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CONFIDENTIAL

INTERNATIONAL BANK FOR RECONSTRUCTION AND DEVELOPMENT

INTERNATIONAL DEVELOPMENT ASSOCIATION

PROJECT PERFORMANCE AUDIT REPORT

ON

PAPUA NEW GUINEA FIRST TELECOMMUNICATIONS PROJECT

(LOAN 546-PNG)

July 17, 1975

Operations Evaluation Department

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Note: Approximate Currency Equivalents (Australian dollar)

1967-71	A\$ 1.00 = US\$ 1.12
1972	A\$ 1.00 = US\$ 1.23
1973-74	A\$ 1.00 = US\$ 1.40

SUMMARY

Loan 546-PNG of June 1968, for the expansion and improvement of telecommunication services, was the first World Bank Group operation in Papua New Guinea. The loan, for US\$ 7.0 million, was fully disbursed in February 1974. It has been followed by a second telecommunications loan (852-PNG of 1972) and loans and credits in other sectors.

The project supported with the loan was Papua New Guinea's 1969-72 telecommunications program, addressed mainly at building a modern medium-capacity network interconnecting the main towns and at more than doubling the automatic local telephone capacity. It was appraised to cost US\$ 15.5 million equivalent and the loan would have covered 73% of the project's foreign exchange requirements. In 1969 the project was modified to include provision of services to a large copper mining complex in Bougainville Island; the enlarged project was estimated to cost US\$ 20.0 million equivalent.

Overall the project was remarkably successful, in spite of the very challenging environment. Most of the original project works were completed to the initial schedules, although two loan closing date extensions were required to complete some specific segments and the Bougainville expansion. The enlarged project was complete by the date of loan closing, except for improvements to the radio outstation system (providing communication to remote and isolated spots) which failed to achieve acceptable performance standards. This item represented approximately 1% of the total project's cost.

The project's final cost is US\$ 32 million equivalent, double the appraised estimate and 1.6 times the estimated cost of the enlarged project. Final cost of telephone expansion was US\$ 3,100 per net main line added into service within the project (after allowance for spare long distance capacity built), which is about double the appraised unit costs. This overrun is well explained by changes in local and international markets and finance.

During the project, Papua New Guinea's telecommunication services expanded and improved very substantially. Local telephone exchange capacity increased at 15% p.a. (becoming 96% automatic), subscriber lines by 13% p.a., and telephone density from 0.6 to 1.1 telephones per 100 inhabitants. In addition, 95% of subscribers now have subscriber trunk dialing (STD), a vast improvement over the original manual system which frequently resulted in several hours' to a day's delays.

The Department of Posts and Telegraphs (P&T) performed generally well, as expected, and was always very cooperative towards the Bank. The principal changes in the P&T during the project were related to the introduction of commercial accounting and management (the project's main institution-building target), and to the substantial improvement and expansion of training and recruitment. The financial performance and outlook of P&T, which was chronically unsatisfactory before the project, is now sound and has improved faster than required by the loan agreement.

The Bank handled the project appropriately, although it did not look into the need to steer P&T early and steadily away from expatriate dependence. Bank's appraisal of P&T's training resources was overoptimistic and could have recognized the need to innovate substantially in the recruitment and training practices addressed at junior professional levels and below, and identified the need for a special effort aimed at transferring all senior posts to nationals as early as possible.

PROJECT PERFORMANCE AUDIT MEMORANDUM

ON

PAPUA NEW GUINEA FIRST TELECOMMUNICATIONS PROJECT (Loan 546-PNG)

1. Introduction

1.01 This memorandum presents the result of a performance audit on the telecommunications project supported by Loan 546-PNG of 1968, the first operation of the World Bank Group with Papua New Guinea. The loan was fully disbursed in February 1974. A second telecommunications loan (852-PNG of 1972) and loans and credits in other sectors have followed. The audit is based on the project's appraisal report, the attached completion report, review of Bank files, discussion with relevant Bank officials, and viewing of a half-hour film prepared by the Borrower on the project's development.

2. Project and Loan Description

2.01 Papua New Guinea has approximately 2.5 million inhabitants, including scattered tribes speaking about 700 languages and three linguae francae, among which can be found some of the world's most primitive peoples. Papua New Guinea comprises the Eastern half of New Guinea Island, as well as New Britain, Bougainville, New Ireland and several hundred other islands north of Australia. It combines Papua (part of the Commonwealth of Australia) and New Guinea (a United Nations Trust under Australia) into a single Administration of Papua New Guinea which was the Borrower of this loan. Since December 1973, Papua New Guinea has had internal self-government as a stage towards independence (which was scheduled for 1974, but postponed). Financially it is supported to a large extent by an annual grant from Australia, which is the loan Guarantor. All postal and telecommunications activities are the responsibility of the Department of Posts and Telegraphs (P&T) which was the Beneficiary.

