TRAFFIC SYSTEM MANAGEMENT PRACTICE IN THAILAND : A TALE OF HAT YAI CITY

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abstract : This paper describes the result of a planning study on traffic management practice in Hat Yai, a regional city in the South of Thailand with a city and peri-urban population of 260,000. Concerns over the problems created by chronic and severe traffic congestion in Bangkok has prompted the Office of the Commission for Management of Road Traffic to carry out a planning study on traffic and transport management in four regional cities in Thailand. Prior to the study, traffic management in Hat Yai has concentrated primarily on traffic regulation and enforcement.; little use has been made of traffic engineering. The study showed that application of traffic system management principles in provincial urban centres is still in its infancy. Thus, the benefits to be gained appear to be substantial.

1. INTRODUCTION

The traffic situations in the city of Hat Yai in terms of congestion and safety are deteriorating. This is due to two important factors. First the rapid increase in the demand for travel brought about by the boom in the Thai economy over the last few years and clearly demonstrated in the large growth in number of vehicle registrations. Second the inadequacy of the present traffic system to cope with the situation. This paper describes the results of a planning study on traffic and transportation management in Hat Yai, a regional city in the South of Thailand (OCMRT 1995). Concerns over the problems created by traffic congestion in Bangkok which has been at critical level for a number years has prompted the Office of Commission for Management of Road Traffic (OCMRT) to carry out a planning study on traffic and transport management in four regional cities in Thailand. The forward planning study has the clear objectives of improving the movement of vehicles and pedestrians in terms of speed, convenience and safety. General as well as specific problem situations and examples of proposed traffic management measures are described.

2. HAT YAI TRAFFIC SYSTEM

Hat Yai city is the most developed and urbanised centre in the South of Thailand. It is the second largest regional city outside Bangkok, with Chiang Mai in the North being the largest. Officially, it covers an area of 22 sq.km however, its *de facto* boundary has been extended by substantial peri - urban development. The population of the city is about 160,000 and is growing at an annual rate of 3.1% The total population of the city and peri-urban development is some 260,000.

2.1 The Road Network

The city traffic system comprises some 630 roads with a total length of approximately 190 kilometres, which is low compared with western cities of similar size. This is due almost entirely to the absence of a secondary road system. The network has 761 junctions 45 of which are signalised and 102 are controlled with stop signs with the remaining junctions uncontrolled. Figure 1 shows the city boundary, road network and its hierarchy.

2.2 Number of Registered Vehicles

At the end of 1994 the number of registered vehicles in Hat Yai under the Motor vehicle Act stands at 305,936 units, an increase of 28% over the previous year. The main types of vehicles are :

motor cycles	242,677	units	(79.3%)
Passenger Cars	17,489	units	(5.7%)
Pick-up trucks	40,673	units	(13.3%)

