CHAPTER I

INTRODUCTION

Transport in general, and particulary highway transport plays an essential role in the persuit of development objectives of the country. Its function serves as a factor to enable goods and passengers to be transferred between and within production and consumption areas resulting in improvement economy to the region associated.

Improved highway lowers travel time and consequently savings. These savings can be defined as a combination of road user and non-road user benefits. These are sometimes referred as vehicular and non-vehicular benefits or as direct and indirect benefits. Basically, motor vehicle user benefit takes the form in reduction of vehicle operation cost, travel times and accidents plus the increase in comfort and convenience to the drivers. The term non-user benefit may be defined as benefits derived by other than motor vehicle user. This includes the benefit occuring to industry, commerce and adjacent land-owners.

In Thailand, great effects to overcome poor highway transport have been made. Many roads were being constructed or upgraded in recent years and among one of them is the Bang Pa In - Nakhonsawan Highway.

The Route and Its History

The Bang Pa In - Nakhonsawan Highway, designated route No.32 (A-2) was a part of the Department of Highways' 7-Years Development Plan (1965 - 1971). It starts from near Bang Pa In at 52 + 000 km north of Bangkok on Phaholyothin Highway running north for 188 kilometers passing Ayutthaya, Ang Thong, Sing Buri, Chai Nat and joins Phaholyothin road again at approximately three kilometers from Nakhonsawan's town center.as shown in Fig. 1.

The construction of the highway started on November 1968 and completed on June 1972. The highway was constructed according to the standard for primary road issued by Department of Highways. It has two lanes, each 3.5 meters with adjoining shoulder of 2.5 meters making the total surface width of 12 meters altogether. The pavement consists of 5-6 cm, asphaltic concrete placed on 25 cm crushed graded aggregate and 35 cm sand (45 cm in southernmost section).

There are 5 important bridges along the highway, spanning the Pasak River, Lop Buri River (twice), Khlong Bang Kaeo and Chao Phraya River. These five bridges are constructed in prestressed concrete. The remaining 62 bridges were built in ordinary reinforced concrete and the total length of all 67 bridges is 3,426 meters. In addition, there are 568 box and pipe culverts. This large quantity of structures has been necessary on the account of the frequent floods and many waterways in the areas through which the road passes.

