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CONFIDENTIAL

INTERNATIONAL BANK FOR RECONSTRUCTION AND DEVELOPMENT

PERFORMANCE AUDIT
OF THE
THAILAND SECOND HIGHWAY PROJECT

March 19, 1974

Operations Evaluation Department

PREFACE

Loan 455-TH to the Government of Thailand - the second of five highway loans approved to-date - was closed in July 1972 and the following report represents an audit of achievements under the Loan against the objectives on the basis of which it was approved.

The valuable assistance provided by the Thai Department of Highways is gratefully acknowledged.

Note: Currency Equivalent (Baht)

US \$1.00 = Baht 20.80

SUMMARY

In June 1966, the Bank made a loan of US\$ 36.0 million to the Government of Thailand (Loan 455-TH) to help finance a US\$ 72.0 million second highway project comprising the construction and improvement of four roads, Bangkok-Sriracha, Nakorn Sawan-Chiangrai, Udorn-Sakol Nakorn, and Khonkaen-Chumpae, and feasibility studies of another road, Thern-Ngao (see map), all of which were part of the Government's 1965-1971 highway program. During negotiations, the Government accepted the Bank's suggestion to undertake a study of transport policies and coordination. The project was completed ahead of schedule except for sections of one road which were delayed by six months because of minor difficulties, including floods. The actual total cost of the project was 11% less than estimated during appraisal. Final engineering and supervision were satisfactory and the project was well managed by the Department of Highways. The feasibility study of the road scheduled for later construction or improvement was completed after the final engineering of the project roads had been accomplished. In agreement with the Bank, funds from the loan were used to pay for renewing the services of consulting advisory engineers starting two months before the closing date of the first loan (March 31, 1969), which had provided financing since 1965. The performance of the advisory consultants was on the whole satisfactory.

Traffic on the first three project roads has exceeded expectations indicating that the anticipated economic returns (31%, 21%, and 18%, respectively) are also likely to be surpassed as actual construction costs approximate or fall below appraisal estimates. On the fourth road, Khonkaen-Chumpae, traffic is somewhat less than forecast but the anticipated return of 23% is still likely to be attained given construction cost underrun. It is clear that as the actual traffic trends are expected to continue, the project is a good investment.

A transport coordination study was eventually financed by the USAID and completed in 1970, but it did not produce recommendations which the Government could act upon. Recommendations resulting from the Bank's transport survey conducted in 1970/71 have been accepted by the Government and are being implemented.

AUDIT OF THAILAND SECOND HIGHWAY PROJECT

Background

On June 24, 1966, the Bank and the Government of Thailand signed a loan of US\$ 36.0 million (Loan 455-TH) to finance the foreign exchange cost of a second highway project estimated to cost a total of US\$ 72.0 million equivalent. The loan became effective on August 23, 1966 with a closing date of September 30, 1970. This project, like the previous one (Loan 341-TH signed in June 1963, for US\$ 21.9 million)^{1/} was an integral part of the Government's 1965-1971 highway development program (originally 1963-1970 program) envisaging the construction of 4,500 kms of new roads and the paving of 3,100 kms of existing roads, to almost double the road network. In 1963, the Bank expected to finance about 30% of the program. To date, the Bank has financed five highway projects in Thailand, totalling US\$ 129.5 million. The latest loan, signed in December 1972, was part of a second Government highway program.

In view of the increasing importance of highway investments in Thailand, the Bank, during the negotiations of the second loan, discussed with the Government the problem of transport coordination, including the consequences of certain practices in the road transport industry for rail-ways and ports. As a result, the Government invited the Bank to suggest terms of reference for a proposed study on measures to improve transport coordination, in which the USAID had indicated an interest.

The Project

The objective of the project was the improvement and construction of sections of four national primary highways totalling about 770 kms (Table 1). Most of the improvements and construction were necessary to meet the expanding traffic associated with the rapid economic development of the country; traffic had grown at an annual rate of 14% between 1959 and 1964 and it was expected to continue at 10% until 1975. The project was justified principally in terms of reduced road user and road maintenance costs.

The first project road provided for the improvement and enlargement of 95 kms from the outskirts of Bangkok to Sriracha which form part of the main trunk road in the southeastern region leading to the Cambodian border.

^{1/} A comprehensive evaluation of the first highway project was made by the Operations Evaluation Department. See "Comparative Evaluation of Selected Highway Projects", Report No. 349, dated March 6, 1974.

