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**PROJECT PERFORMANCE AUDIT REPORT**

**INDONESIA - FIRST HIGHWAY PROJECT (CREDIT 154-IND)**

**June 20, 1978**

Operations Evaluation Department

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**INDONESIA - FIRST HIGHWAY PROJECT (CREDIT 154-IND)**

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PROJECT PERFORMANCE AUDIT REPORT

INDONESIA - FIRST HIGHWAY PROJECT (CREDIT 154-IND)

Preface

This report presents a performance audit of the Indonesia First Highway Project for which Credit 154-IND for US\$28 million was fully disbursed in December 1975, with a cancellation of US\$0.2 million. The Audit Memorandum is based on the attached Project Completion Report (PCR), prepared by the Bank's East Asia and Pacific Regional Office, discussions with Bank staff and Government officials, review of project files and the minutes of the Board of Executive Directors' meeting which considered the project.

OED staff visited Indonesia in February 1978 in connection with this audit to carry out discussions with the Directorate General of Highways (Bina Marga), some Provincial Offices, and the Government's Planning Agency (BAPPENAS). The assistance and courtesies extended by the Government are gratefully acknowledged. A draft of this report was sent to the Government for comments; however, no comments were received.

On the basis of the above, while the audit accepts the PCR's principal conclusions, it considers that some of the important failures and the lessons of the project experience are not adequately treated in the PCR. Examination therefore is made in some depth of the problems of: project preparation, work accountability, delays in equipment procurement program and its effects on the road rehabilitation programs, inappropriate composition of equipment spare parts procured under the project, early deterioration of rehabilitated roads, and inadequately prepared training program.



PROJECT PERFORMANCE AUDIT BASIC DATA SHEET  
INDONESIA FIRST HIGHWAY PROJECT (CREDIT 154-IND)

KEY PROJECT DATA

<u>Item</u>	<u>Appraisal Expectation</u>	<u>Actual or Current Estimate</u>
Total Project Cost (US\$ Million)	46.7	50.0
Overrun (%)		7.1
Credit Amount (US\$ Million)	28.0	28.0
Disbursed		27.8
Cancelled		0.2
Date Physical Components Completed	12/73	12/75
Proportion of Time Overrun		60%
Economic Rates of Return:		
Rehabilitation Program	40%	27%—over 100%
Maintenance Program	20%	N.A.

OTHER PROJECT DATA

<u>Item</u>	<u>Original Plan</u>	<u>Revisions</u>	<u>Actual</u>
First Mention in Files			12/24/68
Negotiations			5/69
Board Approval			6/17/69
Credit Agreement			6/20/69
Effectiveness Date			10/02/69
Closing Date	12/31/73		12/31/75
Borrower		Republic of Indonesia	
Beneficiary		Ministry of Public Works and Power	
Fiscal Year of Borrower		April 1 - March 31	
Follow-on Project Name		Second Highway Project	

MISSION DATA

	<u>Month/ Year</u>	<u>No. of Weeks</u>	<u>No. of Persons</u>	<u>Man-Weeks</u>	<u>Date of Report</u>
Appraisal	3-4/69	3	2	6	6/03/69
Supervision I	11-12/69	2.7	1	N.A.	1/20/70
Supervision II	3-4/70	1.7	2	N.A.	7/24/70
Supervision III	10/70	2	2	N.A.	12/09/70
Supervision IV	1-2/71	2.4	1	N.A.	3/12/71
Supervision V	10-11/71	1.7	2	N.A.	12/06/71
Supervision VI	4/72	1	3	N.A.	5/22/72
Supervision VII	10-11/72	2.4	3	N.A.	11/24/72
Supervision VIII	9-10/73	2	3	N.A.	10/12/73
Supervision IX*	7/74	1	1	N.A.	8/16/74

\* Last supervision mission by Headquarter's staff. Subsequent updating Supervision Summaries dated 1/31/75, 8/11/75 and 2/04/76, and Project Completion Report dated 9/27/76 based on information from Resident Staff.

CURRENCY EXCHANGE RATE

Name of Currency	Rupiah (Rp)
FY70	US\$1 = Rp 326
FY72	US\$1 = Rp 378
FY74	US\$1 = Rp 415
FY76	US\$1 = Rp 415



PROJECT PERFORMANCE AUDIT REPORT

INDONESIA - FIRST HIGHWAY PROJECT (CREDIT 154-IND)

Highlights

The main purpose of the First Highway Project was to carry out emergency rehabilitation of 3,000 km of priority road sections in five selected provinces of Indonesia and a four-year maintenance program and related work in 20 provinces, including the five selected for the road rehabilitation program. The project also included technical assistance and training to support the above operations.

The project was completed about two years behind schedule with a cost overrun of about 7%. Due to the nature of the work (i.e., emergency rehabilitation of 109 individual sections) and changes in program composition made by the Government without the Bank's agreement, it was difficult to keep an accurate account of the rehabilitation work done (paras 7 and 21-22). The delay in the maintenance program was due mainly to the slow progress in the maintenance equipment procurement program (paras 8 and 23-26). The quality of the consultants' technical support services and effectiveness varied, but overall their services are considered as satisfactory (para. 9 and PCR, para. 3.23). The training program had to be reorganized during the execution due mainly to the inadequate preparation of the program at the time of appraisal (paras 10 and 31-32).

The reestimated rates of return on the rehabilitation program based on the checks on five sample road sections range between 27% and over 100% (paras 11-13 and PCR, Annex). This represents a generally favorable return over the appraisal estimate of an average of 40% return and is due to much greater traffic growth than expected at appraisal. In spite of the shortcomings in project formulation and execution which are discussed in this audit, the project has accomplished considerable physical results and played a catalytic role in the overall improvement of Indonesia's highway system in the years following the inception of the project. The project was also responsible for substantial improvements in planning and administrative capabilities of the Directorate General of Highways (para. 14). In view of the fact that the project was an emergency operation which was initiated with insufficient preparation, the project's achievement is considered to be substantial.

Other points of interest are:

- inadequate formulation of the road rehabilitation program (paras 16-20);
- what appears, in retrospect, as an unbalanced composition of equipment spare parts procured under the project (paras 27-28); and
- premature deterioration of rehabilitated roads (paras 29-30).



PROJECT PERFORMANCE AUDIT MEMORANDUM

INDONESIA - FIRST HIGHWAY PROJECT (CREDIT 154-IND)

I. Background

1. Indonesia, an archipelago of more than 3,000 islands stretching 5,000 km along the equator, has a land area of about 1.9 million km<sup>2</sup>, about four times that of France. The major islands, Java, Sumatra, Sulawesi and Kalimantan, account for about 70% of the total land area.

2. About 65% of the total population (estimated at about 130 million in 1975) live in Java which accounts for only about 7% of the land area. Population pressure in Java and Bali is intense, while vast parts of other islands, particularly Kalimantan, are undeveloped and under-populated.

3. The economies of the islands are inter-dependent, and this means seaborne trade, mainly in rice, copra, oil products, cattle, construction materials, and local and imported manufactured consumer goods. As a result, sea communication plays a vital role in the economy. The road and rail systems connect the interior of islands with the ports and also serve to connect surplus and deficit areas within each island.

4. At the time of the appraisal of the First Highway Project in 1969, Indonesia's transport infrastructure had fallen into disrepair as a result of long neglect and lack of maintenance. The lack of managerial capacity had compounded the effects of scarcity of funds for the maintenance of existing facilities. The limited maintenance funds available had been mismanaged, investments had been planned haphazardly, and facilities had been operated inefficiently. The Government's priority in the transport sector therefore was improvement of planning and management. In the road sector, the Highway Services, a group of consultants financed by UNDP, was developing a framework for planning and execution of rehabilitation and development for highways, which became the basis for the project. Transport planning and management have now much improved, partly as a result of the present project.

II. The Project

Project Description

5. The First Highway Project, for which a Credit Agreement was signed in June 1969, was to carry out emergency rehabilitation of the country's dilapidated road system, a four-year maintenance program and related works, and to provide technical assistance and training. The credit was to finance US\$28 million of the total project cost of US\$46.7 million which included the following components:

- (i) a four-year program to rehabilitate 109 high priority road sections, totalling about 3,000 km, in five provinces;

- (ii) a four-year program to improve routine and periodic maintenance over the road network in 20 provinces, including the five in (i) above;
- (iii) the rehabilitation of workshop facilities in the 20 provinces;
- (iv) four-year pilot training and experimental programs, in three provinces, for all aspects of highway work;
- (v) the implementation of stores inventory and works costing procedures;
- (vi) the provision of technical experts to support the above operations;

and included the procurement of equipment, materials and services therefor.

