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IMPLEMENTATION COMPLETION REPORT

KINGDOM OF THAILAND

**THIRD HIGHWAY SECTOR PROJECT
(LOAN 3220-TH)**

JUNE 26, 1995

**Infrastructure Operations Division
Country Department I
East Asia and Pacific Region**

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CURRENCY EQUIVALENTS

Currency Unit = Baht (B)

US\$1 = B 26 (April 1990)

US\$1 = B 25 (December 1994)

FISCAL YEAR

October 1 - September 30

UNITS AND MEASURES

(Metric System)

ABBREVIATIONS AND ACRONYMS

| | | |
|-------|---|--|
| ADB | = | Asian Development Bank |
| DOH | = | Department of Highways |
| ERR | = | Economic Rate of Return |
| LTD | = | Land Transport Department |
| MOTC | = | Ministry of Transportation and Communications |
| NESDB | = | National Economic and Social Development Board |
| NSC | = | National Safety Council |
| ONEB | = | Office of the National Environment Board |
| PD | = | Police Department |
| PWD | = | Public Works Department |

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**IMPLEMENTATION COMPLETION REPORT
KINGDOM OF THAILAND
THIRD HIGHWAY SECTOR PROJECT
(Ln. 3220-TH)**

Preface

This is the Implementation Completion Report (ICR) for the Third Highway Sector Project (Ln. 3220-TH) to the Kingdom of Thailand in the amount of US\$ 50.0 million equivalent which was approved on June 7, 1990 and made effective on September 11, 1990.

The loan was closed on the original closing date of December 31, 1994. Final disbursement took place on February 15, 1995, at which time the balance of US\$ 872,694.71 was canceled.

The ICR was prepared by Ephrem Asebe, Consultant, EA11N, Infrastructure Operations Division of the East Asia & Pacific Region, Country Department I and reviewed by Vineet Nayyar, Infrastructure Division Chief and Mr. Mohammad Farahandi, Acting Projects Adviser. The borrower provided comments that are included as appendixes to the ICR.

Preparation of this ICR was initiated during the Bank's last project supervision mission in November 1994. A separate ICR mission was undertaken in February 1995 to obtain Government views and to assist the Borrower in the preparation of its own contribution to the report. It is based on material in the project file. The Borrower further contributed to the preparation of the ICR by providing views reflected in the mission's aide-memoire and providing a separate evaluation, which is attached as Appendix B.

**IMPLEMENTATION COMPLETION REPORT
KINGDOM OF THAILAND
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(Ln. 3320-TH)**

Evaluation Summary

Introduction

i. The Third Highway Sector Project (Ln. 3220-TH) was the 12th in a series of projects to assist the highway sector, beginning with the National Highway Project (Ln. 341-TH) in 1963. In 1988, because of the level of maturity reached by the Department of Highways (DOH), the Bank shifted to a sector format of which the project under review is the third in a series which now numbers four. Up to and including the Third Highway Sector Project, the Bank had lent a total of US\$ 549.6 million to the highway sub-sector in Thailand. The project also represents the Bank's third and final financial participation in the Government's 1987-1991 Sixth Five-Year Road Program, comprising an investment of US\$ 1,478.5 million financed by the Government, the Japanese Overseas Economic Cooperation Fund (OECF), Asian Development Bank (ADB), and IBRD.

ii. Past highway projects have often been implemented within budget and ahead of schedule by the DOH, which is considered to be a mature institution. The Project Completion Report (No. 13768) covering both the Highway Sector Project (Ln. 2984-TH) and the Second Highway Sector Project (Ln. 3008-TH) showed higher economic rates of returns for the sub-projects than at appraisal despite some initial delays and cost overruns experienced in implementation, mainly due to the economic boom and heavy demands on the construction industry, which required rebidding of some contracts.

Project Objectives:

iii. The main objectives of the Third Highway Sector Project (together with the Highway Sector Project (Ln. 2984-TH) and the Second Highway Sector Project (Ln. 3008-TH) were to assist the Government in further improving the overall efficiency of the highway sector and were aimed at: a) improving the quality of interurban roads (by focusing on maintenance and rehabilitation); b) relieving congestion (by improving capacity); (c) improving road traffic safety; d) reducing environmental pollution from vehicle emissions and traffic noise; and e) improving policies on road transport and road use.

iv. The Bank financed a total of US\$ 187 million under the first three highway sector projects out of DOH's US\$ 1,478.5 million Sixth Five Year Development Program. The Third Highway Sector loan amounted to US\$ 50.00 million of which US\$ 38.1 million was allocated for civil works (rehabilitation/improvement of interurban roads and bridges); US\$ 3.5 for equipment (to reduce air and noise pollution) and US\$ 8.0 million for consulting services and training.

v. The Bank sought and reached agreement on: a) the level and composition of DOH's 1987-1991 Sixth Five Year Highway Development Program; b) the financing plan; c) the annual review of

the program implementation; d) the priority of maintenance and rehabilitation over new road construction during periods of resources constraints; e) the economic and technical criteria for the road works; and f) the preparation of Action Plans for traffic safety, vehicular emission and noise pollution and road transport industry efficiency by December 30, 1990. All of the aforementioned covenants were relevant to maximizing benefits, and were complied with.

vi. Thailand's rapid economic growth (averaging 12% per annum between 1987 and 1991) combined with an average traffic growth on the order of 17% p.a in the late 1980's, and a vehicle fleet growing at about 14% p.a., continued to place severe and increased strains on the country's transport system. The Government's Plan for dealing with these complex issues was appropriate, and the Bank's support timely. The project's civil works component were within the competency of the DOH, were realistically appraised, and presented no special problems. All the objectives were clearly formulated, were designed to build on past achievements, and were properly phased for follow-on. The scope of the Action Plans was realistic and they have established objectives and a program of action which has enjoyed continued Government support under the Se HPlan (1992-96), which has continued to focus on the implementation of the objectives established under the Action Plans with support under the Bank's Fourth Highway Sector Project (Ln. 3446-TH).

Implementation Experience and Results.

vii. The Project achieved all of its major objectives and is likely to achieve substantial development results without major difficulties given the Government's commitment through follow-on projects. All the road sections that DOH had selected for financing under the Project were successfully implemented, generally before the stipulated dates and within the contract prices. They included 15 rehabilitation sub-projects, totaling 469.76 km, with an initial contract price totaling about US \$67.2 million, and requiring loan funds of US\$ 33.6 million. The ERR estimates for the sub-projects after completion are higher than the minimum required Economic Rate of Return (ERR) of 12%. With respect to the Action Plans, most of the activities were completed. All the project covenants were met. However, overall physical performance of DOH's Sixth Five-Year plan was only 70% completed and the balance of the projects were carried over to the Seventh Plan. The main reasons for the relatively lower performance were initial delays, high cost overruns due to sharp rises in construction costs, and construction capacity constraints due to increasing private sector demands.

viii. The Project is likely to be sustainable. Government's commitment, institutional capability, and built-in incentives, supported by an outlook of continued sustained economic growth and budget surplus provides a strong impetus to DOH's program. The Government is keenly aware that the continued dynamic economic growth can be maintained only if the road sector, which handles 80% of all freight ton-km and 90% of all passenger-km, does not become a bottleneck. As previously stated, DOH is a mature institution capable of effectively planning and implementing a large scale investment program, while the other primary implementing agencies, the Ministry of Transport and Communications (MOTC) and the Land Transport Department (LTD), recognize their respective current institutional weaknesses and are consequently augmenting their institutional capacity with technical assistance partly financed under the Fourth Highway Sector Project (Ln. 3446-TH). The Bank has maintained a dialogue on the project issues through its supervision and preparation of follow-on projects. With regard to the urban environmental issues, it is clear that the Action Plan components

have definite social impact considerations which in turn encourages Government to adopt policies favorable to changes.

ix. The key factors supporting sustainability are the same ones which made it possible to achieve the initial project objectives: borrower commitment, institutional capabilities, built-in incentives, and robust economic growth.

x. The Bank's participation in helping to address road safety, air and noise pollution and road transport efficiency issues through the Action Plans has had a catalytic impact and is favorably regarded by the officials of the implementing agencies. The Bank fostered ownership of the program, starting with the initial concept of the Action Plans, by recognizing the initiatives of the implementing agencies, and by building support for the project through the participation of the relevant institutions in the Plans' further development and implementation. With respect to DOH, the Bank recognized its relative maturity and allowed DOH to select priority projects, and manage the overall program within the parameters set in the Loan Agreement.

xi. The DOH has performed most satisfactorily with respect to the implementation of the civil works components of the project. Despite difficulties arising from the unanticipated high economic growth (average planned GDP growth was 5% for 1987-91, while actual growth was 12%) the Borrower continued to meet the loan covenants and achieved highly satisfactory results. The preparation of the Action Plans, while slower than anticipated, was also acceptable. It is clear, however, that to improve on the results achieved to date, the Land Transport Department will require additional institutional capacity as its current staffing levels are not adequate to deal with the emerging complex issues that it will face in the future.

