

การศึกษาทางด้านเศรษฐกิจของทางหลวงเก็บค่าธรรมเนียม

สายบางปะอิน-นครสวรรค์



นายวันชัย ภาคลักษณ์

004570

วิทยานิพนธ์นี้เป็นส่วนหนึ่งของการศึกษาคามหลักสูตรปริญญาวิศวกรรมศาสตรมหาบัณฑิต

แผนกวิชาวิศวกรรมโยธา

บัณฑิตวิทยาลัย จุฬาลงกรณ์มหาวิทยาลัย

พ.ศ. 2519

ECONOMIC STUDY OF TOLL ROAD BANG PA IN-NAKHONSAWAN

HIGHWAY IN THAILAND



MR. WANCHAI PARKLUCK

A Thesis Submitted in Partial Fulfillment of the Requirements

for the Degree of Master of Engineering

Department of Civil Engineering

Graduate School

Chulalongkorn University

1976

Accepted by the Graduate School, Chulalongkorn University in partial fulfillment of the requirements for the Degree of Master of Engineering.

Kisid Prochnaloma

.....
Dean of the Graduate School

Thesis Committee

Niwat Darananda

.....
(Prof. Dr. Niwat Daranandana, Chairman)

Sukree Kampananonda

.....
(~~Assoc.~~ Prof. Sukree Kampananonda)

Supradit Bunnag

.....
(Asst. Prof. Supradit Bunnag)

Anukalya Israsena

.....
(Mr. Anukalya Israsena Na ~~Ayudhya~~);

Advisor: Mr. Anukalya Israsena Na ~~Ayudhya~~

Date: April 1976

หัวข้อวิทยานิพนธ์ การศึกษาทางเศรษฐกิจของทางหลวงเก็บค่าธรรมเนียมสาย

บางปะอิน-นครสวรรค์

ชื่อ

นายวันชัย ภาคลักษณ์

แผนก วิศวกรรมโยธา

ปีการศึกษา

2518

บทคัดย่อ

จุดประสงค์ของการศึกษานี้เพื่อที่จะทำการศึกษามหาของทางหลวงเก็บค่าธรรมเนียมผ่านทางสาย บางปะอิน-นครสวรรค์ ซึ่งเป็นเส้นทางอีกเส้นทางหนึ่งที่ใช้ในการคมนาคมติดต่อกับภาคเหนือของประเทศไทยนอกเหนือจากทางหลวงหมายเลข 1 การศึกษาได้แสดงออกมาในรูปของการเปรียบเทียบระหว่างเส้นทางทั้งสอง โดยประเมินผลทางด้านระยะเวลาในการเดินทาง, ค่าใช้จ่ายของการใช้ยานพาหนะ ตลอดจนลักษณะและรูปแบบของการจราจร นอกจากนี้ยังได้ทำการสำรวจจุดเริ่มต้นและจุดหมายปลายทางของยานพาหนะที่ใช้ทางหลวงเก็บค่าธรรมเนียมสายนี้ รวมทั้งการสอบถามผู้ใช้ยานพาหนะถึงจุดประสงค์และเหตุผลของการใช้ทางหลวงสายนี้

ผลจากการศึกษาพบว่า ทางหลวงเก็บค่าธรรมเนียมสายบางปะอิน-นครสวรรค์นี้มีบทบาทที่สำคัญหลายอย่างเช่น:- ลดเวลาในการเดินทาง, ประหยัดค่าใช้จ่ายของการใช้รถในการเดินทาง ตลอดจนความสะดวกสบายสำหรับผู้ที่ใช้ทางหลวงสายนี้



Thesis Title Economic Study of Toll Road: Bang Pa In-Nakhonsawan
Highway in Thailand
Name Mr. Wanchai Parkluck, Department of Civil Engineering
Academic Year 1975



ABSTRACT

The objective of this study was to investigate the role of Bang Pa In-Nakhonsawan toll highway as an alternative route to the middle and northern parts of Thailand. Measurements of travel time, travel speed, traffic volume, character of traffic and traffic pattern were made in driving along the toll highway and alternative free highways between the same termini. Origin and destination studies as well as questionnaires concerning the preference of routes were made at the same time to determine the number of motorists that choose each route--the toll highway and alternative nontoll highways.

Analysis including the factors of unit travel cost, toll charge, savings in travel time and cost, reasons and percentage of motorist electing to use the toll highway were made. The results were that the Bang Pa In-Nakhonsawan toll highway played an important role in reducing travel time and travel costs hence, saving or benefit plus comfort and conveniences to the road user as a whole.

