

# STUDY ON TRANSPORT INVESTMENT IN BANGKOK METROPOLITAN REGION DURING THE 8<sup>th</sup> NATIONAL ECONOMIC AND SOCIAL DEVELOPMENT PLAN (1997-2001)

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**Abstract:** This research primarily aims to investigate the effects of the proposed 8<sup>th</sup> National Transport Plan (1997-2001) on traffic conditions in Bangkok Metropolitan Region (BMR). The study starts with a review of previous national plans, followed by an analysis of the government's financial capacity available for transport investment during the 8<sup>th</sup> Plan. The study has applied a strategic transport planning model to demonstrate the usefulness and capability of the plan. It also assigns priorities to the proposed projects for the preparation of the revised investment plans in accordance with a reduced financial capacity.

## 1. INTRODUCTION

### 1.1 Background

Severe traffic problems that cause loss of amenity to the Bangkok Metropolitan Region (BMR) have long been noted by every government agency responsible for alleviating the congestion. Although the government appreciates the magnitude of the problem and has gradually increased the annual transport budget, the problem is becoming ever more complex. Failure to solve traffic congestion is undoubtedly due partly to the lack of coordination amongst over ten traffic agencies. There exist duplications of authority and proposals for transport projects that are incompatible with travel demand. Although the government examined and monitored the implementation programs in its areawide transport policy as stated in the NESDB (1985) for the 5<sup>th</sup> (1982-1986) through the 6<sup>th</sup> (1987-1991) Plan or JICA (1990), NESDB (1991), Rujopakarn *et al.* (1994) and Rujopakarn (1995) for the period of the 7<sup>th</sup> Plan (1992-1996), same ineffective procedures have been followed to tackle the problem, and there is still a lack of coordination.

During the 8<sup>th</sup> Plan (1997-2001), all the state agencies proposed to carry out more than 150 transport projects. These, however, raise problems of compatibility with the country's financial capacity and public travel demand.

### 1.2 Objective

This research aims to:

- investigate previous transport investment plans;
- determine the country's transport financial capacity;
- analyse the effect of the 8<sup>th</sup> Transport Plan (1997-2001) on traffic conditions in BMR under 1997, 2001 and 2006 design years;
- prioritize the proposed projects and recommend appropriate investment plan (s).

### 1.3 Study Area

The BMR study area comprises Bangkok Metropolitan Area, BMA (sector 1-6) and its adjacent provinces, namely Samut Prakarn (sector 7-8), Nonthaburi (sector 9-10), Pathumthani (sector 11-12), Nakhon Pathom (sector 13) and Samut Sakhon (sector 14), covering approximately 7,732 sq km (Figure 1).

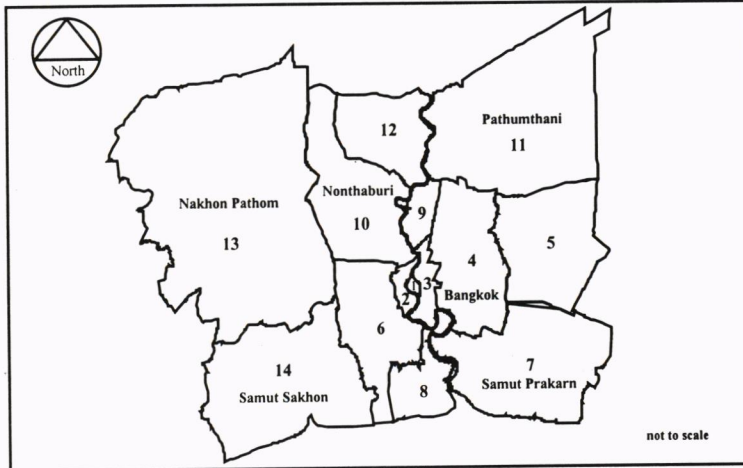


Figure 1. BMR Study Area

Source: OCMLT (1998)

## 2. STUDY METHODOLOGY/APPROACH

The main study procedures are as follows:

- data collection: secondary data on planning data, transport network and projects during the 8<sup>th</sup> Plan, and previous transport investment plans (OCMLT, 1982-1997);
- data analysis: future years planning data, transport investment characteristics and the country's financial capacity;
- transport model analysis: examination of the existing UTDM strategic 4-step transport model (OCMLT, 1998) and its application for future travel demand analysis;
- evaluation: overall traffic conditions evaluation through traffic indicators: the volume to capacity ratio (v/c) and the average travel speed; to demonstrate the effectiveness of transport plans.

Since there exist over 150 proposed transport schemes (Figure 2) during the 8<sup>th</sup> Plan and some receive special approval from high level authority, more importantly many projects have already started. And, because of the limited time scale, this study will not rank all proposed projects by standard economic indices. Instead, the consideration will be focused on the sector and the network v/c ratios under the "without 8<sup>th</sup> Plan projects" compared to the "with 8<sup>th</sup> Plan projects" scenario for the design year 2001.

The sector v/c ratio comparison provides information on geographical sectors where traffic problems occur and persist before and after implementing the plan. Thus it is possible to rank each sector by performance. The network v/c ratio shows comparative travel demand levels for each proposed project. The v/c ratio of 1.0 or more scores the highest. Different values will be proportionally calculated. Projects with high network v/c ratios found in sectors with also high v/c ratios are considered important. This implicitly demonstrates the effectiveness of the proposed projects. 50% weighting is applied to this combined performance measure.