Summary of Findings, Future Operations, and Lessons Learned

xii. **Findings** - Thailand's road transport development has entered a new phase towards the end of the Sixth Highway Development Program. In the future, improving the quality of the existing road network is equally as important as the physical growth of the network. The Bank's continued involvement is playing a catalytic role in enhancing the quality and efficiency of the road transport sector. The long term Bank and Government relations in the sector have produced a special relationship which is mutually beneficial. While DOH has proved to be a viable institution capable of implementing complex investment programs, this cannot be said of LTD, which has only recently been a beneficiary of Bank financed project components.

xiii. **Future Project Operations and sustainability** - The three Action Plans for the operational phase of the project supporting its sustainability are: a) the follow-on program (Bank's Fourth Highway Sector Project); b) the prioritizing of rehabilitation and maintenance (DOH Seventh Highway Program); and c) the use of sophisticated tools such as the Highway Design Model (HDMIII/IV) to improve Thailand's Pavement Management System.

xiv. **Lessons for Future Projects in Thailand** - The main lessons learned are that: a) the Bank should have recognized that a more detailed appraisal of the project would have helped the Borrower in the implementation of the project, particularly in view of the impact of the effect of rapid economic growth on the project costs. At the same time, preparation of more detailed terms-of-reference for the

technical assistance components under the Action Plans would have helped to reduce the time required between completion of the Action Plans and their implementation; b) the Bank should have recognized the institutional weakness of the Land Transport Department and included specific technical assistance in the project to assist in the institutional strengthening of the department as well as help in the implementation of LTD managed components; and c) in Thailand, the impact of sustained economic growth on the performance of the road transport system has resulted in negative externalities such as problems of safety, noise and air pollution. Now that the country has built its basic road network and the investment strategy shifts to include more complex socio-economic policies, a greater understanding of the interrelationships between the macroeconomic environment and road transport sector dynamics may be critical for future efficient allocation of resources in the transport sector.

**IMPLEMENTATION COMPLETION REPORT
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(LN. 3320-TH)**

PART I: IMPLEMENTATION ASSESSMENT

A. Statement/Evaluation of Objectives

1. **Background and Statement of Objectives** - The history of the Bank's involvement in the highway sector dates back to 1963 when the National Highway Project (Ln. 341-TH) was approved. Up to the Third Highway Sector Project, a total of eleven loans amounting to US\$ 549.6 million have been for highway development. This project also represented the Bank's third and final financial participation in the Government's 1987-1991 Road Development Plan, comprising an overall investment of about US\$ 1,478.5 million, financed partly by the Government, ADB, Overseas Economic Cooperation Funds of Japan and the Bank. Thailand's transport system is multi-modal, though road transport plays a predominant role - handling 80% of all freight ton-km and 90% of all passenger-km. In 1990, the public road network consisted of approximately 189,414 km, of which 52,451 km or 27.6% was under the responsibility of DOH. The average traffic volumes on roads in the Central Region was nearly 8,000 vehicles per day. Despite large transport sector investments over the last twenty years, Thailand's rapid economic development (averaging 12% p.a. between 1987 and 1991) continued to place severe and increasing strains on the country's transport system. With traffic growth averaging 17% p.a. in the late 1980's and the vehicle fleet growing at about 14% p.a., the reduction of congestion, vehicle emissions and air pollution, and increasing road safety and road transport sector efficiency emerged as critical issues.

2. Past highway projects had been successfully implemented by DOH, a mature institution, often within budget and ahead of schedule. The project completion report (No. 13768 covering both the Highway Sector Project (Ln. 2894-TH) and the Second Highway Sector (Ln. 3008-TH) produced higher economic rates of returns for the sub-projects than at appraisal, despite some initial delays and cost overruns experienced during implementation. These delays and cost overruns were mainly due to the economic boom, which resulted in heavy demands on the construction industry.

3. The main objectives of the Third Highway Sector Project were to assist the Government in further improving the overall efficiency of the highway sector. Together with the Highway Sector Project and the Second Highway Sector Project, the Third Highway Sector Project (Ln. 3220-TH), was designed to support DOH's highway development plan for interurban (National and Provincial) roads which aimed at: (a) improving the quality of interurban roads (by focusing on maintenance and rehabilitation); (b) relieving congestion (by improving capacity); (c) improving road traffic safety; (d)

reducing environmental pollution from vehicle emissions and traffic noise; and (e) improving policies on road transport and road use.

4. The components designed to achieve the development objectives of the project were: (a) specific sub-projects of DOH's road development plan selected annually on the basis of the procedures and economic criteria agreed upon under the loan 2894-TH; b) equipment, technical assistance, studies and training to assist in the preparation of the three action plans to achieve (i) road traffic safety; (ii) improving environmental conditions by reducing pollution caused by vehicular emissions and noise; and (iii) improving the efficiency of road transport for freight and passengers. The Bank provided financing equivalent to US\$ 50.0 million, of which US\$ 38.1 million was for civil works (rehabilitation/improvement of interurban roads and bridges); US\$ 3.5 was for equipment (reduction of air and noise pollution); and US\$ 8.0 million was for consulting services and training.

5. **Evaluation of Objectives** - The Bank's support of the objectives of the Third Highway Sector Project were a logical continuation of its earlier involvement in the sector with the First and Second Highway Sector Projects. The specific objectives of the Bank-financed components of the Third Highway Sector Project were realistically drawn up and focused on the priority phase of the measures necessary to achieve the objectives in the long run. The civil works component was clear, realistic, and within the implementation capabilities of the Department of Highways. With respect to the Action Plans, the Government had taken measures to improve road traffic safety under the First Highway Sector Project (Ln. 2894-TH), and to improve the environment by reducing noise and vehicular emissions pollution under the Second Highway Sector Project (Ln. 3008-TH). Preparation of the three Action Plans represented the initial phase of comprehensively addressing these long term and complex issues in Thailand's transport sector. The underlying concepts were relatively new, and the institutions participating in drafting the Action Plans were many (National Safety Council, Office of the National Environment Board, Department of Land Transport, Police Department, and the Ministry of Transport and Communication). The principal implementing agency, the Land Transport Department (LTD), had no extensive relations with the Bank prior to this project.

6. In order to promote the overall objectives under the project, the Bank sought and reached agreement on: a) the level and composition of DOH's 1987-1991 Sixth Five Year Highway Development Program; b) the financing plan; c) an annual review of the program implementation; d) the priority of maintenance and rehabilitation over new road construction during periods of resources constraints; e) the economic and technical criteria for the road works; and f) the preparation of Action Plans for traffic safety; vehicular emission and noise pollution, and road transport industry efficiency by December 30, 1990. All the aforesaid covenants were relevant to maximize benefits and ensure sustainability. To support the DOH's Sixth Program, the Bank provided financing under the three highway sector loans totaling US\$ 187 million, or 6.2 percent, of the overall DOH Sixth Five Year Highway Development program of US\$ 3,084 million.

B. Achievement of Objectives

7. The Third Highway Sector Project has substantially achieved both its overall sector and specific objectives.

8. **Specific Objectives** - The specific objectives of the project were for the most part achieved. All of the 15 sub-projects identified by DOH, based on the economic and technical criteria agreed upon, were successfully completed. Thirteen were completed ahead of the stipulated time in the contract. The final cost of the 15 sub-projects was below the estimated cost. The economic rates of return for 4 of the sub-projects were higher than estimated at appraisal, and the ERR for all other sub-components was above the minimum 12% threshold set in the Loan Agreement. The fact that 11 of the 15 sub-projects identified by DOH had ERRs below the estimate at appraisal, partially reflected sharp cost increases resulting from the construction boom. The detailed engineering, including environmental assessment of the Bangkok-Chonburi Road and the Bangkok Outer Ring Road was financed under the project, while construction of these roads was financed by OECF. The preparation of the Action Plans included under the project were completed by a committee chaired by LTD, representing concerned agencies. Implementation of the Action Plan components dealing with road safety and reducing environmental pollution were carried out as planned. However, for the Action Plan dealing with road transport industry efficiency, the lack of clear terms-of-reference at appraisal resulted in only a small beginning in this area. Implementation is continuing under the Fourth Highway Sector Project, supported by the Bank.

9. **Sector Policies** - The three highway sector projects focused on improving overall efficiency of the highway sector through increased capacity and improved maintenance of the network under the Sixth Development Program. In this sense, objectives relating to sector policies were substantially achieved. The Program was initially based on the assumption that overall economic growth during the 1987-1991 period would average 5%. However, it turned out that the economy averaged about 12% between 1987-91. The program was revised upward during the Second and Third Highway Sector Projects from the initial US\$ 998.6 million to US\$ 1,316.8 million and US\$ 1,478.5 million, respectively. DOH's development expenditure increases were due to the addition of new projects, and to accommodate the sharp cost increases caused by the pressures on the construction industry. Actual expenditures for the Sixth Development Program were estimated to be Baht 28,873.2 million (US\$ 1,354.2 million, a figure close to the medium forecast), and according to DOH, 70% of the physical targets of the program were met. DOH's total final revised planned expenditure was Baht 77,100.1 million (US\$ 3,084 million) compared to actual expenditures of Baht 74,1485 million (US\$ 2,965.8 million).

C. Major Factors Affecting the Project

10. **Specific Project** - Unlike the first two highway sector projects, the Third Highway Sector Project faced virtually no major problems in attaining its objectives, in spite of difficulties in attracting sufficient bids for some contracts due to fact that the road construction industry was operating at full

capacity. Most of the sub-projects were executed within the contract price, either on or before the estimated contract completion date. With respect to the Action Plans, there was an initial three month delay in the submission of the individual Action Plans, although this delay did not affect their inclusion into the Seventh Development Plan or their being financed under the Fourth Highway Sector.

11. **DOH's Five-Year Program** - Over the planned period, three factors affected the timely and more efficient execution of DOH's Program. Firstly, the implementation of the Program started rather slowly. This delay contributed to the carry over of DOH's program into the Seventh Development Plan. Secondly, the economy was experiencing unprecedented and sustained high growth. The Sixth Development Plan anticipated 5% annual growth rate, while the real GDP grew to be among the highest in the world. between 1987 and 1993. The growth rate throughout the 1987-1991 period was over 12% per annum, and since 1988, the budget has recorded a surplus for six consecutive years. Throughout the same period, the structure of the economy changed, with the manufacturing sector reaching 27% of GDP, the largest in ASEAN. These remarkable achievements in economic growth and structural change created both opportunities and challenges for the infrastructure sector. The anticipated budgetary constraints became non-binding. The high sustained economic growth created rapid increases in the vehicle population and traffic growth, which aggravated infrastructure bottlenecks, not only in the Bangkok Metropolitan Region (BMR), but also in secondary cities, making priority adjustments in the highway investment program a necessity. Particularly in BMR, the costs of congestion, road traffic safety, and air pollution and vehicle emission emerged as serious problems. Finally, in the early phase of DOH's program, the growth of private sector investments, which drove the economic growth, heightened the demand for construction activities. There was high demand for manpower, especially engineers, and there were few contractors available to bid on civil works contracts. Accordingly, the costs of the sub-projects were substantially different than the engineers estimates, as were the bid prices, which led in some cases to rebidding in order to be in compliance with MOF requirements. Thus, initial implementation delays, higher-than-expected growth in traffic demand, and high demand in the construction industry affected the timeliness of implementation of DOH's Five-Year Program.