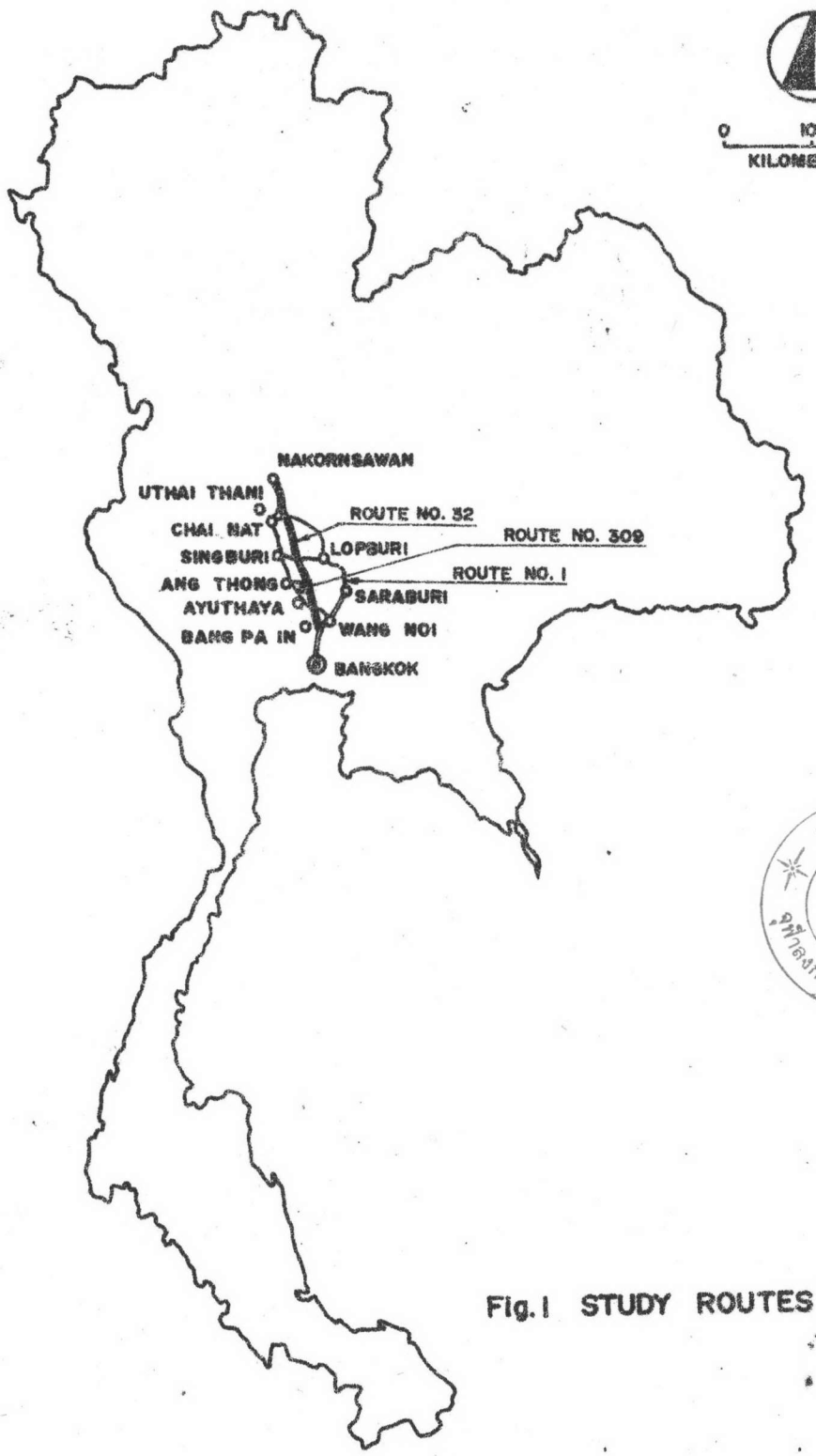

Fig. 1 STUDY ROUTES

Bridges over all navigable rivers and khlongs provide ample vertical and horizontal clearance for navigation even during adverse condition of flood.

Before the construction of this highway, journeys to and from the northern part of the country were through longer indirect route No.1. After the inauguration date of 23rd April 1972, this highway provides a shorter, more comfortable and safer route to the northern part of Thailand by about 100 kilometers. Also, it provides convenient access and communication to farmers and others along the route whose only means of transportation was by boats along the khlongs and rivers or over the rice field during the flood season or ox-carts and walking during the dry season.

The total final cost of the project including engineering consultant, design and construction etc. was 585 million baht. Financing of the project was partly through National Budget 52 % and from World Bank 48 %.

Detail Information of the Bang Pa In to Nakhonsawan Highway

Construction Cost	551 million baht
Survey, Design, Inspection and Consult	34 million baht
Final Cost	585 million baht
Name (Popular and well known)	Asian Highway
Destinated National	Route No. 32

Type of Highway	Primary Route, 2-lane Highway
Length of Highway	188 kilometers
Type of Surface	Asphaltic Concrete
Width of Surface	7.0 meters
Width of Shoulder 2@ 2.50 m	5.0 meters
Right of Way	70 - 165 meters
Speed Limit	100 kph

In order to gain sufficient revenues to balance the payments for the project, it was decided that toll will be introduced on the route. Two toll stations were set up at Bang Pa In (55 + 850 km) and at Ang Thong (96 + 800 km). The toll rates will be charged according to the type of vehicles. Since the opening, the rates had been revised and changed once. The change was made on 1st April 1973 a year after the road was opened and they remained in effect ever since. Table 1 shows the past and present toll rates by type of vehicles.

Table 1 Past and Present Toll Rates

Tpye of Vehicle	Previous Toll Rate ฿	Present Toll Rate ฿
Motorcycle	1	1
Passenger Car	3	3
Light Trucks and Buses		
Wt. < 2,000 kg	3	3
Wt. > 2,000 kg	10	8
Heavy Buses and Trucks	10	8
Heavy Trucks (10-wheel)	15	10

Purpose and Scope

The main purpose of this research is to investigate the induced and diverted traffic of the new facility, also the economic benefits of the project as compared to the existing facilities. The benefits under investigation will include

1) the reduction in operating expenses initially to the users of the facility
2) savings in time for both passengers and freights
3) increased comfort and convenience

The study however, will not deal with the measurement of the benefits of comfort and convenience in monetary term.

Expected Usefulness of the Study

The research is a case study of benefit gained by the Bang Pa In - Nakhonsawan Highway. The results obtained will be in form of road user savings. They will provide guide lines for assesment the total benefit of the road user costs in the present condition. Further, it will indicate to the authority whether the present toll rate is appropriate and it will provide relevant information in the decision making whether this category of road is justifiable to the country.

Literature Review

In recent years, there have been many highway constructions and improvement projects in many parts of Thailand. Highway is a factor in developing new area, transportation of persons and goods, a growing necessity in serving the increasing commerce and industry and security of a nation. The experience of many countries has proven that highway is a prime factor in reducing transportation cost which, in term, reduces the cost of goods that are dispatched from or delivered to the areas that the new or improved highways traverse. Many studies have been made on the road user and non-user benefit of the highway in relation to the traversed area both in Thailand and other countries.