2.02 The project was appraised in October 1967, as the first concrete action of the World Bank Group to support Papua New Guinea's development. The loan agreement for US\$ 7.0 million equivalent, to cover approximately 73% of the foreign costs of Papua New Guinea's 1969-1972 telecommunications program, was signed in June 1968 and became effective in November of the same year. The loan closing date, initially set for June 30, 1973, was subsequently extended to December 31, 1973 and eventually to March 31, 1974.

2.03 The project, appraised to cost approximately US\$15.5 million equivalent, ^{1/} was mainly aimed at building a modern, medium capacity microwave system interconnecting the main towns, with VHF and HF spurs to other points. Automatic local exchange capacity was to be more than doubled by adding

^{1/} Plus US\$ 0.7 million of loan interest during construction.

about 10,000 lines with provision of appropriate outside plant. The main microwave system design was later changed to higher capacity bearers, and the emergence of the Panguna copper mine project (with a US\$ 300 million investment) in Bougainville Island brought a change and enlargement of the project in 1969; the latter mainly substituted several proposed HF links by a tropospheric scatter system of higher quality and capacity interconnecting New Guinea, New Britain, New Ireland and Bougainville Islands, and added some 2,000 more telephone lines capacity in four new automatic exchanges in Bougainville Island. This expansion of the project, which was financed by the Government, brought changes in the agreed allocation of proceeds without modifying the loan's total amount; by then the project was estimated to cost approximately US\$ 20 million equivalent.

2.04 Although the main objectives of the loan were financial (in the double sense of supporting a good project and initiating operations with Papua New Guinea), the Bank also addressed itself to the transformation of P&T into commercial operation while remaining one of the Administration's departments. Pro-forma commercial accounts were to be prepared in FY 1968/69 and a full commercial accounting system was to be implemented by 1969/70. The P&T also agreed to apply gradually a substantial tariff increase, and a loan covenant established its obligation to aim at obtaining an 8% rate of return on average net fixed telecommunications assets as soon as possible after the completion of the project.

3. Project Implementation

3.01 Most of the project developed as expected, in spite of the very challenging environment requiring the use of high-altitude helicopters as the main means of transportation to build and maintain stations in otherwise inaccessible terrain. Most of the original project works were completed to the original schedules, although extensions to the loan closing date were required to complete some specific long distance links and the Bougainville expansion.

3.02 Actual achievements by June 1972 were close to the appraised estimates though somewhat below the estimates for the expanded project. By June 1973 the project's achievements were well on target of the expanded expectations, as shown in the following table:

	30 June '68 Actual	30 June '72 Appraisal Estimates	30 June '72 Expanded Estimates	30 June '72 Actual	30 June '73 Actuals <u>a/</u>
Telephone exchange capacity lines	10,480	18,430	20,430	19,610	20,860
% in automatic exchanges	78%	98%		95%	96%
Main telephones in service	7,764	14,500	16,100 <u>c/</u>	13,315	14,596
% exchange fill <u>b/</u>	74%	79%	79% <u>c/</u>	68%	70%
Waiting list for telephone service	875	0		1,029	617
Telephones (all stations)	14,886	27,000	30,000 <u>d/</u>	26,120	28,977
Telex subscribers	30			123	131
Long distance channels (approx.)		200			1,100

a/ These figures can be taken as approximately representing the conclusion of the project under the first loan.

b/ Main lines in service/exchange line capacity.

c/ Assuming 79% fill as in appraisal expectation.

d/ Assuming the same telephones/main lines expected at appraisal.

3.03 When the loan was closed, the project was complete except for the HF radio outstations, a system for providing voice communication to remote or isolated places. The equipment supplier (RACAL's Australian subsidiary) was unable to meet the system specifications (which are now recognized by the P&T to have been too demanding for the frequency range chosen by them). Significant delays followed the first factory tests, and field modification of non-complying equipment was carried out by the supplier in efforts to meet the required standards, but in the end only the base stations and a small part of the remote stations were found to be useable. This setback has delayed the provision of improved service to isolated users by probably two to three years. 1'

3.04 The project's final total cost is approximately US\$ 32 million equivalent, which is double the appraised estimates. If one considers that

1' Useable equipment is equivalent to A\$ 0.12 million or 24% of contract value. RACAL paid the P&T A\$ 0.13 million as damages. This leaves A\$ 0.25 million (50% of contract price or 1% of the total project's cost) paid out of the loan, to be written off unless equipment can be resold for use under less demanding conditions. This settlement reflects that both P&T and RACAL recognize their share of responsibility in this matter.

the Bougainville expansion was expected at the time of its inclusion to cost an additional US\$ 5.0 million equivalent, then the final total cost is approximately 1.6 times the combined original estimates. The final cost of telephone expansion 1/ was approximately US\$ 4,400 per net main line effectively added into service during the project, or US\$ 3,100 per line if allowance is made for the spare capacity in the new long-distance network. The figures derived from the appraisal cost estimates are US\$ 2,200 and US\$ 1,500 per line, respectively. 2/ Both actual unit costs of telephone expansion are about twice the appraised unit costs.