ACKNOWLEDGEMENT



The author is deeply indebted to Mr. Anukalya Israsena Na Ayudhya for his generous guidance, supervision and especially for his encouragement in this research. Special acknowledgement is also made to Prof. Dr Niwat Daranandana, Assoc. Prof. Sukree Kumpanananda and Asst. Dr. Supradit Bunnag to serve on his thesis committee.

Acknowledgement are due to Mr. Chawalit Sukhawanna engineer of the Research Traffic Section, and Mr. Kitipol Asaparporn engineer of the Research Project Section for their invaluable suggestions and some available data on the toll road.

Finally, the author wishes to acknowledge and thank the graduate school of Chulalongkorn University for the financial support.

TABLE OF CONTENTS

	<u>Page</u>
Title Page in Thai	i
Title Page in English	ii
Thesis Approval	iii
Abstract in Thai	iv
Abstract in English	v
Acknowledgements	vi
Table of Contents	vii
List of Tables	x
List of Figures	xiv



Chapter

I	INTRODUCTION	1
	The Route and Its History	2
	Purpose and Scope	6
	Expected Usefulness of the Study	6
	Literature Review	7
II	TRAFFIC STUDIES OF THE BANG PA IN-NAKHONSAWAN HIGHWAY	12
	Traffic Volume	12
	Vehicle Registration	21
	The Variation of Traffic by Hour	33
	The Variation of Daily Traffic in a Week	42
	The Variation of Daily Traffic by Month	42



TABLE OF CONTENTS (continued)

<u>Chapter</u>		<u>Page</u>
	Composition of Traffic Volume	46
	Origin-Destination Surveys	48
	Trip Purpose for Passenger Car	57
	Motorists' Choice of Route	59
	Average Occupancy Rate	62
	Journey Time and Speed Measurements	63
III	UNIT ROAD USER COST	67
	The Component of the Road User Cost	69
	Determination of Road User Cost Component	70
	Depreciation Cost	75
	Interest Cost	75
	Fuel Cost	76
	Tyre Cost	77
	Parts Cost	78
	Labour Cost	79
	Lubricant Cost	80
	Overhead Cost	81
	Occupants Time Cost	82
IV	BENEFIT TO ROAD USER COST	88
	Distance	88
	Average Travel Speed	90

TABLE OF CONTENTS (continued)

<u>Chapter</u>		<u>Page</u>
	Travel Time	90
	Road User Cost	92
V	CONCLUSIONS AND RECOMMENDATIONS	96
	Recommendations for Further Work	100
	REFERENCES	101
	APPENDICES	103
	VITA	

LIST OF TABLES



x

<u>Number</u>	<u>Title</u>	<u>Page</u>
1.	Past and Present Toll Rates	5
2.	Details of Traffic Counting Station Along Route Nos. 32, 1 and 309	13
3.	Average Daily Traffic (ADT) and Percentage of Buses and Trucks on Route Nos. 32 and 1	15
4.	Average Daily Traffic (ADT) and Percentage of Buses and Trucks on Route No. 1	16
5.	Average Daily Traffic (ADT) and Percentage of Buses and Trucks on Route Nos. 1 and 309	17
6.	Vehicle Registration in Changwat Ayuthaya by Year	22
7.	Vehicle Registration in Changwat Ang Thong by Year	23
8.	Vehicle Registration in Changwat Lopburi by Year	24
9.	Vehicle Registration in Changwat Singburi by Year	25
10.	Vehicle Registration in Changwat Chai Nat by Year	26
11.	Vehicle Registration in Changwat Uthai Thani by Year	27
12.	Vehicle Registration in Changwat Nakhonsawan by Year	28
13.	Vehicle Registration Combined the Seven Changwats	29
14.	Vehicle Registration of the Whole Kingdom of Thailand Excluding Bangkok	30
15.	Hourly Volume in a Week at Bang Pa In Toll Station (8th-13th December 1975)	34

LIST OF TABLES (continued)