KING'S COLLEGE TRANSPORTATION STAFF (1957) prepared the report to predict the possible volume of traffic expected to use the proposed type vehicular tunnel. The flow of traffic over the four bridges at Newcastle, and the vehicular ferries at Jarrow and North Shields were studied by means of classified volume counts and origin-destinations surveys. The economic study of cross-river journeys between specific zones were also investigated for all facilities in form of journey times and journey costs. In order to predict the total traffic volume using the tunnel, the traffic were divided into two categories: one was the diverted traffic from the present crossings and the other was the induced traffic by the provision of

the proposed tunnel. In making the analysis of the cross-river traffic it was assumed that the proposed tunnel would replace the Jarrow ferry. The analysis of traffic after the tunnel is operating therefore is concerned only with the bridges, the North Shields ferry and the proposed tunnel.

The principal finding of the investigation is that, based on a toll scale designed to produce maximum gross revenue, 6,200 vehicles per day would be likely to use the tunnel. This volume, based only on diversion of present traffic and expected generation of traffic, would produce a gross revenue from tolls of £280,000 per year.

CLAFFEY (1961) determined what highway travellers on toll highways were paying for travel time. He measured travel time, fuel consumption, and speed changes in driving sections of toll highways and parallel free highways between the same termini. Origin and destination studies were made at the same time to determine the number of drivers that chose each route--the toll highway and the parallel nontoll highway.

His mathematical analysis included the factors of running cost accident cost, toll charge, running time, speed change and percentage of drivers selecting to use the toll highway. A speed change unit is a plus or minus change in speed of 1 mph. In the analysis, only speed changes of 3 mph and more were included. Claffey's data and particular solution yielded a time value of 2.365 cents per vehicle-

minute plus or minus 0.59 cent. The value of a speed change unit (1 mph change) was 0.48 cent plus or minus 0.062 cent. The value of a speed change unit is obviously not reliable. The speed change unit was adopted as a means of measuring the relative comport of the drive, or one measure of impedance. The 2.365 cents per car-minute reduces to $1.42 a car-hour, or $0.89 per person-hour, on the basis of 1.6 persons per car, based on 1959 prices..

The study of Claffey is good, despite some mathematical and field data uncertainties, because it uses the market place as means of pricing the traveller's time. Whatthe traveller will pay to reduce travel time seems to be an accepted approach to the value of passenger car travel time, but so far no one has devised a way to price the traveller's willingness to pay. The Claffey study measured the price of time paid under the one condition of intercity toll highway use, but not willingness to pay. Further, the highly important urban travel, including the home-work, work-home movement was not included.

KAMPSAX (1965) investigated the feasibility of the economic advantages of the following two possible alternative schemes.

- Improving the existing route between Saraburi and Nakhon-sawan to form a part of the main trunk road system.
- Developing a new direct route as a part of the main trunk road system either between Saraburi and Nakhonsawan via

Lopburi and Chai Nat or between Bang Pa In and Nakhonsawan via Ayuthaya, Ang Thong, Singburi and Chai Nat. The existing parts of these routes shall be improved to only minimum required standards.

The scope of work laid down in the same article calls for an economic appraisal and comparison of the two alternative schemes taking the form of assessing and quantifying benefits accruing to the national economy by way of savings in vehicle operating costs and increased production and comparing these benefits with the total capital investment in the road and associated facilities. Kampsax found that of all the alternatives he has studied, the Bang Pa In to Nakhonsawan should be constructed, since it will give the highest benefit. The benefit cost ratio of the proposed highway in 1970 will be 2,5 and in 1980 will become double of the year 1970.

THOMAS (1967) reported on the value of passenger-car travel time. Thomas's report is generally recommended as a source of fundamental factors and concepts and references to the subject. In his study a mathematical model for the value of passenger-car travel time based on field studies of commuter travel between home and work place wherein there was opportunity to travel either a toll highway or a non toll route was developed.

DEPARTMENT OF HIGHWAYS (1973) studied economic effect and road user benefit to the proposed improvements of Bang Na-Bang Pakong and Chonburi-Siracha highway by adding two carriage ways and up-grading the original road between Chonburi-Siracha highway. The benefits to be considered in this study were road user cost namely, the saving in transport costs (including the reduction in the cost of fuel, tyres, maintenance, repairs and depreciation of vehicles) plus the saving in travel time and possibly accident reduction. Indirect benefit such as social benefits and land value increases are neglected in this study; as there is already a full access to the whole road length and it is considered that such development benefits will not be large. The road user benefits were the total saving in operating and time cost for traffic on the present road, less than those for the purpose improved road.

KAMPSAX (1975) developed the methodology of evaluating the benefit from an improved highway as a reduction in the road user costs. In the methodology the road user costs are composed of running costs plus fixed cost which are termed as operating cost and time cost. Kampsax also produced the calculation methodology for comparing the vehicle operating cost caused by the various road characteristics known as the "Delta-L-method". In "Delta-L-method" travel cost on various types of road surfaces were taken into account as an equivalent factor to be multiply to the travel distance and hence travel costs.