Plan A). With area of concentration in regional location theory, Ricasio successfully defended his thesis entitled "The Changing Pattern of Distribution of Manufacturing Industries in the Philippines: 1967-1975."

The other new planners are: Rodolfo G. Adato, Remedios C. Alebin, Suzzette B. Badon, Tomas L. Buen, Reynaldo A. Cacatian, Luis Ma. R. Calingo, Serafin B. Cruz, Minda M. Desamito, Jose R. Enverga, Joseph Michael P. Espina, Leida N. Fernandez, Leslie B. Gatan, Zante L. Garcia, Jean M. Gonzales.

Narecita T. Ibañez, Evangeline T. Lopez, Ma. Lourdes T. Munarriz, Fernando S. Nabong, Myrna O. Nieva, Elizabeth D. Papa, Benilda A. Planas, Jane Estela Q. Quimpo, Joselina R. Santiago, Ernesto M. Serote, Orlino P. Tuzon, and Julie Viloria. Public Works Planning and Development— Prof. F.B. Silao, Prof. P.C. Cal, and Mr. E.M. Serote.

The two-day conference was, for the most part, devoted to the discussion of the outputs of the work teams. Five sessions were actually spent on this. Another session was devoted to the consideration of the requirements of the graduate programs.

Faculty members present in the conference include: G.S. Calabia, B.V. Cariño, T.C. Firmalino, C.O. Marquez, J.U. Nierras, E.M. Serote, F.B. Silao, M. Tekie, J.R. Valdecañas, L.A. Viloria, L.P. Buenvenida, D.A. Endriga, Y.M. Exconde, Z. Manalo, and L. S. Velmonte.

Secaretarial support was provided by Ms. Norma B. Alcantara, Minerva B. Vergel de Dios, Edith P. dela Rosa and Lina B. Dayao.

Of the 27 graduates, nine chose to specialize in transport planning, nine in infrastructure support, six in regional location theory, and three in housing.

SCURP 28 Complete Special Course in Planning

Twenty-eight participants in the Six-Month Special Course in Urban and Regional Planning (SCURP) received their certificates of training during the closing ceremonies at the Aberdeen Court, Quezon City, on April 19, 1979. Executive Director Ernesto C. Mendiola of the Human Settlements Regulatory Commission was the guest speaker.

The SCURP is a joint project of the institute of Environmental Planning and the U.P. Planning and Development Research Foundation, Inc. (PLANADES). It's main objective is to enable participants to "acquire a broader understanding of the growth and change in urban and regional systems and upgrade their skills and competencies in formulating human settlement development plans and programs."

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One of the 3rd SCURPians receives his certificate of training from Dean L.A. Viloria, PLANADES President Antonio Varias and Training Director Jimmy Nierras.

Now on its third year, the SCURP adopts a different focus every year. This year's course had for its theme the "planning for the basic needs of human settlements." The special course is under the supervision of Prof. Jaime U. Nierras, Director of Training of the Institute.

The successful participants represented some ten government agencies and two private firms. The Bureau of Lands accounted for more than half of the participants.

The following is a list of the successful trainees: Alcide B. Amador, Amado T. Atienza, Vicente P. Aviles, Romeo S. Bacos, Ma. Erlinda L. Bajenting, Timoteo M. Bandong, Francisco A. Bayas, Lucila M. Cagulada, Octavio G. Canta, Victor T. Cendaña. Tomasito C. Cruz, Ramon R. Dalena,

Florante M. Ilarde, Rodney C. Lopez, Corazon R. Macavinta, Antonio M. Magdamit, Luis A. Mamitag, Jr., Eleno R. Marbil, Marie Josephine P. Pansacola, Eugenio A. Parel, Danilo S. Rangel, Jeremias O. Resus, Benigno V. Sanico, Jr., Aproniano V. Singson, Manuel P. Troncales III, Antonio B. Tudanca, Erasmo D. Valdecañas and Concordio D. Zuñiga.

4th SCURP

Meanwhile, the Training Division has also announced the opening of the 4th SCURP on September 3, 1979. The six-month nondegree course will focus on planning for integrated rural development.

The new focus is in line with the current policy of "countryside development" enunciated by President Marcos in his budget message of 1978. It is also in response to the expressed desire of government agencies determined in a nationwide survey conducted earlier this year by the training staff.

