

DP/UN/INS-72-069/1



UNITED NATIONS

UNITED NATIONS DEVELOPMENT PROGRAMME

ROAD DEVELOPMENT IN IRIAN JAYA

INDONESIA

Project findings and recommendations

Prepared for the Government of Indonesia
by the United Nations,
acting as executing agency for the
United Nations Development Programme

New York, 1979

NOTES

Abbreviations used:

FUNDWI	-	Fund of the United Nations for the Development of West Irian
OPE	-	Office of Project Execution (UNDP)
PWD	-	Public Works Department
Rp	-	Rupiah

The designations employed and the presentation of material in this report do not imply the expression of any opinion whatsoever on the part of the Secretariat of the United Nations concerning the legal status of any country, territory, city or area or of its authorities, or concerning the delimitation of its frontiers or boundaries.

As of February 1979, the rate of exchange was 623 rupiahs (Rp) to the US dollar.

ABSTRACT

The project in Irian Jaya was to identify priority road needs, plan the road development programme, award contracts for engineering work, strenghten the road engineering unit of PWD, organize the maintenance of roads and of appropriate equipment and vehicles, and train staff on the job. The work was to coincide with the Second Development Plan (1974 - 1979). By the end of the period some 180 km of roads and bridges had been completed. On-the-job training in road and bridge engineering and maintenance and repair of heavy equipment was satisfactory. Although PWD is now well endowed in human and material resources it faces the difficult challenge of constructing roads between the main towns and to the Central Highlands. At the same time, the Jayapura Central Rebuild Workshop needs upgrading and the inadequacy of road maintenance calls for more funds and a reassignment of responsibilities.

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INTRODUCTION

Background

The project was approved in August 1974 with preparatory assistance commencing in April 1973 as a follow-up of activities engaged upon by the land transport project FUNDWI/29 under the FUNDWI programme. The six-year project (INS-72-069) was to provide technical support and assistance to the Provincial Public Works Department in identifying priorities, programming and implementation of the first phase of the road development programme of the Government of Indonesia in Irian Jaya during the Second Development Plan 1974 - 1979, Repelita II.

Arrangements

UNDP's financial contribution, as revised in July 1978, amounted to \$US 568,194 and the Government's counterpart contribution committed to road development in Irian Jaya with Repelita II funds was Rp 3,569,470,000.

At the Government's request UNDP also channeled about \$US 1,000,000 of the FUNDWI residual funds for the procurement of heavy road construction equipment and also approximately \$US 200,000 for the procurement of hot-mix asphalt equipment to support the Government's road development program.

The Plan of Operations was submitted in September 1973 and signed for approval on 20 August 1974. Field work began in May 1974. Originally the project was to be for three years; however needed changes in the input of experts, equipment and finances required a number of project document revisions and amendments. The latest approved project document revision in July 1978 set 30 April 1979 as the completion date.

The executing agency for the project was the United Nations, with the Ministry of Public Works-Directorate General of Highways (Bina Marga) as the participating agency.

Objectives

The objectives of the project as revised were as follows:

1. Identifying the first priority roads and bridges for reconstruction, rehabilitation or improvements.
2. Planning, detailing, costing and scheduling the road development programme.
3. Carrying out road and bridge surveys and design, soil and materials investigations, testing and quality control.
4. Selection, award and supervision of contracts for the implementation of road and bridge engineering works.
5. Strengthening the road engineering unit of the Provincial Public Works Department.

6. Organization of an effective road maintenance system throughout the province.
7. Provision of repairs and maintenance to mechanical equipment, machinery and vehicles to be used on road and bridge works.
8. On-the-job training of departmental personnel in highway and mechanical engineering.

I. SUMMARY OF PROJECT OPERATIONS

A. Road engineering works

The Government in its second five-year development plan Repelita II (1974 - 1979), gave a high priority to road development in Irian Jaya with a total input of Rp 3,558,200,000 (see Annex IV).