3.05 The main factors in these substantial increases were the installation of enlarged trunk transmission capacities in the mainland (see PCR, para. 5.02), a doubling of buildings costs (general in the country at that time and brought about by rapid development and prevalence of a contractor's market), higher switching costs due to quantity and design changes, lower than expected exchange fill (70% actual against 79% forecasted), and re-valuation of Australian currency relative to the US dollar.3/

3.06 Both the low exchange fill and the high average costs of expansion are partly explained by the very small sizes of the exchanges (average about 500 lines) brought about by the low number of inhabitants per settlement and the very early stage of demand by nationals. High costs of the long-distance components are partly accounted for by the extreme topographical conditions which posed severe transportation problems and very stringent requirements on equipment reliability and power supply characteristics. Given the effectiveness with which the whole project was handled by the P&T, it is unlikely that much lower costs could have been achieved by managerial or other improvements but this audit lacks sufficient information to adopt a firm position on the matter.

4. Impact of the Project

4.01 In 1968-1973, the period covered by the project, Papua New Guinea's telecommunication services expanded and improved very significantly. Telephone exchange capacity increased at a net cumulative 15% per annum while at the same time 70% of the manual capacity was replaced with new automatic

1/ Telephone cost equals total costs less telex, telegraph and outstation network costs.

2/ The cost of the spare long-distance capacity is calculated on the following assumptions: 70% of bearer and power supply costs, and 30% of channelling and LD switching costs, are allocated to spare capacity. All transport costs are allocated to the LD system, split 70% to bearers and power and 30% to channelling and LD switching. 50% of buildings costs are allocated to the LD system and split 50% to bearers and power and 50% to channelling and LD switching. Consultants costs are allocated proportionally to other costs. Interest during construction is allocated proportionally to loan disbursements. Radio outstations are considered neither as telephone lines nor as long-distance network. Appraised and final numbers of subscriber lines in service as per attached PCR, Annex 1.

3/ Exchange rates varied from US\$ 1.00 = A\$ 0.898 at appraisal to US\$ 1.00 = A\$ 0.673 at completion. Final costs are calculated assuming the average of these (US\$ 1.00 = A\$ 0.79) throughout the period.

equipment, raising to 96% the proportion of automatic capacity. Growth of subscriber lines proceeded at 13% per annum, slightly lagging behind provision of exchange capacity. The waiting list, while not down to zero as expected at appraisal, is a manageable 617 or about equal to the last half year's net connection of new main lines into service, which is good for an emerging system. Telephone density (all stations) in Papua New Guinea increased from approximately 0.6 telephones per 100 inhabitants in 1968 to about 1.1 in 1973. This was comparable to the Philippines (1.0) and Saudi Arabia (1.0), well above many Asian countries (e.g. Afghanistan 0.1, Indonesia 0.2) but below Australia (34.0), Hong Kong (19.4) or Singapore (10.1).

4.02 The main achievement of the project is in the long-distance facilities. In 1968, the local telephone exchanges were very poorly interconnected through few and obsolescent HF radio circuits, and many hours or even more than a day's delay for trunk calls was usual. Today approximately 95% of telephone subscribers have subscriber trunk dialing (STD) throughout Papua New Guinea, part of the traffic to Australia is also STD, and total traffic revenue has grown by a cumulative 52% p.a. in 1970-73. 1/ Completion of the long distance network has given all towns access to high grade international circuits, which were already available at Madang since 1967 through the SEACOM submarine cable but could not be reached. No quantitative economic justification of the project was given at appraisal, but its broad qualitative implications (especially on the modern sectors of the small towns formerly semi-isolated, and on nationwide radio broadcasting) have been well recognized; they are being further studied, along with cost structures and pricing policies, 2/ in a research project under the second loan.3/

5. Institutional Development

5.01 The P&T's engineering and management followed Australian Post Office practices and performance was good, as expected; P&T proved throughout the project to be cooperative and responsible. Weaknesses that emerged when P&T adopted commercial accounting were overcome by appropriate organizational improvements. Other modifications took place in adequate response

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- 1/ No direct information on growth in number of calls is available. The period includes a 40% increase in call-unit charges introduced as STD became available.
- 2/ This includes changes such as charging no connection fees, a policy with which P&T has experimented on a limited basis and now proposes to extend it to the whole of the country.
- 3/ The research project was a Bank initiative and will be carried out by Papua New Guinea institutions supported by Australian consultants under Bank guidance and financing.

to the growing scope of P&T's operations, the need to create increasingly strong regional centers, and to absorb the international, coastal and licensing services which were transferred to P&T in 1973 as part of the move of Papua New Guinea towards internal self-government. Thus, P&T continues to stand as a competent organization with its future mostly well in hand.