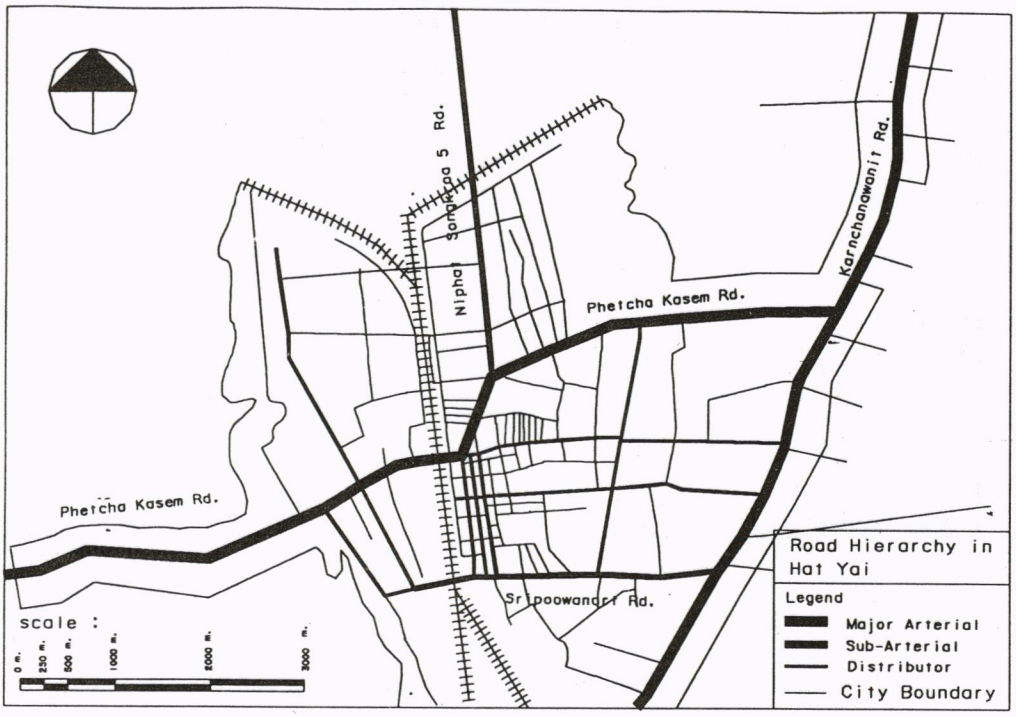

Figure 1 : Hat Yai Road Network and Hierarchy

3. EXISTING TRAFFIC SITUATION

3.1 Link Capacity

At present, traffic volumes on most links in the road network are still below capacity, except for Phetcha Kasem Road which is the main arterial in the network. On Phetcha Kasem Road, a divided 6 - lane arterial road, with 4 lanes being effectively used by traffic in the morning peak hour (0700 - 0800 hr) the flow out of the city is 1604 veh/hr and into the city is 1789 veh/hr, taking a typical mid - block capacity for urban roads with interrupted flow at 900 veh/hr/lane (Austroads 1988) the volume/capacity ratios of 0.89 and 0.99 for outgoing and incoming traffic respectively are closer capacity in this period. For other periods, traffic flows are quite stable. Table 1 gives details of traffic volumes.

Table 1 : Traffic volumes on Phetcha Kasem Road

Time	Flow (pcu/hr)	
	out	in
7.00 - 8.00	1604	1789
8.00 - 9.00	1481	1548
9.00 - 10.00	1259	1268
10.00 - 11.00	1296	1158
11.00 - 12.00	1166	1104
12.00 - 13.00	1213	1060
13.00 - 14.00	1252	1132
14.00 - 15.00	1205	1196
15.00 - 16.00	1302	1557
16.00 - 17.00	1563	1528
17.00 - 18.00	1759	1664
18.00 - 19.00	1283	1229

3.2 Intersection Capacity

The use of pre-timed single plan traffic signal controllers at all the 45 intersections has resulted in many major junctions operating near or above their practical capacity during the morning peak hour. Typical total volumes of flow into a junction varies between 3000 - 4000 pcu/hr. These junctions are located on the arterial and major distributor roads. SIDRA (Signalised Intersection Designed and Research Aid) a program for computing capacities and performance of signalised and unsignalised as well as roundabout intersections by using analytical models and the lane-by-lane method of calculations (Australian Road Research Board 1993) was used to analyse the performance of these junctions. The results indicate that of the 7 junctions six are operating above the practical degree of saturation of 0.90. Details are shown in Table 2.