The first priority roads for rehabilitation or reconstruction were identified by the Government as follows:

	<u>km</u>
- Sentani - Kemiri - Boroway - Genyem road	62
- Rendani - Warmare road	30
- Biak - Korem road	40
- Fak-Fak - Torea road	20

In addition, the Government decided to undertake the construction of roads with funds channeled from other sources:

	<u>km</u>
- Kemiri - Depapre road	22
- Kuansu - Genyem road	10
- Besum - Merem road	9
- Warombaim - Berap - Denta road	35
- Warmare - Prafi road	10
- Fak-Fak - Kalimati road	5
- Nabire - Kalibumi road	5
- Ring-road for Sorong	4
- Sorong - Klamono road	48
- Sorong - Rufai road	3

Quotations from local road contractors for the first priority roads were called for in 1974 and evaluated by the project. The contractors' prices were excessive and unrealistic mainly owing to a lack of heavy equipment and to excessively high operating costs being quoted in the bids. To alleviate the grave shortage and immediate problem of heavy road construction equipment in Irian Jaya, the Government requested that, in addition to an allotment of \$US 3,225,300 of heavy equipment for Irian Jaya, obtained via Bina Marga (United States Eximbank loan), an amount of \$US 1,000,000 of FUNDWI residual funds be channeled for the procurement of heavy road construction works on the first priority roads. Thus, UNDP/OPE carried out the procurement of the equipment as project INS-76-003 - Strengthening Road Maintenance and Rehabilitation in Irian Jaya through provision of heavy construction equipment. A list of that equipment is in Annex III.

After the equipment was received, the road construction work could finally proceed at a satisfactory pace, although due to the belated arrival of the equipment, not all intended road-works could be completed within the project period. However, detailed surveys, designs and final engineering preparation of bills of quantities were finalized. By the end of the project period (30 April 1979) the following roads, including bridges, were completed:

	<u>km</u>
Jayapura district:	
- Sentani - Kemiri - Boroway - Genyem road	62
- Kemiri - Depapre road	22
- Kuansu - Genyem road	10
- Besum - Merem road (total 9 km)	5
- Warombain - Berap - Demta road (total 35 km)	3
Cendrawasih district:	
- Biak - Korem road (total 40 km)	23
Manokwari district:	
- Rendani - Warmare road (total 30 km)	22
- Warmare - Prafi road	10
Fak-Fak district:	
- Fak-Fak - Torea road (total 7 km)	2
- Fak-Fak - Kalimati road	5
Paniae district:	
- Nabire - Kalibumi road	5
Sorong district:	
- Ring-road for Sorong	4
- Sorong - Rufai road	3
- Sorong - Klamono road (total 48 km)	3

Local contractors have also executed smaller civil engineering projects through the Province of Irian Jaya, i.e. bridges near Fak-Fak, Merauke and Wamena.

Also the project assisted and advised the Government in general land-development schemes, mainly for transmigration and resettlement purposes. The two main schemes the United Nations was engaged in were a rice project in Oransbari and transmigration /resettlement projects in the Nimboran Valley (Genyem area).

B. On-the-job training programme

1. Road and bridge engineering

The surveys, calculations, designs and execution of road construction works in the Jayapura district are also used as the framework in which the on-the-job training of departmental personnel in road-and-bridge engineering was carried out. In general, this on-the-job training can be regarded as highly successful. About 20 Government employees were upgraded in their knowledge of general road-building; however, the limited knowledge of national personnel in basic mathematics restricted the training in geometrical design. As a result, more advanced systems of surveying and computing could not be carried out.

2. Maintenance and repair of heavy equipment

Except during the period from January 1976 through June 1977, when no United Nations expert in mechanical engineering was available, the on-the-job training in mechanical engineering was carried out with quite satisfactory results. It took place in two different locations: at the field workshop near road construction projects for the instruction in maintenance of and small repairs to heavy construction equipment and at the Central Rebuild Workshop in Jayapura in general workshop techniques and larger repairs and overhauls to equipment. For training in rebuilding and overhauling heavy equipment written-off equipment was used and as a result a bulldozer and a couple of dumptrucks that were normally beyond repair could be put back into use.

C. Fellowship training

The selection, award and placement for the overseas fellowship training programs have been completed. This training of departmental personnel has contributed to improved road engineering technology in the province. Although not in the actual framework of fellowship training, a very successful trip was made in 1978 to Papua New Guinea by high ranking Public Works Department officials to study the governmental road maintenance system in that country.

II. ASSESSMENT

The main objective (to give technical assistance and training to the national agency, improve the road engineering capacity and technology and implement the road rehabilitation programme in Irian Jaya) generally speaking has been met. At the completion date of the project activities, the provincial Public Works Department has a well-trained, experienced technical staff and a reasonable quantity of equipment for the surveying, designing and execution of the future road and bridge construction projects, needed for the continuing development of the hinterlands of Irian Jaya.