5.02 The acceleration of the move towards independence brought to P&T the question of rapidly transferring functions to national hands ("localization"), with associated recruitment and training problems, well before either P&T or Bank had expected. In 1973 the Government required the P&T to reduce its expatriate staff to 513 by the end of that year, to 436 in 1974 and to 371 in 1975. At appraisal in 1967, nationals represented approximately 65% of P&T's total staff but were found almost exclusively at or below the level of skilled workmen (e.g. jointers); there were only 26 national technicians, none in supervisory fields, and no prospect of any among professional staff for many years. Training at the P&T's own center proved remarkably inadequate, in spite of the Bank's optimistic opinion at appraisal; of 30 new trainees recruited in 1970, only 3 passed to the program's second year of study. To deal with localization requirements, the P&T wholly reorganized the Port Moresby training center, and by the project's end it was planning another center to be built in Lae; training results improved and from 1976 the centers will turn out approximately 30 graduates per year at junior and senior technician levels. The University of Technology at Lae started educating professional engineers, and from 1971 a P&T scholarship program was available for good first-year performers to carry them through the remaining three years of university and then bring them into the Department; by 1974 there were 23 such 'cadets' enrolled, with 7 already in their fourth year. In 1974 the University also began a sub-professional course aimed at P&T's needs. The P&T believes that these combined actions are adequate to match the localization requirements, but this is probably true only at junior professional levels and below; heavy dependence on expatriates at the senior levels is likely to continue for a long time.^{1/} A program of selecting promising young school or university graduates, training them to intermediate postgraduate levels abroad, and promoting them rapidly within the P&T with a view to occupying the senior posts as soon as they are equipped with a suitable education background (although without much work experience) has been lacking. Although P&T has doubts whether this would have been the best approach, it appreciates that failure to localize senior executive positions at an early date will extend foreign dependence well into political post-independence times. This is potentially dangerous for functional continuity and efficiency.

5.03 The uncertain prospect for expatriates throughout Papua New Guinea as it approached independence led many of them to leave prematurely in 1973. The situation got worse in 1974 as expatriates were offered substantial

^{1/} By now one national, formerly a traffic officer, has been successfully appointed (Acting) Director of P&T in 1975.

lump-sum compensation if they left the country before the year's end. To the P&T this brought a reduction in expatriates faster than required by localization targets, and thus the problem was how to retain expatriates in sufficient numbers to sustain service and management standards while the new training efforts yield good national replacements. Increasing staff shortages and turnover resulted; progress reporting in 1973 and 1974 was therefore delayed. But the P&T managed to avert any major crises and sufficient functional continuity was generally achieved.

5.04 Another important institutional achievement was the transformation of P&T from a relatively stagnant (though competent) unit run on a non-commercial basis and operating at a considerable financial loss, to a dynamic department providing rapidly expanding and improving services, managed on commercial principles, making a reasonable return on its investments and having a continuously improving financial outlook. Commercial accounting was implemented in time for FY 1969/70 as covenanted, but the audited accounts for that year were submitted nine months late; thereafter the preparation and submission of accounts and financial statements has gradually normalized. All other covenants have been satisfied.

5.05 The financial performance of the P&T has improved substantially. FYs 1968/69 and 1969/70 combined gave a surplus of approximately A\$ 0.5 million instead of a forecasted net loss of A\$ 0.1 million. Compared with the target 8% rate of return to be attained as soon as possible after project completion, a return of 10.5% was actually achieved in FY 1972/73 while the project was still being completed. This improvement comes mainly from the tariff changes implemented in the early stages of the project as agreed at appraisal, and from the larger than expected growth in traffic; the latter has occurred even though P&T's telephone tariffs are now among the world's highest, with US¢ 8 per unit call charge (e.g. for a local call). Incorporation of the lucrative international service (1973), now available throughout the territory, should improve even further P&T's financial outlook.^{1/}

6. Bank Performance

6.01 Mostly the Bank handled the project appropriately and in recognition of the competence of P&T and its consultants. It was successful in orienting the P&T towards commercial accounting and related changes in attitude and management. The Bank was right in foreseeing the rapid improvement of P&T's financial performance that resulted from the material and institution-building aspects of the project, and it has been to Papua New Guinea's definite advantage that the Bank decided to support this very modern project. ^{2/}

^{1/} Further information on P&T's financial performance is given in the PCR, Annexes 3a and 3b. Assets were revalued at June 30, 1969.

^{2/} Bank's financing was additional to the Australian periodic grant to the country.