Beyond Km 6 from Bangkok, the project road provides a shortcut, for about 45 kms, to the existing coastal section of road and then proceeds southward to Sriracha for 44 kms parallel to the existing road, forming together a four-lane highway (see map). The southeastern region is one of the most developed in Thailand; traffic had grown at 30% per annum between 1962 and 1965 and the existing two-lane road with over 6,000 vehicles per day traffic was heavily congested. The second road covered the improvement of 413 kms of four northern sections of the 950-km main road extending from Bangkok through the northern region to Chiengrai near the Burmese border. The road connects the northern region with the Central Valley area, both of which are for the greater part heavily populated and well developed. Traffic had grown at about 16% per annum between 1963 and 1966 for the first two sections of the project road between Nakorn Sawan and Tak in the Central Valley, diminishing in the third section, Tak-Thern in the sparsely populated lower northern region, and picking up again in the fourth section, Ngao-Chiengrai, which starts 187 kms beyond Thern. The remaining two roads to be improved, Udorn-Sakol Nakorn and Khonkaen-Chumpae, are respectively the eastern and western branches of the trunk road running towards the Lao-tian border, in the northeastern region of Thailand. This is the poorest region in the country and the Government began to devote attention to it in the early 1960's with increasing emphasis on road transport. Traffic on the two roads had grown at 32% and 35% per annum respectively between 1963 and 1966, stimulated partly by the earlier opening of the U.S.-financed Friendship Highway.

Final engineering of all four roads was carried out previously, two as part of the first project and two by consulting firms hired by the Department of Highways. The second project provided for minor revisions of engineering on the first two roads to comply with slightly lower standards agreed with the Bank during appraisal. It further provided for consulting services to supervise construction and improvements and to prepare the engineering and feasibility study of a 190-km section of the Nakorn Sawan-Chiengrai road between Thern and Ngao which was not considered sufficiently justified for inclusion in the second project.

During negotiations it was agreed that the Government would consult with the Bank before imposing tolls on the Bangkok-Sriracha road. It was further agreed that the Thai Department of Highways would set up a statistical office to systematically collect economic and traffic data. The Loan Agreement included the usual covenants regarding proper maintenance of the highway system and loading limits.

The project was expected to be completed in the first half of 1970.

Project Implementation

As shown in Table 1, the project was successfully implemented with some savings in costs and time. The actual total cost of the project was 11% less than estimated during appraisal; costs of the physical component, including contingencies, were 8% less than anticipated and engineering

and supervision costs were 43% less than expected. Actual foreign exchange costs were just slightly under net (excluding contingencies) estimated costs by US\$ 0.3 million, which led to the cancellation from the loan of this amount, plus the entire foreign exchange contingency allowance of US\$ 4.6 million. No difficulties were encountered on three of the roads which were completed well ahead of schedule. A six months' delay occurred on sections of the Nakorn Sawan-Chiangrai road due to initial delays in engineering works, delays in delivery of equipment and in right of way acquisitions, some contractors' personnel difficulties and floods. The road also incurred a slight 3% cost overrun while for the other three project roads costs were below estimates. The above delays were the major cause of the first postponement of the closing date by one year to September 30, 1971. Another one-year postponement to July 31, 1972 was necessary for the Department of Highways to complete payments for the engineering and design of the section of the Nakorn Sawan-Chiangrai road scheduled for later construction, to complete payments to contractors and to continue the services of the advisory engineers. (See Tables 2 and 3.)

The performance of engineering and supervisory consultants has been satisfactory. The engineering studies of the 190-km Thern-Ngao section of the Nakorn Sawan-Chiangrai road were made in late 1968 after it became possible to analyze the impact of the traffic of the newly opened, adjoining, Chiangmai-Lampang road, financed under the first loan. In fact, traffic had nearly doubled on a 95-km section of the Thern-Ngao road (Thern-Lampang) since the Chiangmai-Lampang road was opened in late 1967 (see Table 4). The reconstruction of the Thern-Lampang section was thus financed in the Bank's fourth highway loan (1969). The remaining portion is a paved road and is considered by Bank engineers adequate to carry present traffic.

The other provisions of the project were adhered to. The agreed design standards were observed. No toll was imposed on the Bangkok-Sriracha road. A systematic effort at collecting statistics was begun and although the data suffer from inaccuracies the process is well established in the planning division and is likely to improve. As a result of this effort, the Department has the necessary data to do simple feasibility studies. The maintenance of the highway system has been adequate for routine operations but progress has been slower for periodic, heavy work. Assistance in maintenance was rendered by the consulting advisory engineers financed by the Bank.