It should be noted however that the present road rehabilitation and construction programme is generally restricted to the construction of roads from coastal towns to fertile areas in the hinterlands and that no connecting roads are constructed between the major towns in Irian Jaya or from the coast to the Central Highlands. If such roads were to be executed, the present road construction capability of the PWD is not able yet to cope with the much more difficult terrain conditions and the complicated logistics. In addition, two problems arising during the project execution tend to restrict the overall implementation of the envisaged project objectives in some sectors. These problems are the under-utilization of the Central Rebuild Workshop "Bengkel Induk" and the problem of road maintenance.

The Central Rebuild Workshop "Bengkel Induk" in Jayapura is administratively under the control of the provincial Public Works Department and the provincial government. Although established to handle all major repair and overhauls of government and privately owned equipment and vehicles, the workshop activities have been restricted to repair of PWD - owned equipment and vehicles. The low status, limited budgets and operational constraints have resulted in a limited output, capacity and efficiency. All of this contributed to a low morale and general slowing down in the activities of the workshop. Although the integration of the Central Workshop in the Bina Marga Workshop organizations has been agreed on, the decision has yet to be physically implemented.

With regard to road maintenance, the low priority and limited budget allocations given by the provincial government have contributed in a large measure to, and continue to account for, the serious deterioration of the road system in the province. Additionally, road maintenance equipment is lacking in the PWD districts and regular and routine road maintenance is neglected. Efforts by the project to implement recommendations for organized road maintenance have not met with success and emergency repair on an ad-hoc basis remains the policy.

It appears that this situation is not confined to Irian Jaya, as other parts of Indonesia are facing similar problems.

Also the type of asphalt pavement used, the so-called single course penetration macadam, is very sensitive to this lack of regular maintenance. This type of pavement construction consists of an application over the subbase of a structure of crushed stone, penetrated with asphalt bitumen and sealed off with a fine mineral aggregate.

Advantages of this pavement type are the low cost and the possibility to construct this pavement with less-skilled labourers, but a big disadvantage is that especially during the wet season, traffic can cause rapidly enlarging potholes, which, if not immediately repaired, result in a complete disintegration of the pavement.

III. CONCLUSIONS AND RECOMMENDATIONS

A. General conclusions

By the end of the project period, it can be observed that the technical assistance and training to the Government counterpart agency, the improvement of the road engineering capacity and technology and the implementation of the road rehabilitation programme were successfully completed. The Government is capable now to execute the road projects as planned in the next Repelita programme without further technical assistance or training.

However, although the construction of new road and bridge projects continues now at a satisfying pace, some problems encountered during the project period are still unsolved and may threaten the results achieved. Those problems and the proposed solutions and general recommendations for follow-up in the development of the hinterland areas are described hereunder.

B. Road maintenance

The establishment of an adequate regular road maintenance scheme is not yet realized. This is causing even some of the recently constructed roads to start to deteriorate already. If this lack of maintenance continues, it can be expected that within a few years many roads will be impassable and have to be reconstructed again for many times the cost of regular maintenance. There do not exist any technical problems in road maintenance; the regular maintenance of the repair cycle has perhaps only logistical implications, but the nonexistence of road maintenance is entirely due to the low priority and limited budget allocations by the Government.

It is highly recommended that the Government change this policy as soon as possible, for example by assigning the responsibility of road maintenance to more suitable Government agencies, modifying channels for the flowing of funds and enlarging the budget allocation in order to start regular road maintenance works. The guidelines as described in the technical report "A plan for road maintenance in Irian Jaya" can be used but the estimate for the additional equipment needed - trucks, loaders and graders - is currently \$US 1,500,000 and the yearly costs for salaries, depreciation, equipment maintenance and fuel amounts to \$US 500,000. In addition to the regular road maintenance activities, consisting mainly of upkeeping the drainage systems, cleaning the road shoulders and filling potholes, it is also recommended that a single application be made of hot-mix asphalt, sealing the top of the existing and planned roads constructed with a penetration macadam pavement. This will result in much higher resistance to traffic loads, fewer potholes and higher skid resistance.

The provision of a complete mobile hot-mix asphalt plant and an asphalt finisher, purchased from FUNDWI residual funds, will enable the road maintenance teams to carry out the application of the above-mentioned hot-mix asphalt layers and can in general contribute to the recommended road maintenance schemes.