Nonetheless, the Bank should have taken an interest in the need to steer P&T steadily away from expatriate dependence and towards wholly national hands. Its appreciation of the P&T's training resources was overoptimistic, and did not recognize at appraisal the need to innovate substantially in the recruitment and training practices in order to generate a steady supply of national junior professionals and lower staff levels. At no time had the Bank identified the need for a special effort of early recruitment, graduate education and rapid promotion aimed at transferring all senior posts to nationals as early as possible, although from the start it was explicitly aware of Australia's actions preparing Papua New Guinea for self-government and eventual political independence.

6.02 A minor matter where the Bank could have done better is on the periodic reporting requirements it set up, which were accepted and generally followed by P&T. It is unclear what the Bank meant to do with the information it asked for. Repetitive information (e.g. description of the project, copied identically quarter after quarter) could have been omitted after the first report except to inform of changes. In contrast, description of progress was too brief and sketchy and did not allow a clear understanding of the main events without resorting to additional sources of information; for instance, it is not possible to find out from the reports what went wrong with the RACAL contract or how the conflict was settled and why so (furthermore, a review of all Bank files, and discussion with Bank staff dealing with the project, was also insufficient to clarify the issue satisfactorily).

7. Conclusions

7.01 Overall this was a very successful project. Most physical achievements went beyond initial expectations, and the impressive difficulties posed by the terrain were satisfactorily overcome. Except for delays in submitting initial accounts and financial statements, all loan covenants were adhered to. As main outcome of the project, the previously isolated pockets of telephone service are now well interconnected by an efficient and modern network which, additionally, gives access to all main towns to high quality international circuits. Unit costs of telephone expansion were actually double the appraised estimates, reflecting both internal market conditions and international monetary and pricing situations. Tariffs are now among the highest in the world but, in spite of this, traffic has grown much faster than forecasted and connections' demand is building up vigorously. The P&T has become a dynamic, rapidly expanding organization managed in commercial terms, obtaining a reasonable return on capital, and presenting a favorable financial outlook. The economic significance of all these changes must be considerable, but has not yet been assessed.

7.02 The Bank's impact through this project (the first ever financed by the World Bank Group in Papua New Guinea) has been mainly related to the P&T's adoption of commercial accounting and related changes in management and attitudes. The Bank's performance was satisfactory, except mainly for its lack of early concern and action on the need to steer P&T away

from expatriate dependence and into national hands at all levels, and its overoptimistic appraisal assessment of then-existing training programs. Although P&T has begun supporting selected students at university (undergraduate) level, a specific program for "localization" of senior posts is apparently not yet under way and (as has occurred in other parts of the world) dependence on senior expatriates will continue well into post-independence times constituting a potential danger to the P&T's functional continuity and efficiency.

INTERNATIONAL BANK FOR RECONSTRUCTION AND DEVELOPMENT

INTERNATIONAL DEVELOPMENT ASSOCIATION

PROJECT COMPLETION REPORT

PAPUA NEW GUINEA FIRST TELECOMMUNICATIONS PROJECT (Loan 546-PNG)

Loan 546-PNG has been fully drawn down and closed. The following Completion Report is based on a mission to Papua New Guinea in May 1974.

1. Project Data

Borrower : Administration of Papua New Guinea
Beneficiary : The Department of Posts and Telegraphs (P&T)
Guarantor : The Commonwealth of Australia
Loan amount : US\$7.0 million
Date loan signed : June 28, 1968
Effective date : November 15, 1968
Closing date : Original - June 30, 1973
 Final - March 31, 1974
Period of grace : Four years
Term of loan : 20 years
Interest rate : ~~6 1/4~~ per annum
Commitment charge : 3/4 of 1% per annum
Amortization : November 15, 1973 - November 15, 1988
Exchange rate : Appraisal: US\$ = \$A 0.898
 Present : US\$ = \$A 0.673
Appraisal report : TO-627a, June 10, 1968
Fiscal year : July 1 - June 30.
Joint financing : None

2. Project Description

2.01 The project as defined in the Loan Documents consisted of P&T's development program for fiscal years 1969-1972 and included:

- (a) Approximately 10,000 lines of local automatic exchange equipment with corresponding buildings and subscribers' installations;
- (b) establishment of a modern long distance network with a microwave system interconnecting principal centers on the main island and associated VHF and HF radio spur routes to secondary centers and to the other important islands; and
- (c) extension of telex and telegraph facilities.

In 1969 the project was expanded, after consultation with the Bank, to provide an additional 2,000 direct exchange lines by three new telephone exchanges on Bougainville Island, the site of a new copper mining operation, and to substitute for the HF radio links originally planned higher-capacity tropospheric scatter and VHF radio systems to connect Bougainville, New Britain and the mainland. The project was expected to be completed by June 30, 1972 with various components of it being brought into service progressively during FYs 1970, 1971 and 1972.