### 3. TRANSPORT INVESTMENT IN BMR

#### 3.1 Previous Investment (1982-1996)

The 5<sup>th</sup> and 6<sup>th</sup> National Economic and Social Development Plans (1982-1986 and 1987-1991) marked the era of important road and expressway projects such as the First and Second Stage Expressway projects and the Middle Ring Road (NESDB, 1985; Rujopakarn *et al.*, 1994 and Rujopakarn, 1995). A trend in favour of mass transit projects emerged towards the end of the 6<sup>th</sup> Plan and has been continuing ever since (NESDB, 1985; OCMLT, 1988-1993; Rujopakarn *et al.*, 1994; and Rujopakarn, 1995). Considering the 6<sup>th</sup> Plan investment of 37 billion baht (6<sup>th</sup> Plan values) the authorities could have invested more than had been announced, but there was practically no public transport share (Table 1). This was mainly due to the cancellation of the Skytrain project. In terms of expenditure, the 6<sup>th</sup> Plan investment was 1.5 times higher than the 5<sup>th</sup> Plan (19 billion baht investment: 5<sup>th</sup> Plan values). Also, the ratio of private share in Expressway construction amounted to 39% of all the investment.

Table 1. Comparison of Actual and Planned Investments during the 6<sup>th</sup> Plan (1987-1991) by Transport System

Transport System	Investment Planned (billion baht)	%	Actual Investment (billion baht)	%
Road/Expressway	20.2	70	35.9	96
Public Transport	8.5	29	0.4	1
Others	0.2	1	0.9	3
<b>Total</b>	<b>28.9</b>	<b>100</b>	<b>37.2</b>	<b>100</b>

Source: Rujopakarn *et al.* (1994)

The 7<sup>th</sup> Plan (1992-1996) marked the beginning of the mass transit era, and the public and private sectors altogether invested approximately 211 billion baht (7<sup>th</sup> Plan values). This was 7 times higher than the investment made in the 5<sup>th</sup> Plan. The investment share on public transport reached 36% (public 28%, private 8%) of all the investment. Noticeable delay can be observed on public transport investment (Table 2).

Table 2. Comparison of Actual and Planned Investments during the 7<sup>th</sup> Plan (1992-1996) by Transport System

Transport System	Investment Planned (billion baht)	%	Actual Investment (billion baht)	%
Road/Expressway	174.8	52 <sup>1</sup>	131.3	61 <sup>2</sup>
Public Transport	141.6	42	73.2	36
Others	18.7	6	6.0	3
<b>Total</b>	<b>335.1</b>	<b>100</b>	<b>210.5</b>	<b>100</b>

Source: Rujopakarn *et al.* (1994) and this study

Note: (1) Expressway System 28%; Road Network 24%.

(2) Expressway System 41%; Road Network 20%.

Figure 3 shows the previous transport investment of each national plan compared to the 8<sup>th</sup> current investment plan (1997-2001).

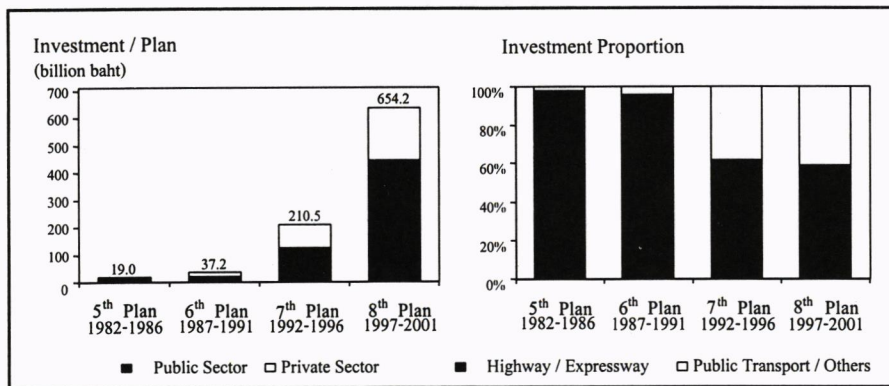


Figure 3. Transport Investment in BMR 1982-2001

Source: Rujopakarn *et al.* (1994) and this study

### 3.2 Transport Investment during the 8<sup>th</sup> Plan (1997-2001)

The analysis of previous investment shows huge increases in budget between each plan. During the 8<sup>th</sup> Plan, all traffic/transport agencies propose to invest approximately 654 billion baht (Figure 3) in 161 projects (excluding 188 billion baht required after year 2001). The proposed investment is 18 times greater than the 5<sup>th</sup> Plan investment. Although, the private sector plans to share 32% of all the investment, the proportion is reduced from the 6<sup>th</sup> and 7<sup>th</sup> Plans by 7%. The 8<sup>th</sup> Plan intends to spend 59% of all the investment in road/expressway development, the remaining 41% is reserved for public transport projects. The budget requirement summarized by the 14 traffic analysis sectors is presented in Figure 4.