D. Project Sustainability

12. The sustainability of benefits arrived at under the civil works component of the Project is very likely because of the Government's strong commitment to maintenance (see section H), the strength of DOH's institutional capabilities, and the favorable macroeconomic environment and performance. The Government is keenly aware that the continued dynamic economic growth enjoyed to-date can only be maintained if the road sector, which handles 80% of all freight ton-km and 90% of all passenger-km, does not become a bottleneck to the economy. The Project established Action Plans to improve traffic safety, reduce vehicle emissions and noise, and improve policies bearing on transport efficiency. While some of these activities took place under earlier projects, they were for the first time institutionalized under the Third Highway Sector Project, and continue to be implemented with strong support, both of the Government and the Bank. Two of the five specific transport goals of the Government's current

development plan include the reduction of environmental damage resulting from traffic growth and improving the structure and pricing (efficiency) of infrastructure, and the Bank's continued financial support hinges on the dialogue and achievement of the targets set out in the Action Plans. One risk to the continued institutionalization of this program of action is lack of institutional capacity in two of the key implementing agencies, MOTC and LTD. However, both agencies recognize their respective institutional weaknesses, and are augmenting their institutional capacity with technical assistance, provided under the Bank's Fourth Highway Sector Project. It has also become clear to the Government that implementation of the Action Plans is required to alleviate the very negative social impacts of increased road use, and public pressure provides strong incentives for the Government to sustain these activities through a favorable policy environment. Finally, Thailand's strong macroeconomic performance not only aggravates traffic, but also provides the fiscal resources to rectify the situation.

E. Bank Performance

13. The officials of the implementing agencies were appreciative of the catalytic role the Bank's recognition and support gave to the concept of the Action Plans. In particular, the Bank's participation in the further development of the three Action Plans provided a much needed boost to promote their familiarity among the agencies involved. One of the objectives of the Seventh Five-Year Plan (1992-96) for road transport is the further development of these Action Plans, and as such, the Government has obtained a further Bank loan under the Fourth Highway Sector Project for the ongoing implementation of the Action Plans.

14. The appraisal report was purposely abbreviated and focused on additions to the Sixth Development Plan. However, in view of the initial delays in starting the program and the rapid cost increases experienced during implementation, a more detailed appraisal would probably have been beneficial to the borrower. The Bank recognized that DOH's program designated for 1987-91 would require an additional two years to complete its targets. Accordingly, the completion date was scheduled for December 31, 1993 and the closing date for December 31, 1994. At appraisal, the Bank also accepted the government's position that the program was fixed regarding its total physical targets (except where it is officially revised), but allowed for flexibility by a) adjusting annual targets in line with changes in fiscal and economic conditions and b) adjusting the resources required to achieve the targets.

15. During supervision, the project's physical implementation was consistently rated satisfactory as all the loan covenants were complied with. The quality of supervision was professional, objective and had the respect of the implementing agencies. It was based on a solid understanding of the borrower's institutional capabilities and the Bank's policies and procedures. An episode illustrates the type of communication. Following the Bank's review of a design study financed under the project, the Bank pointed out its shortcomings with respect to an environmental assessment issue. In turn, these

concerns were addressed by DOH and new terms-of-reference were drawn up and further analysis was carried out to complete the project.

F. Borrower Performance

16. Feasibility studies for DOH's road program were generally done in house and the results continue to be highly satisfactory. Generally, about a third of the engineering is done by DOH, while the remaining two-thirds is handled by consultants, mostly financed under the project. Detailed engineering for the civil works financed under this project was carried out by DOH and under four contracts carried out by consultants. These four contracts were signed in October 1990 for a total of Baht 159.2 million (about US\$ 6.26 million) and were satisfactorily completed in early 1992. The preparation of the first phase of a comprehensive medium to long term Action Plan to improve traffic safety, reduce vehicular air and noise pollution and to improve the road transport industry efficiency was satisfactorily completed by a committee made up of representatives from the relevant agencies, chaired by the Director General of the Land Transport Department (LTD).

17. The project provided US\$ 4.8 million for DOH's program to eliminate "black spots", begun under the First Highway Sector Project. Implementation was satisfactory. Also the project provided for 40 portable traffic counters, two sets of weights-in-motion equipment as well as four vehicles used in the operation of the vehicle weighing program. Procurement of this equipment by DOH was carried out in a satisfactory and expedient manner. Procurement of a second lot of equipment for LTD's program to reduce air and noise pollution and improve traffic safety, however, had to be deferred as a result of LTD's unfamiliarity with Bank procurement procedures. The amount of the loan canceled at loan closing related entirely to the LTD equipment procurement. As a result of the extensive delays in procurement, specifications had to be revised and it was determined that the equipment could be more efficiently procured in combination with other similar equipment being procured under the ongoing Fourth Highway Sector Project.

18. The main implementing agency, DOH, had a record of highly satisfactory performance under Bank financed projects, and this satisfactory performance continued under the Third Highway Sector Project. The civil works components were all completed satisfactorily, either on or ahead of schedule. Compliance with loan covenants was also highly satisfactory. The Loans Control Division, under the Deputy Director General for Engineering, DOH, has developed an efficient system to monitor and coordinate the execution of projects. With respect to the preparation and implementation of the Action Plans, there were some delays in coordinating with all the agencies involved in their preparation. As a result, more of their implementation than planned spilled over into the Fourth Highway Sector Project which included a coordinating consultant to assist the implementing and maintain the focus intended. The Action Plans were prepared in house rather than by a consultant, as originally planned, and this contributed to the initial delays which were experienced. The overall result was, however, satisfactory.

G. Assessment of Outcome:

19. The project has achieved all of its major objectives and is likely to achieve the forecast development results, without major shortcomings. Its outcome can be judged as satisfactory. All of the sub-projects executed under the civil work components were completed as planned on or before the contract completion dates. The ERRs were all higher than the minimum rate of 12%. The Action Plans prepared under the project, have been incorporated into the Seventh Highway Plan, further assuring sustainability of the institutional objectives of the project.

20. The overall physical outcome of DOH's Sixth Development was assessed at 70%. This is satisfactory, especially when one observes that the Sixth Plan underestimated the rate of GDP growth by more than 40%. The Sixth Plan, therefore, did not envision the shortages of materials, sharply rising construction costs, nor the eventual need to rebid some of the contracts.

H. Future Operation

21. To assure sustainability and the improvement of the quality and efficiency of road transport, DOH will continue to use the Thailand-Pavement Management (TPM) System. TPM was first introduced in 1984, and has been continually refined since then. DOH is further embarking on a course to improve the TPM by incorporating into it elements of the Bank's Highway Design and Maintenance Model (HDM IV). The TPM has so far proven useful in determining the economically optimal allocation of available maintenance funds among road links on the basis of alternative maintenance strategies.

22. A survey carried out in 1990 showed that 66% of DOH's network length had a roughness of less than 4 IRI (indicating good condition), while only 5% had an IRI above 6 (fair). According to a 1993 survey of all of DOH's paved roads (44,495 km), 62% was considered good, 20% fair and 18% poor. By 1996, DOH expects to be allocated about US\$ 8,000 per km for maintenance; up from US\$ 4,000 in 1992. The quality of the road network is, therefore, expected to show further improvement.

23. The Government in its Seventh Plan, continues to build on the Sixth Development Plan objectives, to achieve maximum utilization of existing infrastructure capacity, while at the same time undertaking capacity-increasing investments to reduce transport bottlenecks that inhibit economic growth.

24. Finally, the Bank is expected to continue its support of the Seventh Plan and beyond, to assure that the strategies initiated under the three Action Plans during the Third Highway Sector Project will reach their goals, and to demonstrate its commitment for sustaining the quality and improvement of the road system. Under these future operational conditions, the proportion of good quality roads, i.e. roads with an IRI less than 4, would increase, and targets set for emission control and road safety would be met.

I. Key Lessons Learned

25. While the project was completed satisfactorily, there are lessons to be learned as described below:

(i) The Bank should have recognized that a more detailed appraisal of the project would have helped the Borrower in the implementation of the project, particularly in view of the impact of the effect of the rapid economic growth on the project costs. At the same time, preparation of more detailed terms-of-reference for the technical assistance components under the Action Plans would have helped to reduce the time required between completion of the Action Plans and their implementation.

(ii) The Bank should have recognized the institutional weakness of the Land Transport Department and included specific technical assistance in the project to assist in the institutional strengthening of the department as well as help in the implementation of LTD managed components. This TA is in place, financed under the Fourth Highway Sector Project.

(iii) In Thailand, the impact of sustained macroeconomic performance on the road transport sector performance has resulted in negative externalities such as problems of safety, noise and air pollution and reduced road transport efficiency. Now that the country has built its basic road network and the investment strategy shifts to include more complex socio-economic policies, a greater understanding of the inter-relationships between the macroeconomic environment and road transport sector dynamics may be critical for future efficient allocation of resources in the transport sector.