3. Objective and Justification

3.01 The mainland of Papua New Guinea has extremely rugged terrain and roads are difficult and expensive to build. Even today the capital, Port Moresby, has no land transportation links to any other of the main centers and the road connecting Lae and the Highlands is the only major link in the country. Islands form the rest of the country and these contain two of the major towns, Rabaul and Kieta, and the country's major mineral resource, the Bougainville copper mines; adding further to the country's difficult communications problem. In 1968 the isolated centers of population were served by small local telephone networks of reasonable quality but the long distance network was rudimentary; totaling 13 HF radio circuits and 5 very unreliable VHF radio circuits. Several hours' delay in placing a call was normal and delays exceeding one day were common.

3.02 The principal aim of the project, therefore, was to provide the basis of a modern long distance service to support the country's further economic development and to facilitate the forming of a nation from the many separate ethnic and tribal groups involved. These long distance routes were also to make available to the main centers the high quality submarine cable connection to the world network which was already available at Madang. Local service development was to keep waiting lists to acceptable sizes and the basis for a modern telex and telegraph system was to be established as a further aid to national development.

4. Construction Schedule

4.01 Performance of the project has been very good and completion dates for the various components of the project, compared to the estimated completion date for the whole project of June 30, 1972, were

- (i) 10,000 lines of local switching equipment - June 30, 1972
additional 2,000 lines of the enlarged project - November 30, 1973

(ii) Provision of long distance routes and introduction of subscriber trunk dialing

Lae	- Wau and Bulolo	}	June 1971
Lae	- Rabaul/Kokopo/Toleap/Keravat		
Rabaul	- Arawa/Kieta/Panguna	}	January 1972
Lae	- Finschhafen		
Lae	- Goroka/Kundiawa/Kainantu	}	June/July 1972
Lae	- Port Moresby/Popondetta/Kerema		
Goroka	- Mount Hagen/Mendi	}	
Goroka	- Madang		
Goroka	- Wewak	}	
Wewak	- Vanimo)	November 1972

(iii) Improvement of telegraph services - progressively with improvement of the long distance network.

4.02 The major objectives of the project were achieved close to schedule.

4.03 The one item in the project which was unsuccessful was the scheme to introduce an advanced HF radio outstation service. Partly due to local HF radio propagation conditions the contractor, RACAL, was unable to meet the specified performance requirements. P&T kept the Bank informed of its protracted negotiations with the company on the failure of the outstation units to provide adequate service and of the selective calling system to perform properly. These have culminated in termination of the contract. Of the \$A 0.5 million contract, base station equipment worth approximately \$A 120,000 was acceptable to P&T and can be used but the remaining \$A 380,000 worth of terminal equipment was not suitable for installation in remote locations. After negotiations, Racal contributed \$A 130,000 as damages to P&T. P&T is currently attempting to sell the equipment to the Australian Post Office which has similar equipment in service under less exacting conditions. If this is successful, P&T could halve its present prospective loss of \$A 0.25 million.

4.04 Beside the monetary loss, the failure has slowed the rate of extending service to remote customers. P&T has a current contract for VHF radio outstation equipment which will not be subject to disturbance from high isokeraunic levels and will also seek further bids for HF radio-based systems in other areas but it is proceeding cautiously and towards a less ambitious system in the latter case than was attempted through the Racal contract.

5. Project Cost Estimates

5.01 At the time of appraisal, the project was estimated to cost \$A 14.5 million and the extension agreed in 1969 to improve service to New Britain and Bougainville Islands increased the estimate by a further \$A 3.7

million, bringing the original estimate for the total project to \$A 18.2 million. The actual cost for the enlarged project was \$A 24.7 million according to P&T's cost recording system. However, such a recording system involves allocation of common costs both within the project and between the project and ongoing works. There is, therefore, some uncertainty associated with the "actual" costs and the figures given above must be viewed in this light. The fact that the Australian dollar appreciated relative to the US dollar by about 25% over the project period also affects the comparability of the estimates and recorded costs.

5.02 Annex 2 shows a detailed break-up of the recorded expenditures and the original estimates for the expanded project. It indicates that main cost differences arose as follows:

- (a) Switching equipment costs were substantially higher due to the combined effect of price rises and a need for more equipment due to higher than expected traffic levels.
- (b) Multiplex costs were \$A 1.5 million higher as 1141 channels were installed to cater for the traffic growth compared to the approximate 200 channels originally proposed.
- (c) The New Britain/Bougainville project cost approximately \$A 5.6 million rather than the \$A 3.7 million estimated.

6. Program Achievements

6.01 The 1969-72 program which was the project financed by Loan 546-PNG has transformed the telecommunications system in Papua New Guinea from one consisting of poorly interconnected pockets of local service to a modern nationwide automatic system interconnecting the main centers of population and giving them high quality access to the rest of the world. It will greatly aid further national development and will be an invaluable tool in the nation-building which will follow independence.