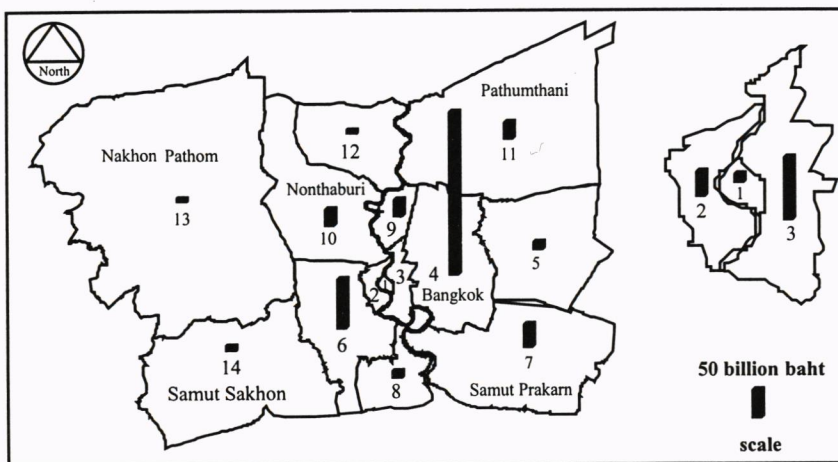


Figure 4. Transport Investment in the 8<sup>th</sup> Plan (1997-2001) by Sector

It can be seen that 53% of all the budget requirement will be concentrated in the east-inner area of Bangkok (sector 3) and the adjacent area (sector 4). This amounts to more than 345 billion baht. This is because there are several mass rapid transit and expressway projects in the sectors mentioned. Considering only the projects in Bangkok area (sector 1-6), the total budget required amounts to over 75% of all the investment plan or 494 billion baht.

#### 4. GOVERNMENT FINANCIAL CAPACITY

The transportation sector is becoming more and more important, especially in the role of the national economic generator. Since the beginning of the 7<sup>th</sup> Plan, the government has realized the significant economic loss from traffic congestion, and has thus continuously increased the annual transport budget. In 1996 the overall budget for the land transport sector reached 1.5% of GDP, valued at 82 billion baht. This investment proportion has gradually increased every year, from 4% of the annual budget in 1987 to almost 10% in 1996 (Bureau of the Budget, 1987-1996). The sector's budget grew by 27% p.a. over the decade, compared with 16% p.a. average growth for the budget as a whole.

The transportation sector budget (including relatively small non-land transport expenditures) ranked 5<sup>th</sup> after the public health and social services sector (22%), the education sector (20%), the national/internal security sector (18%) and the general services sector (13%) respectively, even though the country's base is agriculture. This sector received only 9% of the annual budget. The rest (8%) was allocated to the debt services sector, the science and technology and the commerce and tourism sectors (NSO, 1996). For BMR alone, the transport investment proportion was 27.5% of the land transport sector budget. This is equal to 2.7% of the government fiscal year budget, 843 billion baht in 1996.

OCMLT (1997), under the present economic crisis, estimated the land transport sector budget for the 8<sup>th</sup> Plan to be 544 billion baht while the total fiscal year budget for 1997-2001 would be 4,753 billion baht. From the above proportions, it can be concluded that the average government's financial capacity for land transport investment in BMR should be 27.5 billion baht/year. In 1996, the local government (Bangkok Metropolitan Administration, BMA) contributed about 5.5 billion baht in land transport investment in Bangkok. Thus, the total possible investment budget for BMR should be 33 billion baht/year or 165 billion baht for the 8<sup>th</sup> Plan.

#### 5. BMR TRAVEL DEMAND

##### 5.1 Overview

BMR, the area which generates over 56% of GDP, has 12.1 million population (20% of the country's population) and 6.9 million employment. In other words, 57% of all BMR residents are employed. It is forecast that in the next 10 years, the population and employment in BMR will attain 15.8 million and 9.5 million respectively (Table 3).

Table 3. BMR Planning Data (Population and Employment)

Area/Sector	Population (thousand)			Employment (thousand)		
	1997	2001	2006	1997	2001	2006
Bangkok	8,653	9,925	11,457	4,758	5,744	6,718
Nonthaburi	704	783	875	303	359	399
Pathumthani	615	682	762	390	450	491
Nakhon Pathom	759	839	938	437	500	537
Samut Sakhon	386	430	480	321	381	421
Samut Prakarn	1,029	1,131	1,264	717	847	942
<b>Total</b>	<b>12,147</b>	<b>13,790</b>	<b>15,776</b>	<b>6,926</b>	<b>8,281</b>	<b>9,508</b>

Source: OCMLT (1998)

Despite its importance to the country as a whole, BMA has very limited road space of only 1,000 km of main roads, 2,825 km of local roads and about 90 km of expressways. These represent 10% of the BMA area. Also, the public transport is insufficient. From the above planning data, the study applied the UTDM strategic transport planning model for BMR

(OCMLT, 1998) and found that BMR, in 1997, generates 18 million person-trips (excluding 3 million truck trips per day), of which 54% are private trips. It is expected that in 2006, the public transport share will be reduced to 39% of all the total 26 million trips (excluding 4.5 million truck trips), even though there will be several mass rapid transit lines in the future. Overall BMR travel demand forecasts are summarized in Table 4.