Although majority of the participants come from government agencies, applicants from private entities are also welcome.

For more details, interested parties are requested to communicate with the Training Director, U.P. Institute of Environmental Planning, Diliman, Quezon City.

About the Contributors

- PRIMITIVO C. CAL-is one of the few Filipino experts in a field that is almost the exclusive preserve of foreign consultants-transport and traffic planning, engineering and management. He is at present Assistant Professor at the UP Institute of Environmental Planning and concurrently project director of the Metro Cebu Land Use and Transportation Study jointly sponsored by the MPWTC, NEDA and the Ministry of Human Settlements. He is also project adviser at MHS, consultant at PPDO/MPWTC and the Metro Manila Traffic Management Authority and Technical Director of Asia Consultants, Inc. These professional involvements of his are backed up by a solid educational preparation which includes a Ph.D. in transportation planning (University of Dundee, U.K., 1976), a master's degree in transportation engineering (Asian Institute of Technology, Bangkok, 1970), and a bachelor's degree in civil engineering (Cebu Institute of Technology, 1965).
- ESTEBAN Q. CASES, JR.—teaches traffic engineering at the newly set-up Transport Training Center, University of the Philippines, a position he assumed after a two-month training in traffic management, engineering and planning in Tokyo, Japan. He holds a B.S. in civil engineering (cum laude), University of the Philippines, 1977. As head of the TTC Traffic Survey Team he has been involved in a number of traffic studies in Metro Manila and Metro Cebu.
- JOSE CRISANTO, JR.—is President and General Manager of Metro Manila Transit Corporation, a state-owned bus firm. At the same time he serves as Antion Officer for Transportation in the Office of the Governor, Metropolitan Manila Commission. His involvement in the transportation business spans almost 30 years now. Upon obtaining his degree in Law (MLQU, 1951) he became legal officer of ALATCO Transportation, Inc. and Eastern Tayabas Bus Co. In 20 years he rose to become General Manager of both bus firms. From 1971 to 1972 he was President of Pantranco North and South Express, Inc., the country's largest bus company. Then in 1972 he became President and General Manager of the Manila-based JD.Transit, Inc., a position he held until the MMTC was organized in 1974.
- DESMOND MURRAY DENT—Is Consultant Project Manager of the Traffic Engineering and Management (TEAM) Project which is upgrading the traffic facilities in Metro Manila. A holder of degrees in Engineering and Economics, both obtained from

Queensland, Australia, Mr. Dent is associate member of the Australian Institution of Engineers. He also spent several years studying rail and road transportation engineering in the United Kingdom. Mr. Dent was responsible for installing the first computer controlled traffic system in Australia and for the design and construction of area traffic control systems in the City of Brisbane in his capacity as traffic control manager engineer for the Main Road Department of Queensland, Australia, prior to his coming to Manila.

JAIME U. NIERRAS-is Assistant Professor at the UP Institute of Environmental Planning and Consultant to the Ministry of Human Settlements. He obtained two master's degrees in planning: Master in Urban Planning (Michigan State University, 1971) under a Fulbright-Hays grant and Master in Urban Transportation Planning (University of British Columbia, 1977) under a United Nations Fellowship and a degree in Architecture (University of the Philippines). Mr. Nierras has had a very extensive experience in physical planning, comprehensive town planning urban renewal and the like having been connected with various government and private planning agencies. Part of his fellowship grants was the opportunity to observe city planning and transport planning and management in major cities of North America, Western Europe, the Middle East and Asia. He has also lectured extensively on various topics related to planning as well as attended several international conferences on different aspects of planning.

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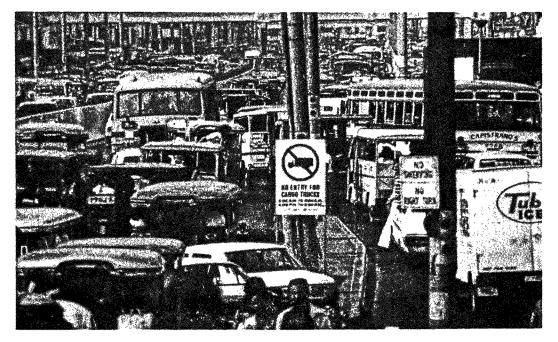
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