Implementation

6. The project was completed in December 1975, two years behind the appraisal expectation, at a cost overrun of about 7%. However, the main part of the project, i.e., road rehabilitation, was completed by the end of 1974, about one year behind schedule. The extension of the Closing Date for the credit to December 1975 was mainly to enable the completion of the equipment procurement program.

7. (i) Road Rehabilitation. The rehabilitation program progressed slowly due to late arrival of equipment purchased under the project and shortage of local funds. By November 1972, well over half way through the project period, only about 30% of the work had been completed. The quality of the work varied and in some areas is inadequate for the traffic and terrain conditions. A supervision mission (in October 1973) reported that inadequate drainage often gave rise to early failure of rehabilitated pavements. Due to the nature of the work (i.e., emergency rehabilitation of numerous individual road sections), it was difficult to keep an accurate account of the work done. This question is discussed under the Points of Special Interest.

8. (ii) Maintenance Program and Workshop Rehabilitation. The program experienced some initial delay for the same reason as for the rehabilitation program. Workshop buildings were completed by the end of 1971, about a year behind schedule. The delivery of maintenance equipment was expected by July/August 1971, but by mid-1972, only about 75% of the highway equipment to be procured under the credit had been received in the provincial headquarters. The main causes of delay in equipment procurement were the Government's unfamiliarity with Bank procurement guidelines and the time it took for the consultants to prepare the list of maintenance equipment to be procured. The program was completed only toward the end of 1975.

9. (iii) Technical Support Services (TSS). Consultants provided (1) management support to the Directorate General of Highways, and (2) operational support to 20 provinces covered by the project. Their services were to cover the period between May 1970 and the second half of 1972, but were extended to February 1973 to complete the tasks initiated. The quality of the consultants' services and their effectiveness varied. However, the PCR considered the consultants' services on the whole can be "qualified as satisfactory" (PCR, para. 3.23). Moreover, the consultants' technical assistance made it possible to repair and operate otherwise abandoned equipment to carry out the road rehabilitation program pending arrival of the new equipment (see paras 24-26).

10. (iv) Training. The training program was undertaken by the consultants as part of their Technical Support Services to cover all aspects of highway work and administration. The consultants conducted courses for the Indonesian highway personnel in such fields as Cost Accounting, Stores Inventory and Soils and Materials Investigations and Testing. The Bank's supervision mission in October 1972 reported, however, that such "an ad hoc training approach" did not meet the requirements, and that the consultants' terms of reference lacked the emphasis on training. The Government and the Bank therefore agreed to institute a different type of consultants' service related more specifically to training of highway maintenance and betterment personnel. Following this agreement, the TSS training was phased out during the subsequent few months and separate consultants specializing in training were retained to continue the training task. The new consultants' work was financed mainly by the Third Highway Project.

#### Project Results

11. The main part of the project was a road rehabilitation program in five provinces, which was to be carried out with the equipment provided by the credit; it accounted for 70% of the total project cost. The Appraisal Report estimated a weighted average return of over 40% on the total rehabilitation expenditure (equipment depreciation as well as current cost, i.e., wages, materials, etc.). No individual section included in the project was shown to produce less than 15% return. Reestimated return in the PCR on five sample sections of roads in the West Sumatra and East and West Java Provinces, which include both high and low traffic roads, shows rates of return ranging between 27% and over 100% assuming the life of the investment is five years instead of seven as assumed in the appraisal. These generally higher returns are due to much greater traffic growth than assumed at the time of appraisal, i.e., about 12% p.a. vs. 6%-7%. The latest information seems to show that the appraisal expectation of 7-year investment life was too optimistic; some road sections had to be rehabilitated again only after two years of original rehabilitation. Using 2-year life, the re-estimated rates of return range from negative to over 100%. The negative return is for two relatively low trafficked sections (250 to 550 vehicles per day in 1974). If generated agricultural production is included in addition to transport cost savings, the rates of return for these low trafficked sections would increase from negative to a range of 7% and 24% (c.f., PCR, Annex).

12. Due to the nature of the work involved, i.e., minimal improvement on more than one hundred of relatively short sections of roads scattered in the five provinces, both the appraisal and the PCR estimates of

investment return were based on incomplete information which was supplemented by the consultants' and Bank staff's rough estimates. Nevertheless, the range of return shown by the PCR calculation on sample sections, which are small in number but appear to be fairly representative, seems to suggest that, with a few possible exceptions, the beneficial effects of the rehabilitation project which were expected at the time of appraisal have generally materialized.

13. The investments in maintenance which accounted for most of the remaining 30% of the project cost were expected to produce about 20% return at the time of appraisal. Due to lack of data, no reestimation of return was attempted in the PCR. But in the light of the generally favorable return on the rehabilitation part of the project, which was similar in its nature to periodic maintenance, and the continued high priority attached to maintenance both by the Government and the Bank, there is little reason to doubt that the maintenance part of the project lived up to the appraisal expectation.

14. The Government recognized the substantial improvements in planning and administrative capabilities of the Directorate General of Highways since its association with the Bank/IDA through the First Highway Project. The improvement on the provincial level of highway administration is considered particularly noteworthy. The Government feels that the institution-building effects of Bank/IDA projects are best realized through close association of Indonesian highway officials with Bank experts. In addition to the help it can expect from the Bank's Resident Staff in Jakarta which includes a full-time highway engineer and a transport economist, the Government considers that as frequent a visit as possible by Bank/IDA supervision missions for current and future projects would be highly desirable.

### III. Main Issues

15. The major problems encountered in project execution were: inadequate preparation of, and lack of accountability for, the road rehabilitation program, delays in equipment procurement and their effect on the project, premature deterioration of rehabilitated roads, and inadequate preparation for the training program. These issues are discussed below:

#### Road Rehabilitation Program

##### (i) Formulation

16. The 109 sections of roads in five provinces totalling the 3,000 km included in the IDA project for rehabilitation were listed in a side letter to the Credit Agreement. These roads were to be rehabilitated using the equipment to be procured under the project. According to the Appraisal Report, the 3,000 km represent part of 12,000 km of high priority roads in all provinces of the country, which were identified by the consultants to be the most urgent highway rehabilitation needs. The Appraisal Report also

states that financial and organizational constraints precluded rehabilitation of all high priority roads in all provinces at that time.

17. The appraisal, however, recognized that an undetermined length of high priority roads in provinces other than the five included in the project was also to be rehabilitated by the Government outside the IDA project. It appears that the roads in the five provinces were selected for the project, in addition to their high priority, because their concentration in relatively adjacent areas would make IDA supervision easier. The "larger program" of the Government, that is, the 3,000 km of project roads plus some other roads in other provinces, was not clearly defined, nor did the relative priority between the rehabilitation programs within and without the IDA project appear to have been agreed between the Government and IDA. Thus, the recognition of this larger program alongside the rehabilitation program under the project, without clear definition of relationship between the two, resulted in an open-ended road rehabilitation work and caused confusion on accounting for project work (see Accountability below).

18. It was already noted that by November 1972, well over half way through the project period, only about 30% of the road rehabilitation work under the project was complete. The Government's comment on this finding was that it had, in fact, rehabilitated more roads outside the agreed list and that the priority had changed since the list of project roads was prepared. In response to this, the IDA suggested to the Government that a new list of roads should be prepared reflecting the latest priority, but there is no record that any such list was ever received by IDA.

19. Two questions arise. Since the list of roads was supposed to include "the most urgent highway rehabilitation needs" identified by the consultants' study, what was the ground for the IDA to agree to a revision of the list? Secondly, having agreed to the need for a revision, why did not the IDA follow up the matter and agree on a revised list? The answer to the first question seems fairly obvious. In spite of the statement in the Appraisal Report that the roads in the agreed list were high priority investment needs, OED doubts that the selection of these roads by the consultants was, considering the poor data and the limited time available, really based on adequate analysis. Discussions with Government officials as well as Regional Projects staff, and available records in the Bank's files, tend to confirm this view. There was considerable urgency to prepare the project quickly preceding the appraisal since it was an emergency program and, in order to meet the emergency need for road rehabilitation, it appears that some compromise was made in the orderly preparation of the project.

20. The answer to the second question - why no revised list was agreed - is not readily available. Since the Government did not prepare a new program but was proceeding with the rehabilitation program on an ad hoc basis, the question arises as to why the IDA did not work with the Government to prepare a revised program, especially since the Resident Staff

may have been in a position to render such assistance as necessary. The available records seem to suggest that IDA merely repeated its request for a new list and, not getting any response from the Government, gave up its insistence on the list after the 1972 supervision mission. The result was that the rehabilitation program proceeded without a clear definition of its composition.