Table 4. Overall BMR Travel Demand

<b>BMR Travel Demand</b>	<b>1997</b>	<b>2001</b>	<b>2006</b>
Total Daily Trips (million trips/day)	17.94	21.72	26.22
Total Daily Truck Trips (million trips/day)	3.11	3.71	4.48
% Private Transport Trips	54	57	61
% Public Transport Trips	46	43	39
Average Trip Rate incl. Truck (trips/person)	1.73	1.84	1.95
Average Trip Rate excl. Truck Trips (trips/person)	1.48	1.58	1.66

As stated earlier, the government has supported the public transport since the beginning of the 7<sup>th</sup> Plan. However, detailed investigation of the 8<sup>th</sup> Plan shows there is about 350 billion baht for a 1,000 km road/expressway investment program (including budget required after the 8<sup>th</sup> Plan). This will certainly improve private transport travel. Meanwhile a public transport system (mass transit) of 240 km is to be developed at a cost of 500 billion baht (including budget required after the 8<sup>th</sup> Plan). The difference in level of service between the two systems will greatly affect mode split behaviour. The private transport mode is expected to still be dominant throughout the 8<sup>th</sup> and 9<sup>th</sup> Plans (2002-2006).

## 5.2 Base Year Traffic Conditions: 1997

Presently, there is 21 million trips/day (including truck trips) or 7.8 million passenger cars per day (pcpd). 500,000 passenger cars per hour (pcph) and 914,000 public transport trips take place during the morning peak-hour. The average travel speed in the morning peak in BMR is found to be 19 kph. BMR has an acceptable volume to capacity ratio (v/c) of 0.61, while the inner area of Bangkok is relatively more crowded. Its v/c ratio reaches 0.94 which brings the inner area travel speed down to only 11 kph.

Rujopakarn *et al.* (1994) estimated traffic conditions in BMR and stated that the 7<sup>th</sup> Plan should be able to maintain the 1996 average travel speed in the inner area of Bangkok and the surrounding areas of 11.5 and 17 kph respectively. When compared to the existing 1997 network evaluation results, the average travel speeds are 11 and 18 kph respectively. Although there are delays in implementing a number of 7<sup>th</sup> Plan projects, the government could, in some way, manage the traffic problems and maintain the traffic conditions at almost the same level as if the full 7<sup>th</sup> Plan were in effect.

## 5.3 Traffic Conditions in 2001: Without the 8<sup>th</sup> Plan

By the end of the 8<sup>th</sup> Plan, year 2001, there will be 25 million trips/day (including 3.7 million truck trips) or 10 million pcpd. 642,000 pcph and 1 million public transport trips will take place during the morning peak-hour. If there is no full implementation of the 8<sup>th</sup> Plan, the traffic conditions in BMR will be aggravated. The overall average travel speed will drop to only 11 kph and the v/c ratio will increase to 0.77. A detailed investigation reveals that the average travel speed in inner area of Bangkok drops by 50%, compared to the base year case, to only 5.8 kph. Moreover, the v/c ratio reaches 1.13. Overall v/c ratios of Bangkok and the northern area of Bangkok increase to 1.05. The problems are spreading to the suburban areas.

#### **5.4 Traffic Conditions in 2001: With the 8<sup>th</sup> Plan**

With full implementation of the 8<sup>th</sup> Plan, traffic conditions will be significantly improved. The average travel speed increases by 64% to 18 kph compared to 11 kph in the case without the 8<sup>th</sup> Plan. The average travel speed under the 8<sup>th</sup> Plan implementation case is about the same as in the base year, while the overall travel demand increases by 20%. The area v/c ratio improves to 0.66. The average travel speed in the inner area of Bangkok increases by 52% from 5.8 to 8.8 kph. The saturation level of the area reduces from 1.13 (without the 8<sup>th</sup> Plan case) to 0.97. Comparing this to the without 8<sup>th</sup> Plan case, the 8<sup>th</sup> Plan helps by reducing 280,000 pcu-hr travelling time but increases travelling distance by 1.6 million pcu-km. Travellers on non-road public transport also save 30,000 person-hr travelling time. In total, there is an economic benefit from travel time savings about 48 billion baht/year (1997 values).

#### **5.5 Traffic Conditions in 2006: Without the 8<sup>th</sup> Plan**

There will be 31 million trips/day or 12 million pcpd, 50% higher than the existing condition. 793,000 pcph and 1.2 million public transport trips will take place during the morning peak-hour. These result in an overall v/c ratio of 1.0. The average travel speed drops to 6.4 kph compared to 19 and 11 kph for the base year and year 2001 (without the 8<sup>th</sup> Plan cases) respectively. The v/c ratio of the inner area reaches 1.52 with a very low average travel speed of 3.2 kph, 45% lower than in year 2001 of the identical condition. Overall traffic conditions are extremely poor.

#### **5.6 Traffic Conditions in 2006: With the 8<sup>th</sup> Plan**

The 8<sup>th</sup> Plan will improve the BMR traffic conditions by 56% in terms of the average travel speed. However, the average travel speed is only 10 kph. The overall v/c ratio is 0.87. The v/c ratio of the inner area reaches 1.29 with a speed of 4.4 kph. Although this is 38% better than the previous case, the traffic conditions are still unacceptable. The non-road public transport under the 8<sup>th</sup> Plan projects reduces travel time by 38,000 person-hr while the road network can save 26,500 pcu-hr but travellers need to travel 2.5 million pcu-km farther. However, there will be an economic saving of 50 billion baht/year (1997 values) compared to the non-implementation case.