<u>Number</u>	<u>Title</u>	<u>Page</u>
16.	Average Daily Traffic by Month at Bang Pa In Toll Gate	44
17.	Average Daily Traffic by Month at Ang Thong Toll Gate	44
18.	Percentage Composition of Traffic Volume	47
19.	Origin and Destination Zones	50
20.	Sampling Factors for Each Type of Vehicle on Wednesday 10th December 1975	52
21.	Sampling Factors for Each Type of Vehicle on Saturday 13th December 1975	52
22.	Daily Trips by Types of Vehicle Between Zone 0 and Other Zones on Weekday	53
23.	Daily Trips by Types of Vehicle Between Zone 0 and Other Zones on Weekend	54
24.	Total Daily Trips by Four Types of Vehicle Between Zone 0 and Other Zones	55
25.	Trip Purpose for Passenger Cars on Typical Weekday by Percentage	57
26.	Trip Purpose for Passenger Cars on Typical Weekend by Percentage	57
27.	The Number of Sample and Percentage of Total Studied Type of Vehicles for Motorists' Choice of Route	60

LIST OF TABLES (continued)

<u>Number</u>	<u>Title</u>	<u>Page</u>
28.	Average Occupancy Rate	62
29.	Average Travel Time Between Two Toll Gates and Average Travel Speed by Type of Vehicles	64
30.	Average Travel Time and Speed on Route Nos. 1 and 309 for Cars	66
31.	Costs of the Typical Passenger Vehicle	70
32.	The Cost of the Light Commercial Vehicle	72
33.	The Cost of Heavy Bus	73
34.	The Cost of Heavy Truck	74
35.	Basic Average Depreciation Cost	75
36.	Basic Average Interest Cost	76
37.	Basic Fuel Cost	77
38.	Basic Tyres Cost	78
39.	Basic Parts Cost	79
40.	Basic Labour Cost	79
41.	Basic Lubricant Cost	81
42.	Basic Overhead Cost	81
43.	Vehicle Occupancies and Trip Purposes	82
44.	Times Values of Vehicle Occupants	84
45.	Time Cost by Vehicle Type (at benchmark speed)	84
46.	Summary of the Basic Cost Components by Type of Vehicle	85

LIST OF TABLES (continued)

<u>Number</u>	<u>Title</u>	<u>Page</u>
47.	Road User Cost (Baht/km) by Type of Vehicle for Road Class I Paved	86
48.	Road User Cost (Baht/km) by Type of Vehicle for Road Class I Paved	87
49.	Comparison of Distances Between Route No.32 and Other Routes	89
50.	Comparison of Average Travel Speed Between Route No.32 and Old Routes	91
51.	Comparison of Travel Time Between Route No.32 and Old Routes	93
52.	Comparison of Road User Costs (include toll charge) Between Route No.32 and Old Routes	94
53.	Comparison of Road User Costs (exclude toll charge) Between Route No.32 and Old Routes	95

LIST OF FIGURES



<u>Number</u>	<u>Title</u>	<u>Page</u>
1.	Study Routes	3
2.	Average Daily Traffic (ADT) on Route No.1	18
3.	Average Daily Traffic (ADT) on Route Nos.309 and 32	19
4.	Vehicle Registrations in Changwats Ayuthaya, Ang Thong, Singburi, Chai Nat and Seven Changwats Combined	31
5.	Vehicle Registrations in Changwats Lopburi, Utahi Thani, Nakhonsawan, Seven Changwats Combined and the Whole Kingdom Excluding Bangkok	32
6.	Hourly Volume at Bang Pa In Toll Gate on Monday 8th December 1975 (both directions)	35
7.	Hourly Volume at Bang Pa In Toll Gate on Tuesday 9th December 1975 (both directions)	36
8.	Hourly Volume at Bang Pa In Toll Gate on Wednesday 10th December 1975 (both directions)	37
9.	Hourly Volume at Bang Pa In Toll Gate on Thursday 11th December 1975 (both directions)	38
10.	Hourly Volume at Bang Pa In Toll Gate on Friday 12th December 1975 (both directions)	39
11.	Hourly Volume at Bang Pa In Toll Gate on Saturday 13th December 1975 (both directions)	40

LIST OF FIGURES (continued)

<u>Number</u>	<u>Title</u>	<u>Page</u>
12.	Hourly Volume at Bang Pa In Toll Gate on Sunday 14th December 1975	41
13.	Average Daily Traffic in a Week	43
14.	Average Daily Traffic by Month	45
15.	Origin-Destination Zones	51
16.	Comparison of Total Trips by Percentage Between Weekday and Weekend	56
17.	Percentage of Trip Purpose of Passenger Cars on Route No. 32	58
18.	Reason Distribution by Percentage of Motorists' Choice of Route No.32 by Each Type of Vehicle	61