(ii) Accountability

21. Since no new list of roads has been submitted by the Government, it is difficult to determine the extent of achievement of the project objective for road rehabilitation. Because of this, the work progress reported by supervision missions did not appear to have been based on any systematic records; they seem to be only guesstimates. There were even some apparent conflicts among the estimates made by different supervision missions.1/

22. There is also a conflict between supervision reports and the PCR on the question of whether or not rehabilitation work under the project was actually completed. The supervision report dated January 31, 1975 stated that the work was completed and added that "the work accomplished exceeded the project's target of 3,000 km". The PCR (para. 3.03), on the other hand, states that 91% of the roads listed in the side letter were rated good or fair in 1974, implying that rehabilitation work was done on these roads.2/ Irrespective of which estimate is to be accepted, there remains the question that because the agreed list was discarded on the ground that it did not reflect the current priority and no new list was agreed, it is not possible to determine that the project target of rehabilitating 3,000 km of high priority road sections has been accomplished, let alone exceeded.

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1/ For example, a supervision report dated October 1973 suggests that 80% of the agreed work had been executed by about the middle of 1973. Since there was no revised list of roads, the work completed must refer to the original list attached to the side letter. If so, since by November 1972 only 30% of the work was reported to have been completed (c.f., para. 7), this means fully one-half of road work was executed during the 11-month period. In light of the very slow pace of rehabilitation up to the end of 1972, it is rather unlikely that such a drastic improvement in work execution was achieved during so short a period. The supervision report of October 1973 made no reference to such efficiency improvements.

2/ The same paragraph of the PCR (which was dated September 1976) adds that "it can reasonably be assumed that these (i.e., the balance of 9%) unsatisfactory sections were improved in subsequent years".

#### Procurement and Use of Equipment

23. About US\$22.4 million, or 80%, of the total amount of the credit of US\$28 million was allocated to procurement of equipment for road rehabilitation, maintenance and workshops. The appraisal mission recommended that the procurement program should be coordinated with rehabilitation of workshops, recruitment of technical advisors to train equipment operators and the formulation of inventory procedures. For without these actions, the equipment to be purchased could not be properly utilized.

24. Bidding for equipment procurement was postponed a number of times because the rehabilitation of workshops took much longer than anticipated. And, when the specifications for equipment to be purchased were prepared, there were prolonged discussions with the Government and numerous revisions had to be made in response to the Government's comments. These caused delays in the arrival of equipment. While the intention was to carry out the emergency road rehabilitation work with the equipment financed by the credit, even the main part of the equipment procurement program was not completed until three years after the credit signature.

25. When the equipment arrived, it could not be effectively employed because of delays in the release of funds from rehabilitation and maintenance budgets to the Provincial Public Works Departments.<sup>1/</sup> The delay in fund release is said to be due to over-restrictive financial control on the use of funds for force account work and on a rigid interpretation of the central Government's financial decree by the Provincial State Accounting Offices. It was not until toward the end of 1972 that the necessary funds were provided and equipment utilization improved.

26. The result has been that the equipment financed by the project did not adequately serve the purpose of rehabilitating the road system on an emergency basis. Much of the road work that was carried out during the period of the project had to be done with the then existing equipment and with a meager and unreliable supply of funds. This partly explains the inadequate construction of some of the project roads and the subsequent need for premature reconstruction.

#### Spare Parts Procurement

27. About 10% of the expenditure for equipment in the project, or about US\$2 million, was used for the procurement of spare parts. The Government officials mentioned that as they did not have any prior experience with the new equipment at the time of procurement, they had to rely completely on consultants for estimates of spare parts needs. The

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<sup>1/</sup> A supervision mission in April 1972 reported that in Surabaya "more than a hundred items of equipment had been standing idle (some items for up to six months) because the funds for operation of the equipment had not been released".

consultants' recommended spare parts list included about 50% in value of "slow moving" parts such as axles, bumpers, chassis, steering wheels, etc., which later turned out to be not in great demand. In fact, much of these parts have never been used and, due to manufacturers' model changes, these unused parts do not fit the recently acquired equipment.

28. Why the consultants included a large quantity of such spare parts in their list is not clear. The Government officials said, however, that, when the list was presented to them, they had thought that only a small part of all types of spare parts in the recommended list might be purchased pending gaining some experience with the new equipment. However, because of the need to avoid delay in IDA credit disbursement, they proceeded with the procurement of the entire package of recommended spare parts. The Government officials said that one alternative at that time was to cancel part of the credit for spare parts purchase and obtain their financing in a subsequent Bank/IDA project, but this alternative was not pursued because, they felt, there was no assurance that, even if there were to be subsequent Bank/IDA financing of a highway project, costs of spare parts would be included in it. This question could have been raised with IDA, but unfortunately the Government officials seemed to have been somewhat excessively hesitant in their dealings with IDA. Communication between the Bank/IDA and the Government at the time of the First Project does not appear to have been as open as it is today.

#### Premature Deterioration of Rehabilitated Roads

29. While emphasizing the emergency nature of the rehabilitation work which involves relatively minor work,<sup>1/</sup> the appraisal mission expected the investment life would extend to seven years and this was the basis for the economic rate of return calculation. However, as already mentioned, many road sections had to be rehabilitated again within two to four years.

30. The appraisal expectation concerning the useful life of the investment may have been unrealistic. However, the principal cause for the early failure of roads appears to be the absence of a strict adherence to the design specifications in the road work. It was already noted that, while surface water drainage was to be provided under the project, inadequate drainage often gave rise to early failure of the rehabilitated pavements. It appears that the design specifications were often ignored and supervision of the work was inadequate. OED staff's discussions with Government officials suggest that the former was often done deliberately in order to spread funds over as many road sections as possible. PCR economic evaluation showed marginal rates of return for those roads which had to be rehabilitated again in two years. From this, it is clear that spreading the funds so thinly turned out in the end to be a more costly method of dealing with the emergency rehabilitation requirements.

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<sup>1/</sup> The Appraisal Report says the work "would range from minor patching and sealing to replacement of failed bituminous pavements and would include the correction of grade and compacting of shoulders and the rehabilitation of surface water drainage".

Training Program

31. Part of the consultants' Technical Support Services (TSS) was to provide on-the-job training in all aspects of highway work and administration (see PCR, paras 3.24-3.30). It appears, however, that at the time of appraisal the training work was simply attached to the consultants' tasks as just one more additional item. The consultants' terms of reference did not spell out how this task should be carried out. The inadequacies of this ad hoc approach to training was recognized in the supervision report of November 24, 1972, which said that the consultants' "Terms of reference were not . . . specifically oriented towards training and they have, therefore, accomplished only a limited amount of training". Based on this finding, the Bank and the Government agreed that a new approach was needed and decided to phase out the training responsibilities of the original consultants and, in July 1973, a new firm was retained to concentrate on training only, financed mainly by the Third Highway Project (Credit 388-IND). After some initial difficulties, the new firm was reported to be making better progress. The Government feels that, while the new consultants' training approach, such as the use of audio-visual devices, was an improvement over the method used by the previous consultants, their technical knowledge of highway engineering problems did not appear to be fully adequate to deal with concrete problems faced by highway officials in the provinces. Thus, it is not clear whether there was a net improvement in the training program resulting from the switching of consultants.

32. The training program had been undertaken without adequate preparation and as a result much of the efforts under the project has not produced the desired results. The training program was one of many components of the project which was prepared during a relatively short period of time to meet the emergency requirements for road rehabilitation. Although the need for training was obvious, the appraisal failed to properly provide how the program should be organized. In retrospect, it might well have been better to have provided for a study to organize the training activities as a prior step to the training program itself.

IV. Conclusions

33. Although many difficulties were experienced - including delay in execution and inadequate civil construction work, uneven quality and account of the work performed, and poor planning of equipment spares and of training - the project has accomplished considerable physical results, not only within the IDA-financed program but also, through its catalytic role, in the overall improvement of the highway system of the entire country. For example, 68% of Indonesia's road network was rated to be in good or fair condition in 1974 against only 17% in 1968. In view of the fact that the project was an emergency operation which was initiated with inadequate preparation and considering the chaotic state in which the highway administration found itself at the beginning of the project, these are no mean achievements. These efforts are being followed up with the subsequent road projects, the latest being the Fifth Highway Project now being appraised.

34. The economic effects of the project were generally in line with the expectations at appraisal despite the shorter-than-expected service lives of many roads. The project also contributed to the improvement of planning and administration of highways in Indonesia, especially at the provincial level. The institution-building impact of the project was therefore substantial.

35. Notwithstanding these achievements, the project is also a case where a number of important shortcomings were found in its execution. Much of the difficulties with the project were due to its inadequate preparation. While the emergency nature of the project might account for this, poor preparation affected performance and militated against the objective of effectively meeting the emergency requirement. The delays in the equipment procurement program meant that much of the emergency rehabilitation had to be done with the existing inadequate equipment. The lack of adherence to design specifications resulted in a premature deterioration of many rehabilitated roads. The spare parts purchased included a large number of items which turned out to be unneeded. The original arrangements for a training program did not work and a new training program using another group of consultants was introduced.