Advisory Services

The Bank agreed to finance from loan funds the continuation for two and a half years (February 1, 1969 - July 31, 1972) of the consulting advisory engineering services financed since 1965 under the first loan. The results of the institution-building functions of these consultants (T.P. O'Sullivan & Partners) were extensively analyzed in the 1974 evaluation study of highway projects made by the Operations Evaluation Department (see footnote, page 1). The consultants helped strengthen the engineering

and operations functions of the Department, including planning, maintenance and equipment. However, certain institutional weaknesses persist particularly in maintenance and economic planning, making it necessary to continue consulting services to date and to launch a major maintenance study.

In retrospect it appears that to achieve more effective institutional changes the Bank should have provided the consultants with more precise terms of reference, including specific definition of responsibilities and definite implementation schedules. More importantly, the Department of Highways has not given continuous dynamic support to some of the major institutional reforms desired by the Bank. At times the Department utilized the consultants for general advisory purposes and diverted them from the intended institutional tasks to work on projects and feasibility studies.

The second loan financed about 14 man-years of consultant assistance. The consultants helped in several phases of Bank-assisted projects, including informal training of the Department's staff in managing Bank-assisted projects in such areas as contract procedures and agreements with consultants. They have assisted in feasibility studies and in the review of the new 1972-76 highway plan. They further revised Standard Specifications to reflect local conditions; they helped prepare a maintenance manual including maintenance planning procedures, and advised on the reorganization of equipment operations. In addition, the consultants gave valuable advice on general technical matters which, according to the Department of Highways, enriched the experience of the staff and resulted in improved and more economical engineering and design. This may, indeed, have been the most important contribution of the consultants' assistance.

Project Justification

It is clear from Table 4 that the actual traffic reached in all sections of the first three roads amply justifies these road investments. On the fourth road, Khonkaen-Chumpae, traffic is somewhat less than expected due to the generally slow development of the area and to indirect effects of decreased American military traffic after 1970.^{1/} Although traffic counts are available only through the first half of 1972, less than three years after the expected completion of the roads, a trend of increasing traffic is established. Indeed, the high levels of traffic reached on the Bangkok-Sriracha road have prompted the Department of Highways to recently seek financing from the Asian Development Bank for converting the road to a four-lane highway for its entire length. The proposed project would involve (a) adding two lanes to the two-lane 45-km section (km. 6 from Bangkok to Chalburi) newly built under the Bank project and (b) upgrading the old two lanes on the remaining 44-km portion to Sriracha. A feasibility study made by the Department of Highways justifies the new project.

^{1/} Military traffic was excluded from traffic projections in the appraisal report and is also excluded from the Department of Highways traffic counts.

In light of the new project proposal for the Bangkok-Sriracha road the question arises whether it would have been more efficient and economical had the Bank's project provided for building the entire road to a four-lane standard, especially since traffic was estimated to reach capacity on half the length of the road by the time construction was completed (See Table 4). In retrospect it appears that the Bank's appraisal may have been over-cautious and the project road may turn out to be a case of underinvestment. However, the reasoning of the Bank's appraisal team at the time was correct under the circumstances, deciding to wait and see how traffic would develop on both the old and new road. If the new road became congested soon after opening, it was thought likely that some of the traffic would have shifted to the old road. Serious congestion would have been avoided while new additions and improvements would have been made.

The underruns in actual construction costs and the traffic levels attained since 1970 indicate that the rates of return are likely to exceed the forecast at least for the first three roads. As shown in the table below, actual 1971 traffic was higher than expected; costs were appreciably lower than estimated in the appraisal calculation of the rate of return which included costs of contingencies and right of way. As noted earlier two of these roads were completed well ahead of schedule and the six months delay on the Nakorn Sawan-Chiengrai road is offset by the higher traffic and lower actual costs.

	Rate of return estimated in <u>Appraisal Report</u>	Actual cost as % of estimated including contingen- cies, right of way, engineering and supervision ^{1/}	Actual 1971 traffic as % of <u>projected traffic</u>
<u>Bangkok-Sriracha</u>	31%	68	108
<u>Nakorn Sawan-Chiengrai</u>	21%	87	132
<u>Udorn-Sakol Nakorn</u>	18%	80	150
<u>Khonkaen-Chumpae</u>	23%	63	85

^{1/} These percentages are different from those given in Table 1 for individual roads as the latter do not include right of way, engineering and supervision.