PART II: STATISTICAL ANNEX

**IMPLEMENTATION COMPLETION REPORT
THAILAND
THIRD HIGHWAY SECTOR PROJECT
(Loan 3220-TH)**

Table 1: Summary of Assessments

| <u>A. Achievement of objectives</u> | <u>Substantial</u> (/) | <u>Partial</u> (/) | <u>Negligible</u> (/) | <u>Not applicable</u> (/) |
|--------------------------------------|---|-------------------------------------|-----------------------------|-------------------------------------|
| Macroeconomic policies | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input checked="" type="checkbox"/> |
| Sector policies | <input checked="" type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| Financial objectives | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input checked="" type="checkbox"/> |
| Institutional development | <input checked="" type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| Physical objectives | <input checked="" type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| Poverty reduction | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input checked="" type="checkbox"/> |
| Gender concerns | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input checked="" type="checkbox"/> |
| Other social objectives | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input checked="" type="checkbox"/> |
| Environmental objectives | <input checked="" type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| Public sector management | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input checked="" type="checkbox"/> |
| Private sector development | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input checked="" type="checkbox"/> |
| Other (specify) | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input checked="" type="checkbox"/> |
| <u>B. Project sustainability</u> | <u>Likely</u> (/) | <u>Unlikely</u> (/) | <u>Uncertain</u> (/) | |
| | <input checked="" type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | |
| <u>C. Bank performance</u> | <u>Highly</u> <u>Satisfactory</u> (/) | <u>Satisfactory</u> (/) | <u>Deficient</u> (/) | |
| Identification | <input checked="" type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | |
| Preparation Assistance | <input type="checkbox"/> | <input checked="" type="checkbox"/> | <input type="checkbox"/> | |
| Appraisal | <input type="checkbox"/> | <input checked="" type="checkbox"/> | <input type="checkbox"/> | |
| Supervision | <input checked="" type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | |
| <u>D. Borrower performance</u> | <u>Highly</u> <u>Satisfactory</u> (/) | <u>Satisfactory</u> (/) | <u>Deficient</u> (/) | |
| Preparation | <input type="checkbox"/> | <input checked="" type="checkbox"/> | <input type="checkbox"/> | |
| Implementation | <input type="checkbox"/> | <input checked="" type="checkbox"/> | <input type="checkbox"/> | |
| Covenant compliance | <input type="checkbox"/> | <input checked="" type="checkbox"/> | <input type="checkbox"/> | |
| Operation (If applicable) | <input checked="" type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | |
| <u>E. Assessment of outcome</u> | <u>Highly</u> <u>Satisfactory</u> (/) | <u>Satisfactory</u> (/) | <u>Deficient</u> (/) | |
| | <input type="checkbox"/> | <input checked="" type="checkbox"/> | <input type="checkbox"/> | |

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Table 2: Related Bank Loans

| Loan/Credit Number | Project Name | FY Approve | Status PCR/PAR No. (Date) |
|-----------------------------|------------------------------------|---------------|------------------------------|
| <i>Preceding Operations</i> | | | |
| Ln. 341-TH | National Highway Project | 1963 | None. |
| Ln. 455-TH | Second Highway Project | 1966 | PAR 362 (3/19/74) |
| Ln. 535-TH | Third Highway Project | 1968 | PAR 758 (5/27/75) |
| Ln. 626-TH | Fourth Highway Project | 1969 | PAR 1634 (6/15/77) |
| Ln. 870-TH | Fifth Highway Project | 1973 | PCR 4476 (5/9/83) |
| Ln. 1519-TH | Sixth Highway Project | 1978 | PCR 6205 (5/20/86) |
| Ln. 1638-TH | Bangkok Traffic Management Project | 1979 | PCR 7068 |
| Ln. 2035-TH | Provincial Road Project | 1982 | PAR 8447 (3/16/90) |
| Ln. 2311-TH | Second Provincial Road Project | 1983 | PCR 9542 (4/30/91) |
| Ln. 2894-TH | Highway Sector Project | 1988 | PCR 13768 (12/9/94) |
| Ln. 3008-TH | Second Highway Sector Project | 1989 | PCR 13768 (12/9/94) |
| <i>Following Operations</i> | | | |
| Ln. 3446-TH | Fourth Highway sector Project | 1992 | Ongoing |
| | Fifth Highway Sector Project | | Appraised |

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Table 3: Project Timetable

| Steps in Project Cycle | Date Planned | Date Actual |
|--|----------------------------|-------------|
| Identification (Executive Project Summary) | May-89 | 13-Nov-89 |
| Preparation | n/a | 1-Oct-89 |
| Appraisal | Oct-89 Dec-89 Nov-89 | 24-Jan-89 |
| Negotiations | Feb-90 May-90 Mar-90 | 20-Apr-90 |
| Letter of development policy (if applicable) | Mar-90 | 26-Jun-90 |
| Board Presentation | Apr-90 May-90 | 7-Jun-90 |
| Signing | Jun-90 | 13-Jul-90 |
| Effectiveness | 11-Oct-90 | 11-Sep-90 |
| Project completion | 31-Dec-94 | 31-Dec-94 |
| Loan closing | 31-Dec-94 | 31-Dec-94 |

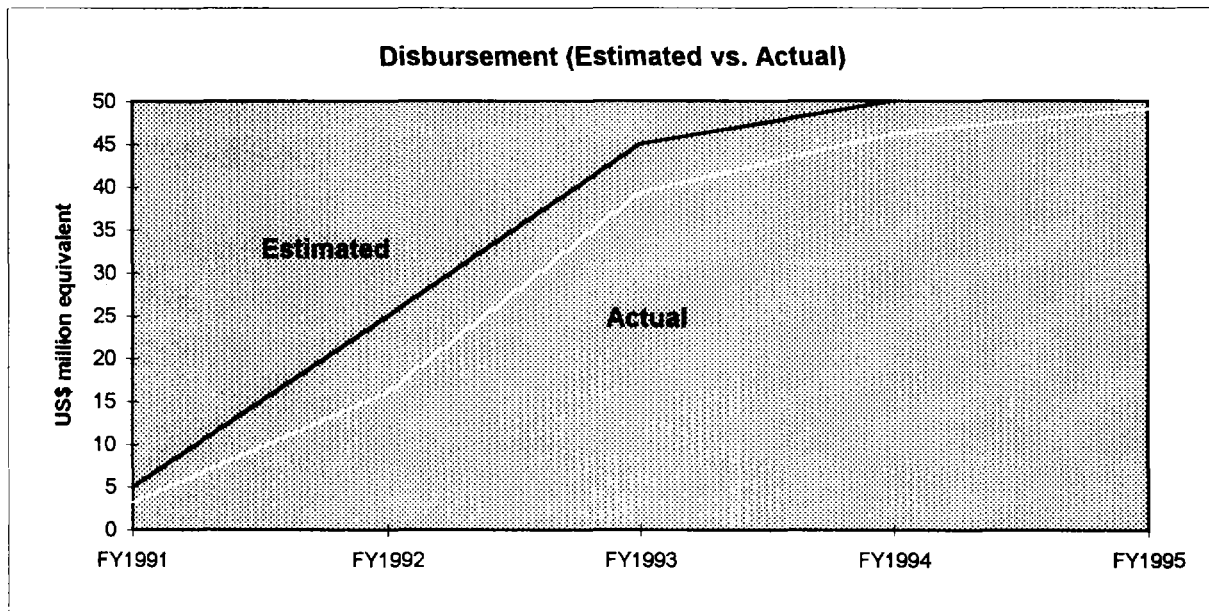
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**Table 4: Loan Disbursements: Cumulative Estimates and Actual
(US\$ millions equivalent)**

| | FY1991 | FY1992 | FY1993 | FY1994 | FY1995 |
|----------------------------|--------|--------|--------|--------|---------|
| Appraisal estimates | 5 | 25 | 45 | 50 | 50 |
| Actual | 3.18 | 16.1 | 39.33 | 46.2 | 49.13 |
| Actual as % of estimates | 64% | 64% | 87% | 92% | 98% |
| Date of final disbursement | | | | | 2/15/95 |



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Table 5: Key Indicators for Project Implementation

A: Construction Time Performance of Project Activities

| Rt. | Contract Title | Contract No. | Length (Km) | Contract Period (mos.) | Notice to Proceed | End of Contract | Date of Subs. Compl. | Compl. Cert. Issued | End Maint. Period | Maint. Cert. Issued |
|------|---------------------------------------|--------------|-------------|------------------------|-------------------|-----------------|----------------------|---------------------|-------------------|---------------------|
| 331 | Route 36 - Route 334 | R-1 | 39.00 | 24 | 11/1/91 | 10/31/93 | 10/19/93 | 11/5/93 | 10/18/94 | 1/5/95 |
| 331 | Routye 344 - Route 304 | R-2 | 59.00 | 28 | 1/1/91 | 4/30/94 | 7/28/94 | 8/11/93 | 7/27/94 | 8/24/94 |
| 214 | J. to Tha Tum - A.Cham Phra | R-3 | 23.80 | 15 | 2/3/92 | 5/2/93 | 2/15/93 | 3/31/93 | 2/14/94 | 3/17/94 |
| 214 | Surin - A.Chom Phra | R-4 | 27.90 | 20 | 2/3/92 | 10/2/93 | 1/30/93 | 3/31/93 | 1/29/94 | 3/17/09 |
| 1174 | B.San Tom Mun - B.Mae Tam Noi | R-5 | 43.60 | 24 | 1/9/92 | 1/8/94 | 12/30/93 | 3/17/94 | 12/29/94 | - |
| 12 | B.Yaeng - A.Lam Sak | R-6 | 22.00 | 17 | 1/1/92 | 3/31/93 | 3/25/93 | 7/1/93 | 3/24/94 | 6/1/94 |
| 3374 | A.Bang Saphan Yai- A.Nong Had Thai | R-7 | 29.00 | 20 | 12/15/91 | 8/14/93 | 10/31/92 | 11/26/92 | 10/30/93 | 1/25/94 |
| 4159 | B.Na Wong - B.Ton Chod | R-8 | 22.60 | 24 | 3/3/92 | 3/2/94 | 1/28/94 | 1/31/94 | 1/27/95 | - |
| 4151 | B.Bo Lo - B.Khuan Nong Hong | R-9 | 27.76 | 22 | 2/1/92 | 11/30/93 | 3/25/93 | 4/16/93 | 3/24/94 | 6/13/94 |
| 24 | A.Songkha - A.Khu Khan | R-10 | 32.00 | 22 | 2/3/92 | 12/2/93 | 6/3/93 | 8/10/93 | 6/2/94 | 12/28/94 |
| 1145 | A.Tak Fa - A.Tha Tako | R-11 | 20.30 | 17 | 2/10/92 | 5/9/93 | 4/28/93 | 7/2/93 | 4/27/94 | 8/29/94 |
| 201 | A.Sikhul - B.Nong Bua Khok | R-12 | 48.00 | 26 | 12/5/91 | 2/5/94 | 9/14/93 | 12/6/93 | 9/13/94 | 10/7/94 |
| 24 | A. Sikhui - Chokchai (section I) | R-13 | 26.00 | 25 | 12/11/91 | 1/10/94 | 8/7/93 | 9/28/93 | 8/6/94 | 9/2/94 |
| 1118 | Pichit - A.Taphan Hin | R-14 | 27.00 | 21 | 1/15/92 | 11/14/93 | 5/3/93 | 7/1/93 | 5/2/94 | 8/19/94 |
| 2263 | Udon Thani - A.Kut Chap | R-15 | 21.80 | 18 | 2/1/92 | 7/31/93 | 7/30/93 | 10/19/93 | 7/29/94 | 8/10/94 |
| | Total | | 469.76 | 323 | | | | | | |