36. There is also the problem of accountability on the rehabilitation program, i.e., whether the originally agreed list of roads has actually been rehabilitated. In fact, this audit questions the desirability of agreeing during negotiations on such a detailed list of roads to be rehabilitated, which tends to limit flexibility in project execution. Since the road work under the project actually was deferred maintenance on many road sections, following the practice of maintenance projects, it might have been sufficient to agree initially with the Government only on the target volume of work in each province. The composition of road sections to be rehabilitated could have been determined later based on a more adequate study by consultants, and, when prepared, such a list might have served as a working document to which revisions could be made by the Government in consultation with IDA to reflect the changing priorities among roads. Yet, for the purpose of both orderly execution and measurement of physical accomplishment of the project, at least an agreed working list is necessary. As things worked out, a firm list was agreed prematurely, then disregarded instead of making appropriate changes in the list to reflect the changing circumstances, and, consequently, the rehabilitation program proceeded without a framework agreed with IDA.

INDONESIA

CREDIT 154-IND

FIRST HIGHWAY PROJECT

PROJECT COMPLETION REPORT

I. Background

1.01 In 1968 the Government of Indonesia requested an IDA credit to help finance the rehabilitation of high-priority roads and the improvement of road maintenance. Credit 154-IND was the first credit for the transport sector in Indonesia. It developed from the first phase of an investigation financed by the UNDP (1968-70 Highway Services) for which the Bank was executing agency.

1.02 Following years of neglected maintenance, Indonesia's basically adequate road system was in a run-down condition; many road sections were not open to traffic anymore, riding quality was poor and pavement failures widespread.

1.03 Rehabilitation of roads was urgently necessary because economic activities were being stifled and agricultural production was lagging because produce could often not be marketed.

1.04 The UNDP-financed study, which started late in 1968 and was carried out by Kampsax (Denmark) and Louis Berger, Inc. (USA) recommended in April 1969 a rehabilitation program covering about 12,000 km of roads and defined the most urgent investments required for this purpose.

1.05 Technical and managerial constraints made it impractical for Indonesia to execute the whole of the rehabilitation program. The project under Credit 154-IND included about one quarter of the consultants' program and covered the most urgent needs to strengthen Indonesia's highway organization.

## II. The Project

### A. General Description

2.01 The project consisted of:

- (a) A four-year program to rehabilitate high-priority roads, totalling about 3,000 km, in five provinces;
- (b) a four-year program to improve routine and periodic maintenance over the road network in 20 provinces, including the five provinces in (a) above;
- (c) the rehabilitation of workshop facilities in the 20 provinces;
- (d) a four-year pilot training and experimental program, in three provinces, for all aspects of highway work;
- (e) the implementation of stores inventory and works costing procedures; and
- (f) the provision of technical experts to support the above operations. The project included the procurement of equipment, materials and services therefor.

2.02 The purpose of the project was fourfold:

- To rehabilitate high-priority national and provincial roads;
- to reduce the general deterioration of the highway network by improved maintenance;
- to provide the necessary administrative and technical organization for this project and future works; and
- to provide training facilities for all highway work and administration.

2.03 Rehabilitation of High-Priority Roads. The UNDP study (para 1.04) provided the basis for selecting roads, the rehabilitation of which would produce large economic benefits. However, financial and organizational constraints precluded inclusion in the project of rehabilitation work in all provinces.

2.04 The rehabilitation element in the project was limited to five provinces: East and West Java, South and West Sumatera and South Sulawesi; the selection of the provinces was based on achieving the widest possible impact throughout the country; the selection of the roads in the provinces was based on achieving the maximum length of improvements on the economically most important roads. The project included procurement of equipment and materials for this rehabilitation program.

2.05 Improvement of Routine and Periodic Maintenance. Due to lack of equipment, materials and expertise, road maintenance had been neglected and the roads had deteriorated badly. The project provided equipment and technical expertise to resume essential maintenance operations.

2.06 Rehabilitation of Workshops. Workshop facilities, a prerequisite for effective road maintenance and construction, were inadequate. The project concentrated on rehabilitation of workshops by repair or construction of the buildings, the provision of equipment, the provision of mobile service units and technical support.

2.07 Pilot Programs. Three provinces were selected (North Sumatera, West Java and South Sulawesi) for special training support and development of techniques most appropriate to each province; the project provided technical support.

2.08 Implementation of Inventory and Costing Techniques. Technical support was also being given towards defining appropriate inventory control and re-ordering techniques.

2.09 Technical Support. Shortage of personnel in the highway organization and the novelty of much of the equipment and methods to be introduced made it necessary to include in the project large-scale technical support. The project included such support initially for two years.

#### B. Cost Estimates

2.10 The project was expected to require capital expenditures of US\$46.7 million of which the Bank would finance US\$28 million, representing the foreign exchange cost of all imported equipment, materials and expatriate staff required for the project. The Government agreed to finance the balance of capital expenditures (US\$18.7 million) plus all recurrent expenditures estimated at Rp 3,100 million (US\$9.5 million) over the four-year project period.

2.11 The estimates had been based on data supplied by the UNDP Highway Services and on preliminary quotations received. A contingency allowance of US\$1.8 million (about 7%) had been added to the credit account.

2.12 The final cost for the project was basically in line with the estimates. Estimates and actual cost are compared in Table 2 and discussed in para 3.33 and 3.34.

### III. Project Implementation and Execution

#### A. General

3.01 Describing the implementation and the effect of this project entails some difficulties:

- (i) The project description deals with four-year rehabilitation, maintenance and workshop programs, whereas the project financed equipment and consulting services;
- (ii) the Technical Support Services under the project were partly a continuation and overlapped with earlier UNDP-financed Highway Services;
- (iii) the fourth year of the rehabilitation and maintenance program was not covered by consulting services;
- (iv) simultaneously with the IDA-financed program, the Government carried out additional rehabilitation works in the five rehabilitation provinces; and
- (v) after the consultants left, the separate administration for work carried out under the IDA project and work directly financed by the budget was not maintained; also documentation of the first three years is much more extensive than of the fourth year of the project, and of the years thereafter.

#### B. Highway Rehabilitation and Maintenance Program

3.02 Spectacular improvement has been achieved in the condition of the road network as a result of the rehabilitation and maintenance work executed by the national and provincial highway agencies of Indonesia.

<u>Province</u>	<u>Total Length</u>	<u>Open to Traffic</u>			<u>Good or Fair Condition 1/</u>		
		<u>1968</u>	<u>1972 2/</u>	<u>1974 3/</u>	<u>1968</u>	<u>1973 2/</u>	<u>1974 3/</u>
East Java	3,690	3,415	3,690	3,226	400	2,575	2,656
West Java	2,513	2,513	2,513	2,513	1,163	1,930	1,999
South Sumatera	3,605	1,211	3,605	3,279	73	2,168	2,614
West Sumatera	1,676	1,459	1,676	1,646	142	960	1,510
South Sulawesi	2,190	1,731	2,190	2,281	163	1,394	1,464
<hr/>							
5 Provinces	13,674 (100%)	10,329 (76%)	13,674 (100%)	12,945 (100%)	1,941 (14%)	9,027 (66%)	10,243 (79%)
<hr/>							
15 Provinces	16,764 (100%)	12,950 (77%)	16,764 (100%)	19,001 (100%)	3,207 (19%)	9,998 (60%)	11,394 (60%)
<hr/>							
20 Provinces	30,438 (100%)	23,279 (76%)	30,438 (100%)	31,946 (100%)	5,148 (17%)	19,025 (63%)	21,637 (68%)
<hr/>							

1/ Good condition: average speed above 60km/hr; fair condition: average speed above 30km/hr.

2/ Final Report Kampsax/Berger May 1973.

3/ Bina Marga Road Condition Report March 31, 1974.

3.03 The Road Condition Report of the Directorate General of Highways of March 31, 1974 indicated that of the roads in the List of Roads attached to the Credit Agreement 54% was in good condition, 37% in fair condition whereas 9% was still rated in unsatisfactory condition; it can reasonably be assumed that these unsatisfactory sections were improved in subsequent years.

3.04 Much of the early work of the rehabilitation and maintenance program was carried out with labor intensive techniques supported by such existing equipment as could be salvaged at the time. During the latter part of 1971, the equipment financed under the credit started to arrive and with the transition from manual to mechanized techniques, quality of work generally increased. Since a large part of the equipment became in fact operational only in 1973, the effect of the equipment procured under the IDA credit has been mainly in subsequent years.