C. Central rebuild workshop

The under-utilization of the Central Rebuild Workshop is a difficult problem. During recent years many private enterprises mushroomed in Jayapura that can carry out the regular maintenance of vehicles and trucks in a reasonably satisfactory way, thereby obviating the role of the Central Rebuild Workshop as the body in charge of maintenance of, and repairs to, all Government and some private vehicles and machines. The recent Government regulation that users of a Government vehicle will be provided with a fixed monthly sum for the purchase of spare-parts and maintenance costs, does not improve the utilization of the Central Workshop. Proposals to reverse the present situation are not implemented by the Government. To maintain at least the present activities (spare-part storage and the carrying out of more complicated repairs to heavy equipment and project vehicles) on an acceptable level, it is recommended that the integration of the Central Workshop into the Bina Marga Workshop organization be done, so that the Central Rebuild Workshop can join the spare-part distribution system of Bina Marga and the funds needed for the payment of salaries and the purchase of expendables can be allocated more easily.

D. Movement of project staff

Especially during the early years of United Nations assistance, on many occasions, project staff trained by the United Nations experts and having gained some experience in the execution of road projects, would be transferred to other projects both governmental and private, in or outside Irian Jaya. Although this can be regarded as a favorable development in that the United Nations assistance and training indirectly contributed to an improvement of technical staff in other regions, nevertheless the project's progress was somewhat hampered by this continuous loss of skilled and trained staff. Although no significant loss of staff has occurred recently, the main reason for the movement of project staff, the administrative bottlenecks in the regular receipt of project funds, still exists. A firm policy to absorb a permanent nucleus of essential personnel into the Public Works Department has to be evolved by the Government, if the principle and intention to retain the road construction unit are to be met. Also, to avoid staff movement due to the paramount desire of many staff to return home, the education and schooling of indigenous students to replace such staff should be promoted.

E. Land development

The logical next step in the development of the hinterlands of Irian Jaya, after their becoming accessible by the completion of several road projects, is the intensifying of land use for agricultural purposes.

This will be realized within the framework of the Government's plans for migration and resettlement, envisaging that during the next Repelita period, a total of 25,000 families will be migrated from Jawa to various parts of Irian Jaya. It has not been decided yet by the central Government which Government agency will be in charge of the planning and execution of migration and resettlement projects. However, it is noted that existing Government agencies in Irian Jaya lack the skilled and trained personnel for a technical advanced surveying, planning and executing of the civil engineering part of the migration and resettlement projects. At the local government's request, a project proposal for technical assistance was submitted by the United Nations. A few

small migration and resettlement projects are already completed but recent, severe socio-economic tensions between the migrants and the indigenous (resettled) population, threaten the success of these projects and perhaps the justification of migration in general. It is recommended that the Government solve the above-mentioned problems before the big migrations schemes are undertaken. As these problems are beyond the scope of technical assistance, it is recommended that the assistance proposals by the United Nations be shelved and/or reconsidered until the Government definitely solves these problems.

Annex I

REPORTS SUBMITTED TO THE GOVERNMENT

A. Technical ad-hoc reports

- J. George - Investigation report on the existing roads in Kabupaten Merauke
" - Report of investigations of runway pavement failure at Wamena airstrip
B. Ratneser - Report and comments on design of bridges Kemiri I and Kemiri II
" - Evaluation of tenders:
a. Reconstruction of Kemiri/Boroway road
b. Reconstruction of Boroway/Genyem road
c. Reconstruction of Rendani/Warmare road
" - A plan for road maintenance in Irian Jaya
W.H.W. Drenth - Memorandum on preventing and control of landslides on the road Jayapura/Santani
" - Memorandum on damage to Nimbu Bridge
" - Memorandum on landslide at Netar
" - Report of a soil survey in the Eastern part of the Grime plain
" - Sketchplan and calculation of the dewatering/drainage of the Eastern part of the Grime plain

B. Progress reports

- B. Ratneser - Semi-annual progress report (General) May 1973 - Feb. 1974
" - Semi-annual progress report (General) March 1974 - Aug. 1974
J. George - Semi-annual progress report (Road and bridge engineering) March 1974 - Aug. 1974
B. Ratneser - Semi-annual progress report (General) Sep. 1974 - March 1975
D.P. Heta - Semi-annual progress report (Project field workshop) Oct. 1974 - March 1975
J. Peet - Semi-annual progress report (Central Rebuild Workshop) Oct. 1974 - March 1975
B. Ratneser - Semi-annual progress report (General) April 1975 - Sep. 1975
J. Peet - Semi-annual progress report (Central Rebuild Workshop) April 1975 - Sep. 1975
W.H.W. Drenth - Semi-annual progress report (Civil engineering) April 1975 - Sep. 1975
E. Yalstkaya and V. Gusev - Report of the evaluation mission
W.H.W. Drenth - Semi-annual progress report (General) Oct. 1975 - March 1976
" - Semi-annual progress report (General) April 1976 - Sep. 1976
" - Semi-annual progress report (General) Oct. 1976 - March 1977