The overall evaluation of traffic conditions in BMR reveals that during 2001-2006, the investment of all the 8<sup>th</sup> Plan projects provides annual economic saving of approximately 50 billion baht. It is considered worthwhile when the annual investment will be 131 billion baht. The traffic results from model applications state that the overall speed and the level of service in the study area will remain at about the same level as in the present year till year 2001, after that the traffic conditions will worsen.

All the traffic evaluation results are presented in Figure 5.

### **6. PROJECT PRIORITIZATION AND PROPOSED INVESTMENT PLANS**

#### **6.1 Project Prioritization**

The study prioritizes all proposed projects according to established criteria. The results obtained are shown on Table 5. This will be used as the framework for the determination of revised plans suitable under the country's financial capacity. Further study on the revised plans will focus only on the budget requirement from the public sector. All private funding shall be excluded from the analysis, but needs to be investigated to assure continuity and integration with public funds on related projects.



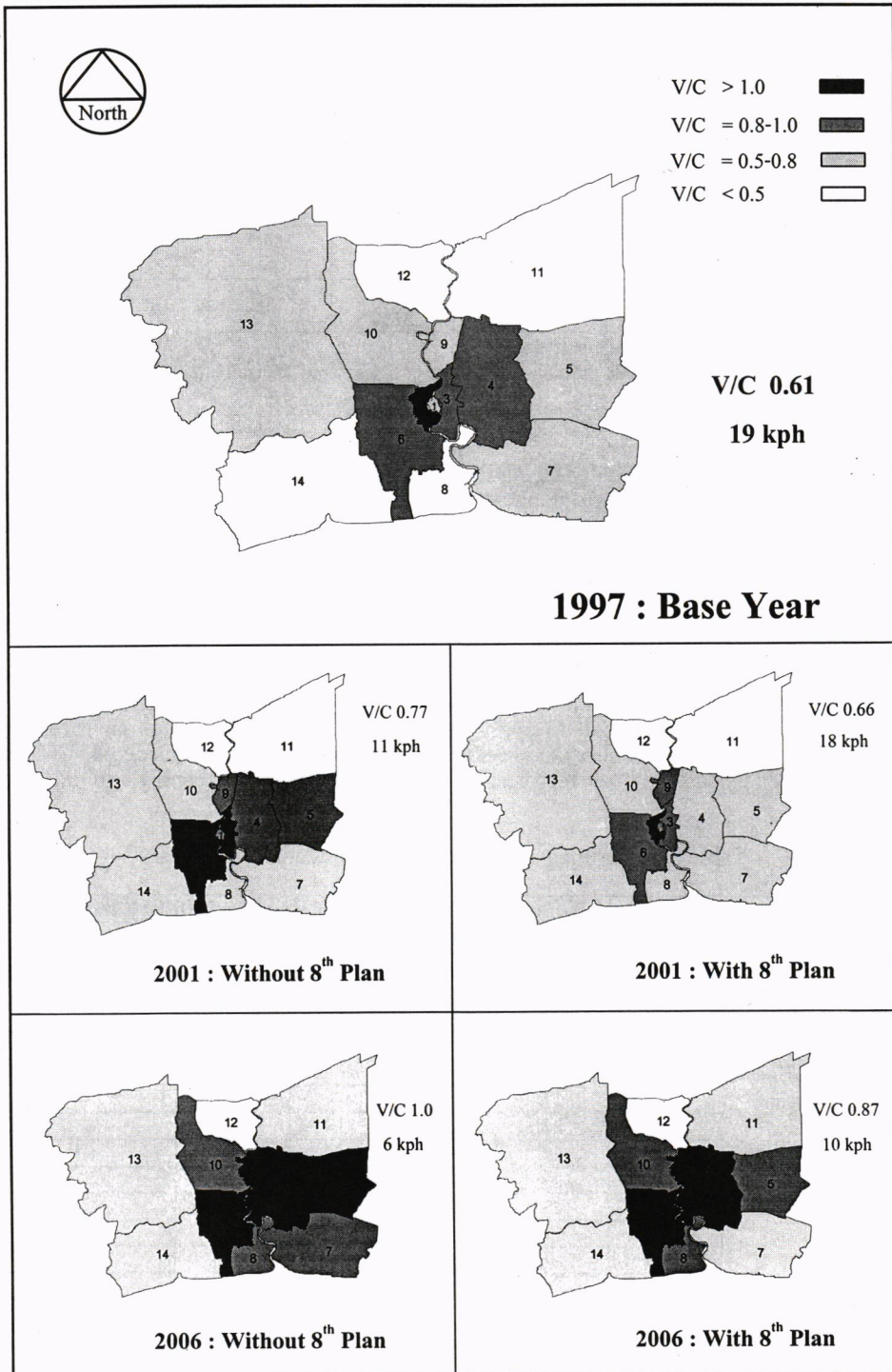


Figure 5. Overall Traffic Conditions in BMR by Sector : 8<sup>th</sup> Plan

Table 5. Overall Investment Required by Project Priority

Project Priority	No. of Projects	Investment Required (billion baht)			
		Public	Private	Total	After 8 <sup>th</sup> Plan <sup>1</sup>
1	46	147.3 49%	151.5 51%	298.8	144.5
2	57	152.5 90%	16.3 10%	168.8	23.9
3	58	144.6 78%	41.7 22%	186.3	19.4
<b>Total</b>	<b>161</b>	<b>444.4 68%</b>	<b>209.5 32%</b>	<b>653.9<sup>2</sup></b>	<b>187.8</b>

Note: (1) Assumed to be all public investment.