3.05 Continued instruction has gradually shown results in quality and quantity of output. One should realize, however, that, although serviceability of the roads increased greatly, the rehabilitation improvements were low-cost often stop-gap measures with a necessarily

limited economic life, especially in face of increasing numbers and weight of trucks. As a consequence, several road sections were covered more than once by the rehabilitation program. Service life is also short because most road sections have insufficient subbase and base courses so that rehabilitation work can only have a temporary effect; such road sections are candidates for betterment work for which Indonesia has launched recently a large program, part of which is financed (1,100 km) under the Fourth Highway Project (Loan 1236-IND).

3.06     Highway Equipment. A study of highway equipment requirements for the rehabilitation and maintenance programs was carried out in the first period of the UNDP Services. The project included the procurement of the full requirement of equipment for the five rehabilitation provinces, whereas the remaining 15 provinces were provided with basic equipment for routine road maintenance only.

3.07     The equipment was procured following international competitive bidding procedures in accordance with World Bank Guidelines for Procurement. The consultants prepared draft sets of bid documents and specifications, and participated in the bid evaluation. The Directorate General of Highways, with advice from the Bank's Resident Staff, prepared the final bid documents, selected the successful tenderers and undertook the pre-delivery inspection and the acceptance of the equipment.

3.08     By far the greatest number of bids were accepted from Japanese manufacturers, the remainder from American, French and German firms. Considering that a high percentage of the suppliers were relatively new to international tendering, it is satisfying to note that most items of equipment received were satisfactory. However, in non-standard production items some problems did occur, and it is recommended that in the future such tenders be restricted to manufacturers with experience in that field. Problems were also encountered with back-up services of the manufacturers.

3.09     Table 3 shows the purchases as intended at the time of appraisal and the number of equipment items actually procured. As may be seen, the difference is remarkably small; the modifications were made in the light of actual needs.

3.10     Workshops. Only rudimentary facilities for equipment maintenance and repair existed in 1968. The provision of new equipment under the project would have achieved little without the backing of a strong workshop organization, with adequate buildings and equipment and a sound spare parts supply organization.

3.11     Two types of workshops were constructed: 22 provincial workshops with equipment financed under the project and 5 regional-based workshops with equipment financed by USAID. The provincial workshops are fully equipped for carrying out routine maintenance and minor repairs. The regional workshops are equipped for carrying out major repairs. The workshop buildings were generally completed by the end of 1971 and the workshop equipment installed in early 1972.

3.12 A standardized workshop and fleet control system was prepared and issued by the Technical Support Services and is being used by the workshops. Originally, the workshops were meant to be solely in behalf of the highway divisions in the provinces. However, to avoid duplication, the workshops are also used for the other sectors of the Public Works Organization, with priority for highway equipment.

3.13 Supplies of spare parts were lacking in the beginning because many manufacturers failed to back up their products. However, after 1973 spare parts were gradually received. At present, the spare parts supply is in moderately good shape: there is evidence of oversupply of little used spares and sometimes shortages of quick moving items.

3.14 Laboratories. Although the Highway Department had a well organized central soils and materials laboratory in Bandung, the provincial organizations were insufficient. The Government therefore included in the four-year highway rehabilitation and maintenance project the provision of regional laboratories in six key provinces. The consultants' services included three soils engineers and five quarry experts to support these activities. Most equipment was financed by USAID. The consultants provided considerable training in this field, and local instructors were trained to continue these efforts.

3.15 Warehouses. New warehouses were provided in each of the provincial workshops, as well as in the regional workshops in the rehabilitation provinces. Manuals for implementation of spare part supply systems were provided and the system began to be adopted.

#### C. Consulting Services

3.16 The Technical Support Services under the project were carried out by Kampsax (Denmark) in association with Louis Berger Inc. (USA). By contract of September 20, 1968, these consultants originally were entrusted with the Indonesia 1968-70 Highway Services; the foreign exchange financing for this contract was provided by UNDP with IBRD acting as executing agency. In a parallel assignment, the Indonesia 1968-70 Transport Coordination Advisory Services (TCAS), covering assistance to BAPPENAS, the Government's central planning agency, were performed under the same contract. Work under a continuation of these contracts constituted the Technical Support Services which were financed under Credit 154-IND.

3.17 As the UNDP 1968-70 Highway Services were the basis of the technical assistance element under the credit, a short description of the results of the original UNDP Services follows:

- (i) The services commenced in October 1968; the first task of the consultants was to prepare an inventory of the highway system and of physical and organizational resources available

for highway work. This task was completed in six months and covered 24,000 km of a total of 32,000 km of national and provincial roads in 23 provinces; simultaneously, traffic counts were organized;

- (ii) the consultants' second task was to prepare a rehabilitation and maintenance program to ensure optimum utilization of the existing network. This program was presented in the consultants' interim report of May 1969. The program identified a first priority program of 4,800 km in 20 provinces. Based on the consultants' findings, IDA agreed to finance the foreign exchange cost of the four-year (1970-73) Highway Rehabilitation and Maintenance Program which is the basis of Credit 154-IND;
- (iii) the consultants' third task was to prepare a highway development program for improvements on those highways where rehabilitation work would not be sufficient. Of a total of 24 projects investigated, two were recommended for immediate final engineering and construction, and 11 for further studies;
- (iv) the fourth task was to provide operational and management support to the national and provincial highway administrations. One group in Jakarta provided support to the Directorate General of Highways, whereas three teams were assigned to supporting three selected pilot provinces.

3.18 A program as described above starting virtually from scratch could easily have failed altogether. With excellent cooperation of the highway authorities, the consultants were successful in at least three of their tasks. The inventory and the rehabilitation and maintenance program became the basis of the Credit 154-IND project, and the operational support, although limited in scope, set the stage for the subsequent Technical Support Services under that credit.

3.19 However, the highway development program for future projects was generally ill-conceived in that the design standards as recommended and agreed during this period were much too lavish and had insufficient relation with traffic demand, terrain, climatic condition and development potential, but above all, with the financial possibilities of Indonesia. Although the betterment concept has now been accepted and is being implemented, some overdesigned roads did get built in the meantime.

D. Technical Support Services in Credit 154-IND

3.20 The Kampsax/Berger contract financed out of Credit 154-IND was concluded in April 1970, commenced in May 1970 and was originally scheduled to terminate during the second half of 1972; the services were extended till February 1973. The contract basically called for:

- (i) Continuation of the management support to the Directorate General of Highways through 1972;
- (ii) continuation of the pilot operations in three provinces for another year; and
- (iii) operational support to all 20 provinces covered by the project for about two years.

3.21 Table 4 shows the man-month input in the different activities and in the types of staff: the first column shows the UNDP input and the second column the Technical Services financed under Credit 154-IND.

3.22 The distribution of the consultants' staff in Jakarta and the provinces varied in the course of time but was basically implemented as intended during the time of appraisal:

- 3-5 experts for advice to highway headquarters;
- 20 highway superintendents and 20 mechanical superintendents, 1 each in the 20 provinces covered by the project;
- 5 quarry advisors, one each in the 5 rehabilitation provinces;
- 3 geologists or materials engineers, 1 for each major island.

3.23 The quality of the consultants' staff and their effectiveness varied; especially among the numerous superintendents were several who did not perform well, partly because of the fact that much of the new equipment with which they had to work did not arrive till towards the end of their assignment. Nevertheless, the project's goals were reached, and it is difficult to ascertain how much should be attributed to the consultants. As a whole, the consultants' performance may be qualified as satisfactory.

E. Training

3.24 Special mention should be made of the training element included in the project and its implementation by the consultants' staff. In the field, emphasis was placed on on-the-job training supplemented

by short specific training courses. At the more senior level, the counterparts also received management training and training outside Indonesia through scholarship programs.

3.25 Continuous on-the-job training was carried out in all fields of activity. Training for routine maintenance was achieved by assistance to junior engineers and foremen. Basic training for equipment operators was provided in the larger provinces when and where machines and funds became available. Team training in rehabilitation techniques was accomplished where equipment groups could be assembled. Unfortunately, the late arrival of equipment reduced the effect.

3.26 Considerable on-the-job training was given to soils engineers and technicians, both in laboratories and in the field. Also quarry operators have been trained, although here, too, the late arrival of equipment decreased the effect.

3.27 Extensive training was conducted in the workshops covering all aspects of work, including management, control and documentation and use of tools and workshop equipment.

3.28 Handbooks for foremen were prepared for different pavement techniques; courses were developed and carried out on laboratory work, foundation design and pavement design. The courses provided training for 200 engineers and technicians.