- W.H.W. Drenth - Semi-annual progress report (General) April 1977 - Sep. 1977
H. Schied - Semi-annual progress report (Mechanical engineering) July 1977 - Sep. 1977
W.H.W. Drenth - Semi-annual progress report (General) Oct. 1977 - March 1978
" - Semi-annual progress report (General) April 1978 - Sep. 1978
C. Hindrichsen - Semi-annual progress report (Civil engineering) May 1978 - Sep. 1978

Annex II

PROJECT STAFF

A. International experts

<u>Name</u>	<u>Nationality</u>	<u>Function</u>	<u>Period</u>
B.D. Ratneser	Sri Lanka	Chief Technical Adviser	May 1974 - March 1976
J. George	United Kingdom	Highway and Bridge Engineer	May 1973 - Jan. 1975
J. Peet	United Kingdom	Mechanical Workshop Expert	May 1974 - Jan. 1975
D.P. Heta	New Zealand	Senior Mechanic	July 1973 - Dec. 1975 Aug. 1978 - July 1979
W.H.W. Drenth	Netherlands	Associate Expert/Civil Engineer	April 1975 - March 1977
		Civil Engineer/Teamleader	April 1977 - April 1979
H. Schied	Federal Republic of Germany	Associate Expert/ Mechanical Engineer	July 1977 - March 1978
C. Hindrichsen	Denmark	Associate Expert/ Civil Engineer	May 1978 - April 1979

B. Senior national staff

Ir. Sihombing	Director of the Public Works Department, Irian Jaya
Ir. Pujiyanto	Division Engineer, Road Construction Department
Ir. Sugihardjo	Chief Civil Engineer
Mr. Sinaga	Chief Central Workshop
Mr. Sihombing	Project Engineer
Mr. Manurung	Project Engineer
Mr. Sitorus	Project Engineer
Mr. Subagio	Chief, Soil laboratory
Ir. Karmoyo	Mechanical Superintendent
Mr. Sitinjak	Senior Mechanic
Mr. Napitupulu	Senior Mechanic
Mr. Wartomo	Secretary, P W D
Mr. Kumbaitan	Accountant, P W D

Annex III

EQUIPMENT PROVIDED BY UNDP

During the period May 1974 through December 1978 the following equipment, supplies and spare parts were provided.

	<u>\$US</u>
- Local purchase of emergency spare parts for various types of heavy equipment	5,521.83
- Purchase of spare parts for an International Harvester Payloader	2,550.00
- Purchase of spare parts for Galion and Caterpillar equipment	3,890.00
- Purchase of spare parts for International Harvester Trucks	24,511.10
- Local purchase of emergency spare parts for various types of heavy equipment	1,259.82
Total	<u>37,732.75</u>

In the framework of project INS-76-003 - Strengthening road maintenance and rehabilitation in Irian Jaya through provision of heavy equipment - the following items were provided:

	<u>\$US</u>
OPE/HQ/6A001 - One (1) unit "Caterpillar" Crawlertractor D7F with ripper and spare parts	90,689.03
OPE/HQ/6A002 - Two (2) units "Caterpillar" Motorgraderes 120G with spare parts	132,774.35
OPE/HQ/6A003 - One (1) unit "Caterpillar" Traxcavator 955L with ripper and spare-parts	53,702.60
OPE/HQ/6A004 - One (1) unit "Massey Ferguson" Diggerloader MF 50 A with spare parts	26,000.00
OPE/HQ/6A005 - Eleven (11) units "International Harvester" drumtrucks ACCO-173A with spare parts	235,718.43
OPE/HQ/6A006 - Two (2) units "International Harvester" tanktrucks ACCO-1730A	52,689.40
OPE/HQ/6A007 - One (1) unit "Galion" roadroller with spare parts	26,010.00
OPE/HQ/6A008 - One (1) unit "Hyster" compactor with spare parts	24,751.37
OPE/HQ/6A009 - Two (2) units "Ingersoll Rand" compressors, with jackhammers, rockdrills and spare parts	22,060.14
OPE/HQ/6A012 - One (1) unit "Phoenix" bitumen heater with spare parts	11,645.47
OPE/HQ/6A013 - Spare parts for "Little Ford" bitumen distributor	1,004.60
OPE/HQ/6A014 - Spare parts for "Phoenix" bitumen heater	1,047.06