As to the fourth road, Khonkaen-Chumpae, traffic fluctuated since the opening of the road in late 1968 and has continued to fluctuate during 1970-72 making it difficult to assess future traffic trends well. Traffic was

short of expectations in 1971 and 1972, respectively by 15% and 12%. However, since the road was completed 19 months ahead of schedule at a cost 37% lower than estimated in the appraisal calculation of the rate of return, it is clear that the expected return on this road is likely to be attained.

Transport Coordination

The Bank helped draft the terms of reference of the Transport Coordination Study begun in 1968 by Wilbur Smith/Lyon Associates and financed by the USAID. Its purpose was to provide the Government with guidelines for setting up an appropriate coordinating organization, for preparing investment programs for the various modes of transport and improving regulation of transport activities. The Study did not fulfill its purposes; rather it provided the basic survey and data base for accomplishing the task in a second phase. In 1969, the Bank criticized extensively the report, which it found disappointing. In October-November 1971 the Bank carried out a transport sector survey, the main recommendations of which the Government agreed to implement after a reorganization of Ministries had taken place. With the fifth highway project of 1972, the Bank provided technical assistance for the implementation of recommendations to improve transport planning and coordination.

Table 1

Thailand Loan 455-TH Estimated and Actual Costs and Completion Dates

	Length (km)	Total Costs		Actual Cost as % of Estimated	Foreign Costs		Average Cost per km (US\$ thousand)	Completion Dates		Time Over or Underruns (months)
		Estimated (incl. 15% contingencies) (US\$ million)	Actual		Estimated (incl. 15% contingencies) (US\$ million)	Actual		Estimated	Actual	
A. Construction and Improvement										
1. Bangkok-Biracha	108	23.55	20.39	86%	11.3		188 ^{a/}	6/70	7/69	-11
2. Nakorn Sawan-Chiengrai	413	25.66	26.45 ^{b/}	103%	12.3		64	6/70	12/70	+ 6
3. Udorn-Sakon Nakorn	161	10.73	9.57	89%	5.2		59	6/70	12/68	-18
4. Khonkaen-Chumpae	94	6.57	4.70	71%	3.2		50	6/70	11/68	-19
Subtotal	776	66.50	61.11	92%	32.0	29.11				
B. Engineering and Supervision										
1. Revision of existing engineering and preparation of bidding documents for 1 and 2, above		1.88	0.25							
2. Supervision of construction of A, above		3.80)								
)	3.22							
3. Feasibility studies and revision of engineering for 190 km of road		0.34)								
Subtotal		6.02	3.47 ^{c/}	57%	3.6	1.95 ^{d/}				
C. Unallocated (rounding off)										
					0.4					
Total		72.51	64.58	89%	36.0^{e/}	31.06				

^{a/} Costs per km were high especially in the first 6 kms, beginning from the outskirts of Bangkok, which consisted of enlarging the existing two-lane road into a four-lane highway including the construction of a 400-m four-lane bridge. For the next 46 km, a new two-lane highway was built which shortcut the coastal section of the existing road.

^{b/} Contractor claims are pending, but actual payments are not expected to exceed US\$ 0.5 million, and they will be met from Government funds.

^{c/} A precise breakdown of expenditures under this category is not yet available. It should be noted, however, that the advisory consulting engineers financed under the First and Second Projects have assisted in reviewing engineering and contract documents, in supervision, and in the feasibility study.

^{d/} Includes funds for extension of advisory services (originally financed under the first loan) between February 1, 1969 and July 31, 1972, totalling to 164 man months.

^{e/} Net (excluding contingencies) estimated costs were US\$ 31.4 million.

SOURCE: Appraisal Report No. T0531a, May 31, 1966.
Supervision Report, January 12, 1973.
Department of Highways Completion Report, January 5, 1973.

Table 2
Thailand Loan 455-TH Total Costs ^{a/}
(in US\$ equivalent)