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Table 5: Key Indicators for Project Implementation

**B. Construction Cost Performance of Project Activities
(In thousand Baht)**

| Rt. | Contract Title | Contract No. | Length (Km) | Cost Estimates | | | Actual Cost | | | Cost Diff. |
|------|------------------------------------|--------------|-------------|----------------|---------|-----------|-------------|---------|-----------|------------|
| | | | | Local | Foreign | Total | Local | Foreign | Total | |
| 331 | Route 36 - Route 334 | R-1 | 39.00 | 54,724 | 54,724 | 109,448 | 51,655 | 51,655 | 103,309 | -6,139 |
| 331 | Route 344 - Route 304 | R-2 | 59.00 | 110,246 | 110,246 | 220,491 | 102,324 | 102,324 | 204,647 | -15,844 |
| 214 | J. to Tha Tum - A.Cham Phra | R-3 | 23.80 | 37,669 | 37,669 | 75,338 | 40,186 | 40,186 | 80,373 | 5,035 |
| 214 | Surin - A.Chom Phra | R-4 | 27.90 | 54,752 | 54,752 | 109,504 | 57,662 | 57,662 | 115,323 | 5,819 |
| 1174 | B.San Tom Mun - B.Mae Tam Noi | R-5 | 43.60 | 66,094 | 66,094 | 132,187 | 67,561 | 67,561 | 135,122 | 2,935 |
| 12 | B.Yaeng - A.Lam Sak | R-6 | 22.00 | 43,134 | 43,134 | 86,269 | 43,945 | 43,945 | 87,889 | 1,620 |
| 3374 | A.Bang Saphan Yai- A.Nong Had Thai | R-7 | 29.00 | 46,842 | 46,842 | 93,685 | 45,091 | 45,091 | 90,182 | -3,503 |
| 4159 | B.Na Wong - B.Ton Chod | R-8 | 22.60 | 43,111 | 43,111 | 86,221 | 42,196 | 42,196 | 84,392 | -1,829 |
| 4151 | B.Bo Lo - B.Khuan Nong Hong | R-9 | 27.76 | 45,088 | 45,088 | 90,176 | 38,011 | 38,011 | 76,023 | -14,153 |
| 24 | A.Songkha - A.Khu Khan | R-10 | 32.00 | 72,054 | 72,054 | 144,107 | 72,441 | 72,441 | 144,882 | 775 |
| 1145 | A.Tak Fa - A.Thai Tako | R-11 | 20.30 | 25,638 | 25,638 | 51,277 | 24,689 | 24,689 | 49,379 | -1,898 |
| 201 | A.Sikhul - B.Nong Bua Khok | R-12 | 48.00 | 86,706 | 86,706 | 173,413 | 93,606 | 93,606 | 187,211 | 13,798 |
| 24 | A. Sikhui - Chokchai (section I) | R-13 | 26.00 | 69,321 | 69,321 | 138,642 | 67,591 | 67,591 | 135,181 | -3,461 |
| 1118 | Pichit - A.Taphan Hin | R-14 | 27.00 | 50,572 | 50,572 | 101,145 | 49,964 | 49,964 | 99,927 | -1,217 |
| 2263 | Udon Thani - A.Kut Chap | R-15 | 21.80 | 34,386 | 34,386 | 68,773 | 36,320 | 36,320 | 72,639 | 3,867 |
| | Total | | 469.76 | 840,338 | 840,338 | 1,680,675 | 833,240 | 833,240 | 1,666,479 | -14,196 |
| | Average | | 31 | 56,023 | 56,023 | 112,045 | 55,549 | 55,549 | 111,099 | -946 |

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**Table 6: Key Indicators for Project Operation
(Baht million)**

| Budget Year | Estimated Expenditure | | | Actual Expenditure | | |
|-------------|-----------------------|----------------|-------------------|--------------------|----------------|-------------------|
| | Maint. | Develop. | Ratio Maint./Dev. | Maint. | Develop. | Ratio Maint./Dev. |
| 1987 | 2448 | 3555.7 | 69% | 2448 | 3555.7 | 69% |
| 1988 | 2813.2 | 3110.8 | 90% | 2813.2 | 3110.8 | 90% |
| 1989 | 2707.1 | 6466 | 42% | 2866.4 | 4915.7 | 58% |
| 1990 | 3446.9 | 9836.4 | 35% | 3528.9 | 8053.3 | 44% |
| 1991 | 3706 | 15379.4 | 24% | 4229.3 | 9237.7 | 46% |
| | 15121.2 | 38348.3 | 39% | 15885.8 | 28873.2 | 55% |

Key Operating Indicators:

Budgetary allocation

(Priority for maintenance and rehabilitation of existing roads over new construction of roads during period of resource constraints)

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Table 7: Studies Included in Project

| Study | Purpose as defined at appraisal/redefined | Status | Impact of study |
|--|---|---|---|
| <p>1. Prepare Action Plans on: (i) road traffic safety; (ii) vehicular emission and noise pollution; and (iii) road transport industry efficiency by December 31, 1990.</p> | <p>Assist the Government in: (i) expanding ongoing efforts and preparation of NSC's comprehensive action Program. and its subsequent Implementation for improving road traffic safety.</p> <p>(ii) Controlling air and noise pollution within agreed standards and preparation & implementation of a comprehensive action plan.</p> <p>(iii) develop and implementing programs for improving road transport efficiency, including drafting of changes in rules and regulations, for road user charges, vehicle weight and dimensions, vehicle types and axle loads, privatization of certain services, review of the road transport act</p> | <p>The Action plans were prepared by a committee of representatives from relevant agencies, and chaired by the Director General of LTD. The first Draft was Completed by 2/26/91. Revised Action Plans: to Reduce Emission and Noise Pollution; and Improve Road Transport Efficiency was ready by April 15, 1991.</p> <p>The Actions Plans were approved by the Gov't.. by late August 1991.</p> | <p>The further development and implementation of the Action Plans become the main focus of the Fourth Highway Sector Project which became effective on July 31, 1991.</p> <p>The construction of all road sections were completed mostly ahead of time.</p> |
| <p>Survey and Design of studies : Survey and design (N.& N.E) Survey and Design(N.E.) Survey and Design (Central) Survey and design (South)</p> | <p>Preparations of detailed engineering for the program of financed under loan3220-TH</p> | <p>Four road contracts were signed in oct. 1990 for a total of Baht 159.2million (US\$6.26million). They were satisfactorily completed. The remaining road sections were carried out by DOH.</p> | |
| <p>3. Engineering studies & design of: (i) Outer Bangkok Ring Road (62km) (ii)Bangkok - Chonburi (83km); the construction of which is to be financed under OECF 15th & 18th Yen loans. The studies were financed under loan 3220-TH to expedite the start of construction.</p> | <p>Prepare engineering designs Including : (i) detailed engineering studies with full environmental impact assessment; (ii) design mitigating measures; and (iii) adequately address the resettlement Issues;</p> | <p>The engineering design was completed in early 1993. Following Bank's comment, a new TOR was prepared for the design consultant to study more thoroughly and provide: (i)EIA ;(ii)have mitigating measures design; (iii) prepare adequate plans for the relocation and resettlement of projected affected people.</p> | <p>The consultant has submitted his report. The road sections have been bid and contracts are awarded ; works are underway on most sections.</p> |

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Table 8: Project Costs
(US\$ million equivalent)

| Item | Appraisal estimates | | | Actual /latest Estimates | | |
|--|---------------------|---------------|--------------|--------------------------|---------------|--------------|
| | Local Costs | Foreign Costs | Total | Local Costs | Foreign Costs | Total |
| Road and Bridge rehabilitation/Improvement | | | | | | |
| Civil Works | 33.70 | 33.70 | 67.40 | 32.60 | 32.60 | 65.20 |
| Design | 2.10 | 0.90 | 3.00 | | 11.04 | 11.04 |
| Supervision | 2.00 | 2.00 | 4.00 | | | |
| Sub-Total | 37.80 | 36.60 | 74.40 | 32.60 | 43.64 | 76.24 |
| Road Traffic Safety | | | | | | |
| Civil Works | 4.80 | 4.80 | 9.60 | 2.68 | 2.68 | 5.36 |
| Equipment | | 0.50 | 0.50 | | 0.42 | 0.42 |
| Technical Assistance and Training | 0.10 | 0.24 | 0.34 | | | |
| Sub-total | 4.90 | 5.54 | 10.44 | 2.68 | 3.10 | 5.78 |
| Pollution Control | | | | | | |
| Equipment | | 3.00 | 3.00 | - | - | - |
| Technical Assistance and Training | 0.11 | 0.25 | 0.36 | - | - | - |
| Sub-total | 0.11 | 3.25 | 3.36 | - | - | - |
| Road Transport Industry Efficiency | | | | | | |
| Technical assistance | 0.09 | 0.21 | 0.30 | - | - | - |
| Total | 42.90 | 45.60 | 88.50 | 35.28 | 46.74 | 82.02 |