(2) Excluding organization development budget of Mass Rapid Transit Authority (MRTA) of 281 million baht.

Table 5 points out the difficulty facing the government to invest in all 161 projects. The 8<sup>th</sup> Plan is obviously showing a public shortfall of 279 billion baht. There is a need for project fund rescheduling by project rank or postponement. If the study considers only the rank assigned, all projects classed as (1) should be invested in the 8<sup>th</sup> Plan. The rest (2) and (3) should be implemented in the 9<sup>th</sup> and 10<sup>th</sup> Plans respectively in order to satisfy the financial capacity of 165 billion baht for each plan. In this case, it might take 15-20 years to complete all the 8<sup>th</sup> Plan projects.

However, the 8<sup>th</sup> Plan has already been in existence since 1997, many projects have been completed and in service and a lot of projects are under construction or have already been committed. It is very difficult to apply only the rank of the project as an investment recommendation. The actual status of the project should also be considered. Table 6 presents the analysis results when project status is used as another screening criteria.

Table 6. Investment Required by Project Status and Priority

Project Status	Project Priority	No. of Projects	Investment Required (billion baht)			
			Public	Private	Total	After 8 <sup>th</sup> Plan <sup>1</sup>
Complete	1	6	6.1	-	6.1	-
	2	11	4.0	-	4.0	-
	3	9	6.0	-	6.0	-
	<b>Sub-total</b>	<b>26</b>	<b>16.1</b>	<b>-</b>	<b>16.1</b>	<b>-</b>
On going/Under Construction	1	15	88.5	89.1	177.6	4.1
	2	17	22.9	4.7	27.6	-
	3	22	53.4	15.4	68.8	-
	<b>Sub-total</b>	<b>54</b>	<b>164.8</b>	<b>109.2</b>	<b>274.0</b>	<b>4.1</b>
Committed	1	25	52.7	62.4	115.1	140.4
	2	29	125.6	11.6	137.2	23.9
	3	27	85.2	26.3	111.5	19.4
	<b>Sub-total</b>	<b>81</b>	<b>263.5</b>	<b>100.3</b>	<b>363.8</b>	<b>183.7</b>
<b>Total</b>		<b>161</b>	<b>444.4</b>	<b>209.5</b>	<b>653.9<sup>2</sup></b>	<b>187.8</b>

Note: (1) Assumed to be all public investment.

(2) Excluding organization development budget of Mass Rapid Transit Authority (MRTA) of 281 million baht.

## 6.2 Revised 8<sup>th</sup> Plan (1997-2001)

Under the country's financial capacity and the screening criteria above, the revised 8<sup>th</sup> Plan proposed for investment during 1997-2001 is summarized in Table 7.

Table 7. Proposed 8<sup>th</sup> Transport Investment Plan (1997-2001) in BMR

Project Status	Project Priority	Project	Public Investment Required (billion baht)
Complete	1,2,3	All Projects	16.1
On going/Under Construction	1	All Projects	88.5
On going/Under Construction	2	All Projects	22.9
On going/Under Construction	3	- Don Muang Tollway - Rangsit Interchange - Bangna Expressway - Bang Pa In Expressway	4.0 4.0 21.4 9.0
	<b>Total</b>		<b>165.9</b>

If the revised plan above were accepted, all the remaining projects would have to be delayed for implementation in the 9<sup>th</sup> to 11<sup>th</sup> Plan in order to satisfy the financial constraint. The revised plan takes both project priority and its status into consideration, especially the projects that have already started. However, many priority (3) projects need to be delayed. Exception is made for those expressways under construction and mentioned in Table 7.

According to the above plan, the priority is given to the public transport share of 46% of all investment required during the new revised 8<sup>th</sup> Plan. This is because many road network development projects are pushed into the future plans. This directly corresponds with the government public transport investment policy. However, it should be remembered that the public transport system, especially mass rapid transit, requires a longer lead time to its first operation than road construction which accounts for 54% of this investment plan (excluding private investment on mass transit (82%) and expressway (18%) which total 109 billion baht).

The sector analysis of the revised investment plan shows concentration of the investment in 5 sectors namely sector 3 (inner-east of Bangkok: 15%), 4 (east of Bangkok: 45%), 6 (west of Bangkok: 9%), 7 (south-east of Bangkok or Samut Prakarn: 12%) and 11 (north of Bangkok or Pathumthani: 10%). This totals to more than 90% of all the investment plan. Private investment is concentrated in Bangkok area (88%), the rest is distributed to the north of Bangkok (12%).

## 6.3 Proposed 9<sup>th</sup> Investment Plan (2002-2006)

With limited financial capacity, many priority (3) "on going" projects and all "planned" projects can not be implemented during the 8<sup>th</sup> Plan. If the 9<sup>th</sup> Plan has approximately the same financial capacity as the 8<sup>th</sup> Plan, the investment program should follow the recommendation in Table 8. The plan tries to complete several projects under construction which continue into the 9<sup>th</sup> Plan, and all the rest of the priority (3) "on going" projects. In order to meet the budget constraint, the plan also supports "planned" projects of priority (1) and (2). However, megaprojects such as expressways and mass transit systems (only budget required after year 2001 of the existing 8<sup>th</sup> Plan) which are classed priority (1) and (2) have to be deferred to the next plan (s).