3.29 On the professional and management level, on-the-job training was supplemented by the counterpart system and by training abroad. The counterparts contributed largely to the results of the services. Twenty UNDP-financed scholarships were awarded which allowed a remarkable widening of scope and capability of the able highway staff.

3.30 The consultants also made a considerable effort in proposing and implementing a sound cost accounting system; however, it proved difficult to match the Government's fiscal regulations with their proposals, and the effect of the consultants' work in this field has been small.

#### F. Covenants in the Credit Agreement

3.31 The covenants of Article III of the Credit Agreement were fulfilled. In general, the Borrower complied with the covenants of Article IV quite satisfactorily; the following comments must, however, be made:

- Section 4.01(a). Funds for maintenance operations and for full use of the equipment were in the early years often allocated with considerable delay. It should be noted that at the time Indonesia was in the early years of its recovery period.

- Section 4.01(c). The specific roads rehabilitated were generally those agreed on, but modifications in the program were not always agreed between the Borrower and the Association. However, the object of the program has certainly been reached.

#### G. Performance of the Borrower

3.32 The spectacular improvement of the serviceability of the road network in a very difficult period in Indonesia's development, and largely improved technical capability and capacity of the highway authority's management and personnel, show that a very positive use has been made of the possibilities provided by the input of consulting services and equipment through Credit 154-IND.

#### H. Disbursements

3.33 The delayed procurement of equipment retarded disbursement initially. A comparison with the estimates in the appraisal report shows, however, that at the end of FY72 disbursements had caught up with these delays. It might be difficult to conclude contracts thereafter for the remaining funds in the face of rapidly increasing prices due to the increase of oil prices.

	Bank Fiscal Year				
	1969	1970	1971	1972	1975
Estimated Disbursements	16.4	25.5	27.4	28.0	28.0
Actual Disbursements	0.1	10.2	21.7	26.9	27.8

#### I. Government Expenditures on Rehabilitation of Roads

3.34 The expenditures in Indonesia's development budget for the roads in the rehabilitation program in the five provinces were estimated in the appraisal report at US\$16.3 million. In the first three years of the program, the actual expenditures have been US\$14.3 million. In the years thereafter, no further distinction was made in the budget between "IDA roads" and the rest of the network in the provinces. Over a five-year period, Indonesia spent US\$51.8 million on rehabilitation of roads of which US\$24.8 million were in the five key provinces.

#### Expenditures for Rehabilitation (US\$ Million)

	Appraisal IDA Roads	First Three Years		1974	1975	1970-75
		IDA Roads	Other Roads	Total Roads	Total Roads	Total Roads
5 Provinces	16.3	14.3	1.9	3.9	4.7	24.8
15 Provinces	-	-	4.0	8.7	14.4	27.0
20 Provinces	16.3	14.3	5.9	12.6	19.1	51.8

IV. Review of Economic Evaluation

4.01 It is difficult to evaluate the economic impact of a project such as Credit 154-IND. The road network was so neglected after a period of economic decline that conditions could but improve once Indonesia resumed its drive to development. What different accomplishments would have been achieved with, say, half the project, or with twice as large a project, is conjecture. A fact is that the condition of the road network greatly improved and that the efficiency of the highway authorities increased considerably.

4.02 In the attached annex, rates of return are calculated for five sample road links on an ex-ante and ex-post basis. The most critical factor in the analysis is the life of rehabilitation works; in practice, they last considerably less than the seven years originally estimated. Nevertheless, the ex-post rates on three sample high traffic roads remain high (all over 32%). Two low traffic links are more sensitive to this factor, and rehabilitation has positive returns only with inclusion of generated agricultural production. No information is available on how much production was generated. More than half the links in the project are high traffic roads and will have high ex-post rates. Even if generated production is only modest on the other links, their rates of return will be high enough to give the overall project an acceptable return.

V. Conclusions

5.01 After a remarkably short period of preparation and appraisal, the credit provided for a very large highway equipment procurement and extensive consulting services to support the improvement of maintenance operations in the whole country and the rehabilitation of 3,000 km of roads in five provinces. This was by far the largest assistance to Indonesia in the highway field up to that time, and indeed one of the largest in the world.

5.02 The objectives of the credit have been fully met in that the road network improved and the capability of the highway authorities improved; the project was a success.

5.03 One lesson has been that superintendents are not normally suited to act as isolated individuals as they did in 14 provinces. However technically qualified this group of people may be, they are hardly the type of staff which should be in daily contact with provincial authorities. In future projects of this kind, a professional engineer should complement the superintendents in each province.

5.04 A second lesson is that staff arrival should be better matched with equipment arrival so that consultants' staff can be more effective.

5.05 An important point too is the provision of local funds. Indonesia was financially and economically in great difficulties in 1969. Perhaps it could have been foreseen that the provision of Rupiah funds in the early years of the project would be difficult. In similar future projects, IDA participation in local cost financing, especially in the early years and decreasing thereafter, may be a procedure to consider.



INDONESIA  
CREDIT 154-IND  
FIRST HIGHWAY PROJECT

Reevaluation of Economic Justification

Rehabilitation Element

1. The rehabilitation element under the project was part of a larger rehabilitation program recommended in 1969 by UNDP-financed consultants, Kampsax (Denmark) and Louis Berger, Inc. (USA). That program was based on an inventory covering about 24,000 km out of the roughly 32,000 km of national and provincial roads. The program recommended about 12,000 km for rehabilitation over four years (April 1, 1969 to March 31, 1973), based on an analysis of costs and benefits (reduced vehicle operating costs and, in some cases, the value of increased agricultural production). For each road, a first year benefit/cost ratio (FYB/C) was calculated and roads were ranked for priority on that basis. The results were roughly as follows:

Total program: 11,997 km, FYB/C more than 25%,  
cost US\$114 million equivalent;

Highest priority: 4,810 km, FYB/C more than 50%,  
cost US\$41 million equivalent;

Highest priority for IDA finance: 3,042 km in  
five selected provinces, FYB/C more than 50%,  
cost US\$28.3 million equivalent.

The credit documents included a side letter listing 109 separate links in five provinces and aggregating 3,042 km.

2. IDA's finance for rehabilitation and maintenance (the other main objective of the project) was tied to the purchase of equipment and roughly US\$21 million of the US\$28 million credit went for this purpose. However, road rehabilitation was carried out independently of the arrival of IDA-financed equipment. In fact, many of the roads listed in the side letter were rehabilitated in FYs 1969/70 to 1972/73 with existing equipment before most of the IDA-financed equipment became operational (in 1973 or later). This was within the intention of the Credit Agreement, which defined the rehabilitation element of the project as rehabilitation over a four-year period (by June 1973) of about 3,000 km of high priority links.

Execution of Rehabilitation

3. We do not have a detailed record with respect to each of the 109 links listed in the side letter. We do know that work was done on most of these links (along with work on twice as many other links); in addition, the Government designated other high priority links in the five

selected provinces in substitution of some of the original 109 links. We also know that in the years 1970/71 to 1972/73, the expenditures by the Government on links designated as "IDA financed" amounted to US\$14.3 million equivalent, close to the US\$16.3 million equivalent of local costs estimated in the Appraisal Report for rehabilitation of the 109 links. While the length of road reported to have been "rehabilitated" on individual links was sometimes less than that estimated in the Appraisal Report, this only means that the Government's expenditures from its rehabilitation budget were limited to those, presumably worst, stretches of a link. Lesser work may well have been done on the remainder of the link from other budgetary sources. We have thus assumed that rehabilitation expenditures removed the worst conditions and accounted for the bulk of vehicle operating cost improvements projected for a particular link.

4. In any event, budgetary expenditures are not an appropriate basis for assessing the actual costs of rehabilitation. Nearly half the estimated costs of this work are foreign exchange costs for equipment and materials which are not included in the Government's "rehabilitation" budget. These items are either purchased with rupiahs under separate budgetary categories or financed from foreign aid. Thus only an effective cost accounting system could have yielded a reliable assessment of the costs of rehabilitation. While the consultants attempted to introduce such a system, they had little success in this field (see para. 3.30 of PCR). The consultants' original estimates of rehabilitation costs will therefore be used as the basis for costing the execution of the rehabilitation element.

#### Sample Road Links Selected for Recalculation of Economic Return

5. Five different links have been selected for recalculating the rate of return: two in West Sumatera, one in West Java and two in East Java. The first three were in the original list of 109, while the last two were substituted later. Estimated 1969 ADT (average daily traffic in cars, buses and trucks) on these links varies from about 100 to 1,600; two links were judged to have a potential for inducing additional production. The roads were chosen because we are familiar with them and because we have more detailed records on traffic development and physical conditions on these roads as a result of feasibility studies which were made over the last several years for further improvements on these links. Brief data for each link are set out in Table 5.