Table 2 : Performance of Major Signalised Intersections

No.	Intersection	Degree of Saturation	Practical Spare Capacity (%)	Averag Delay (sec)	Longest Queue (m)
1	Niphat Utit 3 - Thammanoonvithee	0.756	19	19.8	56
2	Sripoowanart - Niphat Utit 1	1.028	-12	50.9	142
3	Supasan Rangsan - Ratyindee	0.921	-2	17.2	49
4	Phetcha Kasem - Karnchanawanit	1.000	-10%	17.3	70
5	Phetcha Kasem - Ratyindee	0.953	-6%	28.3	132
6	Phetcha Kasem - Rat Utit	1.056	-15%	89.1	358
7	Phetcha Kasem - Niphat Songkroa 5	1.233	-27%	21.1	131

Besides the use of primitive form of signal control the inappropriate junction geometry e.g. no provision for right - turn storage lane or lack of clear pavement marking has combined to further reduce the junction performance.

3.3 Traffic Accident

Traffic accidents are problems of major concern to the community. The number of accidents is increasing as are number of injuries and fatalities. In 1994, 2018 cases were reported resulting in 60 fatalities and 332 serious injuries. Table 3 shows summary of accident characteristics for the past two years.

Table 3 : Urban Traffic Accident Characteristics in Hat Yai

Number of	Year		change
	1993	1994	(%)
1. Accidents	1815	2018	11.18
2. Fatalities	43	60	39.60
3. Serious Injuries	295	332	12.60
4. Slight Injuries	721	874	21.22
5. Pedestrian Accidents	9	44	388.90
6. Motorcycles	1500 (41.30%)	1644 (42.24%)	9.6
7. Four-wheel Vehicles	1998 (55.01%)	2208 (56.80%)	10.51
8. Other Vehicles	134 (3.70%)	40 (1.02%)	-70.14
9. Total Vehicles	3632 (100%)	3892 (100%)	7.16

While it is generally accepted that human errors are the main contributing factor to the cause of accidents, the deficiencies in road and environment can and have been a significant factor in the cause of accidents in Hat Yai. The limited sight distance, use of inappropriate traffic control devices at junctions and inappropriate signal timings, caused to a large extent by the lack of traffic engineering know - how and the limited capability of the controllers are a few of the shortfalls that can be improved by traffic management.

3.4 Parking

The ever increasing demand for parking and the lack of off - street parking space has led the city administration to make maximum use of road space and often at the expense of road capacity. Use of road space close to junctions for parking has aggravated delays at some of these junctions which are already operating at sub - optimal level. However, as capacity is becoming a problem in certain areas a change in thinking is emerging as will be described later.

The practice of angle parking is sanctioned at some locations as it increases the available parking supply. This has led road users into the habit of angle parking where it is not provided for, e.g. on major roads. The practice is dangerous and can cause delay to traffic.

4. TRAFFIC MANAGEMENT PRACTICE

The objectives of traffic management have been stated as (Institution of Highways and Transportation and Department of Transport 1987) :

- to reduce road accidents
- to improve access for people and goods
- to improve traffic flows on primary and distributor roads
- to improve the environment

For the city of Hay Yai the first three are prime objectives while the fourth is at present not considered a problem.

4.1 Traffic Management in Hat Yai

Until recently, traffic management in the city has concentrated on the use of traffic regulation and enforcement. The city police who are solely responsible for the management of traffic decide what should be done to facilitate the flow of traffic and make recommendations to the city administrators who then provide necessary hardware supports to implement the recommendations. For example, if the police want to place limits on parking at certain times or places, red and white marking would then be painted on kerbs and signs installed by the city.

Recently, however, more parties have been invited to be involved in deciding what appropriate actions should be taken. these parties have included engineers from the city administration, the local office of highway department, the mayor, official from provincial land transport office and academic. A recent decision was to ban trucks from the inner city for certain time periods and the introduction of odd and even day parking on inner city roads. However, little use has been made of traffic engineering. The closure of 9 median openings from a total of 18 on a 3.0 km section of Phetcha Kasem Road has had some positive effects on traffic flow and accidents. However, inadequate provision for U - turn or right - turn vehicles has created new accidents. In addition the existing signal timings have been in place for a number of years without being upgraded. This is due in part to the lack of personnel in traffic engineering in the responsible agencies and the relatively low level of congestion that prevails.