	<u>\$US</u>
OPE/HQ/6A015 - Spare parts for "Parker" stonecrusher	7,970.23
OPE/HQ/6A016 - Spare parts for "Bedford" trucks	108.97
OPE/HQ/6A017 - Spare parts for "Petter" engines	3,362.62
OPE/HQ/6A019 - Spare parts for "Caterpillar" equipment	11,632.30
OPE/HQ/6A021 - Steel plates	859.20
OPE/HQ/6A022 - Spare parts for "International Harvester" equipment	14,782.31
OPE/HQ/6A024 - Various supplies for workshop (expendable)	3,660.83
OPE/HQ/6A025 - Various supplies for workshop (expendable)	360.00
OPE/HQ/6A027 - Carbide	722.89
NJK - 1627 - Two (2) units "Toyota Landcruiser" all terrain vehicles	13,595.04
Total (F.O.B.)	<u>735,146.90</u>

During the period January 1979 through April 1979 the following equipment and spare parts are expected:

- To compensate for shipping losses and damages the following items have been recorded:

	<u>\$US</u>
OPE/8-M-5001 - Spare parts "Galion" roadroller	3,891.58
OPE/8-M-5001A - Spare parts "I.H." trucks	1,202.39
OPE/8-M-5001B - Various supplies for workshop	455.63
OPE/8-M-5001C - Spare parts "Galion" roadroller	899.00
OPE/8-M-5001D - Spare parts "I.H." crawler tractor	267.64
Total (F.O.B.)	<u>6,716.24</u>

- In accordance with the Government's request the following additional equipment for the construction of hot-mix asphalt roads will be provided:

	<u>\$US</u>
1 (one) unit "Sakai" asphalt finisher	44,360.00
1 (one) unit "Frederick Parker" mobile asphalt mixing plant ..	59,640.00
2 (two) units "Mobile" bitumen heater	44,120.00
1 (one) unit "Mobile" feed section	34,440.00
Spare parts and commissioning	11,500.00
Total (F.O.B.)	<u>194,060.00</u>

Annex IV

FUNDING

A. UNDP contribution

	<u>\$US</u>
- Expert services	410,260.00
- Support personnel	28,638.00
- Travel	17,989.00
- Other costs	9,645.00
- Individual fellowships	17,443.00
- Equipment and supplies	60,152.00
- Miscellaneous	24,067.00
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Grand total	568,194.00
Costs sharing (exclusive of overhead)	187,341.00
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Net encumbrance against I.P.F.	380,853.00

From FUNDWI residual funds:

	<u>\$US</u>
- Supply of equipment and materials as project INS-76-003 (received F.O.B. value)	741,862.87
- Estimated freight costs INS-76-003	100,000.00
- Estimated costs procurement of asphalt-finisher and hot-mix asphalt plant (C.I.F. value)	206,000.00

B. Government contribution

	<u>Rp</u>
- Salaries	106,686,000
- Land compensation	7,823,000
- Construction materials	184,263,000
- Construction equipment and supplies	260,595,000
- Handling costs	87,492,000
- Transportation costs	39,012,000
- Construction contracts	2,861,059,000
- Miscellaneous	11,270,000
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Total	3,558,200,000

Heavy construction equipment for Irian Jaya, received via
Bina Marga from Exim bank USA loan: \$US 3,225,300

Annex V

FELLOWSHIPS

<u>Name</u>	<u>Subjects</u>	<u>Country</u>	<u>Period</u>
Mr. Y. Kasi	Road Survey and Design	Malaysia	April 1974 - Oct. 1974
Ir. S. Syafrin	Highway Construction and Maintenance	Malaysia	April 1974 - June 1974
Mr. Sarjani	Soil and Material Testing	Malaysia	April 1974 - Oct. 1974
Mr. M. Mardjohan	Road Construction Supervising	Malaysia	April 1974 - Oct. 1974
Mr. A. Hidayat	Maintenance and Repair of Construction Equipment	Malaysia	April 1974 - Oct. 1974
Mr. D. Sitinjak	Maintenance and Repair of Construction Equipment	Malaysia	April 1974 - Oct. 1974
Ir. P. Sihombing	Highway Construction and Maintenance	West Germany	May 1975 - Sep. 1975