6.02 The excellent progress made in each area of service is indicated below:

- (a) Long Distance Service - The manual service based on 18 poor quality radio circuits was replaced by an STD service based on a network which, at the date of this report, had more than 500 working high quality circuits in service and adequate capacity for further development.
- (b) International Service - The long distance network development also provided access from all main centers of population to the SEACOM submarine cable which has been available at Madang since 1967. Good quality international services were made available which have since been developed to include international subscriber dialing to Australia and **automatic telex to many countries**. The number of international circuits in use has increased from 6 in 1968 to 120 at the date of this report.

- (c) Local Telephone Service - During the project period the number of direct exchange lines connected to the system increased from 7,700 to 13,300, an average growth rate of approximately 14% per annum.
- (d) Telegraph Services - Both the public telegraph service and the telex service were progressively improved over the project period through the great improvement made in the number and quality of telegraph circuits. It provided the basis of the automatic telex and gentex systems recently placed in service.
- (e) Provision of Program Lines - Although a minor part of the project, the network of high quality (10 KHz) program lines that has been provided to interconnect the national and regional medium frequency radio broadcast transmitter is regarded as nationally important. National programs can now be mixed with local programs to give an expanded broadcast service.

7. Consultants

7.01 The United Kingdom firm, Preece, Cardew & Rider, has acted as technical consultants throughout the project, assisting with network planning, with preparation of specifications and evaluation of bids and with the improvement of maintenance control and reporting procedures. P&T is quite satisfied with its performance.

7.02 The Australian firm, W. D. Scott and Company, assisted with the introduction of a commercial accounting system. Their performance, too, has been satisfactory.

8. Organization and Management

8.01 P&T's organization has operated effectively and its management and technical competence have been good.

8.02 The Bank's requirement that commercial accounting be introduced with separate accounts maintained for its postal and telecommunications operations using the guidance of the consultants, W. D. Scott and Company, in its implementation, has contributed greatly to development of P&T as a business. The desired financial features were given a legal basis by the passing by the House of Assembly in Papua New Guinea of the "Posts and Telegraphs (Finance) Ordinance 1970" which enables P&T to function, from a financial point of view, virtually as a statutory corporation even though it remains a Government Department.

9. Financial Results

9.01 The satisfactory financial performance of P&T from the introduction of commercial accounting in FY 1970 through FY 1973 is summarized in Annexes 3A and 3B.

9.02 Annex 3A compares actual income statements for the telecommunications service with the appraisal forecasts and shows that P&T has achieved the target set in Section 5.08 of the Loan Agreement. This was to raise sufficient revenue to cover operating expenses and to produce a reasonable return on average net fixed assets which would rise to a level of 8% per annum as soon as practicable after completion of the project. The rate of return in FY 1973, the year after project completion, was in fact 10.5%.

9.03 The good financial result is due principally to the community's response to the introduction of high quality long distance and international service progressively through FY 1972 and early FY 1973. Call revenues rose spectacularly as shown below:

<u>FY 1970</u>	<u>FY 1971</u>	<u>FY 1972</u>	<u>FY 1973</u>
\$A 1.50 m	\$A 1.79 m	\$A 2.72 m	\$A 5.28 m

9.04 Annex 3B shows summarized balance sheets and statements of sources and applications of funds for posts and telecommunications for the project years.

10. Contribution to National Development

10.01 Papua New Guinea, which is currently expected to gain full independence on December 1, 1974, has many special difficulties to overcome in becoming a viable nation. It is composed of islands with extremely rugged terrain. Physical communication is heavily dependent on expensive sea and air transportation. The main centers of population are widely separated. Its population includes a number of ethnic and many tribal groupings and they cover the range from highly educated to some of the most primitive people on earth.

10.02 In this environment the telecommunications system has particular importance for economic and social development. The Bank-financed project has given the new country a first-class system for their present needs which has capacity to grow with the country. The surge of traffic discussed in paragraph 9.03 is indicative of the needs it is commencing to fulfill.

10.03 The extreme environment and the fact that there has been a sudden provision of a nationwide automatic telecommunications network to replace

a very minimal long distance network appears to offer a special opportunity for study of the contribution to economic and social development of telecommunications and the current Bank economic studies in this field might be extended to Papua New Guinea.

11. Film on the Project

11.01 P&T has presented to the Bank an excellent half-hour 16 mm color film titled "Tok Tok" which covers the project financed by Loan 546-PNG. It shows the communications problems and the achievements much more effectively than can be done by the words of this report. It is recommended that those concerned with reviewing this completion report should view it.