However, under the present OCMRT study, recommendations put forward for implementation, will also involve traffic engineering principles.

5. RECOMMENDATIONS

A number of options are available for dealing with congestion in urban area. These include increasing road space, shifting demand to other modes, restraining and managing demand and using existing road space more effectively (IHT 1992). Traffic management is part of the last option and would be the most effective measure for Hat Yai, given the low level of congestion and sub - optimal operation

of various elements in the traffic system as previously described. Some of the recommendations addressing the problem of congestion would also have positive effect on safety e.g. installation of traffic signals at junctions previously controlled by stop signs.

5.1 Improving Existing Signalised Intersections

Many of the 45 signalised intersections can be improved despite the limitation of the traffic controllers. For instance, provision of right - turn storage lanes at major junctions can significantly improve a junction performance. Figure 2 shows existing layout of a main junction where right turners have delayed through traffic. Figure 3 shows suggested improvement. The study also recommends restriction of parking to within 100 m on arterial or sub - arterial roads and 50 m on other roads at signalised junctions. This together with a redesign of signal timings has resulted in significant improvement to various junctions as shown in Table 4. For example, for junction number 2 the existing cycle time was 130 seconds and existing parking restrictions on the major road ranges between 24 - 100 metres and the minor road 8 - 22 metres, the improvement in performance was achieved using the suggested parking restriction and a shorter cycle time of 70 seconds as calculated by SIDRA. However, in the medium to long term most of the controllers will need to be replaced by modern units with a plan for linking them together.

Table 4 : Improvement in Performance of Major Signalised Intersections

No.	Intersection	Degree of Saturation	Practical Spare Capacity (%)	Averag Delay (sec)	Longest Queue (m)
1	Supasan Rangsan - Ratyindee	0.751 (0.921)	20%(-2)	10.3 (17.2)	27(49)
2	Phetcha Kasem - Ratyindee	0.751 (0.953)	20%(-6%)	8.3 (28.3)	48(132)
3	Phetcha Kasem - Rat Utit	0.940 (1.056)	-4%(-15%)	37.1 (89.1)	86(358)
4	Phetcha Kasem - Niphat Songkroa 5	0.856 (1.233)	5%(-27%)	26.5 (21.1)	83(131)