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Table 9: Economic Costs and Benefits

| Route | Contract Title | Contract No. IBRD/LN 3200-TH | Length (Km) | ADT VPD(YR) Estimates | ADT VPD(YR) Actual/Est. | IRR (%) Before Const. Estimates | IRR (%) After Const. Estimates |
|--------------|-------------------------------|---|------------------------|--------------------------------------|--|--|---|
| 331 | Route 36 - Route 334 | R-1 | 39.00 | 1,307 | 7,336 | 12.2 | 56.9 |
| 331 | Routye 344 - Route 304 | R-2 | 59.00 | 2,025 | 4,240 | 12.4 | 38.8 |
| 214 | J. to Tha Tum - A.Cham Phra | R-3 | 23.80 | 2,005 | 3,435 | 33.1 | 30.4 |
| 214 | Surin - A.Chom Phra | R-4 | 27.90 | 2,480 | 5,575 | 40.1 | 35.8 |
| 1174 | B.San Tom Mun - B.Mae Ta | R-5 | 43.60 | 346 | 888 | 13.8 | 17.4 |
| 12 | B.Yaeng - A.Lam Sak | R-6 | 22.00 | 2,448 | 3,165 | 25.9 | 22.5 |
| 3374 | A.Bang Saphan Yai- A.Nong | R-7 | 29.00 | 455 | 880 | 22.9 | 19.2 |
| 4159 | B.Na Wong - B.Ton Chod | R-8 | 22.60 | 411 | 3,165 | 27.8 | 17.7 |
| 4151 | B.Bo Lo - B.Khuan Nong Ho | R-9 | 27.76 | 487 | 880 | 23.6 | 18.0 |
| 24 | A.Songkha - A.Khu Khan | R-10 | 32.00 | 1,607 | 2,710 | 32.2 | 22.6 |
| 1145 | A.Tak Fa - A.Tha Tako | R-11 | 20.30 | 914 | 1,003 | 44.5 | 31.8 |
| 201 | A.Sikhul - B.Nong Bua Khok | R-12 | 48.00 | 2590 | 4,184 | 32.0 | 27.1 |
| 24 | A. Sikhui - Chokchai (section | R-13 | 26.00 | 1940 | 3,828 | 19.7 | 17.2 |
| 1118 | Pichit - A.Taphan Hin | R-14 | 27.00 | 3730 | 3,898 | 44.5 | 36.7 |
| 2263 | Udon Thani - A.Kut Chap | R-15 | 21.80 | 696 | 2,987 | 28.0 | 67.5 |
| | Total | | 469.76 | | | | |
| | Average | | 31.32 | | | | |

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Table 10: Status of Legal Covenants

| Loan Agree. Section | Convenant Type | Status | Orig. Fulfill. Date | Rev. Fulfill. Date | Description of Convenant | Comments |
|---------------------|---|--------|-------------------------------|--------------------------------|---|--|
| 3.01 | Counterpart funding | C | - | - | Provide the funds, facilities, services, and other resources required for the project | |
| 3.02 (a) | General conditions | C | - | - | Carry out project in accordance with its Highway Sector Program | |
| 3.02 (b) | Sector policy conditionality: budgetary/allocative change | C | | | Provide adequate budgetary allocations to carry out DOH's 1987-1991 Highway Sector Program. | |
| 3.02 (c) | Consultation | C | 3/1/91 | | Review with the Bank by 3/1 of each FY the progress and implementation of the program. | |
| 3.03 (a) | Sector policy conditionality: technical/economic criteria | C | - | - | Prepare and Select Sub- Projects using technical and economic criteria | |
| 3.03 (b) | Sector policy conditionality: budgetary/allocative change | C | 12/31/90 | 4/26/91 | Priority for maintenance and rehabilitation of existing roads over construction of new ones. | |
| 3.04 | Procurement | C | | | Comply with schedule 4: Procurement and Consultants' Services. | |
| 3.05 (a) & (b) | Monitoring/ reviews | CD | 12/31/90 | 5/13/91 | Prepare action plans on: (i) road traffic safety; (ii) vehicular emission and noise pollution; and (iii) transport industry efficiency by 12/31/90. | first draft was received on 3/31/91. Required committee work. |
| 3.05 (b) | Project implementation arrangements | C | | | Implement the action plans in timely manner. | |
| 4.01(b) | Accounts/audits | CD | 6/30/92 6/30/93 6/30/94 | 8/11/92 11/26/93 7/13/94 | Have the Project accounts audited each FY and furnish to the Bank within 9 months of the end of the FY. | The audit is prepared in Thai and translation into English takes time. |
| 5.01(a)-(c) | Implementation | C | | | Assure appropriate maintenance to network and equipment, and that funding for said purpose available. | Complied. |

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Table 11: Compliance with Operational Manual Statements

| Statement Number and Title | Description of and Comments on lack of compliance |
|--|--|
| No significant lack of compliance with applicable Operation Manual statement (OD or OP/BP) | None |

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Table 12: Bank Resources: Estimated Completion Costs

| Stage of Project Cycle | Actual/Estimates Staffweeks | US Dollars (thousands) |
|---------------------------|--------------------------------|---------------------------|
| Through appraisal | 3.3 | 9.6 |
| Appraisal - Board | 12.2 | 34.7 |
| Board - effectiveness | 7.6 | 19.3 |
| Supervision | 23.7 | 63.8 |
| Completion | 7 | 15 |
| Total | 53.8 | 142.4 |

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Table 13: Bank Resources: Missions

| Stage of Project Cycle | Month/ year | Number of Persons | Days in Fields | Specialized Staff skill Represented | Performance Rating | | Problem Type |
|-------------------------------------|----------------|----------------------|-------------------|---|--------------------|----------------|------------------------------|
| | | | | | Impl. Status | Devel. Obj. | |
| Through appraisal | Jun-89 | 2 | 5 | Economist Hwy. Eng. | - | - | - |
| Appraisal - Board | Nov-90 | 2 | 12.5 | Economist Hwy. Eng. | - | - | - |
| Board - effectiveness (start up) | Jun-90 | 4 | 5 | Economist Hwy Eng. Enviroment. | - | - | - |
| Supervision I | Nov-90 | 4 | 2.5 | Economist Hwy. Eng. Enviroment. | 1 | 1 | No significant problem |
| II | Feb-92 | 2 | 5 | Economist Hwy. Eng. | 1 | 1 | No significant problem |
| III | 12-Sep | 2 | 2.5 | Economist Hwy. Eng. | 1 | 1 | No significant problem |
| IV | May-93 | 2 | 10 | Economist Hwy. Eng. | 1 | 1 | No significant problem |
| V | Dec-94 | 1 | 10 | Hwy. Eng. | HS | HS | No significant problem |
| Completion | Feb-95 | 1 | 5 | Econ/Eng. | HS | - | - |

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Table 14: Sixth Plan Projects Carried Forward to Seventh Plan

| Type of Construction by Region | Total Sixth Plan | | | | Sixth Plan Carried Forward to Seventh Plan | | | | | |
|---------------------------------|------------------|--------------|--------|--------|--|--------------|--------|--------|-------|------|
| | km | Baht million | | | km | Baht million | | | | |
| | | DOH | Loan | Total | | 1992 | 1993 | 1994 | 1995 | 1996 |
| Rehabilitation and construction | 3,543 | 13,543 | 2,629 | 16,172 | 1,263 | 3,048 | 3,537 | 928 | 33 | 33 |
| North | 519 | 1,561 | 295 | 1,856 | 252 | 412 | 226 | | | |
| Northeast | 1,092 | 2,661 | 1,068 | 3,730 | 408 | 609 | 423 | 55 | | |
| Central | 1,299 | 7,393 | 903 | 8,296 | 603 | 1,744 | 1,980 | 655 | | |
| South | 633 | 1,928 | 363 | 2,290 | - | 283 | 908 | 218 | 33 | 33 |
| Widening | 1246 | 27618 | 13729 | 41347 | 6004 | 12285 | 13196 | 6301 | 1081 | 139 |
| North | 58 | 1134 | | 1134 | | 295 | 207 | | | |
| Northeast | 238 | 2166 | 3065 | 5251 | 785 | 1919 | 2048 | 495 | | |
| Central | 805 | 22316 | 10381 | 32697 | 4355 | 9454 | 10832 | 5806 | | |
| South | 145 | 1982 | 283 | 2265 | 864 | 617 | 109 | | 1081 | 139 |
| Interchanges | 11 | 0 | 0 | 3110 | 584 | 664 | 571 | 270 | 0 | 0 |
| North | | | | | | | | | | |
| Northeast | | | | | | | | | | |
| Central | 11 | | | 3110 | 584 | 664 | 571 | 270 | | |
| South | | | | | | | | | | |
| New Links | 667 | 17,789 | 10,454 | 25,242 | 1,329 | 2,663 | 7,942 | 9,605 | 7,288 | 36 |
| North | 130 | 915 | | 915 | 346 | 158 | 95 | 63 | 64 | |
| Northeast | 151 | 846 | 115 | 960 | 238 | 212 | 271 | 134 | | |
| Central | 308 | 11,919 | 10,259 | 22,178 | 745 | 1,946 | 7,101 | 9,028 | 7,151 | 36 |
| South | 78 | 1,109 | 80 | 1,189 | | 347 | 475 | 380 | 73 | |
| Paving | | | | | | | | | | |
| North | 3,109 | 9,732 | 2,102 | 11,833 | 1,420 | 2,583 | 1,707 | 443 | 231 | 94 |
| Northeast | 717 | 1,826 | 458 | 2,284 | 523 | 630 | 310 | 137 | 114 | 50 |
| Central | 986 | 2,199 | 676 | 2,874 | 161 | 508 | 451 | 110 | 52 | |
| South | 933 | 4,280 | 785 | 5,065 | 364 | 933 | 518 | 126 | 25 | 19 |
| | 473 | 1,427 | 183 | 1,610 | 372 | 512 | 428 | 70 | 40 | 25 |
| Total | 8,576 | 65,682 | 28,914 | 97,704 | 10,600 | 21,243 | 26,953 | 17,547 | 8,633 | 302 |
| North | 1,424 | 5,436 | 753 | 6,189 | 1,121 | 1,495 | 838 | 200 | 178 | 50 |
| North | 2,467 | 7,892 | 4,924 | 12,815 | 1,592 | 3,248 | 3,193 | 794 | 52 | - |
| Central | 3,356 | 45,908 | 22,328 | 71,346 | 6,651 | 14,741 | 21,002 | 15,885 | 8,257 | 194 |
| South | 1,329 | 6,446 | 909 | 7,354 | 1,236 | 1,759 | 1,920 | 668 | 146 | 58 |