#### Ex-Ante Rates of Return

6. Except in one case, we do not have the rate of return originally calculated for each of these links. According to the Appraisal Report, all links included in the original list had rates of return of over 15% if benefits as calculated by the consultants were reduced by 50%; on a weighted basis, the average rate of return exceeded 40%. We do have the FYB/C calculated by the consultants for the five sample links which ranged from 57%-125%, with generated production and from 19%-125% without generated production. (The highest FYB/C were for roads without generated production).

7. In the absence of the original rates of return, we have reconstructed these rates based on the following assumptions:

- (a) Vehicle operating cost savings and benefits from generated production were used as calculated by the consultants;
- (b) these benefits were assumed to grow at 7% p.a. (the consultants had used 6% or 7% but the record does not indicate which in a particular case);
- (c) the benefits continue for seven years, based on the consultants' assumption that after this time the roads would receive major improvements or reconstruction; and
- (d) no benefits or costs were shown for changes in road maintenance costs because the consultants had not quantified them in every case and because they would represent negligible amounts in relation to other costs and benefits.

The rates of return are shown in Part A of Table 6 and range from 14% to over 100%.

Ex-Post Rates of Return

8. Most of the rehabilitation work on Link I was completed in 1972 and the other four links in 1973. Accordingly, the opening year for benefits from rehabilitation was taken as 1973 for Link I and 1974 for the others. Traffic counts were available in all cases for 1974, which were used as opening traffic, except for Link I, where 1973 traffic was derived by interpolation. In the case of Links I, III and IV there was substantial traffic growth since 1969, well in excess of the 6-7% assumed by Kampsax-Berger. Link II showed a 12% drop in traffic which may perhaps be explained by overstatements in the 1969 traffic count, which was based on one count station rather than two as in 1974. Link V had a 16% drop in traffic between 1969 and 1974, but a modest growth between 1972 and 1974 which suggests that the 1969 count may have been an overestimate and that 1972 and 1974 represent the total volumes and trends more accurately.

9. As indicated above, we could not establish rehabilitation costs actually incurred and therefore used the original Kampsax-Berger estimates for the ex-post calculation. We also had no independent basis for evaluating the improvements in vehicle operating costs resulting from rehabilitation because we did not see the roads immediately before and after rehabilitation. While the estimates by Kampsax-Berger of improvement in performance of vehicles may be somewhat generous, we have accepted them as generally reasonable and applied them in the ex-post calculation. In the case of Link IV, the unit vehicle operating cost improvements estimated

by Kampsax-Berger were much higher than their estimates for the adjoining road sections in East Java, whereas the conditions on these roads have otherwise been reported as generally equal. We have therefore calculated an alternative rate of return for Link IV based on improvements valued at only 50%. Both construction and vehicle operating costs escalated between 1969 and 1974 due to inflation, but we believe the increase was proportional and therefore would leave the rate of return calculations unaffected.

10. The rehabilitation of Links I and II was expected to lead to substantial amounts of generated agricultural production. We have been unable to establish actual production before and after rehabilitation of these links, but it seems unlikely that in the case of Link I these would come as rapidly and in as large amounts as projected by Kampsax-Berger. However, a November 1974 Feasibility Study by Lyon Associates, Inc., for further improvements on Links I and II confirms that substantial potential for additional production existed in the influence area of these links. We have therefore recalculated the rates of return on these links assuming the value of generated production will be Rp 15 million in the opening year for Link I (that is, one third the Kampsax-Berger estimate) and Rp 8 million for Link II (the same as the Kampsax-Berger estimate). The original estimates were not adjusted for inflation for the same reason as set out above.

11. Traffic growth rates were those applied in the Fourth Highway Appraisal Report for the years 1975-78 inclusive: 12% per year for cars and trucks; and for buses 12% in West Sumatera, 5% in West Java and 3% in East Java.

12. Benefits were allowed to continue for a maximum of five years and another calculation was made to test the assumption that benefits would continue for only two years unless another rehabilitation took place. A reduced average life of rehabilitation works results from finding in the PCR (para. 3.05) that rehabilitation improvements had limited economic life and that "several road sections were covered more than once by the rehabilitation program". Similar conclusions were given by Kampsax-Berger in their Final Report of May 1971 and were established during the appraisal of the Fourth Highway Project. The more optimistic estimate of the life of rehabilitation works by Kampsax-Berger resulted from inadequate allowance for poor quality control in the execution of these works which would reduce their life well below that derived from design considerations alone. Subsequent engineering investigations on the five links (partly reflected in the Fourth Highway Appraisal Report) suggest that physical conditions on Links I and II point to a shorter life of rehabilitation works (around two years) and to longer lives on the other links (three or more years). Precision is not possible in this matter not only because accurate records are not kept but because conditions vary substantially over the lengths of the links.

13. As in the ex-ante calculation and for the same reasons, no allowance is made one way or the other for changes in road maintenance costs.

14. The calculated ex-post rates of return are shown in Table 7 and vary from negative to over 100%. If benefits continue for five years, the

rates of return are more than 27% in all cases. Links III and V have high returns with benefits continuing for as little as two years, and this is true for Link III as well even if benefits are reduced by 50%. Links I and II are not viable if only savings in reduced vehicle operating costs are counted and continue for no more than two years; Link I becomes viable with generated production of Rp 15 million per year for two years and Link II achieves a rate of return of about 7% if generated production is only Rp 8 million per year for two years.

### Conclusions

15. If the originally estimated life of rehabilitation works of seven years is correct, all sample links had adequate ex-ante and ex-post rates of return. The potential life of these works is the most important single factor in the analysis and even where the opening year traffic was less than the original 1969 traffic count, rates of return continued to be very high. Some rates of return were lower ex-post than ex-ante due to a drop in opening year traffic but the ex-post rates in all these cases remained high.

16. If the life of the rehabilitation works is as little as two years, well-trafficked roads such as Links III, IV and V are quite feasible ex-ante at 1969 traffic levels (see Part C of Table 6) and remain feasible ex-post (see Part B of Table 7) even where 1974 traffic was below 1969 figures (Link V). Rehabilitation of low-traffic roads such as Links I and II is only feasible with a two-year life of works (both ex-ante and ex-post) if there is substantial generated production.

17. The conclusions from the five sample roads can be applied to all the links included in the project:

- (a) Where traffic was high (most roads in Java), vehicle operating cost improvements alone amply justified most projects even if the life of rehabilitation was as short as two years; and
- (b) where traffic was low (most roads in West Sumatera, South Sumatera and South Sulawesi), traffic benefits alone were not sufficient to justify rehabilitation if these works lasted substantially less than the originally projected seven years (as reported in a number of instances), and significant development benefits had to accrue as well as to justify the expenditure.

More than 50% (1,667 km) out of 3,042 km of the original list of roads in the five provinces were in Java and their ex-post rates of return will have remained very high even if rehabilitation works lasted only two to five years. Some of the other roads would have marginal rates of return (ex-ante and ex-post) unless substantial development benefits were included. No information is available on these development benefits; if they have accrued in the volumes originally estimated, the overall rate

of return for the project will remain high; if the actual development benefits are lower, the overall rate of return will be reduced substantially but, in view of the very high returns on the high-traffic roads, the overall rate will remain acceptable.

18. The lessons from the First Highway Project are being applied to further highway work in Indonesia:

- (a) Greater emphasis is being placed on the quality of rehabilitation work and on substituting other improvements, so-called betterment, which are fully designed and whose quality can be better controlled;
- (b) the design horizon of betterment works is being extended to at least ten years;
- (c) betterment works are being designed to suit them to individual requirements and to ensure that expenditures on betterment are commensurate to anticipated benefits; and
- (d) the rehabilitation program is gradually being phased out.

These conclusions raise two questions: if the ex-post rates for many rehabilitation schemes are still very high, why should the Government not continue with the rehabilitation program indefinitely, and why should it now switch to betterment which appears to have substantially lower returns (see Fourth Highway Project Appraisal Report)? The following are the answers on the basis of the above investigation:

- (a) If betterment (permanent reconstruction with proper design) could have been executed quickly in 1969, it would have been the preferred solution, with even higher returns than rehabilitation; but this was not possible because design would have had to have been prepared and construction forces mobilized. Getting traffic moving had more priority than waiting and doing the higher return solution. With roads in better condition, this priority does not apply today; and
- (b) the lower return on betterment as reported in the Fourth Highway Project Appraisal represents only the return on the marginal investment to eliminate the inefficiencies of frequent rehabilitation; the large benefits from rehabilitation alone are not counted because they would still accrue with continuation of the rehabilitation system; however, the elimination of the cost of rehabilitation is counted as a benefit. This simply represents the

fact that the Government will not allow the roads to deteriorate again to their condition before rehabilitation. The choices therefore are between a very bad road and rehabilitation (first stage) and a frequently rehabilitated road and betterment (second stage).