Table 8. Proposed 9<sup>th</sup> Transport Investment Plan (2002-2006) in BMR

Project status	Project Priority	Project	Public Investment Required (billion baht)
On Going/Under Construction	1	Continuing Projects from the 8 <sup>th</sup> Plan (1 <sup>st</sup> Stage Blue Line MRTA and BMA Project)	4.1
On Going/Under Construction	3	Remaining Projects from the 8 <sup>th</sup> Plan	15.0
Committed	1	All Projects (except Orange Line MRTA budget required after the existing 8 <sup>th</sup> Plan: 112 billion baht)	80.9 <sup>1</sup>
Committed	2	All Projects (except Phayathai Expressway and Klong Prapra Highway of 25 billion baht each)	65.0 <sup>1,2</sup>
	<b>Total</b>		<b>165.0</b>

Note: (1) Including investment required after the existing 8<sup>th</sup> Plan.

(2) Including 22.7 billion baht investment in parts of the Third Stage Expressway System.

During the 9<sup>th</sup> Plan, 40% of all the investment program or 65 billion baht will be allocated to public transport system development. Although this is less than the previous revised plan (46%), it is still very important. The remaining 60% is reserved for road network development. However, the above excludes private sector investment which totals 66 billion baht and will be all allocated to public transport projects.

From the above 9<sup>th</sup> Plan, the analysis reveals that 74% of all the public investment program or 120 billion baht will be in Bangkok area especially in sector 4 (east of Bangkok: 29%) followed by sector 3 (inner-east of Bangkok: 11%) and sector 6 (west of Bangkok: 13%), while 77% of the private investment will be in the inner area of Bangkok and 18% in the west of Bangkok in sector 6. Almost all of the private investment will be in Bangkok.

#### 6.4 Further Investment Plans

The revised plans for period 1997-2006 will certainly cause delay to the rest of the projects planned and classed as priority (2) and (3). They cost approximately 335 billion baht (90% public and 10% private) and will be allocated to mass rapid transit (37%) and urban/inter-urban road/expressways (63%). It is found that more than 50% of the rest of the budget required shall be in Bangkok. It is obvious that there will be more new projects proposed after the 8<sup>th</sup> Plan. Therefore, the investment plans after the 9<sup>th</sup> Plan are not very useful now since the rest of the projects are almost all megaprojects, and it is not the objective of this study to propose more projects. The study will focus only on the 8<sup>th</sup> and 9<sup>th</sup> revised plans discussed earlier, especially on their effects on the traffic conditions in BMR.

## 7. TRAFFIC CONDITIONS UNDER THE REVISED PLANS

### 7.1 Traffic Conditions in 2001: With the Revised 8<sup>th</sup> Plan

The new 8<sup>th</sup> Plan when complete will significantly alleviate traffic congestion, even though not as much as the existing 8<sup>th</sup> Plan. The average travel speed will increase by 40% from 11 kph to 15.5 kph, 20% lower than existing conditions, but there will be 20% more trips in 2001. Overall traffic conditions are 10% better ( $v/c = 0.71$ ) than the without 8<sup>th</sup> Plan case, but also 10% lower than the existing 8<sup>th</sup> Plan. The small difference is because many megaprojects are not scheduled to open in 2001. The revised network saves 160,000 pcu-hr road network travel time, but increases travel distance by 1.7 million pcu-km. Non-road public transport saves 28,000 person-hr travelling time. All this produces economic benefit in terms of travel time savings of about 26 billion baht/year, lower than the existing 8<sup>th</sup> Plan by 22 billion baht/year.

### 7.2 Traffic Conditions in 2006: With the Revised 8<sup>th</sup>/9<sup>th</sup> Plan

By the end of the 9<sup>th</sup> Plan, the total investment will be equal to 80% of the existing 8<sup>th</sup> Plan (excluding 188 billion baht expected to be invested after the existing 8<sup>th</sup> Plan). However, because of the plan rescheduling, there are both disadvantages and advantages in the 9<sup>th</sup> Plan network, when compared to the existing 8<sup>th</sup> Plan. Traffic analysis of the 9<sup>th</sup> Plan shows better traffic conditions in BMR. The travel speed is improved by 45% from 6.4 kph to 9.3 kph. The  $v/c$  ratio is reduced by 10% to 0.90. However, the inner area of Bangkok has a  $v/c$  ratio of 1.30 which is very critical. It can be concluded that the revised 8<sup>th</sup> Plan can maintain BMR's base year travel speed to only about year 2000. After that, speed will gradually decline as presented in earlier analyses.

Under this plan, the non-road public transport saves 38,000 person-hr, lower than the existing 8<sup>th</sup> Plan, while the road network travel time will be reduced by 404,000 pcu-hr, but travel distance will increase by 2.3 million pcu-km. The overall economic saving amounts to 40 billion baht/year, 10 billion baht/year lower than the earlier analysis.

Traffic conditions under the revised plans are shown in Figure 6.