Source: DOH

IMPLEMENTATION COMPLETION REPORT
THAILAND
THIRD HIGHWAY SECTOR PROJECT
(Loan No. 3220-TH)

Table 15: Overall Economic Targets and Performance in the Sixth Plan (1987-1991)

| Category | Fifth Plan Actual Trends (1982-1986) | Initial Sixth Plan Targets | Implemented (1987-1988) | Revised Sixth Plan Targets | Sixth Plan Actual Trends (1987-1991) |
|---|--|----------------------------------|----------------------------|----------------------------------|--|
| 1. Trade deficit (current prices) | | | | | |
| 1.1 Average value per year (million baht) | 55,600 | 35,980 | 70,039 | 102,445 | 160,900 |
| 1.2 Trade deficit/GDP (%) | 5.8 | 2.7 | 5 | 6 | 8.4 |
| 2. Current account deficit (current prices) | | | | | |
| 2.1 Average value per year (million baht) | 36,000 | 11,800 | 29,060 | 56,921 | 91.1 |
| 2.2 Current account deficit/GDP | 3.8 | 0.9 | 2.1 | 3.2 | 4.5 |
| 3. Export of Goods and Services | | | | | |
| 3.1 Value Growth Rate (%) | 9.8 | 9.9 | 30.3 | 22.1 | |
| 3.2 Volume Growth Rate (%) | 8.4 | 7.4 | 18.1 | 14 | |
| 4. Export Goods | | | | | |
| 4.1 Value Growth Rate (%) | 8.4 | 10.7 | 32.3 | 23.9 | 24.5 |
| 4.2 Volume Growth Rate | 8.3 | 8.1 | 18.1 | 13.6 | |
| 4.3 Average Value per Year (million baht) | 177,500 | 298,700 | 351,550 | 492,552 | |
| 5. Income from Tourism (current prices) | | | | | |
| 5.1 Value Growth Rate (%) | 12.2 | 7.4 | 34.3 | 22.6 | |
| 6. Import of Goods and Services | | | | | |
| 6.1 Value Growth Rate (%) | 3.7 | 9.3 | 34.2 | 23.5 | |
| 6.2 Volume Growth Rate (%) | 2 | 4.5 | 26.8 | 17.8 | |
| 7. Import of Goods | | | | | |
| 7.1 Value Growth Rate (%) | 2.9 | 9.5 | 42.9 | 27.3 | 31.9 |
| 7.2 Volume Growth Rate | 2.9 | 4.6 | 34 | 20.9 | |
| 7.3 Average value per year (million baht) | 233,100 | 326,700 | 421,599 | 594,973 | |
| 8. Economic Growth (% yr at constant prices) | | | | | |
| 8.1 GDP | 4.4 | 5 | 9.7 | 8.4 | 10.8 |
| 9. Expenditure Growth (% yr at constant prices) | | | | | |
| 9.1 Private Sector | | | | | |
| -Consumption | 4.3 | 3.7 | 8.8 | 7.8 | 9.2 |
| -Investment | -0.8 | 8.1 | 24.8 | 16.1 | 26 |
| 9.2 Public Sector | | | | | |
| -Consumption | 3.3 | 5.3 | 2.7 | 6.5 | 2 |
| -Investment | 1.8 | 1 | -6.3 | 4.5 | 6.5 |
| 10. Government Revenue/GDP (%) | 14.8 | 15.8 | 16 | 16.6 | |
| 11. Inflation Rate (%) (consumer price index) | 2.9 | 2.3 | 3.2 | 4.2 | |
| 12. Per capita income (baht) | 21,395 | 27,783 | 26,412 | 34,986 | |

**IMPLEMENTATION COMPLETION REPORT
THAILAND
THIRD HIGHWAY SECTOR PROJECT
(Loan No. 3220-PH)**

Table 16a: Special and National Roads: Surface Type and Condition, 1993

| | km | % |
|------------------------------------|--------|------|
| <i>Type of Road</i> | 56,902 | 100% |
| Paved | 44,495 | 78% |
| Unpaved | 12,407 | 22% |
| <i>Surface Type of Paved Roads</i> | 44,495 | 100% |
| Bituminous Surface Treatment | 16,785 | 38% |
| Asphaltic Concrete | 20,982 | 47% |
| Penetration Macadam | 4,197 | 9% |
| Cement Concrete | 2,531 | 6% |
| <i>Condition of Paved Roads</i> | 44,495 | 100% |
| Good | 27,587 | 62% |
| Fair | 8,899 | 20% |
| Poor | 8,009 | 18% |

Table 16b: Special and National Roads: Road Length by Region, 1993

| Region | Maintenance length | | | | Under construction | Total |
|-----------|--------------------|----------|----------|----------|--------------------|----------|
| | Concrete | Asphalt | Laterine | Subtotal | | |
| North | 99.0 | 12,846.0 | 1,383.0 | 14,328.0 | 2,875.0 | 17,203.0 |
| Northeast | 428.0 | 10,765.0 | 1,133.0 | 12,326.0 | 1,712.0 | 14,038.0 |
| Central | 1,845.0 | 10,456.0 | 983.0 | 13,284.0 | 2,617.0 | 15,901.0 |
| South | 159.0 | 7,897.0 | 628.0 | 8,684.0 | 1,076.0 | 9,760.0 |
| Thailand | 2,531.0 | 41,964.0 | 4,127.0 | 48,622.0 | 8,280.0 | 56,902.0 |

**Table 16c: Special and National Roads: Traffic Volumes and Highway Length by Region, 1993
(km) /1**

| ADT Range | North | Northeast | Central | South | Thailand |
|--------------------|-----------|-----------|-----------|----------|-----------|
| <1,000 | 5,664.00 | 6,878.00 | 2,051.00 | 2,051.00 | 16,644.00 |
| 1,000-2,000 | 2,740.00 | 3,878.00 | 2,328.00 | 1,683.00 | 10,629.00 |
| 2,000-4,000 | 2,681.00 | 3,353.00 | 2,727.00 | 1,559.00 | 10,320.00 |
| 4,000-6,000 | 1,116.00 | 1,326.00 | 1,263.00 | 780.00 | 4,485.00 |
| 6,000-8,000 | 362.00 | 272.00 | 468.00 | 625.00 | 1,727.00 |
| 8,000-15,000 | 565.00 | 324.00 | 962.00 | 434.00 | 2,285.00 |
| 15,000-50,000 | 249.00 | 179.00 | 1,109.00 | 207.00 | 1,744.00 |
| 50,000-100,000 | 0.00 | 0.00 | 229.00 | 20.00 | 249.00 |
| >100,000 | 0.00 | 0.00 | 23.00 | 0.00 | 23.00 |
| Total | 13,377.00 | 16,210.00 | 11,160.00 | 7,359.00 | 48,106.00 |
| Average ADT per km | 2,817.00 | 2,766.00 | 7,957.00 | 4,039.00 | 4,025.00 |

1/ For DOH roads with counts available

Source: DOH, 1995

APPENDIXES

**THE KINGDOM OF THAILAND
THIRD HIGHWAY SECTOR PROJECT (LOAN 3220-TH)**

AIDE MEMOIRE

IMPLEMENTATION COMPLETION REPORT (ICR) MISSION

The Third Highway Sector Project was the last in a series of three highway loans the Bank made in support of the Government's Sixth Five-Year Development Plan. The loan was approved by the Board on 06/07/90 and declared effective on 10/11/90. The loan closed as originally planned on 12/31/94.

A World Bank Implementation Completion Report (ICR) mission visited Thailand from 20 to 24 February, 1995, to solicit the views of the government and implementing agencies; to provide advice and support to the government's effort to make its own contribution to the ICR; and to collect additional data for the preparation of the ICC. The action taken and issues raised during the mission are summarized below. The mission is grateful for the cooperation extended to it by officials of MOTC, DOH and LTD.

During the mission, the objectives of the newly introduced ICR requirements were explained to a team designated by the Government to undertake the task of organizing and overseeing the preparation of the ICR. The mission solicited the views of the government's representatives and those responsible for the follow up of the implementation of the project. The mission has had opportunity to see A.Tak Fa - A.Thai Tako (Route 1145). The road was in very good condition.