Table 1

INDONESIA

CREDIT 154-IND

FIRST HIGHWAY PROJECT

Basic Data

INDONESIA - 7-INSTH01 - First Highway Project - Credit 154-IND

Original Amount	-	US\$28.0 Million
Disbursed	-	US\$27.8 Million
Cancelled	-	US\$0.2 Million
Borrower	-	Republic of Indonesia
Beneficiary	-	Ministry of Public Works and Power
FY Borrower	-	April 1 - March 31
Exchange Rate	-	FY70: US\$1 = Rp 326 FY72: US\$1 = Rp 378 FY74: US\$1 = Rp 415 FY76: US\$1 = Rp 415

Project Data

Negotiations	-	May 1969
Credit Agreement	-	June 20, 1969
Effectiveness	-	October 2, 1969
Physical Completion	-	December 1975
% of Project Completed	-	100%
Credit Closing	-	Original: Dec. 31, 1973 1st Extension: Dec. 31, 1974 2nd Extension: Dec. 31, 1975
Total Costs	-	Original: US\$46.7 Million Actual: US\$50.0 Million +
Economic Rate of Return	-	Original: 40% + Actual: 40% +

Table 2

INDONESIA

CREDIT 154-IND

FIRST HIGHWAY PROJECT

Credit Allocation  
(US\$ '000)

<u>IDA Category</u>	<u>Description</u>	<u>Original Allocation</u>	<u>Original Plus Unallocated Pro Rata</u>	<u>Final Allocation</u>	<u>Difference</u>
1.	Equipment for Rehabilitation and Maintenance	19,800	21,160	21,431	+ 271
2.	Equipment for Workshops	1,125	1,200	1,405	+ 205
3.	Hand Tools for Workshops	75	80	115	+ 35
4.	Equipment for Training and Laboratory	100	110	-	- 110
5.	Office Equipment	100	110	-	- 110
6.	Consulting Services	5,000	5,340	4,864	- 476
7.	Unallocated	1,800	-	-	-
	Total	<u>28,000</u>	<u>28,000</u>	<u>27,815</u>	<u>- 185</u>

Table 3

INDONESIA  
CREDIT 154-IND  
FIRST HIGHWAY PROJECT

Highway Equipment for Rehabilitation and Maintenance Work

<u>Item</u>	<u>Estimated at Time of Appraisal</u>	<u>Actually Procured</u>
Truck-mounted asphalt distributor	16	16
Stationary asphalt melting tank	86	18
Trailer-mounted asphalt heater	31	80
Mechanical broom and tractor	8	10
Compressor (100-150 cu. ft/minute) and tools	68	54
Compressor (350-400 cu. ft/minute) and tools	35	-
Drilling rig for quarry	2	10
Crushing and screening plant (30-40 ton/hour)	11	60
Excavator with shovel	5	12
Concrete mixer (14/10 cu. ft)	57	48
Generating set	14	10
Pick-up (or jeep)	130	231
Loader, wheeled (1 cu. yd.)	28	35
Motor grader (80-112 hp)	54	85
Pulvi mixer	10	4
Mixing plant (gravel pit)	4	-
Diesel pump (4 in.)	63	46
Roller, rubber-tired	5	2
Power saw	22	42
Stone spreader	4	6
Chipping spreader	13	10
Crawler tractor (D6)	21	16
Dump trucks (5-6 ton)	569	478
Flat-bed truck	91	279
Water-tank truck	50	67
Lubrication truck	26	33
Repair truck	20	24
Fuelling truck	16	29
Crane truck	78	62
Recovery vehicle	10	8
Recovery vehicle and low-boy	8	8
Quarry truck	28	36
Industrial tractor	19	21
Mobile welding set	29	66
Vibrating plate tamper	22	55
Concrete vibrator	138	108

In addition, the following were procured:

Stone crane, self-propelled	-	4
Lubrication plant, stationary	-	20
Asphalt spraying machines	-	16

Table 4

INDONESIA

CREDIT 154-IND

FIRST HIGHWAY PROJECT

Kampsax-Berger Staffing

Services Financed by:  
(Man-months)

<u>Activities</u>	<u>UNDP</u>	<u>Credit 154-IND</u>	<u>Total</u>
Inventory	75	-	75
Highway Rehabilitation Program	70	-	70
Highway Development Program	68	-	68
Studies of Development	215	66	281
Highway Organizational Support			
- at national level	69	-	69
- in 3 pilot provinces	212	-	212

Technical Support Services

Management, Administration, Suppliers	-	161	161
Highway Operations, 20 provinces	-	489	489
Mechanical Services, 20 provinces	-	683	683
Soil and Materials, 5 regions	-	156	156
	—	—	—
<b>Total</b>	<b>709</b>	<b>1,555</b>	<b>2,264</b>

Man-Months

Staffing by Type

Highway Engineers	306	168	474
Mechanical Engineers	80	31	111
Soils and Materials Engineers	80	76	156
Structural Engineers	57	15	72
Quarry Specialists	-	80	80
Economists, Traffic Engineers	130	30	160
Management Specialists	42	52	94
Supply Specialist	14	22	36
Highway Superintendents	-	398	398
Mechanical Superintendents	-	683	683
	—	—	—
<b>Total</b>	<b>709</b>	<b>1,555</b>	<b>2,264</b>

INDONESIA

FIRST HIGHWAY PROJECT

Five Sample Road Links - Brief Description

Road termini with node numbers	Length km	1969 ADT				1974 ADT				Rehab. cost per km (Rp mil.)
		Cars	Buses	Trucks	Total	Cars	Buses	Trucks	Total	
I. Solok 090300 to Lubuk Selasih 090302	29	38	53	34	125 <u>/a</u>	100	65	80	245 <u>/b</u>	1.6
II. Lubuk Selasih 090302 to Padang 090900	32	352	57	203	622 <u>/a</u>	303	72	171	546 <u>/b</u>	2.1
III. Cileuni 031001 to Nagreg 031002	22	1,038	140	345	1,523 <u>/a</u> 3,021	336	558	3,915 <u>/b</u>		1.8
IV. Mangli 011010 to Gembiriono 011013	20	622	136	398	1,156 <u>/a</u> 1,783	161	555	2,499 <u>/c</u>		3.9
V. Gembiriono 011013 to Tanggul 011014	7	703	132	736	1,571 <u>/a</u> 875	134	308	1,317 <u>/c</u>		3.7

/a Total ADT as reported by Kampsax-Berger.

/b Fourth Highway Project Appraisal Report (weighted by distance in some cases).

/c Feasibility Study for Wonorejo-Jember Road by Lyon Associates, Inc., August 14, 1975.

Table 5

Table 6

INDONESIA

FIRST HIGHWAY PROJECT

Five Sample Road Links - Ex-Ante Economic  
Rates of Return for Rehabilitation (%)

A. Rates of Return for Seven Years of Benefits

I.	(excluding generated production)	-	14.05
I.	(including generated production)	-	> 100.00
II.	(excluding generated production)	-	46.95
II.	(including generated production)	-	60.35
III.		-	63.95
IV.		-	96.25
V.		-	> 100.00

B. Rates of Return for Five Years of Benefits

I.	(excluding generated production)	-	3.85
I.	(including generated production)	-	> 100.00
II.	(excluding generated production)	-	40.15
II.	(including generated production)	-	54.75
III.		-	58.65
IV.		-	92.75
V.		-	> 100.00

C. Rates of Return for Two Years of Benefits

I.	(excluding generated production)	-	< 0
I.	(including generated production)	-	62.35
II.	(excluding generated production)	-	< 0
II.	(including generated production)	-	11.25
III.		-	15.55
IV.		-	53.65
V.		-	91.75

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Table 7

INDONESIA

FIRST HIGHWAY PROJECT

Five Sample Road Links - Ex-Post Economic  
Rates of Return for Rehabilitation (%)

A. Rates of Return for Five Years of Benefits

I.	(excluding generated production)	-	27.35
I.	(including generated production)	-	67.85
II.	(excluding generated production)	-	38.65
II.	(including generated production)	-	53.05
III.		-	> 100.00
IV.	(full vehicle operating cost improvements)	-	> 100.00
IV.	(one-half vehicle operating cost improvements)	-	75.95
V.		-	76.85

Rates of Return for Two Years of Benefits

I.	(excluding generated production)	-	< 0
I.	(including generated production)	-	23.85
II.	(excluding generated production)	-	< 0
II.	(including generated production)	-	6.65
III.		-	> 100.00
IV.	(full vehicle operating cost improvements)	-	> 100.00
IV.	(one-half vehicle operating cost improvements)	-	32.65
V.		-	33.95