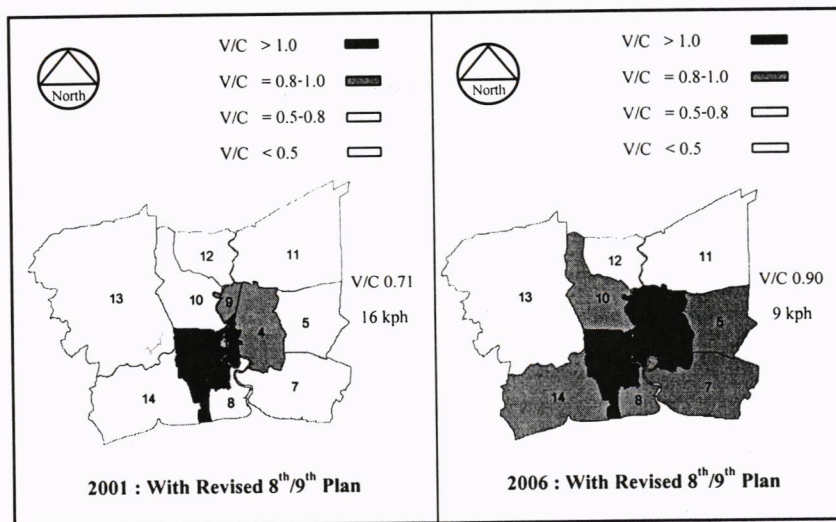


Figure 6. Overall Traffic Conditions in BMR by Sector : Revised 8<sup>th</sup>/9<sup>th</sup> Plan

## 8. CONCLUSION

In the course of this research, discussions have been held with various representatives from transport/traffic related agencies, especially from the Office of the Commission for the Management of Land Traffic (OCMLT), presently overseeing all land transport projects, and the Bangkok Metropolitan Administration (BMA). The representatives from the OCMLT and the BMA who formed the research steering committee accepted the importance of the findings and have made useful recommendations, which have been taken into account and adopted where appropriate. But the findings have been undertaken independently and represent the views of the author.

The study has performed project prioritization which will be extremely useful for the budget bureau and the government to adjust the 8<sup>th</sup> Plan, in order to satisfy budgetary constraints. It is seen from the analysis that the total budget required exceeds the country's financial capacity by four times, that is all projects are to be complete in 20 years. Furthermore, due to the unmanageable and unceasing increase in travel demand, full implementation of the proposed 8<sup>th</sup> Plan will only sustain future year traffic conditions to the base year level. Such conclusion has previously been confirmed by JICA (1990) and Rujopakarn *et al.* (1994) that the government will be required to spend hundreds of billions of baht in every national plan in order just to maintain traffic conditions constant.

In the present economic crisis, this should be a good opportunity for the government to review and strictly control or cancel investment on low priority projects, and support the more fruitful and beneficial projects. The government should also concentrate on implementing appropriate city planning policies and traffic measures, i.e. managed city growth, regional development and traffic demand management. This will help to avoid megaprojects investment in the future. However, the government still has obligations in allocating an enormous amount of budget to projects under construction. Therefore, those as-yet-unstarted projects should be delayed, cancelled or subject to a new comprehensive review.

Rujopakarn *et al.* (1999) analysed traffic conditions in BMR under different scenarios from this study and found that if population and employment forecasts for the base year fall by 300,000 people and 600,000 jobs respectively, and if economic forecasts are adjusted to reflect the economic crisis of the country, the 8<sup>th</sup> Plan can sustain base year traffic levels to about mid-end of the 9<sup>th</sup> Plan (2006). This scenario also indicates what might be expected under normal conditions of growth in conjunction with an effective city management policy. It shows that growth does not necessarily require heavy infrastructure investment.

However, it is seen that full implementation of the existing 8<sup>th</sup> Plan and the revised 8<sup>th</sup>/9<sup>th</sup> Plan provides substantial economic benefit from travel time savings and is considered worthwhile when compared to the annual investment required (Table 9).

Table 9. Economic Benefit from the Existing and Revised 8<sup>th</sup>/9<sup>th</sup> Plans Compared to the Investment Required

Transport Plan	8 <sup>th</sup> Plan Period (1997-2001)		9 <sup>th</sup> Plan Period (2002-2006)	
	Investment Required <sup>1</sup> (billion baht)	Annual Economic Benefit <sup>2</sup> (billion baht)	Investment Required <sup>1</sup> (billion baht)	Annual Economic Benefit <sup>3</sup> (billion baht)
Existing 8 <sup>th</sup> Plan	654.0	48.0	188.0	50.0
Revised 8 <sup>th</sup> /9 <sup>th</sup> Plan	275.0	26.0	231.0	40.0

Note: (1) Rounding figures of both public and private investment.

(2) Estimates for year 2001.

(3) Estimates for year 2006.

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### APPENDIX

Table A.1 Value of Time (VOT) and Vehicle Operating Costs (VOC)

	1997	2001	2006
Value of Time, baht/pcu-hr	131.05	150.07	157.40
Vehicle Operating Costs: Time Component, baht/pcu-hr	89.71	92.99	95.47
: Distance Component, baht/pcu-km	2.56	2.59	2.62
Public Transport High Comfort, baht/person-hr	74.36	85.70	100.00
Public Transport Low Comfort, baht/person-hr	33.50	38.60	45.00

Source : OCMLT (1998) and PWD (1996)