Public Utilities Department
Central Projects Staff
July 1974

PAPUA NEW GUINEADEPARTMENT OF POSTS AND TELEGRAPHSLOAN 546-PNG

Statistical Summary of Achievements
 (Project Period June 30, 1968 - June 30, 1972)

<u>Local Telephone Service</u>	<u>6/30/68</u>	<u>6/30/72</u>	
		<u>Appraisal Forecast</u>	<u>Achievement</u>
Exchange Capacity			
Automatic	8,150	18,000	18,530
Manual	2,330	430	1,080
Total	10,480	18,430	19,610
Direct Exchange Lines	7,764	14,500	13,315
Telephones	14,886	27,000	26,120
Radio Outstations	1,448	*	1,865
Waiting List	875	0	1,029
Exchange Occupancy	74%	79%	68%
No. of National Long Distance Circuits	18	189	237
No. of International Circuits	6	*	40
Telex Customers	30	*	123

* Not quantified at appraisal.

June 25, 1974

PAPUA NEW GUINEA

DEPARTMENT OF POSTS AND TELEGRAPHS

LOAN 546-PNG

Project Costs (Enlarged Project)

(in thousands of dollars)

	Original Estimate		Recorded Costs	
	<u>546-TH (US\$)</u>	<u>Local (\$A)*</u>	<u>546-TH (US\$)</u>	<u>Local (\$A)*</u>
A. <u>Local Telephone Service</u>				
Switching equipment	-	1,526	-	3,099
Outside plant and telephones	1,048	3,514	1,612.8	4,761
Radio outstations	519	556	492.5	746
B. <u>Long Distance</u>				
Switching equipment	-	104	-	503
Radio bearers	3,399	2,280	2,278.3	3,689
Channeling equipment	584	1,791	1,251.9	3,078
Power equipment	450	-	376.2	435
C. <u>Telegraph & Miscellaneous</u>				
Telegraph and telex	-	248	-	614
Transport, tools and mechanical aids	-	232	-	517
Consultants	300	200	457.0	-
Buildings	-	1,460	-	2,592
D. Interest during construction	700	-	531.3	-
E. Expansion of project to improve service to Bougainville and New Britain (distributed over items A, B & C)	-	(3,700)*	-	(5,600)*
TOTAL	<u>US\$7,000</u>	<u>\$A 11,911</u>	<u>US\$7,000.0</u>	<u>\$A 20,034</u>

* Local costs include development funds provided by the Australian Government.

PAPUA NEW GUINEA
DEPARTMENT OF POSTS AND TELEGRAPHS
LOAN 546-PNG

Telecommunications Service Income Statement Summaries - FY 1970

(Introduction of Commercial Accounting) through FY 1973

(in thousands of Australian dollars)

Year ending:	<u>June 30, 1970</u>		<u>June 30, 1971</u>		<u>June 30, 1972</u>		<u>June 30, 1973</u>	
	<u>Appraisal Estimate</u>	<u>Actual</u>	<u>Appraisal Estimate</u>	<u>Actual</u>	<u>Appraisal Estimate</u>	<u>Actual</u>	<u>Appraisal Estimate</u>	<u>Actual</u>
Net operating revenues	3,180	3,443	3,891	4,374	4,747	5,690	5,554	8,804
Total operating expenses	3,035	3,522	3,360	3,959	3,749	5,480	4,099	6,233
Net operating income	145	(79)	531	415	998	210	1,455	2,571
Rate of return	1.5%	-	4.3%	4.1%	6.7%	1.3%	8.6%	10.5%
Operating ratio	95%	102%	86%	91%	79%	96%	74%	71%
Average net plant in service	9,710	7,807	12,416	10,122	14,886	16,629	16,908	24,513

June 26, 1974

PAPUA NEW GUINEADEPARTMENT OF POSTS AND TELEGRAPHSLOAN 546-PNG

Summary of Actual Consolidated Balance Sheets
for
Posts and Telecommunications FY 1970 through FY 1973
(in thousands of Australian dollars)

Year ending June 30:	<u>1970</u>	<u>1971</u>	<u>1972</u>	<u>1973</u>
Net current assets	2,882	4,633	6,344	7,480
Total assets	13,168	22,222	31,010	37,683
Total equity	11,338	19,119	24,363	29,556
Total long-term debt	559	1,482	3,643	5,901
Total liabilities	13,168	22,222	31,010	37,683
Debt/equity ratio	5/95	7/93	13/87	17/83
times current liabilities covered by current assets	3.5	4.4	2.6	5.0

Sources and Application of Funds

Internal cash generation	769	1,635	1,828	4,161
Total borrowings	496	923	2,161	2,368
Government capital investment	2,351	6,990	4,689	2,827
Total sources of funds	<u>3,616</u>	<u>9,548</u>	<u>8,678</u>	<u>9,356</u>
Construction program	3,339	7,953	8,186	6,951
Debt service	51	85	163	329
Increase (decrease) in working capital	226	1,510	329	2,076
Total application of funds	<u>3,616</u>	<u>9,548</u>	<u>8,678</u>	<u>9,356</u>
times debt service covered by internal cash generation	15	19	11	12.6

June 26, 1974