Note : Values in parentheses denote existing conditions

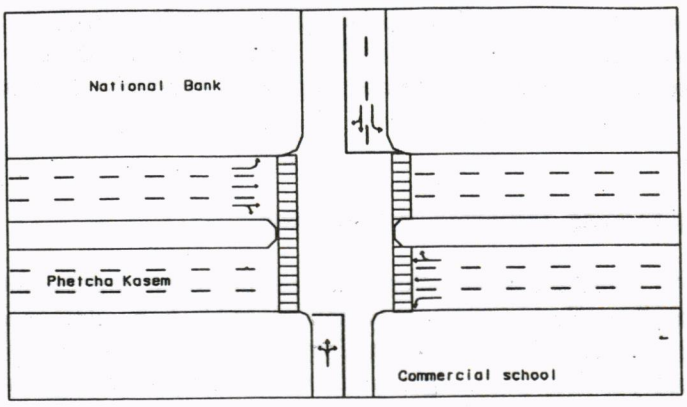

Figure 2 : Existing Intersection Layout

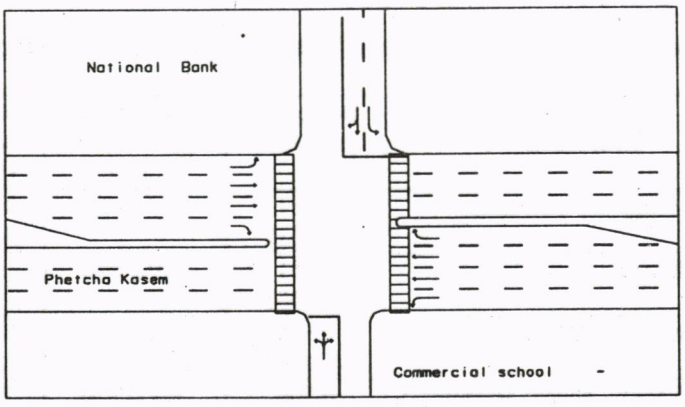

Figure 3 : Suggested Improvement

5.2 Provision of New Traffic Signals

A number of intersections are in need of traffic signals. Long delays to minor stream of traffic and/or large number of past accidents justify their installation Figure 4 shows the existing signalled junctions and the proposed new installations.

5.3 Parking Control

Suggestion on making more road space available for traffic by limiting on street parking made by the study has already been implemented. Odd and even day parking are now in place on three roads. In many countries, angle parking has been viewed by road authorities as dangerous and an impediment to smooth traffic flow (O' Brien 1994). In Hat Yai the places where space is provided for angle parking should be removed, particularly on main roads. Illegal angle parking on kerb lanes should thus be strictly controlled.

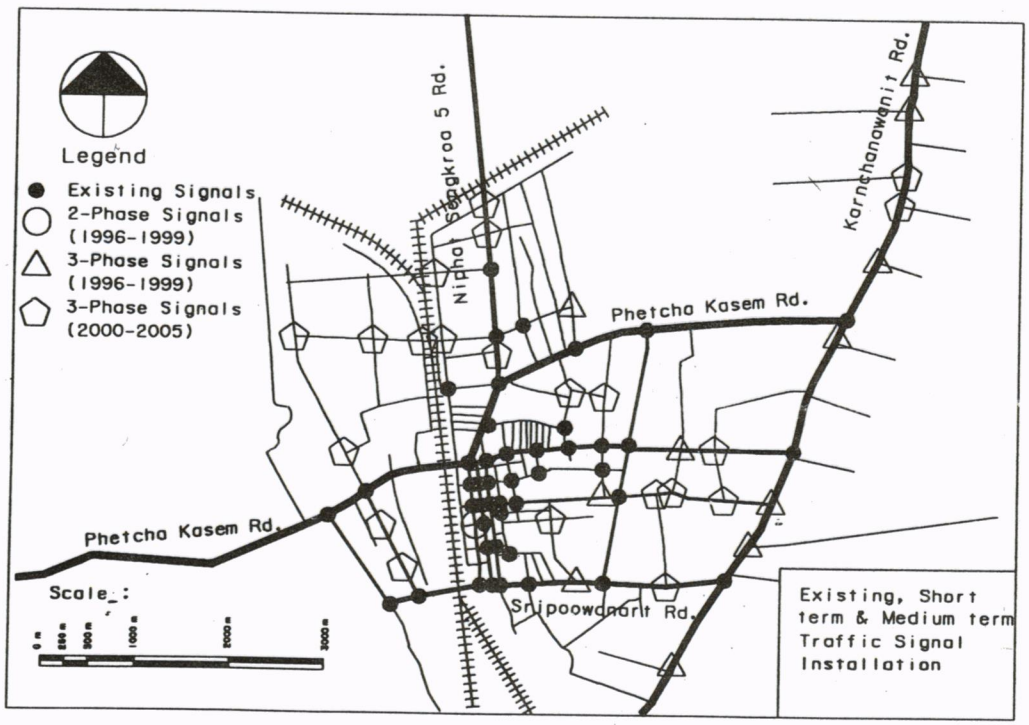

Figure 4 : Existing and proposed traffic signal Installation

6. CONCLUSIONS

Existing traffic congestion and traffic accidents in Hat Yai have been described. Traffic management practice has traditionally centred on the use of regulation and enforcement. The planning study presented in this paper recommends the use of traffic engineering principles to improve traffic management practice in Hat Yai.

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