	<u>1966</u>	<u>1967</u>	<u>1968</u>	<u>1969</u>	<u>1970</u>	<u>1971</u>	<u>1972</u>	<u>Total</u>
<u>Construction and Improvement</u>								
1. Bangkok-Sriracha	1,420,689	6,530,717	7,587,098	4,423,455	443,558	-	-	20,405,518
2. Nakorn Sawan-Chiangrai			6,013,968	9,712,817	9,587,175	1,023,711	80,976	26,418,648
3. Udorn-Sakol Nakorn	419,423	1,802,549	5,829,352	1,043,240				9,094,565 ^{b/}
4. Khonkaen-Chumpae		1,659,293	2,811,837	196,386	62,193			4,729,711
Subtotal								60,648,442
<u>Supervision</u>								
1. Bangkok-Sriracha	82,868	307,390	269,607	233,737	98,684			992,287
2. Nakorn Sawan-Chiangrai		27,194	506,303	738,256	546,523	247,424	166,083	2,232,392
<u>Revision and Design</u>								
1. Nakorn Sawan-Chiangrai		104,962	19,190	11,747	6,843	97,794	11,895	252,433
Subtotal								3,477,112
Grand Total	1,922,980	10,432,107	23,037,965	16,359,641	10,744,977	1,368,930	258,955	64,125,555

^{a/} The following construction costs supplied by the Department of Highways are slightly different from those in Table 1 taken from the Bank Supervision Report of January 1973.

^{b/} This is US\$500,000 less than the cost of the road reported in the most recent January 1973 Bank Supervision report. It accounts for the slight difference in total actual project costs (US\$64.58 million vs US\$64.12 million reported here).

SOURCE: Department of Highways Completion Report, January 5, 1973.

Table 3

Thailand Loan 455-TH. Expected and Actual Disbursements
(US\$ million)

<u>Year</u>	<u>Expected</u>	<u>Actual</u>
1966	4.3	0.92
1967	12.8	4.99
1968	13.3	11.00
1969	5.6	7.92
1970		5.26
1971		0.77
1972		0.20
Total	36.0	31.06

SOURCE: IBRD Statement of Loans, 1966-1972.

TABLE 4

Thailand: Loan 455-TH. Projected and Actual Traffic Levels

	Length (km)	1965	1970	1971	1972 ^{a/}	1973	1974	1975	Annual Rate of Growth (From 1970) %	% Difference Projected Actual in 1971
A. Bangkok-Sriracha										
1. Bangkok - Km 6	6									
Projected			15,500	16,879	18,381	20,016	21,797	23,736	8.9	
Actual		9,550	n.a.	n.a.	n.a. b/				n.a.	
2. Km 6 - Choburi	45									
Projected			11,750 ^{c/}	11,750	11,750	11,750			c/	
Actual		6,600	9,763	10,691	12,366				12.6	- 9
3. Choburi - Sriracha	44									
Projected			10,400	11,284	12,243	13,283	14,412	15,637	8.5	
Actual		6,200	12,664	14,373	15,145				9.3	+ 27
B. Nakorn Sawan - Chiengrai										
1. Nakorn Sawan - Klong Klung	77									
Projected			1,800	2,007	2,237	2,494	2,780	3,099	11.5	
Actual		900	1,837	2,017	2,638				19.9	+ 0.5
2. Klong Klung - Tak	104									
Projected			950	1,054	1,170	1,298	1,440	1,598	11	
Actual		375	1,025	1,375	1,706				29	+ 30
3. Tak - Thern	90									
Projected			500	535	572	612	654	700	7	
Actual		250	839	1,112	1,337				27	+107
* Thern - Lampang	100									
Projected d/		125	350	376	404	434	466	500	7.4	
Actual			645	n.a.	n.a.					
* Lampang - Ngao	87									
Projected d/		275	400	434	471	511	554	600	8.5	
Actual			850	990	n.a.					
4. Ngao - Chiengrai	147									
Projected			1,100	1,186	1,278	1,378	1,485	1,600	7.8	
Actual		450	1,635	1,679	2,212				16.3	+ 41
C. Udorn - Sakol Nakorn										
Projected	160		750	831	920	1,020	1,130	1,252	10.8	
Actual		300	1,089	1,245	1,189 d/				4.5	+ 50
D. Khonkaen - Chumphae										
Projected	95		1,100	1,240	1,397	1,574	1,774	1,999	12.7	
Actual		500	1,221	1,073	1,227				0.2	- 15

a/ Except for the Bangkok-Sriracha road, the available 1972 traffic counts are those taken in April. Another count is usually taken in October.

b/ This section, a suburban road in 1965, has now become a congested city street.

c/ The road was expected to reach capacity in 1970.

d/ Impact of Chiangmai-Lampang traffic not taken into account.

e/ This figure is due to the relatively low traffic observed on one section of the road. It might well be an error because traffic on the other two sections confirms the increasing trend.

* Included in the project for further study, but not for construction.

Sources: Appraisal Report No. TO 531a, May 31, 1966. Department of Highways Traffic Counts.