The mission encouraged the team to focus on: a) assessment of the project objectives, design, implementation and operation experience; b) re-evaluation of the ERR of the sub-projects on the basis of the method used at appraisal; c) evaluation of the Government's and the Bank's performance during the implementation phase of the project with the objective of drawing appropriate lessons from the implementation and operation experiences. The team appreciated the guidance offered by the mission in preparing the ICR.

The Implementation of the civil work components of the project were completed within the engineering cost estimates and the estimated time frame. However, the overall physical completion of the Sixth Highway Development Plan was about 70%. This was attributed to increase in construction prices, material shortage and lack of adequate construction capacity experienced because of the booming economic growth.

The four contracts signed for detailed engineering studies were satisfactorily executed. The detail engineering studies of outer Bangkok Ring Road (62 km), and Bangkok - Chonburi (83 km) and the supplemental studies requested by the Bank on environmental impact assessment and resettlement issues were completed.

The civil work component of the project is most likely to be sustainable. However, measures to control axle-loads and adequate fund for road maintenance will be essential to assure sustainability. Further, the ongoing study to upgrade the existing Thailand pavement management system with HDM III/IV is also likely to enhance sustainability. The mission agrees that the data requirements and output of HDM for

maintenance scheduling and expenditure to be adequate parameters for subsequent monitoring and future impact analysis.

Beside a civil work component, the Third Highway Sector Project loan had also the drafting of three action plans to: improve road transport efficiency; reduce vehicular emission and noise pollution; and improve road traffic safety.

These action plans were completed, after initial delays. The procurement of equipment for analysis of traffic was completed in 1993. However, the procurement of equipment for testing vehicle safety and emission pollution was not financed as planned from this loan.

The action plans provided the basis for subsequent dialogue on the future development issues in the highway sector. The concepts were later incorporated in the Fourth and Fifth Highway Sector Project loans.

The Government values the Bank's support in addressing the issues facing the country, particularly congestion, safety, pollution and road transport efficiency. The Government acknowledged that the participation of the Bank has played a catalytic role in facing these issues with foresight.

DOH was reassessing the Economic Rates of Return for Bank financed roads at the time of the mission and expected to complete the analysis before March 15, 1995. As the actual traffic growth was generally higher than the planned figures, the ERR is expected to be higher than at appraisal.

The overall assessment of the project is highly satisfactory. During the mission it was agreed that the Department of Highway will officially submit the Government's ICR on or before March 15, 1995. The Bank mission office in Bangkok has also agreed to follow up on the timely delivery of the Government's Implementation Completion Report.

March 27, 1995

IMPLEMENTATION COMPLETION REPORT

THIRD HIGHWAY SECTOR PROJECT (LOAN IBRD 3220-TH)

Evaluation Section, Planning Division

Department of highways, Thailand

IMPLEMENTATION COMPLETION REPORT
THIRD HIGHWAY SECTOR PROJECT(LOAN IBRD 3220-TH)

1. Project Description

The main objective of the third highway sector project was to assist the Department of highways(DOH) in further improving the overall efficiency of the highway sector. The project would support DOH's highway development plan for national highway with aimed at :

- (a) improving the quality of interurban roads (by focussing on maintenance and rehabilitation);
- (b) relieving congestion (by improving capacity);
- (c) improving road traffic safety;
- (d) reducing environmental pollution from vehicle emissions and traffic noise;
- and
- (e) improving policies on road transport and road use.

The project consists of following parts :

Part A: Rehabilitation , strengthening, improvement and paving of national highway.

Part B: Improvements in road traffic safety, air and noise pollution control and road transport industry efficiency.

The Third Highway Sector Project , Loan No. 3220 - TH for US \$ 50.00 million, was signed on July 13, 1990 . The loan became effective on July 13, 1990. The loan closing date was December 31, 1994.

The allocation of the amounts of the loan was as follows :

| <u>Category</u> | <u>Amount of the Loan Allocated (U.S. \$)</u> | <u>% of Expenditures to be financed</u> |
|--|---|---|
| (1) Civil Works | 38,500,000 | 50 % |
| (2) Goods | 3,500,000 | 100 % |
| (3) Consultants' services and training | <u>8,000,000</u> | <u>100 %</u> |
| Total | <u>50,000,000</u> | |

2. Project Implementation (for Civil Works)

The DOH selected 15 sections of national highways is shown in Table 1, totalling about 470 KM, to be constructed and improved under this project. These highway sections included in the Five Year Highway Development Plan. The supervision of construction of individual highway project was the direct responsibility of the DOH Resident Engineer and his staff under the overall direction of the Project Director and other Department principals. The Consultant provided staff and services for the overall coordination and general supervision of the project activities.

Overall highway construction and improvement was executed relatively well. The last section of highway construction and improvement was completed in April 1994.

3. Project Costs

Table 3 shows a comparison between the costs envisaged at bank's estimate and the actual project expenditure.

4. Economic Re-evaluation

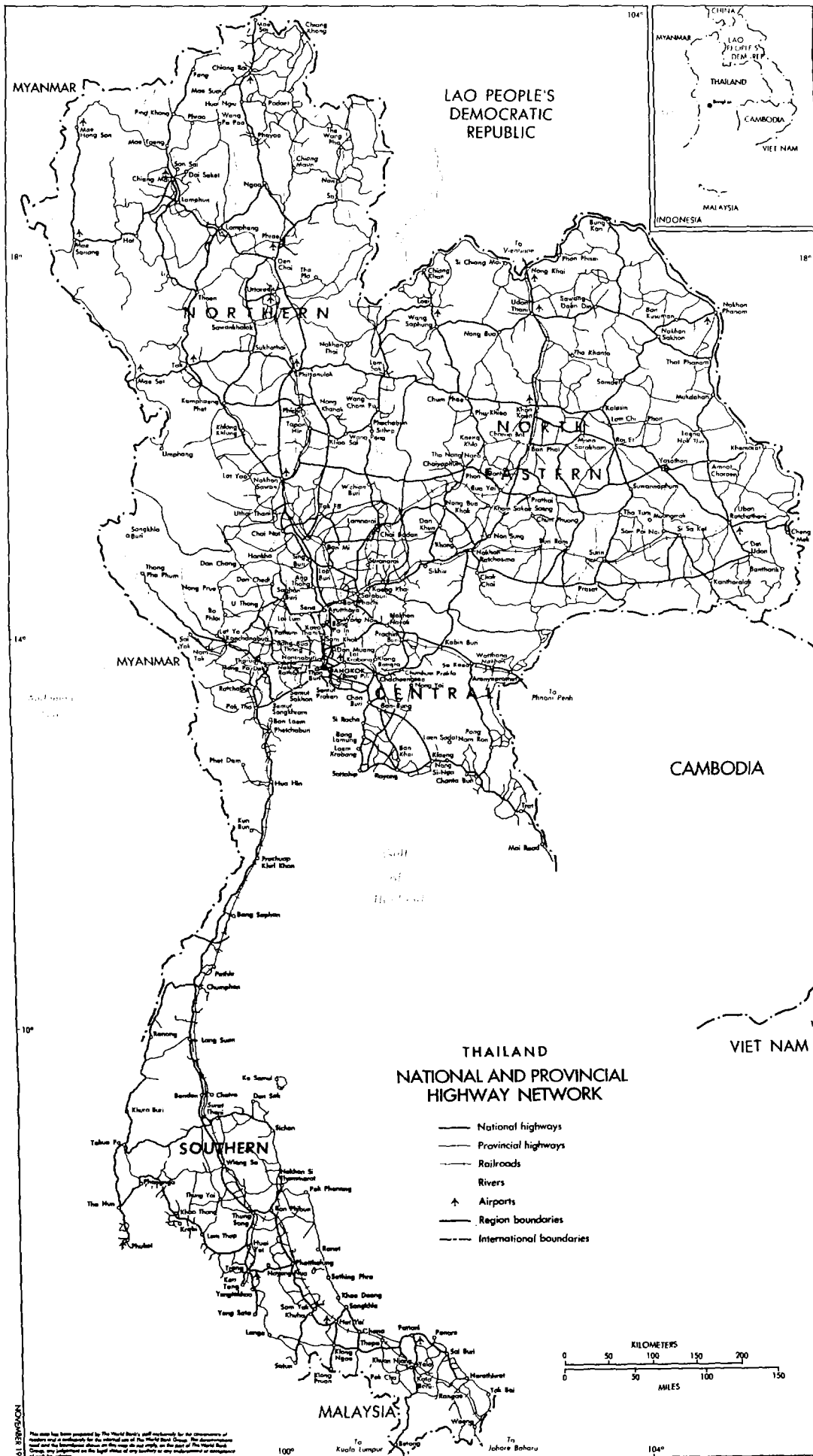
The economic evaluation of each project road was carried out for each road by comparing the costs of constructing and maintaining the road with the anticipated benefits from the improvement over its assumed life (15 years). The economic costs of the project represent outlays, net of taxes and duties, for the feasibility study, engineering design, construction, and supervision of construction. Also included were costs of routine maintenance and period resurfacing required to maintain the standard of road surface with and without the project. The benefits taken into account in the economic analysis were savings in vehicle operating costs. The development benefits were also considered where appropriate.

Vehicle operating costs were calculated for the eight types of vehicles using the road, i.e., motorcycle (MC), cars (PC), light bus (LB), medium bus (MB), heavy bus (HB), light truck (LT), medium truck (MT), and heavy truck (HT). The basic running and fixed costs by vehicle type, road surface and geometric condition, and operating speed were derived.

The re-estimated economic internal rate of return (EIRR) for all 15 highway projects are between 16.0 % and 67.5 % which are higher than the discounted rate of 12 %.

5. Performance of the Bank

The project was closely monitored by the Bank. During implementation, the Bank actively played a constructive role in many parts of Loan Projects. Close monitoring by the Bank was of value in expediting implementation.



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IMAGING

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